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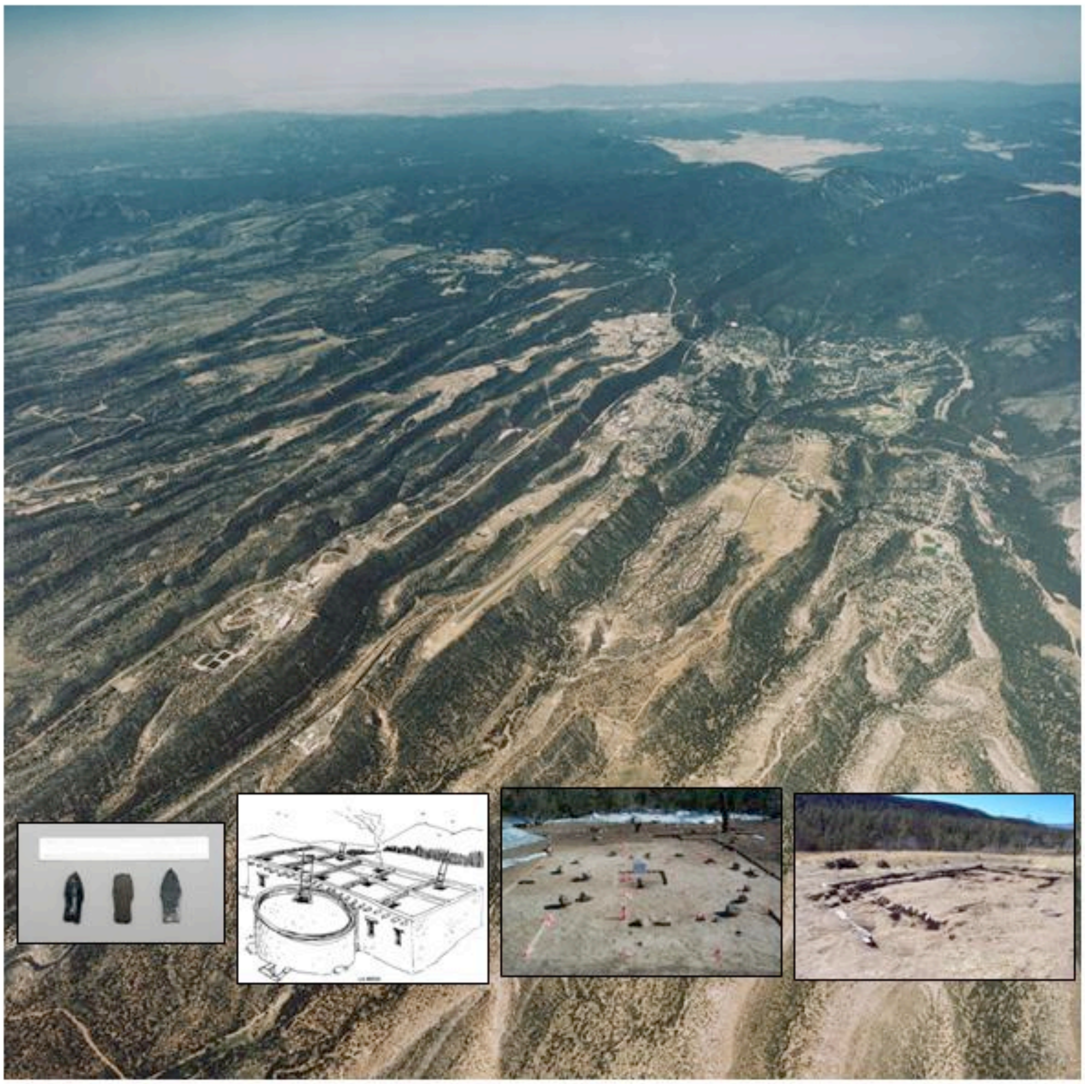
THE LAND CONVEYANCE AND TRANSFER DATA RECOVERY PROJECT: 7000 YEARS OF LAND USE ON THE PAJARITO PLATEAU



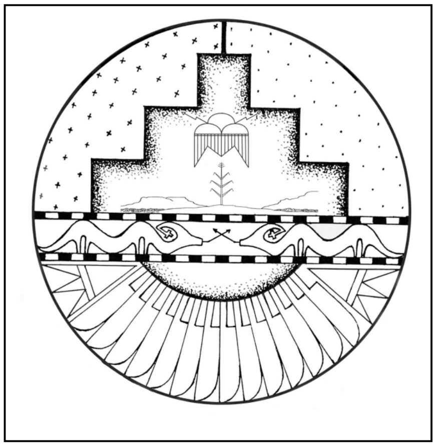
VOLUME 1: BASELINE STUDIES

Edited by Bradley J. Vierra and Kari M. Schmidt

Ecology and Air Quality Group, Los Alamos National Laboratory

June 2008

Edited by Hector Hinojosa, Group IRM-CAS



Artistic representation of the Pajarito Plateau; drawn by Aaron Gonzales.

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Title

THE LAND CONVEYANCE AND TRANSFER DATA RECOVERY PROJECT: 7000 YEARS OF LAND USE ON THE PAJARITO PLATEAU

Volume 1: Baseline Studies

Cultural Resources Report No. 273

Prepared for

U.S. Department of Energy
National Nuclear Security Administration
Los Alamos Site Office

Prepared by

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Los Alamos, New Mexico 87545

June 2008

This report is dedicated to the memory of Charlie Steen.
Photo courtesy of Los Alamos National Laboratory, IR-74-07-338.

Contents

Chapter 1: The Land Conveyance and Transfer Data Recovery Project: 7000 Years of Land Use on the Pajarito Plateau, by Bradley J. Vierra and Steven R. Hoagland ... 1

Chapter 2: The Geology of Los Alamos National Laboratory as a Backdrop for Archaeological Studies on the Pajarito Plateau, by David E. Broxton, Fraser Goff, and Kenneth Wohletz ... 7
- Introduction ... 7
- General Geologic Setting ... 7
- Stratigraphy ... 10
- Geologic Structure ... 30

Chapter 3: Overview of Pajarito Plateau Geomorphology, by Steven L. Reneau and Paul G. Drakos ... 31
- Introduction ... 31
- Geomorphic Processes ... 31
- Nomenclature for Geologic Deposits, Soils, and Surface Processes ... 33
- Divisions of Geologic Time ... 35
- Soil Development and Geomorphic History ... 41
- Geomorphic Setting of Land Transfer Parcels ... 42

Chapter 4: Ecosystems of the Pajarito Plateau and East Jemez Mountains: Linking Land and People, by Teralene S. Foxx ... 45
- Introduction ... 45
- Los Alamos National Laboratory and the Pajarito Plateau ... 45
- Plants and Animals as Indicators of Past Land Use and Change ... 64
- Methods for Plant Surveys ... 77

Chapter 5: Paleoenvironments of the Southern Rocky Mountains of Colorado and New Mexico: A Summary from Lake and Bog Sediments, by R. Scott Anderson ... 81
- Introduction ... 81
- New Records from the Jemez Mountains ... 83
- Summary ... 96

Chapter 6: Modern Pollen Analog Study, Los Alamos National Laboratory, by Susan J. Smith ... 97
- Introduction ... 97
- Modern Environment ... 97
- Pollen Stations ... 108
- Methods ... 111
- Results ... 113
- Conclusions ... 121

Chapter 7: The Current Status of Archaeological Dendrochronology and Dendroclimatology of the Pajarito Plateau, New Mexico, by Ronald H. Towner 123
Introduction........ 123
A Brief History of Dendrochronology 124
Methods and Techniques of Dendrochronology........ 126
Previous Archaeological Dendrochronology on the Pajarito Plateau........ 136
A Summary of Dendroarchaeological Data from the Pajarito Plateau 168
Dendroclimatology and Past Environmental Variability in the Pajarito Plateau Area ... 173
Recommendations and Conclusions 179
Conclusions........ 184

Chapter 8: Dendroclimatic Reconstructions in the Northern Rio Grande, by Ronald H. Towner and Mathew W. Salzer 185
Introduction........ 185
Background and Previous Research........ 185
The Pajarito Dendroclimatic Research Design........ 189
Methods and Procedures........ 190
Results 202
Comparing the Jemez and Chama Reconstructions: Spatial Differences in Pajarito Area Precipitation 218
Discussion........ 237

Chapter 9: A Context for the Interpretation of Archaeomagnetic Dating Results from the Pajarito Plateau, by Eric Blinman and Jeffrey Royce Cox 239
Introduction........ 239
Principles of Archaeomagnetic Dating 240
Sampling and Measurement Practice........ 241
Curve Performance Evaluation........ 248
Archaeomagnetic Results from the Northern Rio Grande Region 288
Conclusions........ 298

Chapter 10: Archaeological Obsidian and Secondary Depositional Effects in the Jemez Mountains and the Sierra de los Valles, Northern New Mexico, by M. Steven Shackley........ 299
Introduction........ 299
Bedrock and Alluvial Deposition of the Sierra de los Valles........ 301
Secondary Deposition and Prehistoric Procurement in Northern New Mexico........ 302
Collection Localities 305
Magmatic Relationship between the Glass Sources 315
The LANL Study 316
The Dacite Study........ 320

Chapter 11: Obsidian Hydration Dating by Infared Spectroscopy, by Christopher M. Stevenson........ 325
Introduction........ 325
Previous Obsidian Hydration Studies in New Mexico........ 325

Conclusions.. 337

Chapter 12: Luminescence Dating in Archaeology, by James Feathers....................... 341
Introduction.. 341
Physical Background.. 341
Radioactivity... 344
Measurements... 345
Dating Ceramics and Lithics 350
Dating Sediments.. 351
Sample Collection... 352

References Cited .... Vol. 4

Appendices .... Vol. 4

List of Figures

Figure 1.1. Location of Los Alamos National Laboratory (LANL) 2

Figure 1.2. The location of the Land Conveyance and Transfer (C&T) Project tracts........ 3

Figure 2.1. Regional setting of the Pajarito Plateau 8

Figure 2.2. Geologic and geographic features of the Pajarito Plateau and surrounding areas 9

Figure 2.3. East-west cross-section showing stratigraphic relations for geologic units of the Pajarito Plateau 10

Figure 2.4. Stratigraphic nomenclature for major rock units of the Jemez volcanic field... 11

Figure 2.5. Schematic cross-section showing interfingering stratigraphic relationship across the Pajarito Plateau.. 12

Figure 2.6. Photos of the Tesuque formation of the Santa Fe Group 13

Figure 2.7. Photos of the Puye formation... 15

Figure 2.8. Photos of the Totavi Lentil 17

Figure 2.9. The 2- to 3-million-year-old Cerros del Rio basalt flow................................. 19

Figure 2.10. Photos of the Tshirege (upper) and Otowi (lower) Members........................ 21

Figure 2.11. Plots of Nd versus Rb, Sr, Y, and Zr for whole rock samples collected from the source domes of Valle Grande Member of the Valles Rhyolite in the Valles Caldera 25

Figure 2.12. Plots of Nd versus Rb, Sr, Y, and Zr for Cerro del Medio tephras collected on the Pajarito Plateau........ 26

Figure 2.13. Locations where post-Bandelier fall deposits and reworked tephras have been recently recognized on the Pajarito Plateau 27

Figure 2.14. Cerro del Medio tephra exposed in north parking lot of Caballo Peak Apartments and along Canyon Road 29

Figure 3.1. Schematic map of New Mexico showing the approximate limits of various physiographic provinces and geographic features 32

Figure 3.2. Digital elevation map of Pajarito Plateau showing land transfer parcels........ 33

Figure 4.1. Established vegetation types of the Los Alamos area in relation to the rest of New Mexico 46

Figure 4.2. Land cover map for LANL and vicinity before the Cerro Grande fire 50

Figure 4.3. Cover types by elevation 51

Figure 4.4. Intermittent stream in lower Ancho Canyon 52

Figure 4.5. Pajarito stream below Pajarito Springs in White Rock Canyon 52

Figure 4.6. Sedge/willow marsh in Pajarito Canyon 53

Figure 4.7. Perennial stream below Ancho Springs in White Rock Canyon 53

Figure 4.8. The Rio Grande at the mouth of Ancho Canyon 54

Figure 4.9. The Rio Grande with native willow along the bank 54

Figure 4.10. Tuffaceous cliffs in Ancho Canyon 55

Figure 4.11. Basaltic cliffs in Ancho Canyon 55

Figure 4.12. Juniper savanna in White Rock Canyon 56

Figure 4.13. Piñon-juniper woodland........ 57

Figure 4.14. Open ponderosa pine forest ... 57

Figure 4.15. Closed ponderosa pine forest ... 58

Figure 4.16. Mixed conifer forest with Douglas fir and white fir ... 59

Figure 4.17. Engelmann spruce and white fir dominate high elevations ... 59

Figure 4.18. Aspen groves are found throughout higher elevations indicating past fire ... 60

Figure 4.19. Sagebrush (*Artemisia tridentata*) shrubland in White Rock Canyon ... 61

Figure 4.20. Oak shrubland and grassland from the La Mesa fire ... 61

Figure 4.21. Subalpine grasslands on mountain peaks ... 62

Figure 5.1. Sampled lake and bog sites in the southern Rockies ... 84

Figure 5.2. Pollen types at the Alto Alamo Bog, New Mexico ... 86

Figure 5.3. Charcoal stratigraphy from the Alto Alamo Bog, New Mexico ... 87

Figure 5.4. Pollen cores from the Valle Santa Rosa Bog, New Mexico ... 89

Figure 5.5. The charcoal record from the Valle Santa Rosa Bog, New Mexico ... 90

Figure 6.1. Elevational range of main vegetation types (Balice et al. 1997:13) ... 98

Figure 6.2. Modern pollen analog summary percentage diagram ... 116

Figure 7.1. Schematic of conifer tree rings ... 127

Figure 7.2. Schematic of chronology building with tree rings ... 128

Figure 7.3. Photograph of A. E. Douglass collecting a live-tree core near Pinedale, Arizona ... 130

Figure 7.4. Map of the Pajarito Plateau and project area ... 137

Figure 7.5. Stem-and-leaf plot of dates from Puyé (underline indicates cutting or near cutting date) ... 144

Figure 7.6. Stem-and-leaf plot of dates from Tsirege (underline indicates cutting or near cutting date) ... 145

Figure 7.7. Stem-and-leaf plot of dates from Fulton's 190 (underline indicates cutting or

near cutting date) 146

Figure 7.8. Stem-and-leaf plot of dates from Tyuonyi (underline indicates cutting or near cutting date) 148

Figure 7.9. Stem-and-leaf plot of dates from Pueblo del Encierro (underline indicates cutting or near cutting date) 154

Figure 7.10. Stem-and-leaf plot of tree-ring dates from Feature 152 at Pueblo del Encierro (underline indicates cutting or near cutting date) 155

Figure 7.11. Stem-and-leaf plot of tree-ring dates from Feature 186, Pueblo del Encierro. 155

Figure 7.12. Stem-and-leaf plot of tree-ring dates from Feature 128, Pueblo del Encierro (underline indicates cutting or near cutting date) 156

Figure 7.13. Stem-and-leaf plot of dates from the Alfred Herrera Site (underline indicates cutting date) 158

Figure 7.14. Stem-and-leaf plot of dates from the North Bank Site (underline indicates cutting date) 160

Figure 7.15. Stem-and-leaf plot of dates from the corral at the Romero Homestead (underline indicates cutting or near cutting date) 166

Figure 7.16. Stem-and-leaf plot of dates from the hog pen at the Romero Homestead (underline indicates cutting or near cutting date) 166

Figure 7.17. Stem-and-leaf plot of dates from the cabin at the Romero Homestead (underline indicates cutting or near cutting date) 167

Figure 7.18. Stem-and-leaf plot of all Pajarito Plateau tree-ring dates (underline indicates cutting or near cutting date) 170

Figure 7.19. Stem-and-leaf plot of all Pajarito Plateau cutting and near cutting dates........ 173

Figure 7.20. Isopleth of growth anomalies in the 960s 175

Figure 7.21. Isopleth of growth anomalies in the 1420s 176

Figure 7.22. Map showing principal components of southwestern precipitation................ 178

Figure 7.23. Laboratory of Tree-Ring Research sample submission form 180

Figure 7.24. Laboratory of Tree-Ring Research tree-ring sample inventory...................... 181

Figure 7.25. An axe-cut juniper limb in the Rio Puerco Valley. 182

Figure 8.1. Map of the project area 186

Figure 8.2. Photo of project area 187

Figure 8.3. Photo of project area 188

Figure 8.4. Photo of sampling with increment borer 191

Figure 8.5. Map of live-tree sample locations 193

Figure 8.6. Skeleton plotting technique 194

Figure 8.7. Chronology building process 195

Figure 8.8. Measuring tree rings 196

Figure 8.9. Correlation of archaeological and living tree samples from Chama 199

Figure 8.10. Correlation of archaeological and living tree samples from the Jemez 200

Figure 8.11. Calibration period comparison of Chama tree growth and historical data 201

Figure 8.12. Calibration period comparison of Jemez tree growth and historical data 201

Figure 8.13. Annual and splined precipitation graph for the Jemez chronology 203

Figure 8.14. Annual and splined precipitation graph for the Chama chronology 214

Figure 8.15. Annual precipitation values for both Jemez and Chama chronologies 219

Figure 8.16. Splined precipitation values for both Jemez and Chama chronologies 220

Figure 8.17. Graph of precipitation value absolute differences, both chronologies 220

Figure 8.18. Z-scores of both chronologies 224

Figure 8.19. Jemez box-and-whisker plot of Bandelier chronology (non-overlapping) 227

Figure 8.20. Jemez box-and-whisker plot of Bandelier chronology (overlapping) 229

Figure 8.21. Chama box-and-whisker plot of Bandelier chronology (non-overlapping) 230

Figure 8.22. Chama box-and-whisker plot of Bandelier chronology (overlapping) 231

Figure 8.23. Orcutt's quadrats of precipitation variability 232

Figure 8.24. Jemez chronology quadrats of precipitation variability 233

Figure 8.25. Chama chronology quadrats of precipitation variability 233

Figure 9.1. Current archaeomagnetic dating curves for the Southwestern United States.... 247

Figure 9.2. AD 950 to 1125 and AD 1000 to 1125 segments of the SWCV2000 and Wolfman VGP curves 250

Figure 9.3. Archaeomagnetic result centerpoints from the DuBois database that could date to the AD 950 to 1125 period.. 251

Figure 9.4. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 950 to 1125 period, contrasted with the SWCV2000 VGP curve .. 252

Figure 9.5. Plot of residual distances from confidently attributed AD 950 to 1125 sample centerpoints and nearest points along the AD 950 to 1125 segment of SWCV2000.. 253

Figure 9.6. The AD 1000 to 1125 segment of the Wolfman Curve and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 950 to 1125 period 254

Figure 9.7. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 950 to 1125 period, contrasted with the Wolfman VGP Curve from the AD 1000 to 1125 period.. 255

Figure 9.8. Plots of residual distances from confidently attributed AD 950 to 1125 sample centerpoints and nearest points along the AD 1000 to 1125 segment of the Wolfman Curve 256

Figure 9.9. AD 1125 to 1225 segments of the SWCV2000 and Wolfman VGP curves 257

Figure 9.10. SWCV2000 and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1125 to 1225 period 258

Figure 9.11. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1125 to 1225 period, contrasted with the SWCV2000 VGP curve.. 259

Figure 9.12. Plot of residual distances from confidently attributed AD 1125 to 1225 sample centerpoints and nearest points along the AD 1125 to 1225 segment of SWCV2000.. 260

Figure 9.13. The AD 1125 to 1225 segment of the Wolfman Curve and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1125 to 1225 period 261

Figure 9.14. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1125 to 1225 period, contrasted with the Wolfman VGP curve for the AD 1125 to 1225 period........ 263

Figure 9.15. Plot of residual distances from confidently attributed AD 1125 to 1225 sample centerpoints and nearest points along the AD 1125 to 1225 segment of the Wolfman Curve 264

Figure 9.16. AD 1225 to 1300 segments of the SWCV2000 and Wolfman VGP curves ... 265

Figure 9.17. SWCV2000 and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1225 to 1300 period 266

Figure 9.18. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1225 to 1300 period, contrasted with the SWCV2000 VGP curve........ 267

Figure 9.19. Plot of residual distances from confidently attributed AD 1225 to 1300 sample centerpoints and nearest points along the AD 1225 to 1300 segment of SWCV2000........ 268

Figure 9.20. The AD 1225 to 1300 segment of the Wolfman Curve and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1225 to 1300 period 269

Figure 9.21. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1225 to 1300 period, contrasted with the Wolfman VGP curve for the AD 1225 to 1300 period........ 271

Figure 9.22. Plot of residual distances from confidently attributed AD 1225 to 1300 sample centerpoints and nearest points along the AD 1225 to 1300 segment of the Wolfman Curve 272

Figure 9.23. AD 1300 to 1400 segments of the SWCV2000 and Wolfman VGP curves ... 273

Figure 9.24. SWCV2000 and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1300 to 1400 period 274

Figure 9.25. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1300 to 1400 period, contrasted with the SWCV2000 VGP curve........ 275

Figure 9.26. Plot of residual distances from confidently attributed AD 1300 to 1400 sample centerpoints and nearest points along the AD 1300 to 1400 segment of SWCV2000 276

Figure 9.27. The AD 1300 to 1400 segment of the Wolfman Curve and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1300 to 1400 period 277

Figure 9.28. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1300 to 1400 period, contrasted with the Wolfman VGP curve for the AD 1300 to 1400 period 279

Figure 9.29. Plot of residual distances from confidently attributed AD 1300 to 1400 sample centerpoints and nearest points along the AD 1300 to 1400 segment of the Wolfman Curve 280

Figure 9.30. AD 1400 to 1500 segments of the SWCV2000 and Wolfman VGP curves ... 281

Figure 9.31. SWCV2000 and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1400 to 1500 period 282

Figure 9.32. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1400 to 1500 period, contrasted with the SWCV2000 VGP curve 283

Figure 9.33. Plot of residual distances from confidently attributed AD 1400 to 1500 sample centerpoints and nearest points along the AD 1400 to 1500 segment of SWCV 2000 284

Figure 9.34. The AD 1400 to 1500 segment of the Wolfman Curve and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1300 to 1400 period 285

Figure 9.35. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1400 to 1500 period, contrasted with the Wolfman VP curve for the AD 1400 to 1500 period 286

Figure 9.36. Plot of residual distances from confidently attributed AD 1300 to 1400 sample centerpoints and nearest points along the AD 1300 to 1400 segment of the Wolfman Curve 287

Figure 10.1. Topographical rendering of a portion of the Jemez Mountains, Valles Caldera, and relevant features 300

Figure 10.2. Generalized stratigraphic relations of the major volcanic and alluvial units in the Jemez Mountains 301

Figure 10.3. Generalized large-scale view of major obsidian source areas and relevant secondary depositional features in north-central New Mexico 303

Figure 10.4. Distribution of tuffs and epiclastic sediments derived from Toledo Embayment and Rabbit Mountain eruptions (from Heicken et al. 1986) 304

Figure 10.5. Obsidian collection localities in the Jemez Mountain region......................... 307

Figure 10.6. Locality 081199-1 south of Rabbit Mountain in the ash flow tuff 309

Figure 10.7. Mix of high-density geological obsidian and artifact cores and debitage (test knapping) at Locality 081199-1 south of Rabbit Mountain... 309

Figure 10.8. Valle Grande Rhyolite obsidian nodules photographed by Boyer and Robinson collected along San Antonio Creek in the caldera (1956:337)............................ 312

Figure 10.9. Rb, Y, Zr three dimensional plot of Valle Grande, El Rechuelos, and Cerro Toledo Rhyolite obsidian source standards... 315

Figure 10.10. Zr versus Y biplot of the elemental concentrations for Valle Grande (Cerro del Medio), El Rechuelos, Cerro Toledo Rhyolite, and Bear Springs Peak obsidian source standards.. 316

Figure 10.11. Rb, Y, Zr three-dimensional plot of Valle Grande Rhyolite and Cerro Toledo Rhyolite obsidian source standards and rock samples submitted by LANL........................ 318

Figure 10.12. Rb, Y biplot of Valle Grande Rhyolite and Cerro Toledo Rhyolite obsidian source standards and rock samples submitted by LANL... 319

Figure 10.13. Cox et al. (1979) classification analysis of one San Antonio Mountain and Cerros del Rio sample.. 322

Figure 10.14. Sr versus Zr plot of the three dacite sources in northern New Mexico, from the data in Table 9.7.. 323

Figure 11.1. A schematic of the hydration layer showing the various forms of water on, and within, the glass.. 326

Figure 11.2. The proportional concentration between OH groups and H_2O molecules in obsidian 328

Figure 11.3. Concentration-dependent diffusion profile for obsidian................................ 329

Figure 11.4. Water band locations in obsidian between 900 and 5200 cm^{-1} 331

Figure 11.5. Infrared transmission measurement 334

Figure 11.6. Infrared photoacoustic measurement 336

Figure 11.7. The relationship between infrared absorbance and depth of the hydration layer as determined by SIMS 336

Figure 11.8a. The relationship between obsidian OH concentration and the pre-exponential 338

Figure 11.8b. The relationship between obsidian OH concentration and the activation energy 339

Figure 12.1. Energy level diagrams showing traps and various charge transitions........ 343

Figure 12.2. Schematic of the dating process........ 344

Figure 12.3. Ranges of different kinds of radiation are shown for typical sediment........ 347

Figure 12.4. TL intensity........ 349

List of Tables

Table 1.1. List of excavated and tested sites 5

Table 4.1. Wetland plants used by Pueblo and Hispanic residents 48

Table 4.2. Floral distribution by community type along an elevation gradient 63

Table 4.3. Percentage of plants used for different activities........ 68

Table 4.4. Plant uses and numbers of plant species used from plant communities........ 68

Table 4.5. Species of plants used by multiple Native American cultures of New Mexico.. 69

Table 4.6. Animal species identified from archaeological sites and the numbers of remains in descending order........ 71

Table 4.7. Historic New Mexico droughts, 1542 to 1989........ 73

Table 4.8. Cross-section from a representative tree on Escobas Mesa sampled after the La Mesa fire........ 74

Table 4.9. Early succession plants in burned areas that may have been plant resources for early peoples........ 75

Table 4.10. Years of severe food stress on the Pajarito Plateau, AD 1150 to 1600 76

Table 6.1. Plant species list for the Los Alamos pollen stations (June 12 to 14, 2002) 99

Table 6.2. List of plant species 105

Table 6.3. Modern pollen sampling stations..108

Table 6.4. Pollen types identified and sample frequency 113

Table 6.5. Summary pollen results 117

Table 7.1. Summary of tree-ring data from all archaeological sites on the Pajarito Plateau..138

Table 8.1. Description of live-tree collections..190

Table 8.2. Descriptive statistics of the live-tree chronologies...196

Table 8.3. Extreme years by century, Jemez chronology 204

Table 8.4. Twenty-five wettest and driest years in the Jemez reconstruction 207

Table 8.5. Extreme years in the Bandelier archaeological periods, Jemez reconstruction...212

Table 8.6. Extreme years per century, Chama reconstruction...215

Table 8.7. Twenty-five wettest and driest years in the Chama reconstruction....................217

Table 8.8. Comparison of extreme years in each reconstruction...221

Table 8.9. Comparison of Z-scores...222

Table 8.10. Quantitative comparison of wet/dry periods in each reconstruction 225

Table 8.11. Jemez reconstruction wet/dry periods compared to Bandelier archaeological chronology (non-overlapping) 227

Table 8.12. Jemez reconstruction wet/dry periods compared to Bandelier archaeological chronology (overlapping)...228

Table 8.13. Chama reconstruction wet/dry periods compared to Bandelier archaeological chronology (non-overlapping) 229

Table 8.14. Chama reconstruction wet/dry periods compared to Bandelier archaeological chronology (overlapping) 230

Table 8.15. Comparison of three models' mean and variance 234

Table 8.16. Quantitative evaluation of precipitation periodicity compared to Bandelier archaeological periods 236

Table 9.1. Segment definitions for curve performance evaluation 249

Table 9.2. Robert DuBois dataset for the northern Rio Grande region 289

Table 10.1. Selected wavelength X-ray fluorescence spectroscopy (WXRF) oxide values (wt. %) for the three major archaeological obsidian source standards from the Jemez Mountains... 305

Table 10.2. Source standard elemental concentrations for El Rechuelos Rhyolite obsidian 307

Table 10.3. Elemental concentrations for Cerro Toledo Rhyolite obsidian in the Jemez Mountains. All measurements in parts per million (ppm) 310

Table 10.4. Elemental concentrations for Valle Grande Rhyolite obsidian in the Jemez Mountains 313

Table 10.5. Elemental concentrations for Bear Springs Peak obsidian in the Jemez Mountains 314

Table 10.6. WXRF nondestructive elemental analysis of obsidian and other rock samples from the LANL collection. Some samples submitted were too friable for nondestructive analysis 317

Table 10.7. Elemental concentrations for the three dacite sources in northern New Mexico. All measurements in parts per million. BHVO is a U.S. Geological Survey Hawaiite basalt source standard 321

Table 11.1. Water species, IR band location, and vibrational motion 331

Table 11.2. Structural water concentrations for some Southwestern obsidian sources 335

Table 12.1. Typical SAR sequence on single aliquot (Murray and Wintle 2000) 350

CHAPTER 1
THE LAND CONVEYANCE AND TRANSFER DATA RECOVERY PROJECT: 7000 YEARS OF LAND USE ON THE PAJARITO PLATEAU

Bradley J. Vierra and Steven R. Hoagland

The Department of Energy (DOE), National Nuclear Security Administration, Los Alamos Site Office and Los Alamos National Laboratory (LANL) are located in north-central New Mexico approximately 100 km north-northeast of Albuquerque and 40 km northwest of Santa Fe (Figure 1.1). The DOE is scheduled to convey properties at or in the vicinity of LANL to the County of Los Alamos, New Mexico, or its designee and to transfer properties to the Secretary of the Interior in trust for the Pueblo of San Ildefonso. The Land Conveyance and Transfer (C&T) Project is directed by Section 632 of PL 105-119, the *Departments of Commerce, Justice, and State, the Judiciary, and Related Agencies Appropriations Act, 1998*, which was passed by Congress on November 26, 1997.

The *Final Environmental Impact Statement (EIS) for the Conveyance and Transfer of Certain Land Parcels Administered by the U.S. Department of Energy and Located at Los Alamos National Laboratory, Los Alamos and Santa Fe, Counties, New Mexico*, 1998, describes the contemplated land use by the County of Los Alamos for the White Rock (A-19), Airport East (A-3), Airport Central (A-7), Airport South (A-5-1), and Rendija Canyon (A-14) tracts as economic development. The mitigation measures involved minimizing impacts to cultural resources by preparing tract-specific Historic Properties Treatment Plans that include provisions for a data recovery program for National Register of Historic Places (NRHP)-eligible archaeological resources that cannot be avoided.

The DOE examined 10 tracts of land (1942 ha; 4796 ac) proposed for the C&T Project (Figure 1.2). As a result of this examination, a July 2002 report entitled *Cultural Resource Assessment for the Department of Energy Conveyance and Transfer Project* (Hoagland et al. 2000a) was produced and submitted by DOE to the New Mexico State Historic Preservation Officer (SHPO) for comments. SHPO concurrence with the recommended NRHP eligibility for the 213 documented archaeological sites was issued on October 6, 2000. One hundred eighty of the sites are eligible or have an undetermined eligibility (i.e., potentially eligible).

The White Rock Tract (A-19) is located directly north of the community of White Rock and State Road 4. The western boundary runs northward from the State Road 4 and Pajarito Road intersection. The tract includes the southern tip of Mesita del Buey and portions of the Cañada del Buey floodplain.

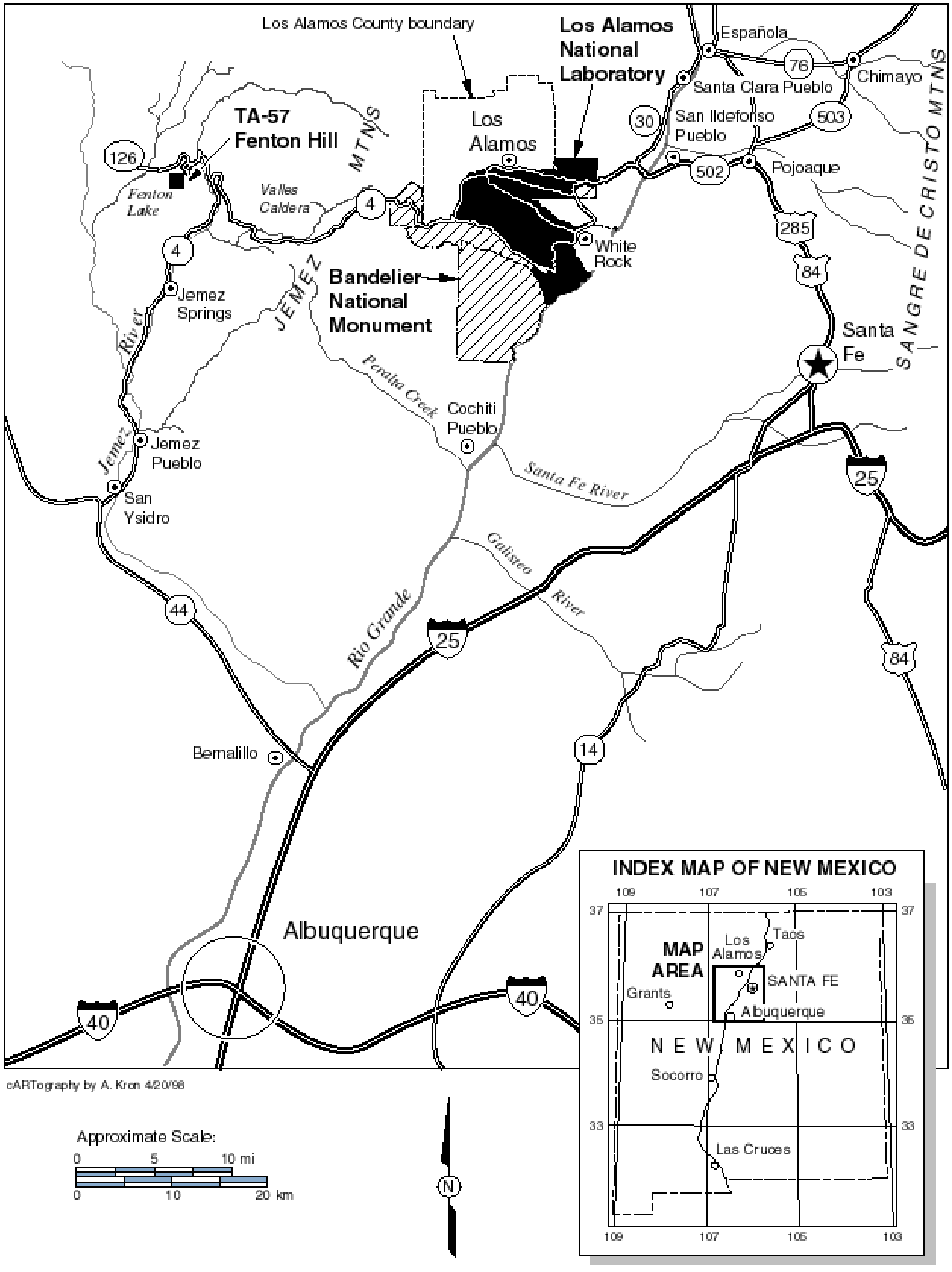
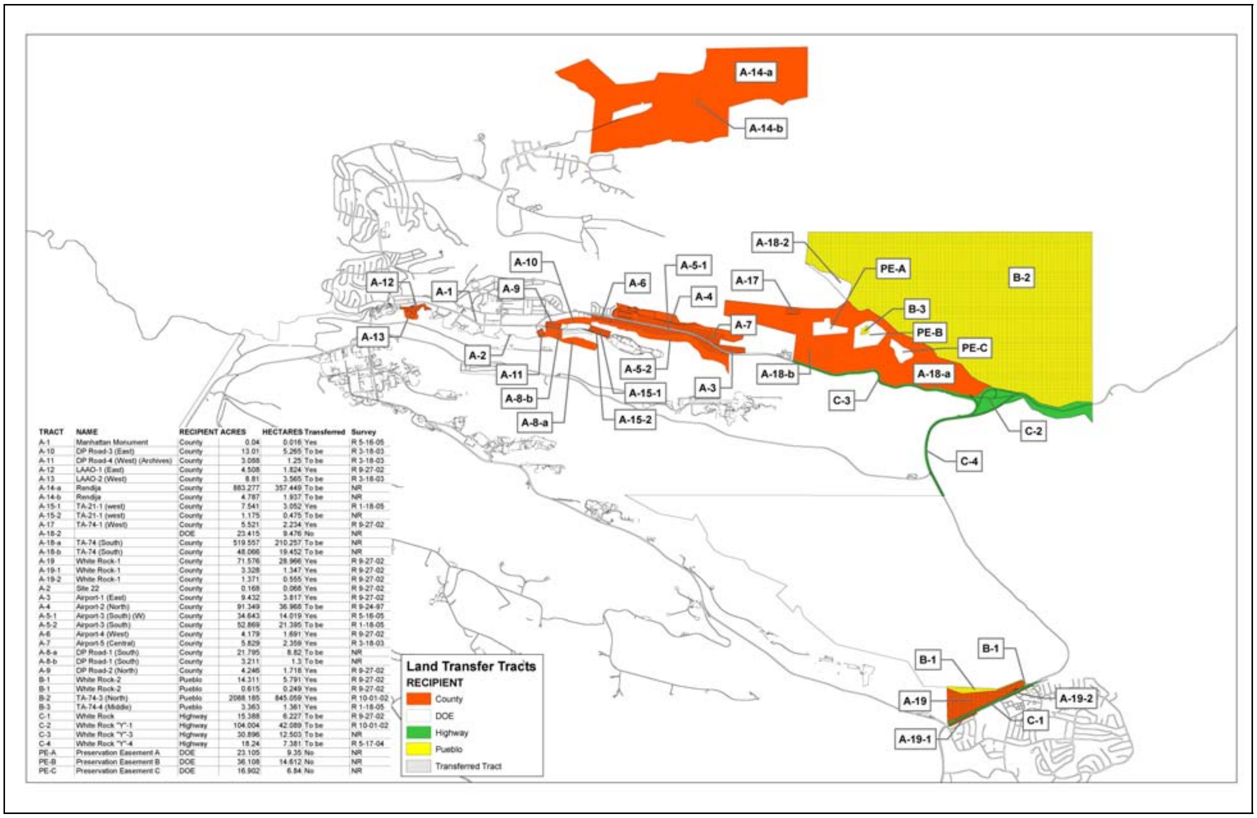


Figure 1.1. Location of Los Alamos National Laboratory (LANL).



TRACT	NAME	RECIPIENT	ACRES	HECTARES	Transferred	Survey
A-1	Manhattan Monument	County	0.04	0.016	Yes	R 5-16-05
A-10	DP Road-3 (East)	County	13.01	5.265	To be	R 3-18-03
A-11	DP Road-4 (West) (Archives)	County	3.088	1.25	To be	R 3-18-03
A-12	LAAO-1 (East)	County	4.508	1.824	Yes	R 9-27-02
A-13	LAAO-2 (West)	County	8.81	3.565	To be	R 3-18-03
A-14-a	Rendija	County	883.277	357.449	To be	NR
A-14-b	Rendija	County	4.787	1.937	To be	NR
A-15-1	TA-21-1 (west)	County	7.541	3.052	Yes	R 1-18-05
A-15-2	TA-21-1 (west)	County	1.175	0.475	To be	NR
A-17	TA-74-1 (West)	County	5.521	2.234	Yes	R 9-27-02
A-18-2		DOE	23.415	9.476	No	NR
A-18-a	TA-74 (South)	County	519.557	210.257	To be	NR
A-18-b	TA-74 (South)	County	48.066	19.452	To be	NR
A-19	White Rock-1	County	71.576	28.966	Yes	R 9-27-02
A-19-1	White Rock-1	County	3.328	1.347	Yes	R 9-27-02
A-19-2	White Rock-1	County	1.371	0.555	Yes	R 9-27-02
A-2	Site 22	County	0.168	0.068	Yes	R 9-27-02
A-3	Airport-1 (East)	County	9.432	3.817	Yes	R 9-27-02
A-4	Airport-2 (North)	County	91.349	36.968	To be	R 9-24-97
A-5-1	Airport-3 (South) (W)	County	34.643	14.019	Yes	R 5-16-05
A-5-2	Airport-3 (South)	County	52.869	21.395	To be	R 1-18-05
A-6	Airport-4 (West)	County	4.179	1.691	Yes	R 9-27-02
A-7	Airport-5 (Central)	County	5.829	2.359	Yes	R 3-18-03
A-8-a	DP Road-1 (South)	County	21.795	8.82	To be	NR
A-8-b	DP Road-1 (South)	County	3.211	1.3	To be	NR
A-9	DP Road-2 (North)	County	4.246	1.718	Yes	R 9-27-02
B-1	White Rock-2	Pueblo	14.311	5.791	Yes	R 9-27-02
B-1	White Rock-2	Pueblo	0.615	0.249	Yes	R 9-27-02
B-2	TA-74-3 (North)	Pueblo	2088.185	845.059	Yes	R 10-01-02
B-3	TA-74-4 (Middle)	Pueblo	3.363	1.361	Yes	R 1-18-05
C-1	White Rock	Highway	15.388	6.227	To be	R 9-27-02
C-2	White Rock "Y"-1	Highway	104.004	42.089	To be	R 10-01-02
C-3	White Rock "Y"-3	Highway	30.896	12.503	To be	NR
C-4	White Rock "Y"-4	Highway	18.24	7.381	To be	R 5-17-04
PE-A	Preservation Easement A	DOE	23.105	9.35	No	NR
PE-B	Preservation Easement B	DOE	36.108	14.612	No	NR
PE-C	Preservation Easement C	DOE	16.902	6.84	No	NR

Figure 1.2. The location of the Land Conveyance and Transfer (C&T) Project tracts.

The Airport Tracts are located east of the Los Alamos town site. The Airport East (A-3) and Airport Central (A-7) tracts are situated along the north side of State Road 502 (East Road) and the Airport South Tract (A-5-1) on the south side of the road a short distance west of the East Gate Business Park. These tracts are located on the mesa between Pueblo and DP canyons (see Figure 1.2).

The Rendija Tract (A-14) is located north of the Los Alamos town site's Barranca Mesa residential subdivision. The tract is situated within Rendija Canyon and Cabra Canyon. Barranca Mesa forms the southern boundary of the tract and Guaje Mountain forms most of the northern boundary. The Rendija Tract is bounded by U.S. Forest Service property to the north, east, and west and by Los Alamos County lands to the south.

The White Rock Tract (A-19) contains 10 archaeological sites, nine of which are NHRP eligible. Two eligible sites, approximately 80 percent of a third eligible site, and the single non-eligible site are situated on a small portion of land to be transferred to San Ildefonso Pueblo. The remaining six sites and approximately 20 percent of another are within the section to be conveyed to Los Alamos County. The Airport Tract parcels (A-3, A-7, and A-5-1) contain five archaeological sites that are all NRHP eligible. The Rendija Tract (A-14) contains 61 archaeological sites, 49 of which are eligible to the NRHP or have an undetermined eligibility. Nine of these sites have been identified as Traditional Cultural Properties (TCPs) by San

Ildefonso and Santa Clara pueblos and are therefore considered eligible to the NRHP. All of the remaining sites have been deemed eligible or potentially eligible under Criterion D of the NRHP, meaning that they are likely to yield information important to prehistory and/or history of New Mexico.

Land transferred to the Department of the Interior to hold in trust for San Ildefonso Pueblo is not an "undertaking" under the National Historic Preservation Act. Therefore, no further compliance is required for the properties that will be transferred to San Ildefonso Pueblo. This includes their ancestral home of Otowi, which is located within Technical Area (TA) 74. However, under 36 CFR 800.5(vii), the conveyance of lands to Los Alamos County is considered an adverse effect to historic properties, if adequate and legally enforceable restrictions or conditions to ensure the long-term preservation of these properties' historic significance are not established. For example, TA-74 is located east of the Los Alamos town site and below the mesa upon which the town site was built. The southern portion of TA-74 is dominated by Pueblo Canyon, the central portion of Bayo Canyon, and the northern portion of Barrancas Canyon. A total of 98 archaeological sites are situated within this technical area. Portions of the land were transferred to San Ildefonso Pueblo. Limited testing was conducted at nine archaeological sites within TA-74 (A-18a) and two sites within the nearby White Rock Y (C-2) tracts to determine potential eligibility.

A Programmatic Agreement (PA) was entered into by the DOE, Advisory Council for Historic Preservation, New Mexico SHPO, and the County of Los Alamos in order to implement the mitigation measures as specified in the EIS (Appendix A). As previously noted, PL 105-119 provides lands to Los Alamos County for economic development. As a result, the County intends to develop portions, if not all, of the Airport Tract parcels (A-3, A-7, and A-5-1), the Rendija Tract (A-14), and their section of the White Rock Tract (A-19), constituting an adverse effect to the historic properties within. Section IV of the PA (see Appendix A) details the actions to be taken in respect to these parcels. In addition, Attachment B of Appendix A describes the required data recovery standards. In order to resolve this adverse effect, DOE has developed a data recovery strategy for those properties that will be unavoidably destroyed or impacted through development. A data recovery plan entitled *Department of Energy Land Conveyance Data Recovery Plan and Research Design for the Excavation of Archaeological Sites Located within Selected Parcels to be Conveyed to the Incorporated County of Los Alamos, New Mexico* (Vierra et al. 2002a) was submitted by DOE to the SHPO and concurred with on May 5, 2002.

The data recovery plan provides a research design to guide the excavation and analysis of data obtained from the sites to be excavated within the tracts being conveyed to Los Alamos County. A series of research contexts consisting of chronometrics, geoarchaeology, paleoenvironment, settlement patterns, subsistence and seasonality, and technology and interaction are proposed. A total of 68 detailed research questions are presented within these contexts by time period and site type. In addition, the field excavation and laboratory procedures used to collect the data necessary to answering these questions are provided.

This data recovery program was implemented for seven archaeological sites within the White Rock Tract (A-19), five archaeological sites within the Airport Tract parcels (A-3, A-7, and A-5-1), and 27 archaeological sites within the Rendija Tract (A-14) (see Table 1.1). The reduced number of sites within the latter tract relates to the identification of nine TCPs and the selection of a sample of 10 fieldhouses that were excluded from excavation. In addition, two sites could not be relocated (LA 86553 and LA 70026). The results of the four-year excavation project are presented within this four-volume set. Excavations were conducted from 2002 to 2005. A total of 39 sites were excavated and approximately 150,000 artifacts were collected. Volume 1 (Baseline Studies) provides background information on geology, geomorphology, environment, and dating techniques. Volume 2 (Site Excavations) presents the excavation reports for the sites excavated in the White Rock, Airport, and Rendija tracts, as well as the results of site testing for the TA-74 and White Rock Y tracts. Volume 3 (Artifact and Sample Analyses) provides the detailed results of artifact and sample analyses, and Volume 4 (Research Design) presents various specialized studies and results of the project research questions.

Table 1.1. List of excavated and tested sites.

Tract	LA Number	Year of Excavation	Site Type	Period of Occupation
White Rock (A-19)	LA 12587	2002	Roomblock and fieldhouse	Late Coalition; Classic
	LA 12587 (Area 8)	2002	Lithic scatter	Late Archaic
	LA 86637	2002	Lithic/ceramic scatter	Late Archaic; Middle Classic; Historic
	LA 127625	2002	Lithic/ceramic scatter	Coalition
	LA 127631	2002	Fieldhouse	Coalition/Classic
	LA 128803	2002	Grid garden	Classic
	LA 128804	2002	Check dam and lithic/ceramic scatter	Historic; Late Classic
	LA 128805	2002	Fieldhouse	Late Classic
Airport (A-3, A-7, and A-5-1)	LA 86533	2003	Lithic/ceramic scatter	Ancestral Pueblo
	LA 86534	2002	Roomblock	Middle Coalition
	LA 135290	2003	Roomblock	Middle Coalition
	LA 139418	2003	Grid garden	Classic
	LA 141505	2003	Fieldhouse	Coalition/Classic
Rendija (A-14)	LA 15116	2004	Fieldhouse	Late Classic
	LA 70025	2004	Fieldhouse	Late Classic
	LA 85403	2004	Fieldhouse	Und. (Classic?)
	LA 85404	2004	Fieldhouse	Coalition/Classic
	LA 85407	2005	Homestead	Early 20^{th} century
	LA 85408	2005	Fieldhouse	Late Classic
	LA 85411	2005	Fieldhouse	Early-Late Classic
	LA 85413	2005	Fieldhouse	Early Classic
	LA 85414	2005	Fieldhouse	Classic
	LA 85417	2005	Fieldhouse	Classic
	LA 85859	2003	Lithic scatter	Early Archaic
	LA 85861	2005	Fieldhouse	Coalition/Classic

Tract	LA Number	Year of Excavation	Site Type	Period of Occupation
	LA 85864	2003	Tipi ring- Jicarilla	Late 19th/early 20th century
	LA 85867	2005	Fieldhouse	Classic
	LA 85869	2003	Tipi ring- Jicarilla	Late 19th/early 20th century
	LA 86605	2004	Fieldhouse	Late Classic
	LA 86606	2005	Fieldhouse	Coalition/Classic
	LA 86607	2005	Fieldhouse	Coalition
	LA 87430	2004	Fieldhouse	Late Classic
	LA 99396	2003	Lithic scatter; one-room structure	Archaic; Coalition
	LA 99397	2003	Lithic scatter	Archaic
	LA 127627	2004	Fieldhouse	Classic
	LA 127633	2004	Storage Feature	Und. (Classic?)
	LA 127634	2004	Fieldhouse	Late Classic
	LA 127635	2004	Fieldhouse	Coalition/Classic
	LA 135291	2004	Fieldhouse	Early Classic
	LA 135292	2004	Fieldhouse	Late Classic
TA-74 (A-18a)	LA 21596B	2002	Grid garden	Coalition/Classic
	LA 21596C	2002	Grid garden	Coalition/Classic
	LA 86528	2002	Rockshelter	Und. (Classic/Historic?)
	LA 86531	2002	Lithic/ceramic scatter	Coalition/Historic
	LA 110121	2002	Lithic/ceramic scatter	Und. (Coalition/Historic?)
	LA 110126	2002	Fieldhouse	Late Classic
	LA 110130	2002	Fieldhouse	Und. (Classic?)
	LA 110133	2002	Lithic/ceramic scatter	Ancestral Pueblo
	LA 117883	2002	Lithic scatter	Archaic
White Rock Y (C-2)	LA 61034	2002	Lithic/ceramic scatter	Und. (Classic/Historic?)
	LA 61035	2002	Lithic/ceramic scatter	Classic

CHAPTER 2
THE GEOLOGY OF LOS ALAMOS NATIONAL LABORATORY AS A BACKDROP FOR ARCHAEOLOGICAL STUDIES ON THE PAJARITO PLATEAU

David E. Broxton, Fraser Goff, and Kenneth Wohletz

INTRODUCTION

The geology of the Pajarito Plateau exerted a significant influence on the cultural development of prehistoric inhabitants. The local landscape provided the raw materials for buildings, pottery, tools, and other artifacts. This chapter provides a geologic overview of the Pajarito Plateau with emphasis on bedrock geologic units that were important sources of raw materials for the early inhabitants of the area.

GENERAL GEOLOGIC SETTING

The Los Alamos National Laboratory (LANL) is situated on the Pajarito Plateau, an east-sloping, dissected tableland bounded on the west by the eastern Jemez Mountains (Sierra de los Valles) and on the east by White Rock Canyon of the Rio Grande (Figure 2.1). The geology of the Pajarito Plateau reflects the interplay of volcanism in the Jemez Mountains and surrounding areas with the development of the Rio Grande rift, a series of north-south-trending fault troughs extending from southern Colorado to southern New Mexico (Figure 2.1).

Volcanism over the last 13 million years built up the highlands area of the Jemez Mountains, while contemporaneous tectonic rifting resulted in subsidence of the area extending from the eastern margin of the Jemez Mountains to the western margin of the Sangre de Cristo Mountains. This area of subsidence, locally termed the Española basin of the Rio Grande rift, is a graben between two larger basins—the Albuquerque basin to the south and San Luis basin to the north (Kelley 1978). During this interplay of volcanism and rifting, erosion removed materials from the highlands areas to the west and deposited them downslope to the east into the rifted lowlands, which were contemporaneously receiving sediments from other sources. The Pajarito Plateau developed in and now occupies the western part of the Española basin (Figure 2.2).

The gently east-sloping Bandelier Tuff covers the Pajarito Plateau. Deep canyons are incised into the Bandelier Tuff and expose it to depths of up to several hundred feet below the general level of the Pajarito Plateau. From west to east, these canyons cut progressively deeper into the Bandelier Tuff and, near the Rio Grande, some of the deeper canyons expose older lavas and sedimentary rocks. Figure 2.3 is a geologic cross-section that shows the distribution of rock units beneath the plateau. Volcanic rocks of the Tschicoma Formation and their derivative sediments (fanglomerate facies of the Puye Formation) extend eastward under the plateau where they interfinger with Santa Fe Group rocks and basaltic rocks of the Cerros del Rio volcanic field (also called "basaltic rocks of Chino Mesa").

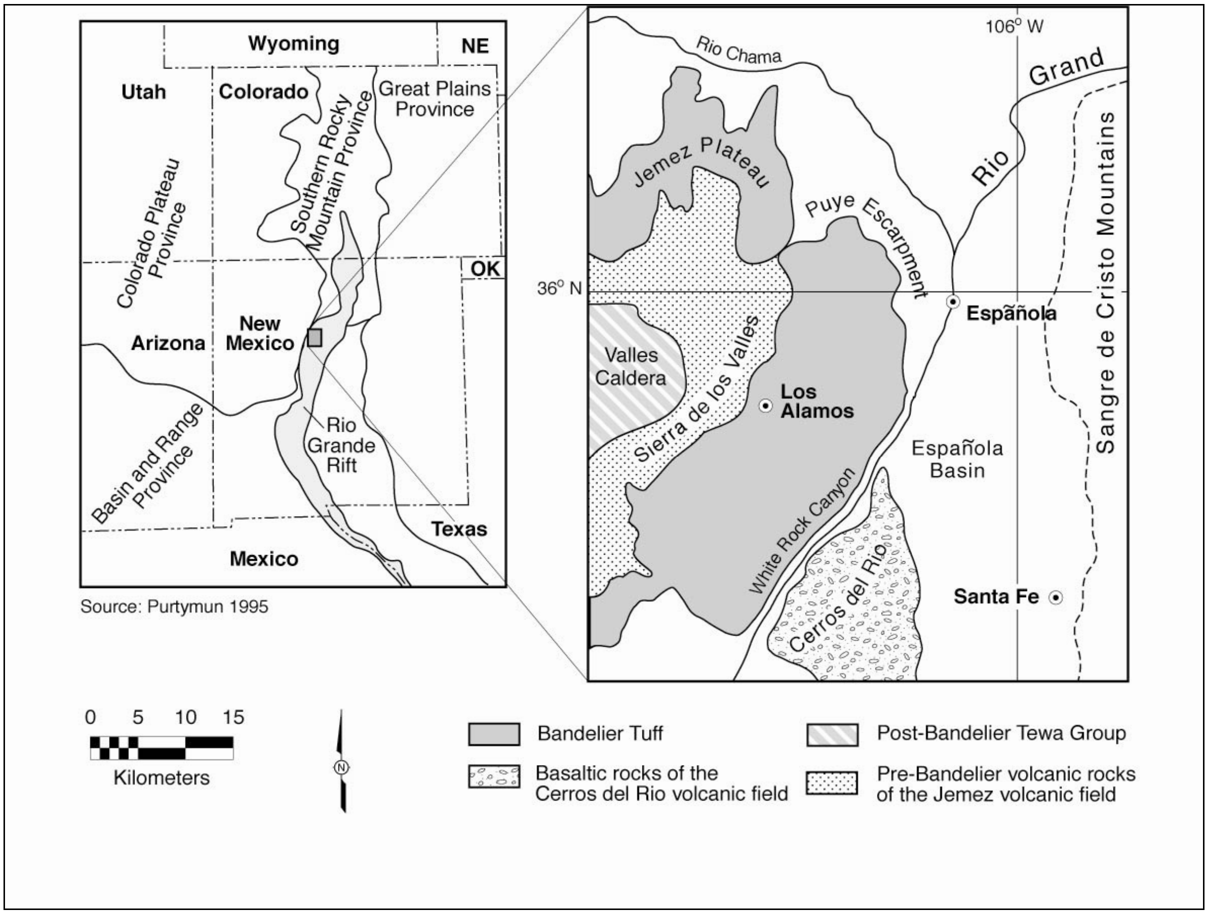


Figure 2.1. Regional setting of the Pajarito Plateau.

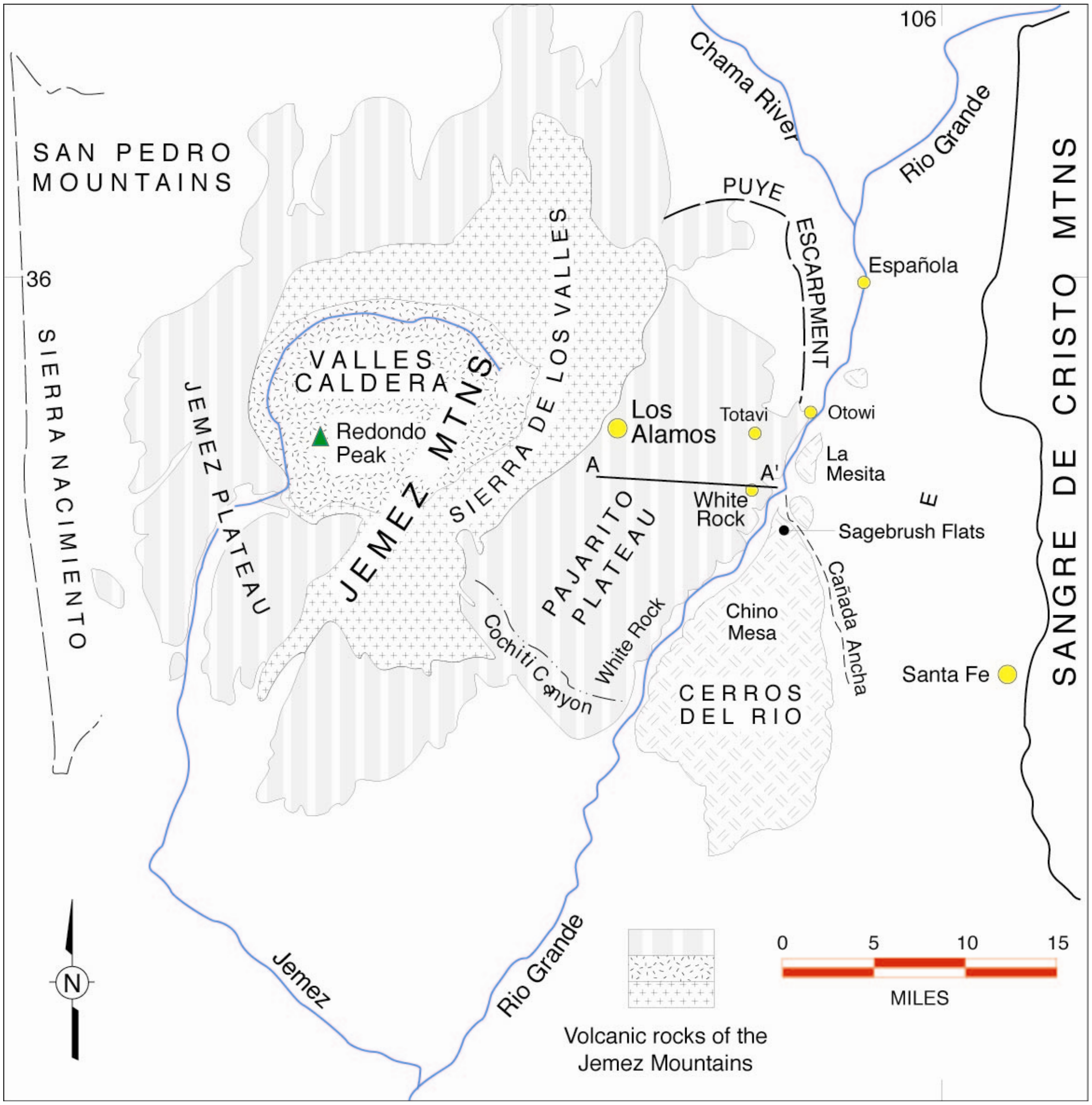


Figure 2.2. Geologic and geographic features of the Pajarito Plateau and surrounding areas. A-A1 is the location of the geologic cross-section in Figure 2.3.

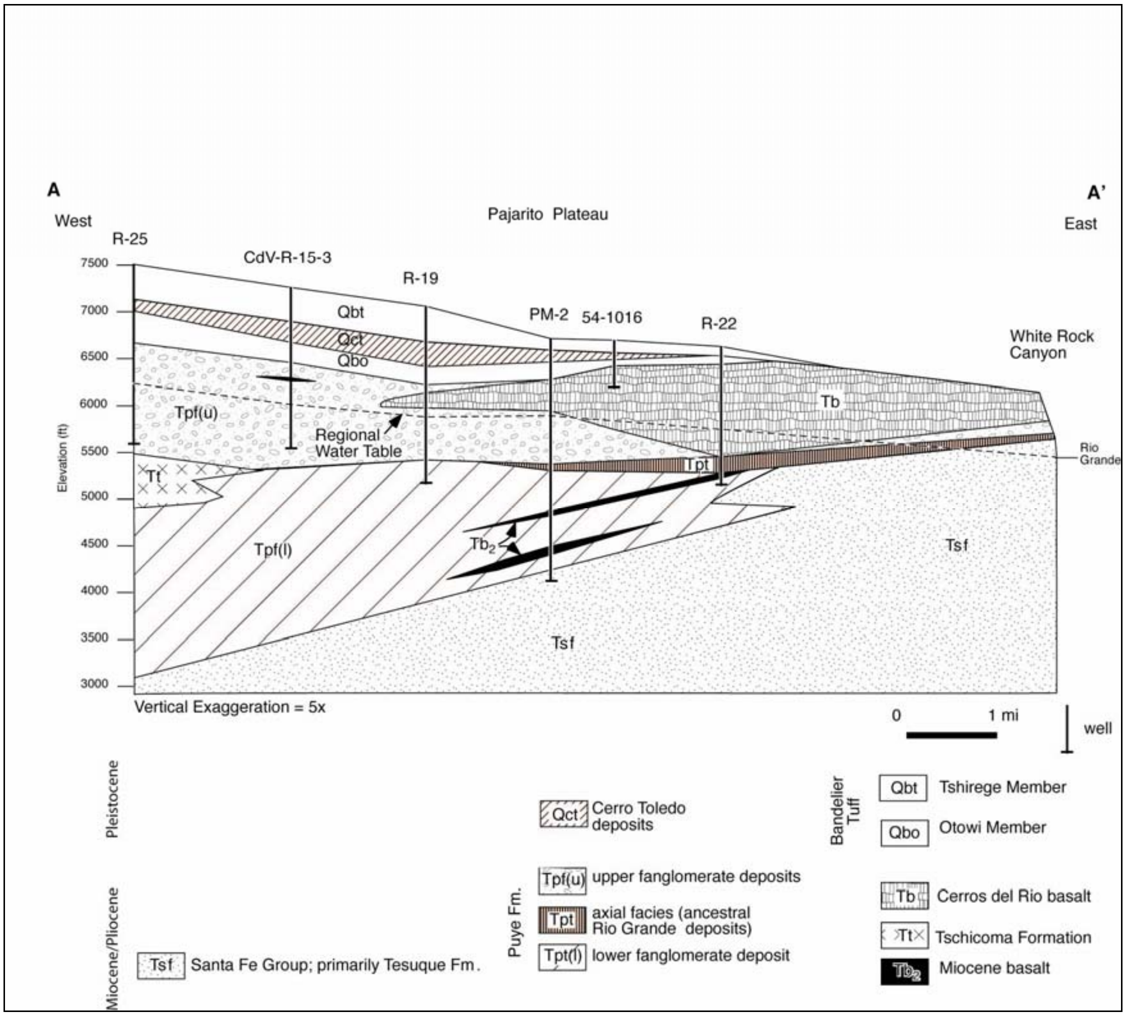


Figure 2.3. East-west cross-section showing stratigraphic relations for geologic units of the Pajarito Plateau; see Figure 2.2 for location of cross-section.

STRATIGRAPHY

A generalized stratigraphic chart for the Jemez volcanic field is shown in Figure 2.4. The following descriptions focus on those rock units that are exposed on or near LANL, starting with the oldest (deepest) and proceeding to the youngest (topmost). Fossil evidence, stratigraphic correlations, and radiometric measurements provide the approximate ages of most of the bedrock units. The bedrock units and their ranges of approximate radiometric ages are listed below in ascending order.

1. Santa Fe Group: 4 to 21 Ma (Manley 1979)
2. Tschicoma Formation: 2.0 to <7.4 Ma (Gardner and Goff 1984; Loeffler et al. 1988; WoldeGabriel 2001, personal communication)
3. Puye Formation: 1.7 to 4 Ma (Spell et al. 1990; Turbeville et al. 1989), which includes a fanglomerate facies, an axial facies (Manley 1979; Turbeville et al. 1989), and a lacustrine facies

4. Basaltic rocks of the Cerros del Rio volcanic field (also known as “basaltic rocks of Chino Mesa”) (2 to 3 Ma) (WoldeGabriel 2001, personal communication; WoldeGabriel et al. 1996)
5. Otowi Member of the Bandelier Tuff: 1.61 Ma (Izett and Obradovich 1994; Spell et al. 1996)
6. Volcaniclastic sediments and tephra of the Cerro Toledo interval: the age of this unit is bracketed by the ages of the underlying Otowi Member (1.61 Ma) and the overlying Tshirege Member (1.22 Ma) of the Bandelier Tuff
7. Tshirege Member of the Bandelier Tuff: 1.22 Ma (Izett and Obradovich 1994; Spell et al. 1990, 1996)
8. Valles Rhyolite: <1.133 Ma (Spell and Harrison 1993) to 50 to 60 Ka (thousand years) (Reneau et al. 1996a; Toyoda et al. 1995)

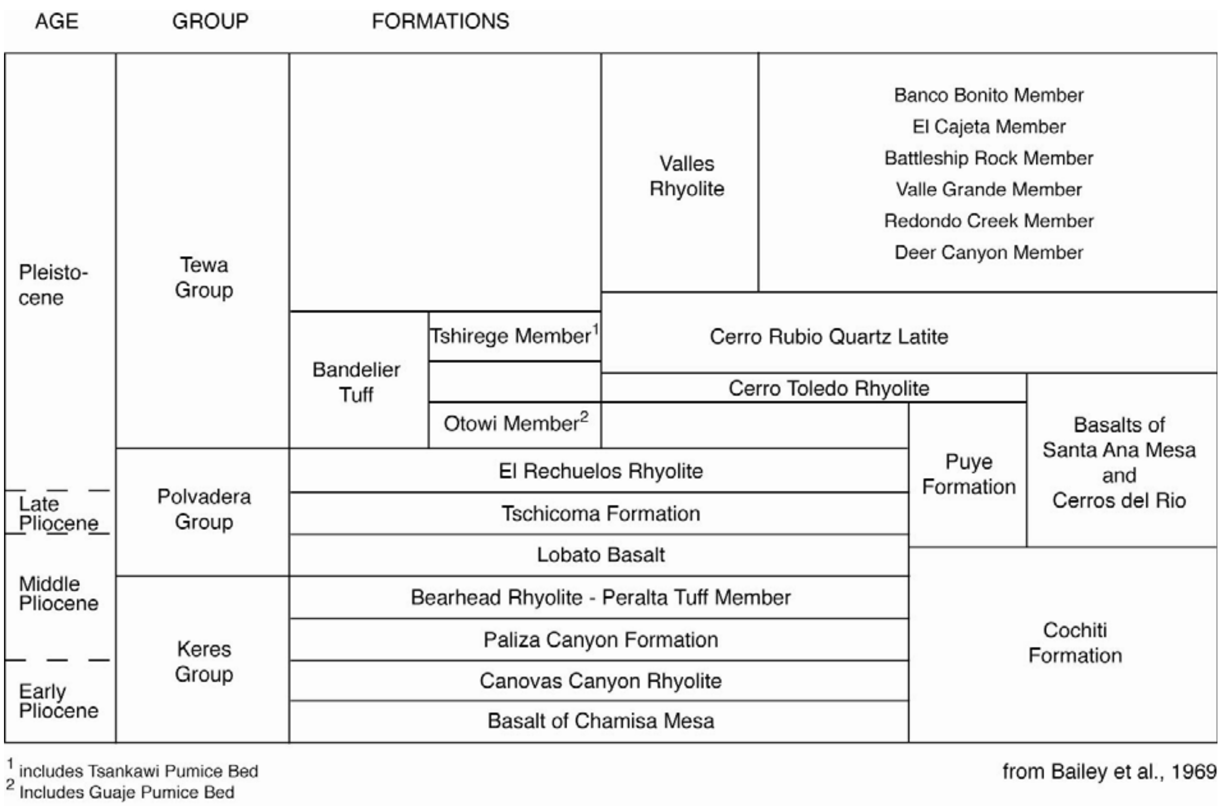


Figure 2.4. Stratigraphic nomenclature for major rock units of the Jemez volcanic field.

A geological map published by R. Smith et al. (1970) shows the distribution of these bedrock units across the Pajarito Plateau. Other general geological maps covering this area are those by Griggs (1964), Kelley (1978), and Goff et al. (1990). More detailed geological maps covering portions of LANL include those by Baltz et al. (1963), Rogers (1995), Vaniman and Wohletz (1990), Reneau et al. (1995), Goff (1995), Goff et al. (2002), Lewis et al. (2002), and Lavine et al. (2003). Figure 2.5 schematically portrays the complex interfingering of volcanic rocks and sediments that occurs below the Pajarito Plateau.

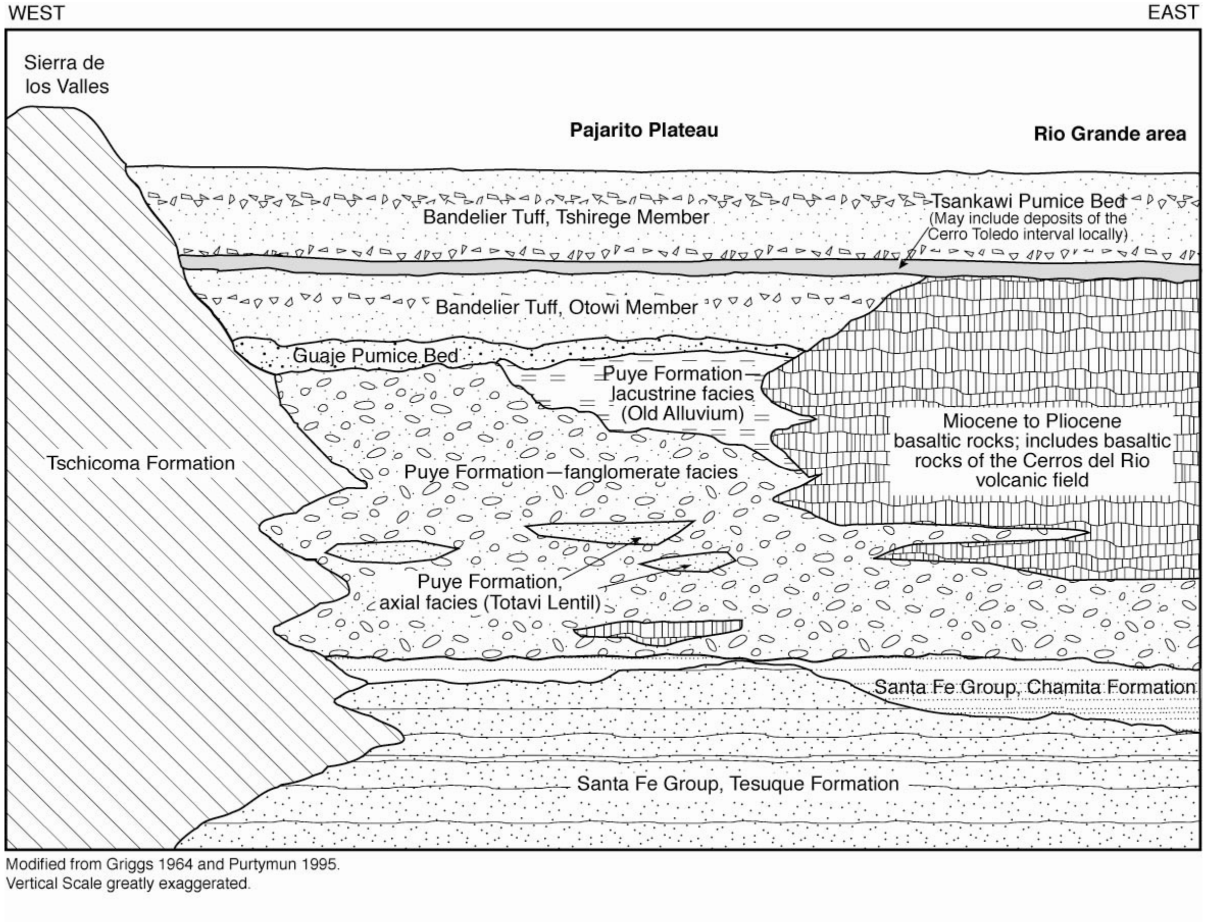


Figure 2.5. Schematic cross-section showing interfingering stratigraphic relationship across the Pajarito Plateau; thicknesses are approximate.

Santa Fe Group

Rocks of the Santa Fe Group crop out in lower Los Alamos Canyon, near the mouth of Guaje Canyon, and along the margins of the Rio Grande from Otowi Bridge south to White Rock. Galusha and Blick (1971) subdivided the Santa Fe Group into formations and members based on geologic mapping and fossil assemblages of late Tertiary mammals. Manley (1979) refined the stratigraphy with additional mapping and dates of interbedded volcanic ash layers, lava flows, and dikes. In the vicinity of the Pajarito Plateau, the stratigraphy and geochronology of the Santa Fe Group is poorly understood because of the near continuous blanket of Bandelier Tuff. Based on exposures near the Rio Grande, the Santa Fe Group beneath the Pajarito Plateau is believed to include, in ascending order, the Tesuque Formation and the Chamita Formation.

Tesuque Formation

The Tesuque Formation is a massive, thick sedimentary deposit consisting of arkosic sediments, derived primarily from Precambrian basement and Tertiary volcanic sources to the east and northeast of the Española basin. This unit is a light pink-to-buff siltstone and silty sandstone with a few lenses of pebbly conglomerate and clay (Figure 2.6). It is poorly to moderately consolidated and has an age range of about 7 to 21 Ma (Cavazza 1989; Manley 1979). Spiegel and Baldwin (1963) describe the Tesuque Formation at the southern end of the Española basin, including the exposures in the vicinity of Otowi Bridge and along White Rock Canyon. This formation exists in deep well boreholes under the Pajarito Plateau and is the primary aquifer for municipal and industrial water supply in Los Alamos County.

Figure 2.6. The Santa Fe Group was shed into the subsiding Española basin from highlands located to the east and northeast. This figure shows the Tesuque formation, which is typically made up of light pink-to-buff siltstone and silty sandstone with lenses of pebbly conglomerate and clay.

Chamita Formation

The Chamita Formation overlies and interfingers with the Tesuque Formation. It consists of arkosic siltstones, sandstones, and pebbly conglomerate and includes two prominent beds of white ash. This formation is thickest in the northern part of the Española basin and thins to less than 9.1 m (30 ft) or is absent under most of LANL property. Aldrich and Dethier (1990) suggest that the Chamita Formation north of the Pajarito Plateau may be as old as 12 Ma. However, paleomagnetic data in the area indicate an age range of 4.5 to 6 Ma (MacFadden 1977), and tephra dates by Manley (1979) support a younger age of about 5 Ma for at least part of the formation.

Tschicoma Formation

The Tschicoma Formation of the Polvadera Group makes up the rugged Sierra de los Valles highlands west of Los Alamos, and it crops out in the headwaters of the larger canyons that cut the Pajarito Plateau. Deep boreholes along the western perimeter of the Laboratory intersect this unit at depths of several hundred feet or more, but the Tschicoma Formation is generally absent in boreholes penetrating the central and eastern parts of LANL.

The Tschicoma Formation consists of numerous thick lava flows that erupted from large overlapping dome complexes. Fragmental deposits of ash and lava debris occur in the distal parts of the formation. It has a variable thickness due to the lenticular shape of its lava flows, and is at least 762 m (2,500 ft) thick in the Sierra de los Valles. The Tschicoma Formation thins eastward under the Pajarito Plateau where it interfingers with the Puye Formation. The lower parts of the Tschicoma Formation may interfinger with rocks of the upper Santa Fe Group.

The Tschicoma Formation ranges in composition from dacite to rhyolite, but dacites are the predominant rock type. The rocks are mainly gray to purplish gray, but in places they are reddish brown. These flows display pronounced jointing and have tops and bottoms commonly marked by blocky breccia. Flow interiors are commonly devitrified to microcrystalline groundmass minerals giving the rocks a stony appearance. Chilled volcanic glass is some times preserved in flow tops and bottoms.

Dated volcanic domes making up the Sierra de los Valles range in age between 2.91 and 5.03 Ma (WoldeGabriel 2001, personal communication). Turbeville et al. (1989) report an age of 2.53 Ma for a Tschicoma ignimbrite within the Puye Formation. In the northern part of the Jemez volcanic field, the Tschicoma Formation is bracketed in age by the underlying Lobato Basalt (7.4 Ma) and the overlying El Rechuelos Rhyolite (2.0 Ma) (Loeffler et al. 1988).

Puye Formation

The Puye Formation is a large apron of overlapping alluvial fans that were shed eastward from the Jemez volcanic field into the Española basin, covering the Santa Fe Group rocks west of and along the Rio Grande. The Puye Formation is intersected by most deep wells on the Pajarito

Plateau (Purtymun 1995), and it crops out in lower Los Alamos Canyon and in canyons to the north. Turbeville et al. (1989) estimated its areal distribution at 200 km^2 (518 mi^2) and its volume at approximately 15 km^3 (3.6 mi^3). Because its primary sources were Tschicoma domes in the Sierra de los Valles, the Puye Formation overlaps and post-dates the Tschicoma Formation in age.

The lithology of the Puye Formation is dominated by conglomerates and gravels consisting of subangular to subrounded dacitic and andesitic lava clasts in a sandy matrix (Figure 2.7).

Figure 2.7. The Puye formation consists of deposits formed by coalescing alluvial fans shed eastward from Tschicoma volcanic centers in the Sierra de los Valles. These deposits of cobbles, gravels, and sand are exposed in canyons in the northern part of the Pajarito Plateau and along the Rio Grande.

At least 25 ash beds of dacitic to rhyolitic composition are interbedded with the conglomerates and gravels (Turbeville et al. 1989), and basaltic ash and lacustrine layers are present along the eastern margins of this formation. Because of its deposition as alluvial fans, the Puye Formation shows considerable vertical and lateral lithological variability. The formation reaches a maximum thickness of approximately 333 m (>1093 ft) in well R-25 on the western side of LANL but thins to 15 m (50 ft) in areas north of the Pajarito Plateau (Dethier and Manley 1985). In the central and eastern portions of LANL, it is approximately 183 m (600 ft) thick and is interbedded with basaltic lavas of the Cerros del Rio volcanic field.

The Puye Formation as defined by Griggs (1964) originally included three units, in ascending order: an axial facies (called the "Totavi Lentil" by Griggs), a fanglomerate facies, and a lacustrine facies (called "older alluvium" by Griggs).

Axial Facies of the Puye Formation

The axial facies of the Puye Formation (also called "Totavi Lentil" or "Totavi Formation") overlies the Santa Fe Group and crops out at Totavi in Los Alamos Canyon and along the east side of the Pajarito Plateau (Griggs 1964). It is generally approximately 15 m (50 ft) thick near the Rio Grande but thickens in a northwest direction. It consists of coarse, poorly consolidated conglomerate containing cobbles and boulders of silicic to intermediate volcanic rocks and Precambrian quartzite, granite, and pegmatite (Figure 2.8). These rocks probably represent axial-channel deposits of the ancestral Rio Grande. The axial facies forms the oldest deposits in the Puye Formation in many areas, but it also interfingers with the lower part of the fanglomerate facies. The age of the axial facies is poorly constrained.

Fanglomerate Facies of the Puye Formation

The fanglomerate facies is the dominant unit of the Puye Formation beneath most of LANL property. Fanglomerate is a general term meaning a rock unit composed of conglomerates deposited in an alluvial fan setting. The fanglomerate facies contains angular to subangular cobbles and boulders of latite, quartz latite, dacite, rhyolite, and tuff in a matrix of silts, clays, and sands. Lenses of silt, clay, and pumice are common. It is interbedded with basaltic rocks of the Cerros del Rio volcanic field in the eastern and central part of LANL. The fanglomerate facies is widespread beneath the Pajarito Plateau and caps the prominent cliffs (Puye Escarpment) along the Rio Grande north of Otowi Bridge.

Lacustrine Facies of the Puye Formation

Griggs (1964) included clay-rich lake beds (the lacustrine facies) as the uppermost part of the Puye Formation. He differentiated them from the fanglomerate facies based on the presence of lake siltstones and ancient stream gravels that fill channels cut into the fanglomerates. Basaltic rocks of the Cerros del Rio volcanic field are also found in these channels (Griggs 1964). The lacustrine facies is present in lower Los Alamos Canyon and extends both northward and southward in discontinuous outcrops for several miles. However, it is apparently of limited extent beneath the Pajarito Plateau, being reported only in boreholes near the eastern edge of the plateau. Most likely, these lake beds were one source of clay used for making pottery.

Figure 2.8. The Totavi Lentil is made of sands, gravels, and cobbles, which were deposited by the ancestral Rio Grande. The deposit contains subangular to subrounded clasts from local sources such as the Jemez volcanic field and rounded Precambrian granitic and metamorphic rocks derived from highlands to the north of the Española basin.

Basaltic Rocks of the Cerros del Rio Volcanic Field

The basaltic rocks of the Cerros del Rio volcanic field crop out primarily on the eastern side of the Rio Grande (Griggs 1964; R. Smith et al. 1970) and occur in the subsurface below much of the Pajarito Plateau (Broxton and Reneau 1996; Dransfield and Gardner 1985). Outcrops within LANL property occur in most canyons along the southern and eastern margins of the plateau. The stratigraphic nomenclature for these basalts has varied with different workers (Aubele 1978; Galusha and Blick 1971; Griggs 1964; Kelley 1978; R. Smith et al. 1970). Kelley (1978) mapped four different units of the Cerros del Rio Basalts, one of which (the Cubero Basalts) includes the five units of the basaltic rocks of Chino Mesa (Griggs 1964). Some of the older basalt flows that have been included in this formation may belong to the Santa Fe Group.

The basaltic rocks of the Cerros del Rio volcanic field form thick lava flows separated by interflow breccia, scoria, and ash (Figure 2.9). The lavas were erupted from numerous vents both east and west of the Rio Grande. In the vicinity of the Pajarito Plateau, these basalts form a north-south-trending highland (now buried by the Bandelier Tuff) extending from the western edge of White Rock to the confluence of Los Alamos and Pueblo canyons (Broxton and Reneau 1996). These basalts are interbedded with the upper part of the Puye Formation.

The basaltic rocks of the Cerros del Rio volcanic field include buried remnants of maar volcanoes in White Rock Canyon (Aubele 1978; Heiken et al. 1986). The aprons of fragmental debris surrounding these buried craters consist of thin layers of basaltic ash and sediments. The maar deposits resulted from steam explosions that occurred where basalt erupted through an aquifer or standing body of water.

Figure 2.9. The 2- to 3-Ma Cerros del Rio basalt consists of a thick sequence of massive lava flows separated by beds of breccia, cinder, and sedimentary deposits. The upper photo shows thick Cerros del Rio basalt flows overlain by the Tshirege Member of the Bandelier Tuff. The lower photo shows Cerros del Rio basalt overlain by the Guaje Pumice bed near the confluence of Pueblo and Los Alamos canyons.

Bandelier Tuff

The Bandelier Tuff consists of the Otowi and Tshirege Members, which are stratigraphically separated in many places by the tephra and volcaniclastic sediments of the Cerro Toledo interval (Figure 2.10). The Bandelier Tuff was erupted from the Valles Caldera complex between 1.61 and 1.22 Ma ago. It is perhaps one of the best studied tuff units in the world, and it has been the subject of numerous geological studies since the early 1960s. The tuff is composed of pumice, minor rock fragments, and crystals supported in an ashy matrix. It is a prominent cliff-forming unit because of its generally strong consolidation. In the Tshirege Member, this consolidation is largely due to compaction and welding at high temperatures after the tuff was emplaced. Its light brown, orange brown, purplish, and white cliffs have numerous, mostly vertical fractures (called joints) that show average spacing of between several feet and several tens of feet. The Tshirege Member includes thin but distinctive layers of bedded sand-sized particles, called surge deposits, which demark separate flow units within the tuff.

Most archaeological sites on the Pajarito Plateau are located on the Bandelier Tuff. Archaeological sites include cavates excavated in soft portions of the tuff as well as a variety of structures (e.g., roomblocks, fieldhouses, dams, and terraces) constructed from tuff blocks. Tools such as manos and metates were shaped from tuff blocks. Because the Bandelier Tuff was such an important source of raw material, its detailed stratigraphy is of considerable importance and is discussed further below.

Otowi Member

The Otowi Member crops out in several canyons but is most extensive in Los Alamos Canyon and in canyons to the north. Griggs (1964), R. Smith and Bailey (1966), Bailey et al. (1969), and R. Smith et al. (1970) are important references describing the nature and extent of the Otowi Member. It consists of moderately consolidated (indurated), porous, and non-welded vitric ash-flow tuff (ignimbrite) that forms gentle, colluvium-covered slopes along the base of canyon walls. The Otowi ignimbrites contain light gray to orange pumice supported in a white to tan ashy matrix of glass shards, broken pumice, crystals, and rock fragments (Broxton et al. 1995; Goff 1995).

The Guaje Pumice Bed occurs at the base of the Otowi Member, making it a significant and extensive marker horizon in many boreholes. The Guaje Pumice Bed (Bailey et al. 1969; Self et al. 1986) contains layers of well-sorted pumice fragments whose mean size varies between 2.0 and 4.1 cm (0.8 and 1.6 in.). It has an average thickness of approximately 8.5 m (28 ft) over much of the plateau with local areas of thickening and thinning. The Guaje Pumice Bed's distinctive white color and stratified bedding make it easily identifiable in outcrops.

Figure 2.10. Two major volcanic eruptions from the Valles Caldera complex in the Jemez Mountains produced the widespread and voluminous ash flow sheets of the Otowi and Tshirege Members of the Bandelier Tuff. The Cerro Toledo interval, an interbedded sequence of rhyolitic tephras and sediments, commonly occurs between the two members of the Bandelier Tuff. The upper photograph shows the subunits of the Tshirege Member overlying deposits of the Cerro Toledo interval. The bottom photographs show Otowi Member ash-flow tuffs (left) and a close up of pumices in fall deposits making up the basal Guaje Pumice Bed (right).

Tephra and Volcaniclastic Sediments of the Cerro Toledo Interval

The Cerro Toledo interval is an informal name given to a sequence of volcaniclastic sediments and tephra of mixed provenance that separates the Otowi and Tshirege Members of the Bandelier Tuff on the Pajarito Plateau (Broxton and Reneau 1995; Broxton et al. 1995; Goff 1995). The unit contains primary and reworked rhyolite tephra normally assigned to the Cerro Toledo Rhyolite as described by R. Smith et al. (1970), as well as dacite-rich sediments derived from the Sierra de los Valles. Although it is intercalated between the two members of the Bandelier Tuff, the Cerro Toledo Rhyolite (and the Cerro Toledo interval on the Pajarito Plateau) is not considered part of that formation (see Figure 2.4; Bailey et al. 1969). Outcrops of the Cerro Toledo interval generally occur wherever the top of the Otowi Member appears in Los Alamos Canyon and in canyons to the north. The occurrence of the Cerro Toledo interval is widespread; however, its thickness is variable ranging from several feet to 81 m (266 ft).

The predominant rock types in the Cerro Toledo interval are rhyolitic tuffaceous sediments and tephra (Broxton et al. 1995; Goff 1995; Heiken et al. 1986; Stix et al. 1988). The tuffaceous sediments are the reworked equivalents of Cerro Toledo Rhyolite tephra that erupted from the Cerro Toledo and Rabbit Mountain rhyolite domes located in the Sierra de los Valles. Primary pumice-fall and ash-fall deposits occur in some locations. Cerro Toledo rhyolite, particularly at Rabbit Mountain, was an important source of archaeological obsidian. Although small amounts of obsidian clasts are present in Cerro Toledo deposits on the plateau, these clasts are generally too small to have been a significant source of archaeological obsidian.

Clast-supported gravel, cobble, and boulder deposits made up of porphyritic dacite derived from the Tschicoma Formation are interbedded with the tuffaceous rocks, and in some deposits, the dacitic detritus is volumetrically more important than rhyolitic detritus. These coarse dacitic deposits commonly define the axial portions of paleochannels.

Tshirege Member

The Tshirege Member is the upper member of the Bandelier Tuff and is the most widely exposed bedrock unit of the Pajarito Plateau (Bailey et al. 1969; Griggs 1964; R. Smith and Bailey 1966; R. Smith et al. 1970). Emplacement of this unit occurred during eruptions of the Valles Caldera 1.22 Ma ago (Izett and Obradovich 1994; Spell et al. 1996). The Tshirege Member is a multiple-flow, ash-and-pumice sheet that forms the prominent cliffs in most of the canyons on the Pajarito Plateau. It also underlies the canyon floor in all but the middle and lower reaches of Los Alamos Canyon and in canyons to the north. The Tshirege Member is generally over 61 m (200 ft) thick in the north-central part of LANL and is over 183 m (600 ft) thick near the southern edge of LANL at Technical Area (TA) 49 (Broxton and Reneau 1996).

The Tshirege Member differs from the Otowi Member most notably in its generally greater degree of welding compaction. Time breaks between the successive emplacement of flow units caused the tuff to cool as several distinct cooling units. For this reason, the Tshirege Member is a compound cooling unit, consisting of at least four cooling subunits that display variable physical properties vertically and horizontally (Broxton and Reneau 1995; Crowe et al. 1978; R. Smith and Bailey 1966). These variations in physical properties reflect zonal patterns of varying degree of welding and glass crystallization that accompanies welding (R. Smith 1960a, 1960b). The welding and crystallization variabilities in the Tshirege Member produce recognizable vertical variations in its properties such as density, porosity, hardness, composition, color, and surface weathering patterns. The degree of welding in each of the cooling units generally decreases from west to east, reflecting the higher emplacement temperatures closer to the Valles Caldera.

The Tsankawi Pumice Bed forms the base of the Tshirege Member. Where exposed, it is commonly 51 to 76 cm (20 to 30 in.) thick. This pumice-fall deposit contains moderately well-sorted pumice lapilli (diameters reaching about 6.4 cm [2.5 in.]) in a crystal-rich matrix. Several thin ash beds are interbedded with the pumice-fall deposits.

Qbt 1g is the lowermost subunit of the thick ignimbrite sheet overlying the Tsankawi Pumice Bed (Figure 2.10). It consists of porous, non-welded, and poorly sorted ash flow tuffs. The “g” in this designation stands for “glass” because none of the glass in ash shards and pumices shows crystallization by devitrification or vapor-phase alteration. This unit is poorly indurated but nonetheless forms steep cliffs because of a resistant bench near the top of the unit that forms a harder, protective cap over the softer underlying tuffs. A thin (10- to 25-cm [4- to 10-in.]), pumice-poor, surge deposit commonly occurs at the base of this unit.

Qbt 1v forms alternating cliff-like and sloping outcrops composed of porous, non-welded, but crystallized tuffs. The “v” stands for vapor-phase crystallization, which together with *in situ* crystallization (devitrification), converted much of the glass in shards and pumices into microcrystalline aggregates. The base of this unit is a thin, horizontal zone of preferential weathering that marks the abrupt transition from glassy tuffs below to crystallized tuffs above. This feature forms a widespread mappable marker horizon (locally termed the vapor-phase notch) throughout the Pajarito Plateau, which is readily visible in many canyon walls. In some locations the transition is marked by a prominent bench developed on top of the glassy tuff (Figure 2.10). The lower part of Qbt 1v is a colonnade tuff that is orange brown, is resistant to weathering, and has distinctive columnar (vertical) joints. The upper part of Qbt 1v consists of white, variably indurated, alternating cliff- and slope-forming tuffs. The tuffs of Qbt 1v are commonly non-welded (pumices and shards retain their initial equant shapes) and have an open, porous structure.

Qbt 2 forms a distinctive, medium brown, vertical cliff that stands out in marked contrast to the slope-forming, lighter colored tuffs above and below (Figure 2.10). A series of surge beds commonly mark its base in the eastern part of LANL, and it displays the greatest degree of welding in the Tshirege Member. It is typically nonporous and has low permeability relative to the other units of the Tshirege Member. Vapor-phase crystallization of flattened shards and pumices is extensive in this unit.

Qbt 3 is a non-welded to partially welded, vapor-phase altered tuff, which forms many of the upper cliffs in the mid to lower reaches of canyons on the Pajarito Plateau (Figure 2.10). Its base consists of a purple gray, unconsolidated, porous, and crystal-rich non-welded tuff that underlies a broad, gently sloping bench developed on top of Qbt 2. This basal, non-welded portion forms relatively soft outcrops that weather into low, rounded mounds with a white color, which contrast with the cliffs of partially welded tuff in the middle and upper portions of Qbt 3. In the western part of LANL, an additional subunit, Qbt 3t, is present above Qbt 3 (Gardner et al. 2001). Qbt 3t is a moderately to densely welded ashflow tuff that has petrographic and geochemical characteristics that are transitional between Qbt 3 and Qbt 4.

Qbt 4 is a partially welded to densely welded ignimbrite characterized by small, sparse pumices and numerous intercalated surge deposits. This unit caps mesas in the western part of LANL, but it is absent from mesa tops over the middle to eastern portions of the Pajarito Plateau. Devitrification and vapor-phase alteration are typical in this unit, but thin zones of vitric ignimbrite occur within this unit in the western part of LANL.

Valles Rhyolite

The Valles Rhyolite includes rhyolites and associated pyroclastic rocks erupted within the Valles Caldera after its collapse. The Valles Rhyolite is comprised of, in ascending order, the Deer Canyon, Redondo Creek, Valle Grande, Battleship, El Cajete, and Banco Bonito Members (see Figure 2.4). The Valle Grande Member of the Valles Rhyolite is of particular interest because the Cerro del Medio dome complex in the northeast part of the Valles Caldera was an important source of archaeological obsidian. Cerro del Medio is the oldest of the Valle Grande domes that erupted on the floor of the Valles Caldera (1.133 ± 0.011 Ma; Spell and Harrison 1993). Other dome complexes include Del Abrigo, Santa Rosa, Seco, San Luis, San Antonio, South Mountain, and La Jara. Within the Valle Grande Member, Cerro del Medio is the primary source of aphyric to sparsely porphyritic high-silica rhyolite obsidian. Other rocks of the Valle Grande Member were less favorable sources of archaeological obsidian because of their higher phenocryst contents (16% to 35%). Assignment of archaeological obsidian to the Valle Grande Member is facilitated by the unique chemistry of these domes. Selected chemical data for the Valle Grande Member are summarized in Figures 2.11 and 2.12.

Although vents for the Valles Rhyolite are confined to the Valles Caldera, fall deposits and reworked tephra from Deer Canyon, Cerro del Medio, and El Cajete eruptions overlie the Tshirege Member at several locations on the Pajarito Plateau (Figure 2.13). Prevailing winds at the time of these eruptions deposited ash and pumice eastward over the Sierra de los Valles and Pajarito Plateau. Deposited as ash and pumice falls, these tephra were quickly washed from the eastern slopes of the Sierra de los Valles and redeposited as sheets of reworked tephra up to 6 m (20 ft) thick in the western part of the Pajarito Plateau before canyon incision. The interbedded nature of primary fall deposits and volcaniclastic sediments indicates that volcanism and reworking of the tephra was penecontemporaneous. At some locations, the fall deposits and reworked tephra are interbedded with early Pleistocene dacite-bearing alluvial fan deposits.

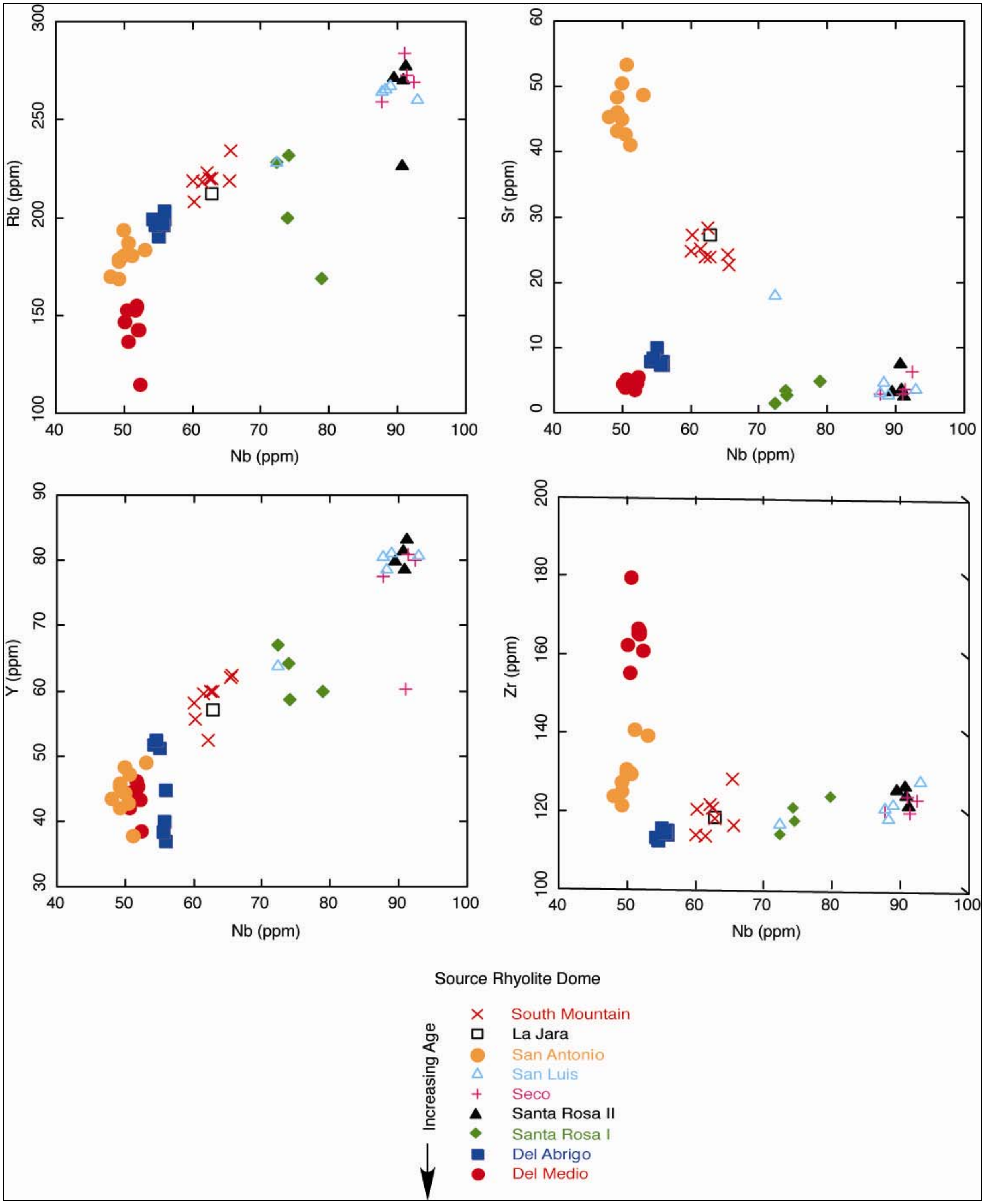


Figure 2.11. Plots of Nd versus Rb, Sr, Y, and Zr for whole rock samples collected from the source domes of Valle Grande Member of the Valles Rhyolite in the Valles Caldera. Data are X-ray fluorescence analyses from Spell (1987).

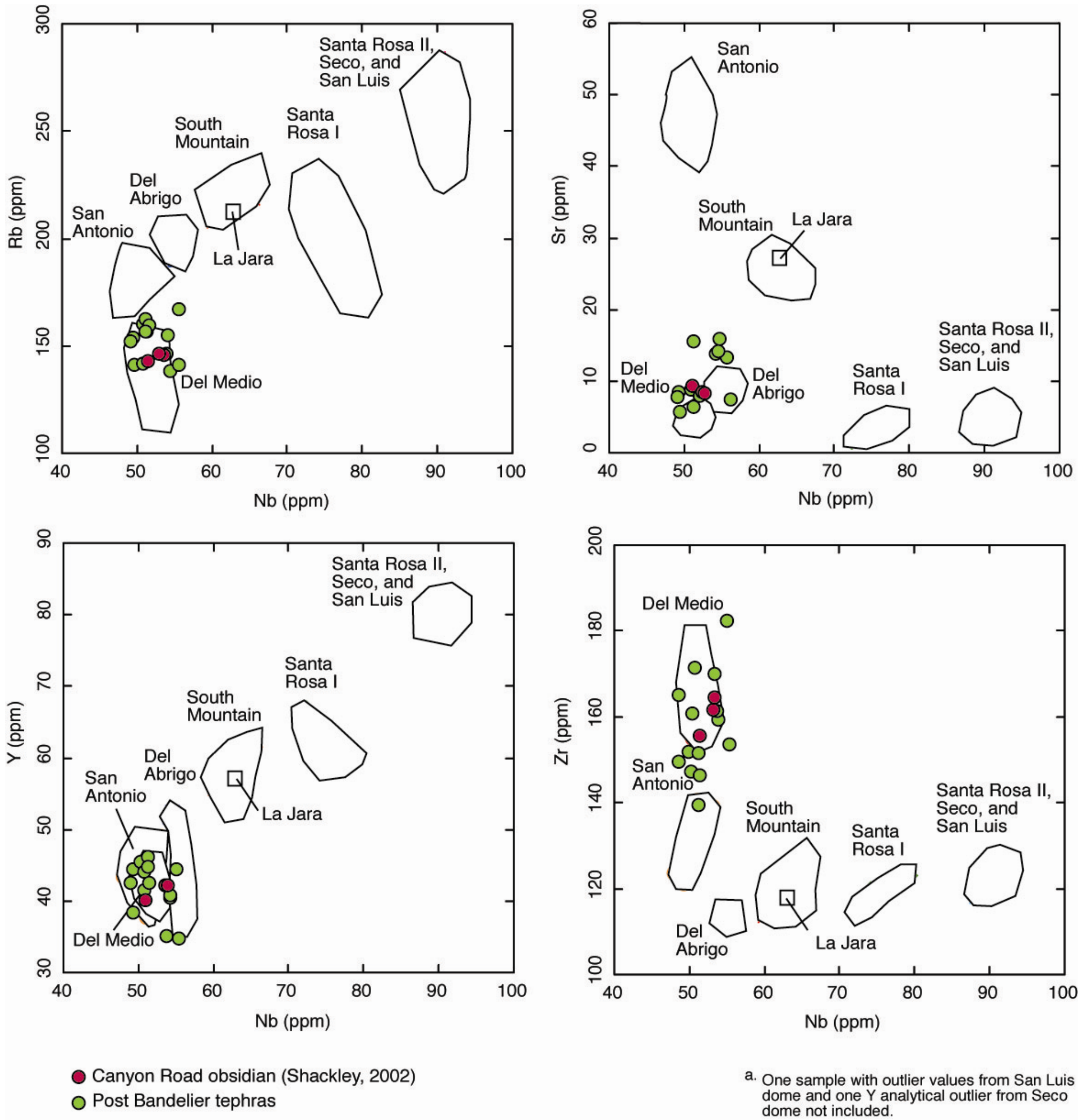
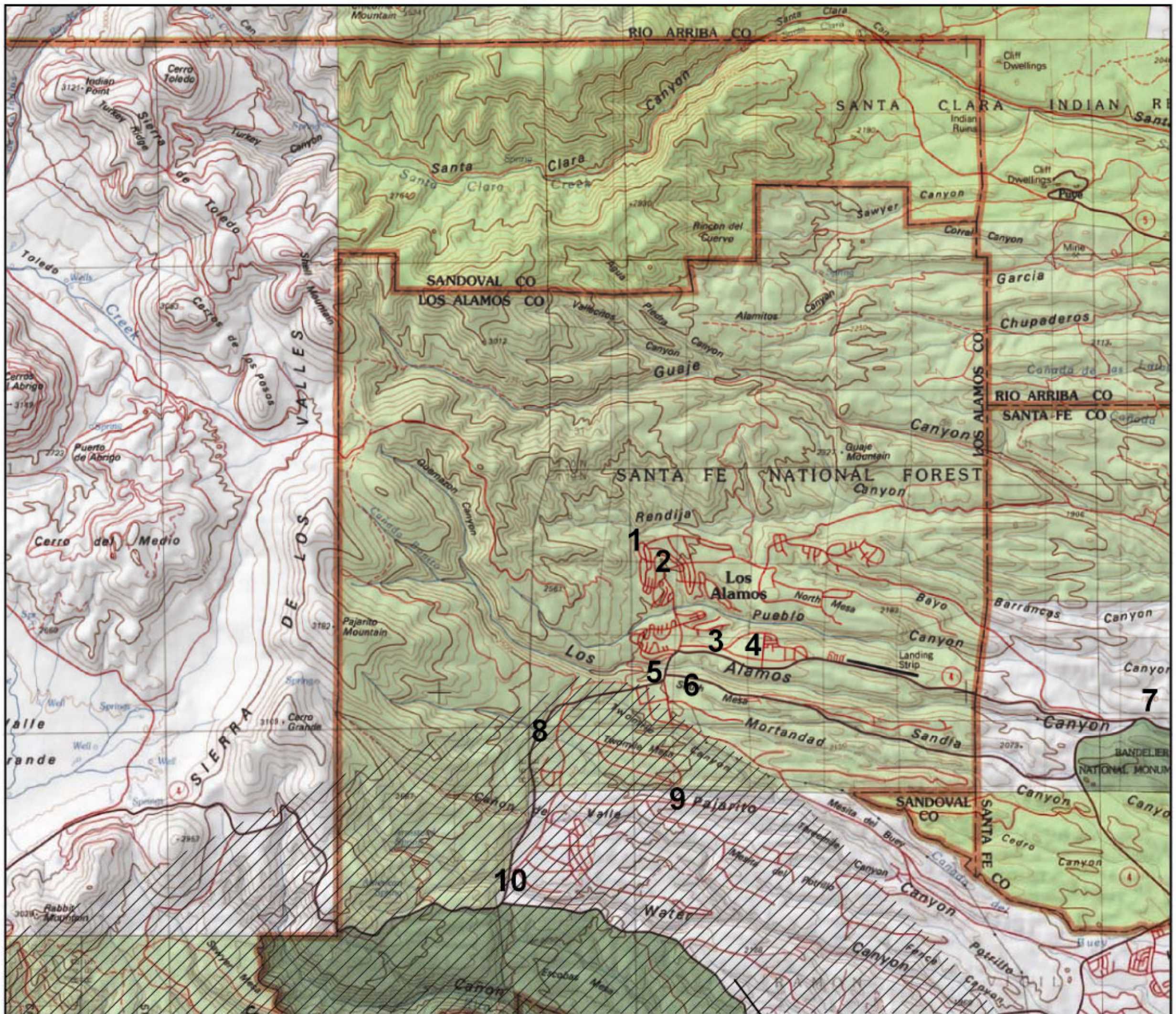


Figure 2.12. Plots of Nd versus Rb, Sr, Y, and Zr for Cerro del Medio tephras collected on the Pajarito Plateau. These data are compared to analyses of source domes (circled areas—see Figure 2.11 for individual analyses; data from Spell [1987]). The tephra data are unpublished X-ray fluorescence analyses (in green) and X-ray fluorescence analyses of obsidian clasts from the Caballo Peaks Apartment site (in red; Shackley 2002).



Limit of El Cajeta Fall Deposits

Deer Canyon (?) and Cerro del Medio Fall Deposits and Reworked Tephras

1 Ponderosa Estates Subdivision
2 Los Alamos County Golf Course
3 Caballo Peak Apartments, Canyon Road
4 Los Alamos County Library
5 Fire Station/South Rim of Los Alamos Canyon
6 Los Alamos County Landfill
7 Top of Mesa North of White Rock Y
8 West Jemez Road
9 Seismic Hazard Trenches, Pajarito Mesa
10 Water Canyon Borrow Pit

Figure 2.13. Locations where post-Bandelier fall deposits and reworked tephras have been recently recognized on the Pajarito Plateau.

Deer Canyon (?) deposits are the earliest post-Tshirege tephra recognized on the Pajarito Plateau. The best examples of these deposits are found within the Ponderosa Estates subdivision of Los Alamos near Guaje Pines Cemetery. The correlation of these tephra to the Deer Canyon Member is tentative because there is little published information about the chemical and petrographic characteristics of Deer Canyon source areas. Bailey et al. (1969) describe the Deer Canyon Member as petrographically distinct, containing abundant phenocrysts of quartz and sanidine and lacking visible ferromagnesium minerals. The fall deposits and reworked tephra exposed in the Ponderosa Estates subdivision also contain abundant phenocrysts of quartz and sanidine, but also contain visible pyroxenes. These tephra contain 250 to 350 ppm Zr and 90 to 150 ppm Rb, which distinguish them from the rhyolites of the Valle Grande Member (see Figure 2.12), but are similar to analyses for Deer Canyon lavas collected in the southwest part of Valles Caldera (100 to 130 ppm Rb and 236 to 267 ppm Zr; Broxton, unpublished analyses). More work is needed to test the correlation between these tephra and the Deer Canyon Member.

Cerro del Medio fall deposits and reworked tephra overlie the Tshirege Member at a number of locations on the Pajarito Plateau. Good exposures of these deposits occur along Canyon Road on the north side of Caballo Peak Apartments, on the north end of the Los Alamos Canyon landfill, and along Diamond Drive adjacent to the Los Alamos County golf course. Deposits are typically well-bedded and include both primary fall deposits and volcaniclastic sediments made up of aphyric pumice, obsidian and stony rhyolite clasts, and ash (Figure 2.14). Obsidian clasts within these deposits are generally less than 1 cm in diameter and probably were not important sources of archaeological obsidian. Correlation with the Cerro del Medio Member is based on stratigraphic position, the crystal-poor nature of these deposits, and the chemistry of pumices and obsidian clasts, which are similar to the lavas of Cerro del Medio (see Figure 2.12).

El Cajete pumice is widespread in the southwest part of the Pajarito Plateau (see Figure 2.3). Deposits consist of up to 1.5 m of primary fallout pumice with minimal reworking. Pumice clasts are 3 to 5 cm in diameter and are characterized a dense, poorly vesicular structure. El Cajete pumice are easily recognized by their lack of significant weathering, low phenocryst content (<5%), and salt and pepper appearance due to presence of small ferromagnesium phenocrysts.

Alluvium

Discontinuous Quaternary alluvial units overlie Bandelier Tuff as thin deposits on mesa tops and as stream deposits in canyons. Alluvial fans made up of dacite debris are interbedded with, and overlie, Valles Rhyolite tephra in the western part of LANL. Dacite cobbles occur with sandy to gravelly alluvium in canyon-floor sediments of the major drainages crossing the Pajarito Plateau. These alluvial deposits probably served as local sources for dacite cobbles found at some archaeological sites.

Figure 2.14. Cerro del Medio tephra exposed in north parking lot of Caballo Peak Apartments and along Canyon Road. These deposits consist of primary ash and pumice falls and reworked tephras. Lower photograph is a detailed view of deposit and shows white angular pumice, clasts of medium-gray stony rhyolite, and clasts of dark gray and black obsidian; quarter included for scale.

GEOLOGIC STRUCTURE

The Pajarito Plateau is on the western margin of the Española basin of the Rio Grande rift, a tectonically active region. The Pajarito fault system is the major border fault on the west side of the basin, and it delineates the boundary between the eastern Sierra de Los Valles and the western part of the plateau (Gardner et al. 2001). Continuing displacement along this fault system is reflected by Holocene movement and historic seismicity (Gardner and House 1987; Gardner et al. 1990). The Pajarito fault system is characterized by northerly trending normal faults that intertwine along their traces. Down-to-the-east displacement across the fault system produced the series of prominent fault scarps west of LANL. Post-Bandelier vertical throw on this fault system is over several hundred feet south and west of LANL but decreases north of Los Alamos Canyon where the fault system is less prominent.

In addition to the main traces of the Pajarito fault system, other faults cut the Pajarito Plateau. The Rendija Canyon fault is a normal fault trending north-south in the west-central part of the plateau; it crosses Pueblo Canyon near its confluence with Acid Canyon and Los Alamos Canyon near TA-41 but does not have clear surface expression south of Sandia Canyon. The Guaje Mountain fault parallels the Rendija Canyon fault and is projected to cross Los Alamos Canyon near TA-2 although there is no clear offset of the Tshirege Member south of North Mesa. North of LANL both of these faults have down-to-the-west movement and zones of gouge and breccia up to several meters wide and produce visible offset of stratigraphic horizons and recognizable scarps.

CHAPTER 3
OVERVIEW OF PAJARITO PLATEAU GEOMORPHOLOGY

Steven L. Reneau and Paul G. Drakos

INTRODUCTION

Los Alamos National Laboratory (LANL) is located on the Pajarito Plateau in the eastern part of the Jemez volcanic field in northern New Mexico, within the Española basin section of the Rio Grande rift tectonic province (Keller and Cather 1994) (Figure 3.1). The Jemez volcanic field lies along the Jemez lineament, a southwest-to-northeast-trending zone of structural weakness defined by a series of northeast-trending faults and volcanic centers extending from the Springerville volcanic field in Arizona to the Taos Plateau volcanic field and Capulin volcano in northern New Mexico (Laughlin et al. 1982).

The Pajarito Plateau is a dissected landscape of alternating mesas and canyons that is located between the east flank of the Jemez Mountains (the Sierra de los Valles) and White Rock Canyon of the Rio Grande (Reneau and McDonald 1996) (Figure 3.2). The Pajarito Plateau is underlain by the Tshirege Member of the Bandelier Tuff, a massive series of ignimbrites erupted from the Jemez Mountains at ca. 1.22 Ma (million years) and associated with development of the Valles Caldera (Broxton et al., this volume; Izett and Obradovich 1994; Reneau and McDonald 1996; R. Smith and Bailey 1966). The evolution of drainages since the eruption of Tshirege Member of the Bandelier Tuff has produced a landscape with a variety of landforms including gently sloping mesa tops, steep canyon walls, and canyon bottoms. This chapter provides an introduction to the geomorphologic nomenclature, history, and setting for the Pajarito Plateau at LANL.

GEOMORPHIC PROCESSES

Geomorphic processes, or physical processes acting on the earth's surface, play an integral role in determining the nature of the land surface at any point in time, how the land can be used, and whether archaeological sites will be preserved at the surface, eroded, or buried. Changes in climate, including changes in the amount, intensity, and seasonal distribution of precipitation, have strongly affected geomorphic processes and therefore the stability of the land surface (Bull 1991). The nature and density of vegetation are also affected by short-term and long-term changes in climate and by the geomorphic processes acting under that climate. In turn, geomorphic processes are affected by vegetation through their influence on surface runoff and erosion, resulting in complex interrelationships. Results of numerous investigations at LANL and in adjacent areas on the Pajarito Plateau have demonstrated that significant geomorphic changes have occurred in this area over the time period relevant for archaeological investigations, resulting in extensive sediment deposition in some areas and erosion in others (e.g., Reneau and McDonald 1996; Reneau et al. 1996a). Archaeological sites from any time period may thus be either buried or removed by erosion depending on the landscape position.

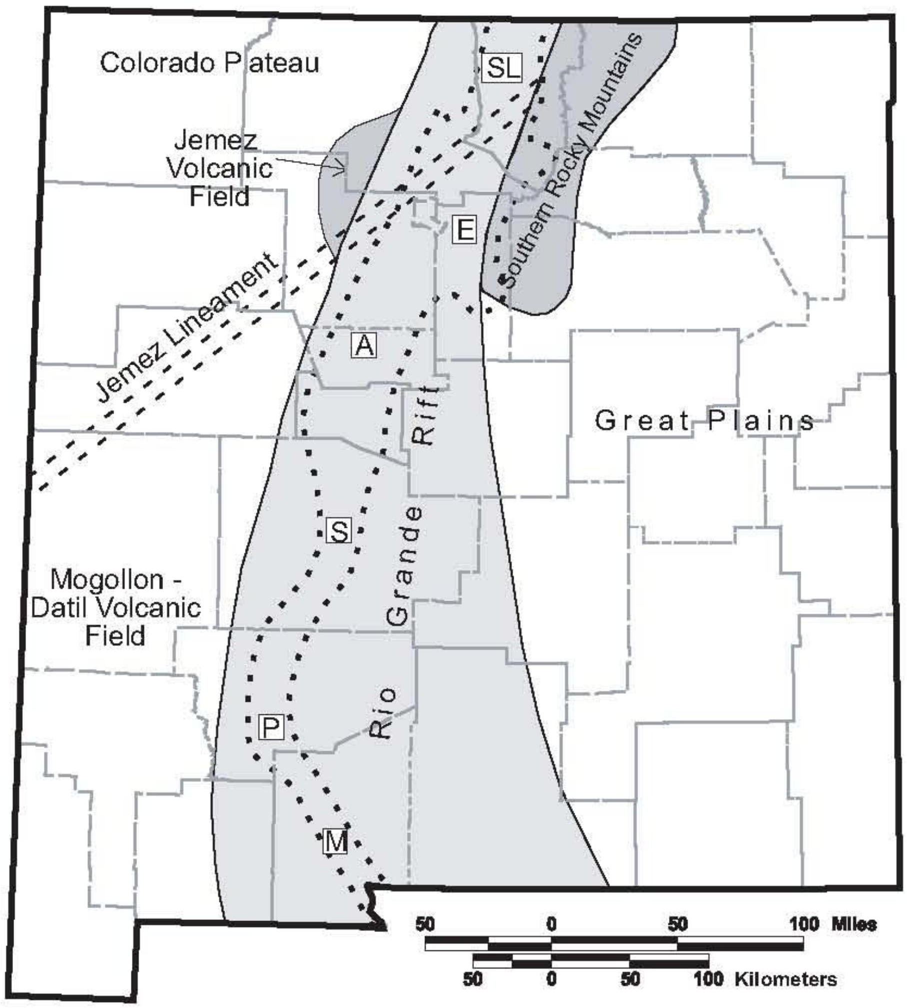


Figure 3.1. Schematic map of New Mexico showing the approximate limits of various physiographic provinces and geographic features. Major basins in the Rio Grande rift from north to south are SL = San Luis, E = Española, A = Albuquerque, S = Socorro, P = Palomas, M = Mimbres. (Modified from Keller and Cather 1994).

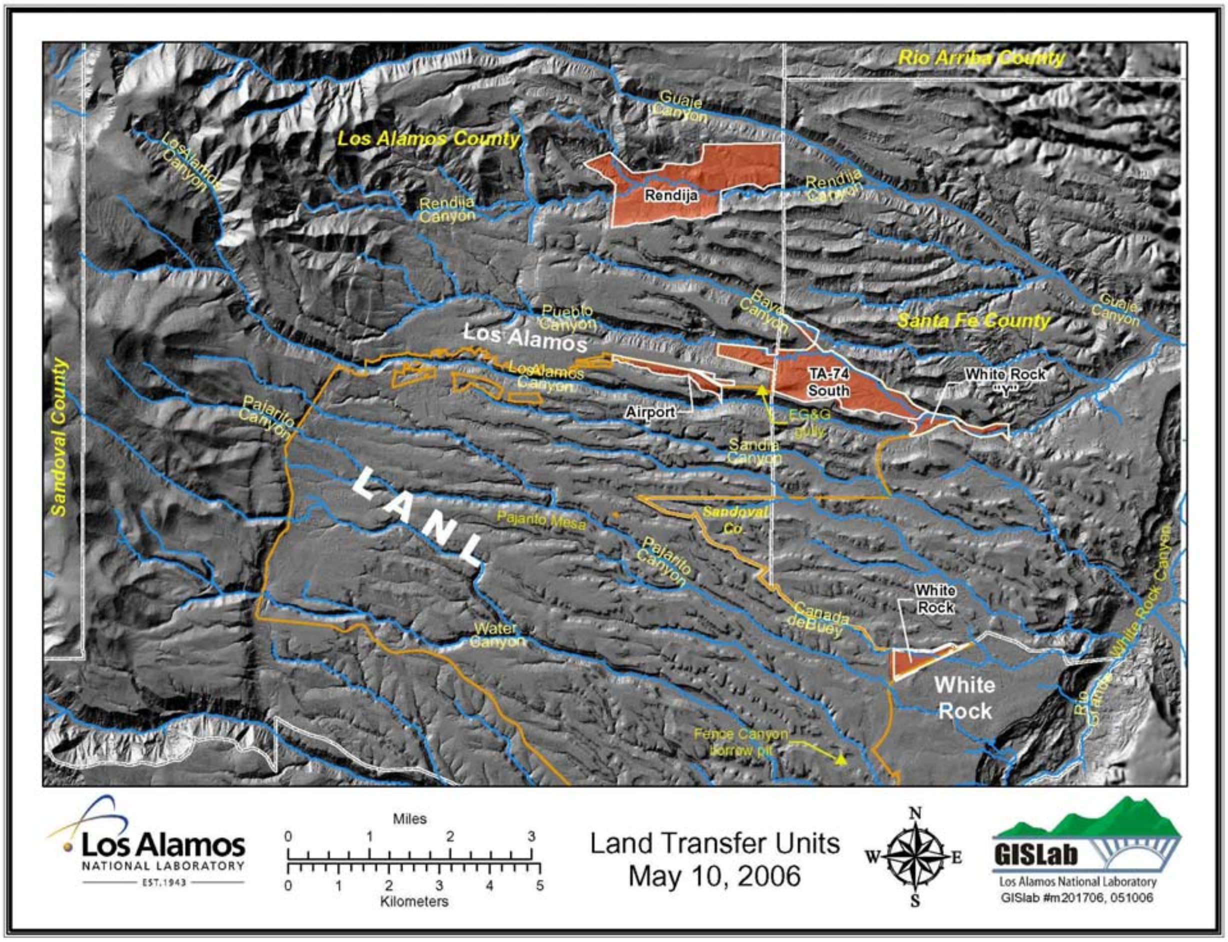


Figure 3.2. Digital elevation map of Pajarito Plateau showing some land transfer parcels.

NOMENCLATURE FOR GEOLOGIC DEPOSITS, SOILS, AND SURFACE PROCESSES

Several basic terms are used in this section for geologic deposits and related surficial materials such as soils and for relevant surface processes. General definitions of geologic terms can be found in Jackson (1997), and the specific usage in this section is discussed below.

Sediment particle size classes have been defined differently in different professions and here we use the basic divisions utilized by geologists and soil scientists. Higher-level subdivisions include "gravel" (particles >2 mm in size), "sand" (0.0625 to 2 mm), "silt" (0.002 to 0.0625 mm), and "clay" (<0.002 mm or <2 μm). Each of these size classes is further subdivided (e.g., very coarse, coarse, medium, fine, and very fine sand). These terms can apply to either individual sediment particles or to sedimentary deposits that are dominated by particles of certain sizes (e.g., sandy gravel or silty sand).

"Alluvium," "alluvial deposit," or "fluvial deposit" refer to deposits from streams or rivers and include a range of sediment texture from gravel to silt. "Channel deposit" refers to alluvium deposited in the active stream channel at any time and is typically relatively coarse-grained. "Floodplain deposit" refers to alluvium deposited outside the active channel by floods that overtop stream banks and is typically relatively fine-grained. "Stream terrace deposit" refers to alluvium that is older than modern channel and floodplain deposits and generally occurs above the modern channel, underlying surfaces ("stream terraces") that represent channels, or floodplains abandoned following stream incision. "Alluvial fan" refers to generally cone-shaped landforms produced by the deposition of alluvium where streams become unconfined and spread out onto gentler surfaces.

"Colluvium" or "colluvial deposit" refers to generally poorly sorted deposits on hillslopes and includes material with varied origin and grain size. Colluvial deposits can be produced from rockfalls or other forms of mass wasting, such as landslides, and can contain abundant boulders. Colluvial deposits can also be produced by less dramatic processes such as the downslope movement of material on slopes following dislodgment by animals or toppling of trees. As used here, colluvium also includes deposits from shallow, dispersed surface runoff, called "slope wash" or "sheet wash." Note that in this context the distinction between "colluvium" and "alluvium" can be somewhat arbitrary because of a gradual change from dispersed runoff to channelized flow, and stratification resulting from deposition by running water can be locally found on hillslopes.

"Eolian deposit" refers to sediment deposited by wind and is generally in the silt to very fine sand range on the Pajarito Plateau. Eolian deposits dominated by silt are often referred to as "loess." Note that it can be difficult to distinguish thin and/or discontinuous eolian deposits from eolian material that has been locally reworked by surface water, and some deposits with an eolian origin may be included with "colluvium" or "alluvium" for simplicity. Also note that eolian material can be incorporated into soils without producing distinct deposits, and much of the silt, clay, and carbonate in many Pajarito Plateau soils may be supplied by wind (Eberly et al. 1996; McDonald et al. 1996; McFadden et al. 1996; Reneau and McDonald 1996; Reneau et al. 1995).

"Lacustrine deposit" refers to sediment deposited in lakes. Lacustrine deposits are commonly fine-grained and well-laminated, although coarse deposits can also occur near the margins of lakes where coarser sediment is supplied by streams.

"Bioturbation" is a process by which soils and sediments are mixed by biological agents. One common process is animal burrowing, which creates both subsurface tunnels and surficial deposits adjacent to entrances to burrows. The term "krotovina" is commonly used for filled animal burrows. The ingestion and excretion of soil by earthworms is another effective means of bioturbation at smaller scales. The toppling of trees also disrupts soils and sediment, creating "pit and mound" microtopography that gets smoothed over time (Denny and Goodlett 1956). Collectively, these processes can both obscure original sedimentary layers and result in the mixing of material from various depths, affecting the ability to decipher geologic and archaeological records. The effects of bioturbation are most pronounced near the ground surface and become more important over time. Note that some eolian or alluvial deposits on the Pajarito Plateau may be lumped with "colluvium" because bioturbation has created a poorly sorted deposit resembling colluvium whose origin can no longer be determined with certainty.

"Soil" is a term for material at the earth's surface consisting of layers or "horizons" that differ from the parent materials as the result of "pedogenic" or soil-forming processes (Birkeland 1999). At LANL, soils form on a variety of parent materials, including alluvial, colluvial, eolian, and lacustrine deposits. General subdivisions of soil profiles include "A," "B," and "C" horizons, and these horizons can be further subdivided associated with vertical variations in soil properties. "A horizons" are the uppermost soil layers and are characterized by maximum additions of organic matter and often by loss of some material to deeper horizons. "B horizons" are subsurface layers that have generally accumulated clay, iron oxides, or other material translocated from overlying horizons. "C horizons" are deeper layers consisting of generally unweathered parent material. Soil properties change over time, and older deposits have better-developed soils than younger deposits (Birkeland 1999). Soil profiles on the Pajarito Plateau can be complex, reflecting variations in geomorphic processes at the surface (Longmire et al. 1996; McDonald et al. 1996; McFadden et al. 1996; Reneau and McDonald 1996). "Buried soils" are created when significant layers of sediment cover relatively stable surfaces and at some sites several distinct soil profiles can be stacked on top of each other, recording episodic deposition. "Stripped soils" are created by erosion of the upper parts of soil profiles, for example exposing B horizons at the surface. "Cumulative soils" are formed at sites experiencing relatively slow deposition, creating relatively weak but relatively thick A and B horizons. Identification of buried soils and stripped surfaces is integral to identification of occupation surfaces, correlation between sites, and evaluation of relative age of sites based on soil-stratigraphic relationships.

DIVISIONS OF GEOLOGIC TIME

Several general divisions of geologic time are relevant for this discussion. At the highest level, the last 1.8 million years are referred to as the Quaternary period (Van Couvering 1997), which is subdivided into the Pleistocene and Holocene epochs. The term "late Quaternary" includes the late Pleistocene and the Holocene, which is the time period relevant for archaeological investigations in North America. The Pleistocene-Holocene boundary is commonly placed at 10,000 radiocarbon years before present (^{14}C yr BP) (Hopkins 1975), although this is an arbitrarily chosen date within a period of transitional climate and may be subject to change (Morrison 1991). However, 10 ^{14}C ka (ka = thousands of years BP) roughly corresponds to a time of major geomorphic changes on the Pajarito Plateau and is an appropriate boundary for this discussion. When calibrated to a dendrochronological time scale (to correct for variations in the $^{14}C/^{12}C$ ratio in the atmosphere over time), 10 ^{14}C ka is equivalent to about 11.35 to 11.55 cal (calibrated) ka or about 9400 to 9600 cal BC. (A recent calibration of the radiocarbon time scale is presented in Stuiver et al. 1998, and we use their conversions here.) The Holocene has no formal subdivisions, and here we use the general terms "early," "middle," and "late" to refer to roughly the first third, second third, and last third of the Holocene.

Geomorphic History

In this section we discuss the geomorphic history of the Pajarito Plateau since about 15 ^{14}C ka (ca. 17.4 cal ka), or since the latest Pleistocene, based on available studies. Emphasis is given to dated deposits and soils from different periods and in different landscape positions and their implications for variations in environmental conditions since 15 ^{14}C ka.

This section uses radiocarbon ages in reference to the geomorphic history of the area because this dating method has provided the most abundant age control for prehistoric deposits on the Pajarito Plateau and in nearby areas. Also, because radiocarbon calibration has changed over time and because many studies utilizing radiocarbon dating have not provided calibrated dates, direct reference to radiocarbon dates allows easier comparison between studies.

Latest Pleistocene

The period between 15 and 10 ^{14}C ka was a time of transitional climate after the peak of the late Wisconsin glaciations in North America and before establishment of the more modern Holocene climate. Paleoenvironmental records in the region, including the record of lake level changes in the Estancia basin (B. Allen 1991), indicate a generally moister climate than at present with significant climatic fluctuations. Deposits dating to the period between 15 and 10 ^{14}C ka on the Pajarito Plateau indicate significantly different geomorphic conditions than during the Holocene that were probably associated with the unique climatic conditions at that time.

Relatively few latest Pleistocene radiocarbon dates have been obtained from the Pajarito Plateau, and available information suggests that the landscape was relatively stable. Some evidence of colluvial deposition has been found, but there was apparently minimal sediment deposition or incision along stream channels. Out of a total of 55 alluvial deposits that had been dated by 1996, only a single site had yielded a date in this range (Reneau and McDonald 1996). This date, 11.6 ^{14}C ka, was obtained from a drill hole sample at a depth of 6.1 m (20 ft) beneath the bottom of the north fork of Ancho Canyon in LANL Technical Area (TA) 39 (Figure 6A of Reneau et al. 1996a). It is similarly expected that in many canyons on the Pajarito Plateau, alluvium of this age, if present, would also be deeply buried.

Dates very close to the Pleistocene-Holocene boundary have been obtained from buried soils at several sites on the Pajarito Plateau and provide evidence for a relatively stable landscape at about 10 ^{14}C ka. Examples include a buried floodplain soil beneath the north fork of Ancho Canyon (9.9 ^{14}C ka, Reneau et al. 1996a, Figure 6A); a buried, organic-rich deposit within a shallow tributary drainage to Cañada del Buey in TA-54 (9.7 and 10.1 ^{14}C ka, Reneau et al. 1996a, Figure 7); an extensive buried soil in a shallow mesa top drainage south of Frijoles Canyon in Bandelier National Monument (10.3 ^{14}C ka, Reneau and McDonald 1996); and a buried soil beneath an alluvial fan at the western margin of LANL in TA-69, between Pajarito Canyon and Two Mile Canyon (10.1 ^{14}C ka, Reneau et al. 2002). McFaul and Doering (1993) report a radiocarbon date of 9.4 ^{14}C ka from humate in a buried soil south of Water Canyon in TA-70, and their sample site is inferred to be analogous to the sites mentioned above.

Slightly older colluvial deposits, dating to the period between 15 and 10 ^{14}C ka, have been identified at several sites on the eastern Pajarito Plateau beneath the buried soils discussed above and suggest at least local deposition of colluvium during this period. One site is along the north wall of Fence Canyon in TA-70, where a 12.3 ^{14}C ka date has been obtained from the upper part of a buried colluvial deposit (Reneau and McDonald 1996, Figure 1-22). Analogous late Pleistocene units on mesa tops may be recorded by deposits studied by McFaul and Doering (1993) north and south of Water Canyon in TA-70 that are bracketed by dates on humate in buried soils of 9.4 and 15.7 to 16.0 ^{14}C ka (see also Reneau and McDonald 1996:58–60). Additional dates of 11.5 to 13.8 ^{14}C ka have been obtained from buried soils and colluvium in Rendija Canyon and on Pajarito Mesa at TA-67 (McDonald et al. 1996; Reneau et al. 1995), indicating local preservation of colluvium of this age at sites farther west on the plateau.

In contrast to the apparent complacency of geomorphic processes during the latest Pleistocene on the Pajarito Plateau, data from White Rock Canyon indicate a very dynamic landscape along the Rio Grande. In particular, the presence of lacustrine deposits demonstrate that large lakes formed at least three times between ca. 13.7 and 12.4 ^{14}C ka, produced by the damming of the river by landslides (Reneau and Dethier 1996). Unique ecological conditions would have existed along the Rio Grande at these times.

Early to Middle Holocene

Extensive deposits of early to middle Holocene age exist on the Pajarito Plateau in a variety of landscape settings, including alluvial, colluvial, and eolian material. These deposits document a substantial flux of sediment that was apparently derived from extensive erosion in upland areas and on slopes. This sediment supply exceeded the capacity of local transport processes acting under the Holocene climate, resulting in widespread aggradation of canyon bottoms and associated deposition along tributary drainages and on slopes, burying latest Pleistocene soils and stream channels. Significant eolian deposition also apparently occurred at this time. There is also some evidence that larger floods occurred during this period than in the latest Pleistocene, causing relatively high rates of stream incision into bedrock in some canyons.

Channels with drainage areas that range from the smallest first-order basins on mesa tops to the largest watersheds draining the Jemez Mountains have provided evidence for significant sediment deposition in the early to middle Holocene, indicating regional controls on erosion and sedimentation that affected a variety of vegetation communities and terrain (Drakos et al. 1996; Reneau and McDonald 1996; Reneau et al. 1996a). In Frijoles Canyon in Bandelier National Monument, up to 13 m (43 ft) of coarse alluvium was deposited before 6.2 ^{14}C ka, deposits which have now been exposed following stream incision (Reneau 2000). In Mortandad Canyon in TA-5, samples from drill holes indicate that 10 to 12 m (33 to 39 ft) of alluvium has been deposited since 7.2 to 7.8 ^{14}C ka (Reneau et al. 1996a; Figure 6B), and the base of the Holocene section is likely deeper. In Los Alamos Canyon, drill hole data show that alluvial deposits bury El Cajete pumice and indicate that 10 m (33 ft) of aggradation has occurred since ca. 50 to 60 ka (Broxton et al. 1994; Drakos et al. 1996). On the western margin of LANL in TA-69 between Pajarito Canyon and Two Mile Canyon, a trench through a small alluvial fan deposited along a drainage off the Pajarito fault escarpment provided excellent constraints on the timing of initial Holocene aggradation, exposing alluvial deposits at a depth of 2 to 2.5 m that were dated at 9.4 ^{14}C ka, overlying a buried soil dated at 10.1 ^{14}C ka (Reneau et al. 2002). North of Water Canyon, on another alluvial fan at the base of the Pajarito fault escarpment, similar dates of 9.4 to 9.6 ^{14}C ka were obtained from near the top of a 6-m- (20-ft-) thick deposit, providing additional support for significant deposition at the very beginning of the Holocene (Gardner et al. 2001). Significant early Holocene deposition has also been found along first-order drainages on mesa tops farther east on the Pajarito Plateau, including a location in TA-73 near the Los Alamos town site where deposition began some time before 7.9 to 8.1 ^{14}C ka, burying a shallow channel on bedrock (Longmire et al. 1996; Reneau et al. 1996a:Figure 3). Roughly contemporaneous deposition in White Rock Canyon is documented by a date of 10.0 ^{14}C ka from the lower part of a small alluvial fan above a late Pleistocene Rio Grande terrace (Reneau and Dethier 1996).

Significant deposition of slopewash colluvium in the early to middle Holocene has been documented at several sites. At a borrow pit exposure on the north wall of Fence Canyon in TA-70, about 2.7 m (9 ft) of slopewash material accumulated between 7.9 and ~4 ^{14}C ka (Reneau and McDonald 1996:Figure 1-22). Notably, an Archaic hearth dated at 4.7 ^{14}C ka was exposed nearby within the slopewash deposits, demonstrating prehistoric use of this geomorphic setting and the potential for site preservation by burial (Reneau and McDonald 1996:Figure 1-23). On the mesa south of Frijoles Canyon in Bandelier National Monument, a similar chronology has been obtained, with dates of 8.6 to 8.7 ^{14}C ka obtained from the lower part of a 1.6-m-thick slopewash deposit above a buried soil that yielded a 10.3 ^{14}C ka date (Reneau and McDonald 1996). Early Holocene slopewash deposits dated at 7.0 ^{14}C ka also overlie a buried, organic-rich deposit within a shallow tributary drainage to Cañada del Buey in TA-54 (Reneau et al. 1996a:Figure 7). Although early to middle Holocene deposits are present at several locations, such deposits are typically buried by younger deposits. Early to middle Holocene deposits are likely discontinuously preserved and may be absent from many locations on the Pajarito Plateau.

Evidence for eolian deposition in the early Holocene has been found in one area, where trenches excavated on Pajarito Mesa in TA-67 exposed fine-grained deposits that yielded dates of 9.3 to 9.5 ^{14}C ka overlying older soils (Kolbe et al. 1994; Reneau et al. 1995, 1996a). The texture and the stratigraphic setting of these deposits both argue for an eolian source for the material, and it is expected that similar deposits occur on other mesas. Two of the dated sites on Pajarito Mesa were locations with oxidized tuff clasts that were interpreted as Paleoindian fire pits constructed during a period of mesa top aggradation (e.g., see Figure 2A of Reneau et al. 1996a), indicating the potential preservation of similar sites elsewhere on the Pajarito Plateau.

Evidence for the occurrence of significantly larger floods on the Pajarito Plateau in the early and middle Holocene than in the late Pleistocene is provided by stream terrace sequences in Rendija Canyon and Frijoles Canyon. Stacked Holocene terraces in each canyon record periods of channel stability and lateral cutting that alternate with incision into bedrock. Average Holocene incision rates have been an order of magnitude higher than Pleistocene rates, suggesting recurring large floods capable of stripping gravel from the streambeds and leading to deeper incision (Reneau 2000; Reneau and McDonald 1996).

Late Holocene

Late Holocene deposits on the Pajarito Plateau are generally similar to early and middle Holocene deposits, suggesting similar geomorphic processes, although evidence from several sites indicates that rates of overall sediment deposition may have decreased in the late Holocene, locally replaced by erosion.

Late Holocene alluvium is widespread in canyons on the Pajarito Plateau, including the lower terraces in Rendija and Frijoles canyons, although in both of these canyons the thickest and/or widest terrace deposits were deposited in the early or middle Holocene (McDonald et al. 1996; Reneau 2000; Reneau and McDonald 1996). Progressive aggradation through the late Holocene is indicated in several canyons that head on the Pajarito Plateau. In Sandia Canyon in TA-53, 4 m (13 ft) of alluvium has been deposited since 2.8 ^{14}C ka (Reneau and McDonald 1996; Figure 1-10), and in Cabra Canyon 4 m (13 ft) has been deposited since about 3.7 ^{14}C ka (Gardner et al. 1990, 2003; Reneau and McDonald 1996:Figure 2-31). The late Holocene section is apparently thinner in other canyons, such as Ancho Canyon in TA-39 where 1.6 m (5 ft) of alluvium has been deposited since 3.0 ^{14}C ka (Reneau and McDonald 1996: Figure 1-29), and the north fork of Ancho Canyon, where a date of 2.9 ^{14}C ka was obtained from a depth of 0.9 m (3 ft) (Reneau et al. 1996a: Figure 6A).

Late Holocene colluvium is present in many areas, including along canyon walls and at the margins of floodplains, demonstrating active erosion and transport of material off hillslopes. Examples include Los Alamos Canyon in TA-62, where 1.4 m (5 ft) of colluvium has accumulated since 3.1 ^{14}C ka (Longmire et al. 1996), and Cañon de Valle in TA-16, where up to 1.9 m (6.2 ft) of colluvium has accumulated since 3.8 ^{14}C ka (Gardner et al. 2001). In other areas, however, colluvial deposits from the early and middle Holocene have been dissected, and erosion has predominated instead of deposition. At the site in Fence Canyon in TA-70 discussed previously, deposition apparently stopped some time after 4.4 ^{14}C ka, and about 4 m (13.1 ft) of incision has subsequently occurred (Reneau and McDonald 1996). Many areas with colluvial soils on the eastern Pajarito Plateau are currently experiencing rapid erosion, including an intensively studied mesa top drainage basin south of Frijoles Canyon in Bandelier National Monument (Wilcox et al. 1996a, 1996b). Erosion is impacting archaeological resources in some of these areas, and 1 liter of potsherds and lithic fragments were collected at a sediment trap in the study area mentioned above after a single runoff event in 1995. Erosion was also apparently active during occupation of some ancestral Puebloan sites, as apparent prehistoric check dams have been seen within a gullied area north of the Tsirege ruins in the Cañada del Buey basin (Reneau and McDonald 1996:54–56).

Late Holocene eolian deposits have been observed at several locations on the Pajarito Plateau. The trenches excavated on Pajarito Mesa at TA-67 provided evidence for thin but extensive late Holocene eolian deposits, averaging about 20 cm thick on the mesa (Kolbe et al. 1994; Reneau et al. 1995, 1996). These deposits date to 0.7 ^{14}C ka or less and cover a series of subsurface archaeological sites near ancestral Puebloan ruins (Reneau et al. 1996a:Figure 2b). Similar thin, discontinuous post-Puebloan age deposits not greater than 20 to 30 cm thick were noted during archaeological excavations on the Mesita del Buey mesa top (Steen 1982). This evidence for young deposition contrasts with evidence for erosion elsewhere on mesa tops, particularly near their margins where tuff bedrock is commonly exposed, and illustrates some of the great variability of surface processes on the Pajarito Plateau.

Late Holocene deposits also occur in White Rock Canyon, in part representing significantly different environments than are found on the Pajarito Plateau. For example, at one location along the Rio Grande 2.1 to 2.6 m (6.8 to 8.5 ft) of fine-grained sediment has been deposited since 2.9 ^{14}C ka directly above a gravel bar along the Rio Grande and may represent Rio Grande floodplain deposits or eolian deposits (Reneau and Dethier 1996; Reneau and McDonald 1996:30). The dated material was in association with fire-cracked stones and indicates burial of an Archaic campsite along the river.

Implications for Site Preservation

Geomorphic processes since the latest Pleistocene on the Pajarito Plateau have resulted in spatially and temporally complex patterns of erosion and deposition that provide abundant opportunities for preservation of archaeological sites of a variety of ages in a range of landscape positions and that also results in destruction of sites by erosion.

The highest potential for site preservation exists along small drainage channels on mesas, on alluvial fans, and in canyon bottoms, where net deposition of alluvium and colluvium has occurred during the Holocene, and on the more stable parts of mesa tops where erosion has been minimal or where deposition of eolian sediment has occurred. Stable parts of fluvial terrace surfaces that have experienced net deposition of colluvium or eolian sediment also have excellent site preservation potential. In contrast, mesa margins have the lowest potential for site preservation due to surface runoff that has eroded soils and exposed bedrock in many areas, and any artifacts in these areas may either have been transported to the site or left as a lag following erosion of associated deposits. Colluvial slopes have variable site preservation potential that is controlled by local geomorphic factors, including slope aspect, relative site position on a particular hillslope, sediment supply, and slope gradient above and below a particular site.

The common presence of a buried soil dating to near the Pleistocene-Holocene boundary beneath early Holocene alluvium or colluvium indicates the potential preservation of Paleoindian sites in many areas, although in canyon bottoms strata of this age may be buried beneath many meters of sediment. The potential for preservation of Paleoindian sites on mesa tops has been demonstrated in an area where apparent fire pits dating to 9.3 to 9.5 ^{14}C ka were found within deposits of inferred eolian material. However, available exposures have indicated great variability in the nature and age of deposits on mesa tops that makes it difficult to predict where sites of a given age might be found. In addition, mesa tops and other relatively stable geomorphic settings where deposition rates are low should be most prone to the mixing of soil and associated artifacts by bioturbation, helping to obscure the archaeological record. This problem should be most severe at older sites that are at or near the ground surface.

The local occurrence of middle and late Holocene alluvial and colluvial deposits also indicates potential preservation of Archaic sites in a range of settings. Buried Archaic sites have been found in colluvial deposits along the margins of canyon bottoms, although these are also commonly areas experiencing erosion in the latest Holocene, contributing to the loss of older sites and preventing burial of younger sites. In comparison to Paleoindian sites, Archaic sites could be much less deeply buried in areas of deposition and less affected by bioturbation near the surface, although the same caveats apply.

Widespread late Holocene deposits that are contemporaneous with or that post-date Puebloan occupation of the area are more areally extensive than earlier Holocene deposits, providing greater opportunity for site preservation following burial. Significant deposits from this period are in the bottoms of major canyons, and the potential for burial should be highest on late Holocene floodplains and near the base of slopes where late Holocene colluvium has been deposited. Additional deposition has occurred on mesa tops where eolian sediment has accumulated, providing local opportunities for preservation of Puebloan sites. Some colluvial slopes below ridge tops and at slope breaks between steeper slopes above and shallower slopes below have also experienced late Holocene deposition and offer good potential for site preservation. Of interest is the apparent use of some areas by Pueblo people during periods of erosion and landscape dissection, and some sites in eroded areas may provide evidence of how they adapted to and utilized an eroding landscape.

SOIL DEVELOPMENT AND GEOMORPHIC HISTORY

The nature of soils and surficial deposits are controlled by environmental conditions acting during their development, and they can therefore provide various kinds of paleoenvironmental information relevant for archaeological investigations.

The characteristics of surface and buried soils provide primary information about the stability or instability of the land surface at various times and can provide supplemental information about climate and/or vegetation. For example, a strongly developed buried soil indicates an extended period of land surface stability followed by some environmental change that caused sediment deposition at that site. Alternatively, a weakly developed soil or a thickened (cumulative) soil indicates a briefer period of stability or gradual sediment accumulation, respectively. Certain soil characteristics, such as gleying or mottling, can indicate the presence of prolonged periods of saturation or fluctuating water levels and, conversely, the absence of these characteristics can indicate that unsaturated conditions prevailed during soil development (Birkeland 1999). Certain soil properties are some times associated with specific vegetation conditions, and their presence may provide ecological information. For example, mollisols are a type of soil with thick dark surface horizons that generally form under grasslands, whereas other soil types such as alfisols, may form under forest cover. Such lines of evidence have been used to infer changes from forest to grassland at some sites with stacked soils with different characteristics (McFaul and Doering 1993). Weakly developed soils that are likely formed in late Holocene deposits burying Ancestral Puebloan sites are likely entisols or inceptisols. Better-developed soils burying Archaic or Paleoindian sites on the Pajarito Plateau have formed during a predominantly semi-arid climate regime, often have carbonate B horizons, and are likely aridisols.

The characteristics of surficial deposits provide primary information about geomorphic processes during their deposition, and in some circumstances can provide supplemental inferences about other aspects of the environment. For example, particle size and sedimentary characteristics of associated deposits can indicate whether an archaeological site was in or near an active alluvial or colluvial setting or at a location subject to eolian deposition, or was alternatively at a relatively stable or eroding site on the landscape. Geomorphic processes can be affected by climatic variables that are too short in duration to be preserved in other paleoenvironmental records, such as tree rings, and the record of geomorphic changes may thus provide unique insight into some important environmental characteristics. For example, while tree rings record variations in annual precipitation, particularly precipitation during the winter months, major environmental changes such as channel incision or arroyo cutting can be caused by changes in the intensity of summer thunderstorms that might not be detected in the tree ring record (Leopold 1951).

GEOMORPHIC SETTING OF LAND TRANSFER PARCELS

Five land conveyance parcels located on the Pajarito Plateau at LANL have been the focus of this investigation. Fieldwork was conducted within the Airport (A-3, A-7, and A-5-1), White Rock (A-19), TA-74 (A-18-a), White Rock Y (C-2), and Rendija (A-14) land transfer parcels (Figure 3.2). Geomorphic maps, detailed descriptions of surficial geology, soils, and the geomorphic history of each tract are presented in Reneau and Drakos (Chapter 57, Volume 3). The following is a brief introduction to the geomorphic setting of each tract.

The White Rock Tract is within the Cañada del Buey watershed (Figure 3.2) and includes part of the active stream channel and adjacent floodplains, colluvial slopes, and alluvial fans. Colluvium throughout most of the parcel overlies basalt of the Cerros del Rio volcanic field, and some areas of the parcel comprise stripped basalt bedrock. The Tshirege Member of the Bandelier Tuff, which overlies the Cerros del Rio basalt, is present as an isolated mesa in the western part of the parcel.

The Airport Tract includes a gently east-sloping mesa between a tributary to Pueblo Canyon on the north and DP Canyon, a tributary to Los Alamos Canyon, on the south (Figure 3.2). Bedrock beneath the mesa consists of the Tshirege Member of the Bandelier Tuff. The mesa is capped by eolian sediments and colluvium that thins to exposed bedrock near the mesa edge.

The Rendija Tract is located within the Rendija Canyon watershed and includes part of the active stream channel and adjacent floodplains, tributary drainages, fluvial terraces, colluvial slopes, ridge crests, and mesitas. Rendija Canyon possesses what may be the most extensive and best preserved set of stream terraces on the Pajarito Plateau, locally including at least five Pleistocene surfaces and four Holocene surfaces (McDonald et al. 1996; Reneau and McDonald 1996). The terrace sequence is well-preserved in the central and western part of the tract, whereas the eastern part of the tract includes colluvial slopes below high ridges leading to tributary drainages to Rendija Canyon with narrow strips of young alluvium and relatively poor preservation of terraces. Rendija Canyon has incised below the Tshirege Member of the Bandelier Tuff, and surficial deposits are underlain by Tschicoma Formation dacite lavas Puye Formation fanglomerates, Cerro Toledo interval (unit Qct) pumice beds and alluvium, and non-welded tuff and pumice beds of the Otowi Member of the Bandelier Tuff.

The TA-74 South Tract is located in a relatively broad part of lower Pueblo Canyon (Figure 3.2). TA-74 South Tract geomorphic features include the active stream channel and adjacent floodplains of Pueblo Canyon, higher stream terraces of Holocene and Pleistocene age, and areas of colluvium and alluvial fans on the side slopes and along tributary drainages. The part of Pueblo Canyon comprising the TA-74 South Tract has incised below the Tshirege Member of the Bandelier Tuff, and surficial deposits are underlain by Pliocene fanglomerates of the Puye Formation and non-welded tuff and pumice beds of the Otowi Member of the Bandelier Tuff.

The White Rock Y Tract is located in Los Alamos Canyon and includes the confluence with Pueblo Canyon (Figure 3.2). White Rock Y Tract geomorphic features include the channel of Los Alamos Canyon, incised into basalt bedrock, and an adjacent stream terrace that is overlain by colluvium derived from a higher, Pleistocene-age terrace. The higher terrace is bordered on the south by colluvial slopes that lead up to a Bandelier Tuff-capped mesa south of the tract. Approximately 15-m- (49.2-ft-) high basalt cliffs border the modern stream channel east of the confluence with Pueblo Canyon.

CHAPTER 4
ECOSYSTEMS OF THE PAJARITO PLATEAU AND EAST JEMEZ MOUNTAINS: LINKING LAND AND PEOPLE

Teralene S. Foxx

INTRODUCTION

After the volcanic eruptions in the Jemez Mountains over a million years ago, development of vegetation on the ash-hewn Pajarito Plateau and in the remnant mountains was influenced by relief and climate and, more recently, by human interaction. Volcanism and erosion influenced the development of the soil through factors like rainfall, vegetation, topography, and time. Geofloras were influenced by drying climate and mountain building. Conversely, the developing soils influenced vegetation through chemical make-up, texture, and water availability (Dick-Peddie 1993). As the environment of the Pajarito Plateau and the Jemez Mountains underwent geologic change, various plant communities became established with woodlands at lower, drier elevations and forests at higher, cooler locales (Figure 4.1).

The erosive power of water developed watercourses that incised deep canyons into the plateau. Riparian zones developed in canyon bottoms, dominated by water-loving species that grew within the area mediated by water flowing permanently or ephemerally through the canyons. Throughout the centuries, before humans inhabited the area, a dynamic process of change took place. Fire, windfalls, floods, and changing weather patterns influenced ecosystems—some times within a microhabitat or within the vast landscape. Some 10,000 years ago, humans entered into the ecosystem for the first time. Although their impact was gradual and largely unnoticed until about 1000 years ago, they did bring change. As people aggregated on the land and began to use it more intensively, the landscape was modified. Using data from ethnobotanical, ethnozoological, and archaeological studies, this chapter describes the ways people used the Pajarito Plateau and the adjacent Jemez Mountains and looks at how they impacted their environments.

LOS ALAMOS NATIONAL LABORATORY AND THE PAJARITO PLATEAU

Los Alamos National Laboratory (LANL) is situated on the Pajarito Plateau. The Pajarito Plateau consists of a series of narrow mesas and deep canyons that trend east-southeast from the Jemez Mountains to the Rio Grande. The defining feature of the plateau is the Tshirege Member of the Bandelier Tuff, a massive series of ignimbrites or "ash-flow tuffs" that erupted from the Jemez Mountains caldera. The Tshirege Member buried most of the former topography between the Jemez Mountains and the Rio Grande thereby creating a new landscape. The subsequent erosion of this formation has resulted in the distinctive topography of the Pajarito Plateau and LANL (Broxton et al., this volume; LASL 1976:4–6; Reneau and McDonald 1996:3).

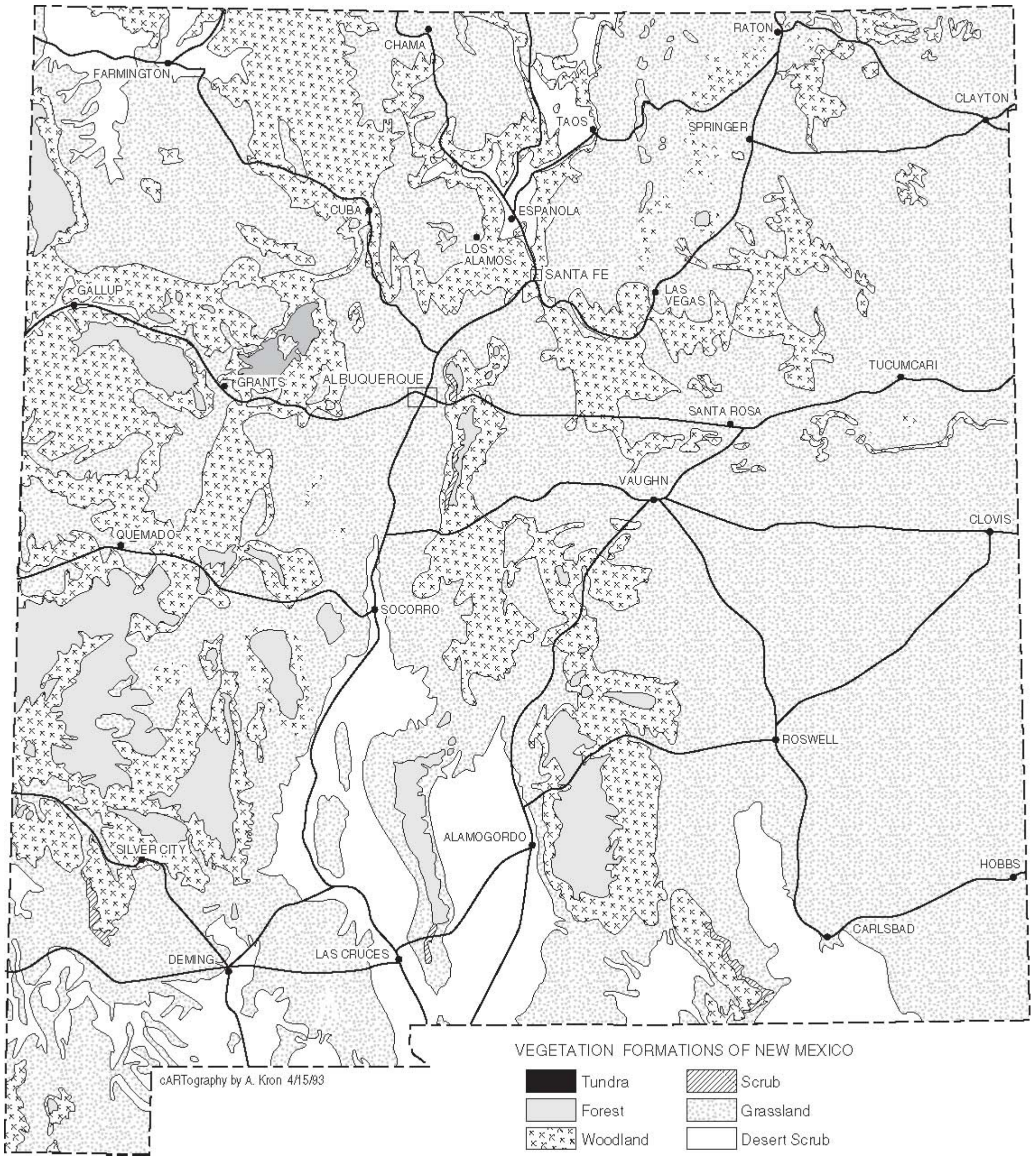


Figure 4.1. Established vegetation types of the Los Alamos area in relation to the rest of New Mexico.

LANL contains several distinct environmental zones. The elevation gradient at LANL is approximately 800 m (2400 ft), ranging from the Rio Grande Valley (1620 m; 5400 ft) to the base of the Jemez Mountains (2340 m; 7800 ft). This elevation change and a complex geologic history have created several different climatic zones, soil types, vegetative zones, and animal habitats within the confines of LANL (Balice et al. 1997:4–6; LASL 1976:2–6; Reneau and McDonald 1996:1–3). Topography is typically rugged and undulating and contains a number of mesa tops and canyon bottoms and their associated steep talus slopes and cliffs. Soils in the canyon bottoms and on the mesa tops of the south and southeastern part of LANL are mostly aridisols and entisols, with an abundance of alluvium on the steep slopes, large tuff rock outcrops, volcanic rock outcrops, talus slopes, and gravelly and sandy loams. Mesa tops are generally associated with areas of high agricultural potential.

Climate of the Pajarito Plateau

Los Alamos has a semiarid, temperate mountain climate. Mean temperatures vary with altitude and average 5°F higher in and near the Rio Grande Valley (1980 m; 6500 ft) and 5°F to 10°F lower in the nearby Jemez Mountains (2600 to 3050 m; 8500 to 10,000 ft) (Bowen 1990:3–17). Mean precipitation values for the Pajarito Plateau over the last 30 years show that higher elevations near Los Alamos receive approximately 48 cm (19 in.) of rain per year, while lower elevations in the piñon-juniper zone near White Rock receive approximately 34 cm (13.5 in.).

Winter temperatures on the Pajarito Plateau range from 15°F to 25°F at night and 30°F to 50°F during the day. Cold Arctic air masses occasionally invade the Los Alamos area from the north and east, but often the shallow layer of coldest air is dammed to the east by the Sangre de Cristo Mountains. Temperatures in the Los Alamos area occasionally will drop to 0°F or below. The freeze-free growing season of 157 days in Los Alamos is relatively short, while the normal growing season in White Rock is even shorter at 145 days. Above 2743 m (9000 ft), frosts can occur during any time throughout the year (Bowen 1990:3–17; Reneau and McDonald 1996:2–3). Summer temperatures are in the 70s and 80s (Bowen 1990, Table 7). Climatic information for the County of Los Alamos extends back to 1910, while that for the community of Española dates back to 1895, and to 1924 for Bandelier National Monument (Bowen 1990; Scurlock 1998).

The normal annual precipitation around Los Alamos, including rainfall and snowfall, totals approximately 46 cm (18 in.). Annual precipitation decreases rapidly toward the Rio Grande Valley, with the normal White Rock precipitation falling somewhere around 33 cm (13 in.). Annual precipitation at higher elevations in the Jemez Mountains is normally around 51 cm (20 in.). In general, the precipitation patterns of the Pajarito Plateau region are characteristic of a semiarid climate where precipitation amounts vary considerably from year to year. Over a 69-year period, the annual precipitation extremes ranged from 17.77 to 77.06 cm (16.08 to 30.34 in.) (Balice et al. 1997:1–12; Bowen 1990:3–17).

Monsoon season on the Pajarito Plateau spans the months of July and August. Convection of warm air over the Jemez Mountains causes thundershowers to develop during the afternoons and early evenings, and these drift over the plateau and cause brief, but intense, rains (Bowen 1990:3–17). Westerly winds push the thunderstorms above the Jemez Mountains towards Los Alamos. The large-scale atmospheric flows transport moisture from the Gulf of Mexico during the summer monsoons, and from the Pacific Ocean during the winter, spring, and fall. Nearly 40 percent of the annual precipitation falls during the monsoon months. Although summer precipitation is heavily weighted toward the monsoons, winter precipitation falls primarily as snow. Accumulations usually approach upwards of 130 cm (51 in.) seasonally, but snowfall levels vary considerably from year to year.

Water Resources

Water is one of the most important elements for permanent habitation. The Pajarito Plateau has both permanent and ephemeral streams and some springs. Few of the canyons of the Pajarito

Plateau have perennial water. Large settlements are associated with canyons that have perennial water (e.g., Frijoles Canyon, Santa Clara Canyon) or springs (e.g., Pajarito Canyon). Pajarito Canyon has a perched aquifer where the water emerges to the surface. Throughout the plateau, there are areas where inhabitants also used water-collecting devices (Steen 1977).

In addition to the permanent and ephemeral streams on the Pajarito Plateau, there are 27 springs that discharge from formations in White Rock Canyon (Purtymun et al. 1980). These springs are habitats for various obligatory and facultative wetland species (Foxx and Tierney 1980), including the giant helleborine orchid (*Epipactis gigantea*).

Water resources and riparian zones are important habitats for many plants and animals. Various plant species were important to the Pueblo and Hispanic residents. Wetland plants were indicators of water; some wetland taxa were used for food and medicine, while others provided building material (e.g., cattail) (Table 4.1). Additionally, wetland and riparian areas attracted greater quantities of game.

Table 4.1. Wetland plants used by Pueblo and Hispanic residents.

Scientific Name	Common Name	Occurrence	Spring	Summer	Habit	Wetland*
Acer glabrum	Rocky Mountain maple	locally common	x		tree	FACW, FAC
Acer negundo	boxelder maple	locally common	x		tree	FAC, FACW
Alnus tenufolia	alder	locally common	x		tree	FACW
Berula erecta	water parsnip	not common		x	perennial	OBW
Betula occidentalis	western water-birch	locally common		x	tree/shrub	FACW
Cyperus aristatus	flatsedge	locally abundant			Perennial	FACW
Equisetum laevigatum	smooth horsetail	locally common			Perennial	FAC, FACW
Forestiera neomexicana	New Mexico olive	common	x		shrub	FAC+
Iris missouriensis	Rocky Mountain iris	locally common	x		perennial	FACW, OBW
Juncus spp.	rush	locally common		x	perennial	FACW, OBW
Mentha arvensis						FACW
Mimulus glabratus	monkeyflower	not common	x		perennial	OBW
Phragmites communis	common reed	occasional			perennial	OBW
Plantago major						FACW

Scientific Name	Common Name	Occurrence	Spring	Summer	Habit	Wetland*
Populus angustifolia	narrowleaf cottonwood	locally common	x		tree	FACW
Populus fremontii	Fremont cottonwood	locally common	x		tree	FACW
Prunus virginiana	chokecherry	locally common	x		shrub	FAC
Rorippa sinuata	yellow cress	locally common	x		perennial	FACW
Rudbeckia lacinata	coneflower	locally common		x	perennial	FACW
Rumex crispus	wild buckwheat					FACW
Salix sp.	willow	locally common	x		shrub	FACW
Scripus sp.	bulrush				perennial	
Typha latifolia	broadleaf cattail	locally common	x		perennial	OBW
Urtica dioca-procera	nettle					FACW

OBW = obligate wetland species; occurs almost always (99%) in wetlands; FACW = Usually occurs in wetlands (67% to 99% of time) but occasionally found in nonwetlands; FAC = Equally likely to occur in wetlands or nonwetlands (34% to 66% of the time).

Plant Communities of the Pajarito Plateau

Mapping and classification of the Jemez Mountains have been done by the US Forest Service for the Santa Fe National Forest (Moir and Ludwig 1979), by Allen (1984, 1989) for Bandelier National Monument, by Potter and Foxx (1981) for the Cerro Grande, by Barnes (1983) for the piñon-juniper woodlands, and by Balice et al. (1997) for LANL and adjacent areas. In the late 1990s, Koch et al. (1996) and Balice et al. (1997) developed a land cover map for the Pajarito Plateau and adjacent east Jemez Mountains. The classification included 10 categories ranging from open water to spruce-fir forests. These classes correspond to the cover types for the land classification map presented in Figure 4.2 (Balice et at. 1997; Koch et al. 1996).

The major cover types were defined by dominant tree species and structural characteristics as follows: juniper savanna, piñon-juniper woodland, ponderosa pine forest, mixed conifer forest, and spruce-fir forest. The relationship between these cover types and elevation is show in Figure 4.3 (Foxx and Hoard 1984). The other cover types—grassland, shrubland, open water, and unvegetated land—are not influenced by topography.

Figures 4.4 through 4.21 show each of the major cover types discussed in Balice et al. (1997), and each are discussed briefly. Additional information concerning plant species that occur in these cover types can be obtained from Foxx and Hoard (1984), Foxx and Tierney (1980), Foxx et al. (1998), and Jacobs (1989).

Open Water, Wetlands, and Riparian Zones

In the arid Southwest, water is essential for survival. On the Pajarito Plateau, springs, perennial and intermittent streams, and the Rio Grande provide life-giving water (Figures 4.4 through 4.9). This cover type includes all land that is periodically flooded (intermittent streams) or is open water (rivers, perennial streams, and ponds). Wetlands are defined as areas with hydric soil and wetland species that either always require water (obligatory wetland species) or must have water part of the time (facultative wetland species). Cattails (*Carex* spp.) are an example of obligatory wetland species and can be found in marshes. Willow and various sedges are examples of facultative wetland species. These species are found on drier sites, sandbars, and mudflats and grass/sedge meadows. Narrow strips along permanent and intermittent rivers and streams are called riparian zones.

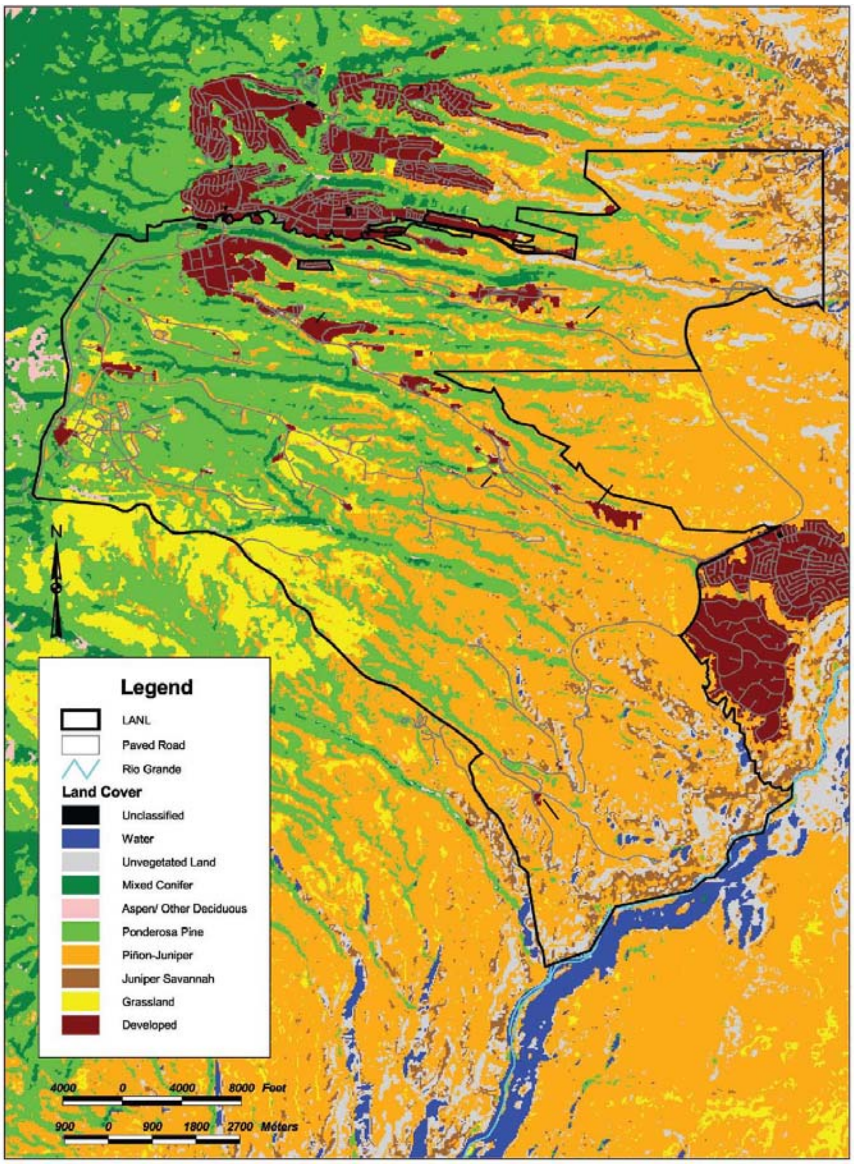


Figure 4.2. Land cover map for LANL and vicinity before the Cerro Grande fire.

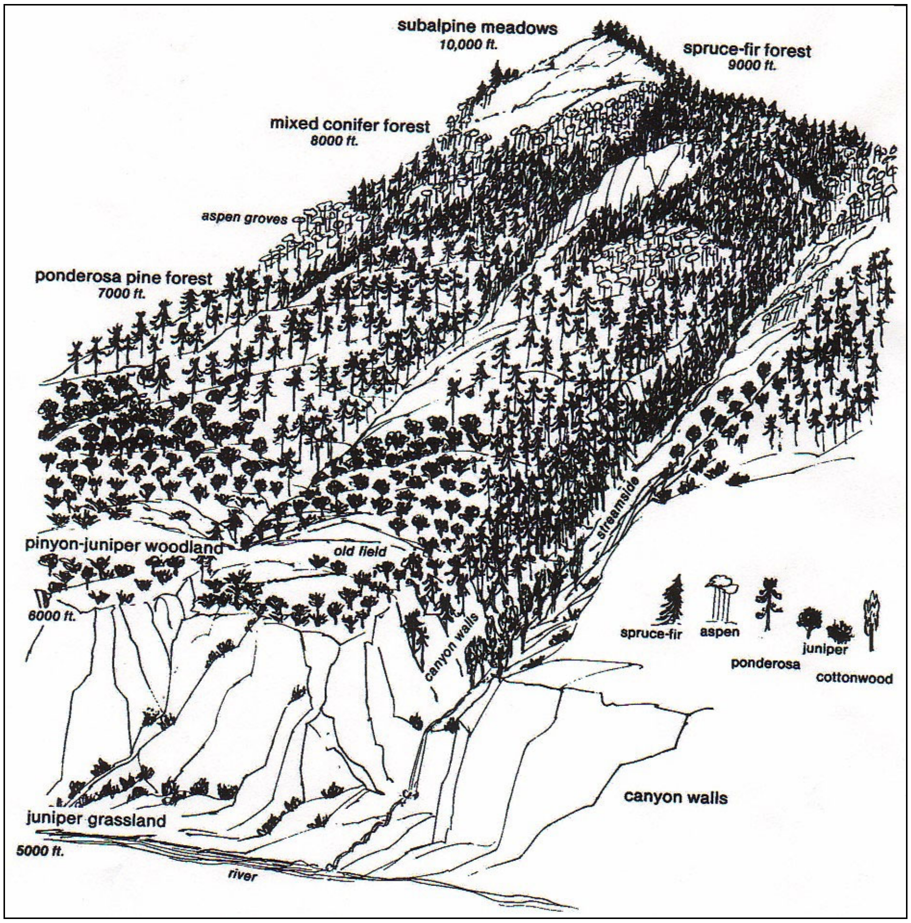


Figure 4.3. Cover types by elevation.

Species within the riparian zones of perennial streams (e.g., Frijoles) include cottonwood (*Populus* spp.) and boxelder (*Acer negundo*). Along the Rio Grande in the vicinity of Bandelier and LANL, tree species have been flooded but were present before construction of Cochiti Dam. Exotic species such as tamarisk (*Tamarix* spp.) and Russian olive (*Elaeagnus angustifolia*) have increased along the Rio Grande, replacing native cottonwoods.

Unvegetated Lands

The unvegetated lands include tuffaceous cliffs, cliff faces, basal cliffs, basalt talus slopes, and felsenmeers. These sites generally have less than 7 percent vegetation, and even though there is not much vegetation, the tuffaceous cliffs and cliff faces were important habitat sites for prehistoric inhabitants. The soft tuff was worked into cavates, and houses and storage areas extended from cliff faces. At lower elevations, the basalt caves provided areas for storage and safekeeping, and petroglyphs are common on the large basalt boulders. Figures 4.10 and 4.11 provide pictures of the tuffaceous and basaltic cliffs around LANL.

Figure 4.4. Intermittent stream in lower Ancho Canyon.

Figure 4.5. Pajarito stream below Pajarito Springs in White Rock Canyon.

Figure 4.6. Sedge/willow marsh in Pajarito Canyon.

Figure 4.7. Perennial stream below Ancho Springs in White Rock Canyon.

Figure 4.8. The Rio Grande at the mouth of Ancho Canyon.

Figure 4.9. The Rio Grande with native willow along the bank.

Figure 4.10. Tuffaceous cliffs in Ancho Canyon.

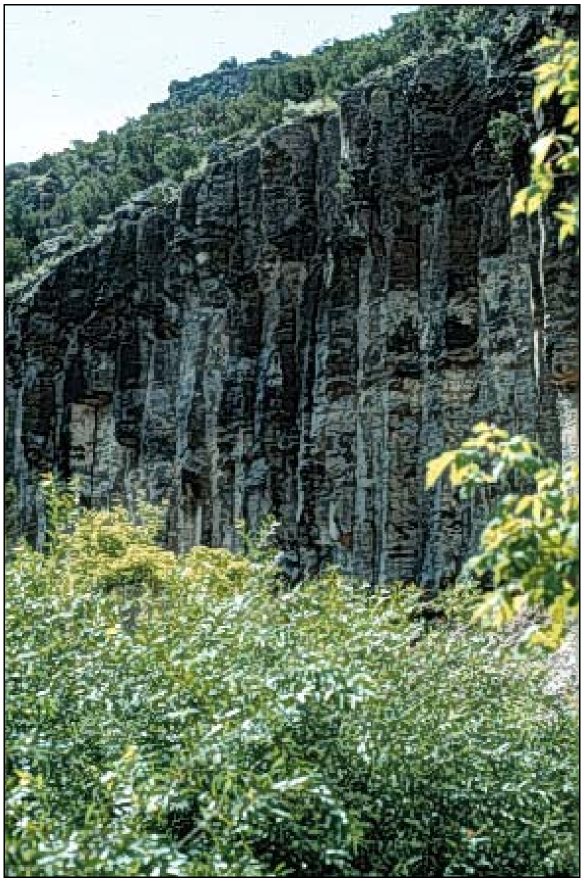


Figure 4.11. Basaltic cliffs in Ancho Canyon.

Juniper Savanna

The juniper savanna is an open grassland that is dominated by one-seed juniper (*Juniperus monosperma*) (Figure 4.12). Land cover in the juniper savanna is between 10 percent and 30 percent. Understory species in this cover type include sideoats grama (*Bouteloua curtipendula*), blue grama (*B. gracilis*), and hairy grama (*B. hirsuta*). The juniper savanna is the primary upland vegetation along the Rio Grande and ranges from 1634 m (5360 ft) to 1951 m (6400 ft) in elevation. There is little evidence of human habitation within this cover type, but evidence of ancient fields and historic animal pens have been found along the upland reaches of the Rio Grande.

Figure 4.12. Juniper savanna in White Rock Canyon.

Piñon-Juniper Woodland

The piñon-juniper woodland consists of open or closed low trees. The dominant tree species are one-seed juniper (*Juniperus monosperma*) and piñon (*Pinus edulis*) (Figure 4.13). One-seed juniper is more abundant at lower elevations, while piñon is more abundant at higher elevations within the zone. These woodlands are between 1890 and 2195 m (6200 and 7200 ft) within the canyons. On the mesa tops these species dominate between 1890 m (6200 ft) and 2195 m (7200 ft). Depending on the altitude, the following species can be found in the understory: blue grama (*Bouteloua gracilis*), Indian ricegrass (*Oryzopsis hymenoides*), and sand dropseed (*Sporobolus cryptandrus*). At higher elevations, mountain muhly (*Muhlenbergia montanus*) is some times present. Most of the habitation sites found on the plateau are located within the piñon-juniper woodland, but many of the homestead sites were located at the ecotone between this type and the ponderosa pine forest.

Figure 4.13. Piñon-juniper woodland.

Ponderosa Pine Forest

This cover type is either a closed or open forest (Figures 4.14 and 4.15). Ponderosa pine (*Pinus ponderosa*) is the dominant species with a cover greater than 7 percent; one-seed juniper and piñon may also be present, but they make up less than 7 percent of the cover.

Figure 4.14. Open ponderosa pine forest.

The ponderosa pine forests can be found at elevations as low as 1890 m (6200 ft) in some protected canyons on the plateau. In more open canyons, ponderosa pine is generally not found below 1921 m (6300 ft). On the mesa tops and lower slopes of the Sierra de los Valles, for example, ponderosa pine forests extend to 2378 m (7800 ft) in elevation.

Understory species in the ponderosa pine forest include blue grama, mountain muhly, mutton grass (*Poa fendleriana*), and little bluestem (*Schizachrium scoparium*). Gambel oak is a common shrub species. A number of fieldhouses and historic homestead sites have been identified in the ponderosa pine forest. Much of the community of Los Alamos and the upper portions of LANL are within this cover type.

Figure 4.15. Closed ponderosa pine forest.

Mixed Conifer/Spruce Fir

Mixed conifer forests typically appear at higher elevations in the mountains and consist of trees that are at least 5 m (16 ft) tall. Douglas fir *(Pseudotsuga menziesii*) and white fir (*Abies concolor*) are the dominant overstory species, although other species such as ponderosa pine may be present in the overstory or midstory (Figure 4.16 and Figure 4.17).

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Figure 4.16. Mixed conifer forest with Douglas fir and white fir.

Mixed conifer forest intergrades with ponderosa pine communities and as “stringers-on” in north aspects of the canyons and on the canyon bottoms above 2104 m (6900 ft) in elevation. These communities continue to 2591 m (8500 ft) on eastern exposures and on flat areas. Shrubs include ninebark (*Physocarpus monogynous*), wild rose (*Rosa woodsii*), cliffbush (*Jamesia americana*), and dwarf juniper (*Juniperus communis*).

Figure 4.17. Engelmann spruce and white fir dominate high elevations.

Aspen Forest

This cover type occurs in montane and upper montane landscape positions. Trees that are greater than or equal to 5 m (16 ft) tall with coverage greater than or equal to 13 percent are present. Aspen (*Populus tremuloides*) is present in the overstory with at least 20 percent cover (Figure 4.18).

Figure 4.18. Aspen groves are found throughout higher elevations indicating past fire.

Some combination of Douglas fir, ponderosa pine, white fir, or Engelmann spruce (*Picea engelmanni)* are also present but does not dominate the overstory. Aspen communities are common at mid-elevations in the mountains, ranging from approximately 2700 to 3030 m (8900 to 9950 ft). Below 2820 m (9250 ft) aspen stands occupy north and northeast aspects, whereas at upper elevations they are found on the southeast- to southwest-facing positions

Shrublands

Shrublands are identified by the presence of shrub species greater than 0.46 m (1.5 ft) in height with at least 15 percent cover (Figure 4.19 and Figure 4.20). Trees are generally not present or, if they are present, they make up less than 10 percent of the cover. Shrubs include fourwing saltbush *(Atriplex canescans)*, which is often an indicator of prehistoric dwellings, chamisa *(Chrysothamnus nauseosus*), which is often found along roadsides and drainages, New Mexico locust (*Robinia neomexicana)*, which is a common species in burned and/or disturbed areas, and Gambel oak, which is common in ponderosa pine forests and burned areas.

Figure 4.19. Sagebrush (*Artemisia tridentata*) shrubland in White Rock Canyon.

Figure 4.20. Oak shrubland and grassland from the La Mesa fire.

Grasslands and Disturbed Areas

Grasslands are dominated by grasses and grass-like plant species. If shrubs or trees are present in this cover type, then the total percent cover is less than 10. Grasslands can be found on hillslopes in White Rock Canyon or other open sites (Figure 4.21). At the crest of the Sierra de los Valles, subalpine grasslands are conspicuous. They occur at 2743 m (9000 ft) on steep southerly and southwesterly slopes. Montane meadows are found in the mixed conifer and spruce-fir zone. Disturbed areas are found throughout and are recognized by the prevalence of weedy species including Russian thistle, summer cypress (*Kochia scoparia*), snakeweed (*Gutierrezia* spp.), and dandelion (*Taraxacum* spp.).

Figure 4.21. Subalpine grasslands on mountain peaks.

Water Canyon Elevation Gradient

The survey of Water Canyon shows that plant diversity is quite high on the Pajarito Plateau. Almost 300 plant species have been identified (LASL 1976:23). Species diversity among all plants except grasses is elevated at higher elevations (Table 4.2).

Table 4.2. Floral distribution by community type along an elevation gradient.

Overstory-Vegetation Type	Elevation (m)	Numbers of Families	Number of Species*
Fir-spruce	2865	18	28
Subalpine grassland	2865	10	24
Mixed conifer	2560	9	22
Ponderosa pine	2255	12	25
Piñon-juniper	1950	8	17
Juniper-grassland	1645	8	11

*Does not include grasses

A maximum of 18 taxonomic families and 28 non-grass species were recorded in the subalpine grassland (LASL 1976). Members of the composite (Compositae) and grass (Gramineae) families occur with the highest frequency and comprise the highest percentage of ground cover at all elevational sites. Total ground cover reaches a maximum of nearly 100 percent at the higher elevations and decreases steadily to a minimum of 15 percent in the juniper woodland community. As with plant communities, animal communities on the plateau are affected by differences in elevation.

Animal Communities on the Pajarito Plateau

Several invertebrates and vertebrate animal communities are represented at LANL. Many species of small mammals such as deer mice (*Peromyscus* sp.), woodrats (*Neotoma* sp.), moles (*Microtus* sp.), squirrels (Sciuridae), and chipmunks (*Eutamias* sp.) occur in the area, some of which are specific to certain elevation gradients. Other small mammals, such as bats (Chiroptera), are present within the Laboratory boundaries as well, and consist of at least 15 different species (Biggs et al. 1997:1–3; LASL 1976:24–27). The area also contains mule deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*). Little is known about other large and medium size mammals of the area, but based on observations and current studies, a minimum of 12 species of carnivores are present. Among these are black bear (*Ursus arctos*), mountain lion (*Felis concolor*), bobcat (*Felis rufus*), gray fox (*Urocyon cineroargenteus*), and coyote (*Canis latrans*) (Biggs et al. 1997:1–3; LASL 1976:24–27).

Cold-blooded animals in the area include several species of fish found in the Rio Grande. The carp (*Ctenopharyngodon* sp.), chub (*Gila pandora*), and white sucker (*Catostomus commersoni*) are abundant in the waters of the Rio Grande on the eastern boundary of LANL. There are a few brown trout found in the area but not enough to represent a significant population, probably due to the turbidity of the river (LASL 1976:25).

There are approximately nine species of reptiles in the LANL area including small lizards and king snakes (*Lamprapeltis getula*), bull/gopher snakes (*Pituophis melanoleucus*), garter snakes (*Thamnophius* sp.), and rattlesnakes (Crotalidae). The Jemez Mountains salamander (*Plethodon neomexicanus*) is a rare amphibian that is found in the area (LASL 1976:25).

There are some 187 bird species from 44 families reported in the area, some of which are permanent residents and some of which are transient populations. Observed permanent residents include the common raven (*Corvus corax*), pygmy nuthatch (*Sitta pygmaea*), western bluebird (*Sialia mexicana*), gray-headed junco (*Junco caniceps*), and rufus-sided towhee (*Pipilo erythrophthalmus*). Summer birds include the turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), peregrine falcon (*Falco peregrinus*), chipping sparrow (*Spizella passerina*), and violet-green swallow (*Tachycineta thalassina*) (LASL 1976:25).

The ecological relationships to the topography are interesting. Animals in the lower elevation zone (1700 to 2000 m; 5610 to 6600 ft) include coyote, rattlesnake, bobcat, gray fox, red-tailed hawk, spiny lizard (*Sceloporus magister*), mule deer, deer mouse, and the cottontail (*Sylvilagus* sp.). Animals in the middle elevation zone (2000 to 2400 m; 6600 to 7920 ft), especially in the canyons, include coyote, raccoon (*Procyon lotor*), mountain lion, American black bear, turkey vulture, American kestrel, golden eagle (*Aquila chrysaetos*), gopher snake, rock squirrel (*Spermophilus variegatus*), and mule deer. Animals from the same elevation zone that inhabit the mesa tops include American black bear, mountain lion, common raven, pygmy nuthatch, Colorado chipmunk (*Tamias quadrivittatus*), pine squirrels (*Tamiasciurus* sp.), and mule deer. Animals in the highest elevations (2400 to 3200 m; 7920 to 10,560 ft) include the American black bear, mountain lion, green-tailed towhee, hairy woodpecker (*Picoides villosus*), Rocky Mountain elk, mule deer, western bluebird, and gray-headed junco (LASL 1976:24–26).

PLANTS AND ANIMALS AS INDICATORS OF PAST LAND USE AND CHANGE

Plants

The Pajarito Plateau has a long history of use by different groups of peoples. Archaeological evidence shows that humans were in the area by at least 10,000 years ago (Steen 1977; Vierra 2005a). Agriculture was a common practice on the Pajarito Plateau by about 1000 years ago. Since the 18^{th} century, the plateau has been logged, grazed, and dry-land farmed. Laboratory activities (disposal sites, roads, building) and fires have affected plant and animal communities in the last 50 years. Disturbances, of whatever kind, typically have a general pattern of plant succession after a given period of time: weedy annuals, replacement of annuals with perennial forbs and grass, and invasion of woody species. Plants known as colonizers are usually the first species to grow on disturbed sites since they out-compete the natural species of the original community after the disturbance (Clements 1928; Foxx et al. 1998).

Prehistoric and historic dwellings, agricultural areas, and the surrounding landscape can provide information about past use and activities (Foxx and Tierney 1984, 1999; Foxx et al. 1998). The remains of vegetal and faunal remains within the hearths at an archaeological site can provide information about possible plant and animal uses. Also, the dwellings themselves and the immediate surroundings can provide information about past use and activities. Habitats that had natural or human disturbance are atypical of the surrounding, undisturbed area. These areas of disturbance often have an abundance of plants that were introduced by human activity (Housely 1974; Yarnell 1958). Various categories of these colonizing plants are useful in determining changes in the environment. There are three categories of species often found in association with natural or human disturbance: invasive weeds (often called pioneer plants), noxious weeds, and camp followers.

Invasive Weeds (Pioneer Plants)

Invasive weeds can be defined as plants that favor an open habitat and thrive in any disturbed area, ancient or contemporary (Lee 1999; Tierney 1973). These plants are called pioneer plants because they are the first arrivals on sites that have been disturbed by human habitation or types of disturbed soils. Most of these species have been introduced from outside the area (e.g., Europe, Africa, or other places within North America) since the time of the European entry into the Southwest and are not native to the landscape. Some species were purposely brought as medicinal or food plants, but others were accidental introductions by seeds clinging to animals or clothing or in goods. Some recent introductions were used as ornamentals (e.g., iris [*Iris missourriensis*]), for repairing spoiled land (e.g., crested wheatgrass [*Agropyron cristatum*]), and landscaping (e.g., Russian olive [*Elaeagnus angustifolia*]). Many of these plants have become naturalized, or have become a common part of the flora of areas in disturbed sites such as archaeological sites, along roadsides, and within floodplains.

Noxious Weeds

Noxious weeds, or a plant that has a negative impact on the environment or the economy, is used in this chapter as defined by the Cooperative Extension Service (Lee 1999). Noxious weeds displace native vegetation, increase soil erosion, and reduce opportunities for land use. In recent years, areas that have been denuded by vegetation after catastrophic wildfires have become prime locations for the growth of noxious weeds such as Canada thistle (*Cirsium arvense*). These weeds are often recent introductions to an ecosystem, and eliminating infestations are important (Lee 1999).

The difference between noxious weeds and invasive weeds is subtle. As the plant becomes common in the environment it may change in its classification. Species such as Russian thistle (*Salsola kali*) have become a common part of the landscape and, although widespread on disturbed soil, is not included in the list of weeds that are noxious in New Mexico. In a Santa Fe New Mexican article dated September 16, 1897, Russian thistle was first reported in the Santa Fe Valley and called a noxious weed. Today, Russian thistle can be found in abundance on some archaeological sites (e.g., Otowi), along roadsides, and in other disturbed sites where subsurface excavation occurred (Yarnell 1958). Since Otowi was excavated in the early 20th century, their presence is to be expected. Unexcavated archaeological sites, however, usually do not have plants like Russian thistle in abundance.

Camp Followers

Camp followers are tolerant of disturbed areas surrounding human activity and, in turn, are tolerated or even encouraged by humans because of their economic or aesthetic value (Tierney 1973). Camp followers have proven to be useful indicators of human activity (Housely 1974; Tierney 1973; Yarnell 1958). They are generally non-native species that were brought along for a utilitarian use such as food, medicine, or ceremony (e.g., wolfberry [*Lycium pallidum*] and sacred datura [*Datura meteloides*]). Indicator species may be native or non-native species that thrive in the disturbance of habitation sites (e.g., walkingstick cactus [*Opuntia imbricata*], four-wing saltbush [*Atriplex canescans*], and lambs quarters [*Chenopodium* spp.]). Prehistoric agricultural areas can often be located by rock alignments and some times by an anomaly in the existing vegetation, even after 400 years of abandonment. Thus, marks of earlier activities as evidenced by existing vegetation are a legacy of the past.

Floral introductions have occurred since people entered into the environments of the Pajarito Plateau. The presence of introduced species (invasive weeds, noxious weeds, and camp followers) indicates use, changing environments, or accidental introductions. The earliest introductions were probably camp followers brought as people migrated to the plateau. Later introductions may have been purposeful or accidental. Scurlock (1998) listed plants introduced since the entry of the Spanish into the middle Rio Grande Valley with approximate dates. Using Scurlock's list as a starting point, we compared that list of introduced plants with Foxx et al. (1998). Those plants that were found in the Jemez were noted. The list of introduced plants for the Jemez was further extended by other references, including Agricultural Research Service (1971), Crockett (1977), Curtin (1965), Lee (1999), Martin and Hutchins (1980), Phillips Petroleum Company (1957, 1960), Stubbendieck et al. (1989), Tierney (1973), Tierney and Hughes (1983). This list includes primarily "wild" species and does not concentrate on domestic species introduced by the Spanish such as wheat, barley, onions, oats, lettuce, watermelon, or fruit trees, or crops introduced by the Spanish such as tomatoes, chilies, cultivated tobacco, and new varieties of corn and beans (Wozniak 1995).

Animals

Introduction of domestic animals (cows, sheep, goats, pigs, horses, and other species) by the Europeans has had a profound impact on the land and peoples of the Southwest. Migratory societies could move when drought occurred and sedentary groups did not have to depend so much on wild foods. The result was that more trading and raiding was possible. Peace fairs such as those held at Taos in the 18th century between Pueblos, Apaches, Comanches, and the Spanish provided a means to distribute goods (Simmons 1991).

As time passed, some animals were no longer necessary for domestic life. For example, in the mid 20th century, burros were no longer needed for the economy as beasts of burden. Many were released and became feral in Bandelier National Monument and the Santa Fe National Forest. In the mid 1970s and early 1980s, the impacts of these animals on the ecosystem and archaeological sites were addressed in Bandelier National Monument. The animals were removed or exterminated. In recent years there has been one feral burro at LANL.

There have been introductions, extirpations, and extinctions of animal species that have changed the nature of the food chains. One example is the introduction of non-native fish, including brown and cutthroat trout. These fish have reduced the numbers of native fish species (Allen 1989) and make it difficult to determine the use of such groups by early peoples.

Prehistoric Land Use

The landscape of the Pajarito Plateau and east Jemez Mountains remained mostly untouched by human influence until approximately 10,000 years ago when small groups of Paleoindian hunter-gatherers followed game animals up and down the Rio Grande and took trips onto the plateau and into the Jemez Mountains to collect obsidian and other subsistence resources. These people moved often to take advantage of the various resources, and as edible plants became available, the consumers would reposition themselves (Tainter and Tainter 1996). These patterns meant that these hunter-gatherers might be at low elevations for gathering spring greens and at higher elevations for collecting summer and fall berries (Tainter and Tainter 1996; Vierra and Foxx 2002; Vierra 2005a).

From those first few people who wandered the mesas and canyons, the use of the area increased slowly. Archaic hunter-gatherer groups relied on small game such as grouse, as well as various plant species. Later, as maize horticulture became established, agriculturalists used the area for foraging. As the population density increased on the Pajarito Plateau, familiar landscapes were modified. Lands were cleared for agriculture, and every piece of wood within walking distance and that was useful for construction, cooking, or heating was quickly collected. The distribution and abundance of native plants and animal species within that area were altered in a short time. Vegetation communities were influenced by introduced and extirpated plants (Tainter and Tainter 1996).

By the Coalition period (AD 1150 to 1325), humans occupied the Pajarito Plateau on a year-round basis, and environmental impacts were, by extension, greater. During the Coalition and Classic (AD 1325 to 1600) periods, population and associated settlement increased, large, aggregated pueblos were developed, and agriculture, particularly in the lower elevations within the piñon-juniper woodland and juniper savanna, increased into all available arable lands. Though virtually abandoned by the late 1500s because of an extensive period of drought, the plateau continued to be used for foraging and hunting by the occupants who remained to take advantage of the plant and animal resources. In general, human activities on the Pajarito Plateau were closely associated with topography; middle elevations were used primarily for habitation, while upper and lower elevations were used for hunting, foraging, grazing, agriculture, and historic recreational activities.

Plant Resources

The Pueblo people used various plants and animals for daily living, including food, clothing, recreation, and ceremony. Use can be determined in three ways: from literature about ethnobotanical or ethnozoological studies, from surveys of sites to determine availability and camp followers, and from the study of macrobotanical and faunal material from archaeological excavations.

Knowledge of early plant and animal uses has been defined by early ethnologists and, more recently, by interviewers of tribal members. During the early 1900s, interviewed persons from the Keres, Tiwa, and Tewa language groups and Athabascans (the Apache and Navajo) related folklore about plants and plant usage. Researchers included Castetter (1935), Castetter and Opler (1936), Cook (1930), Elmore (1943), Jones (1931), Robbins et al. (1916), M. Stevenson (1912, 1915), and Swank (1932). Henderson and Harrington (1914) interviewed tribal members about animal uses. These studies have been a basis for much of the understanding about early plant and animal use. Additional information was obtained through excavations and the recovery of plant and animal remains, and from surveys of sites (Ford 1968; Foxx 1982; Lang 1986; Matthews 1990, 1992; Tierney 1977a, b, 1979; Trierweiler 1990, 1992).

Dunmire and Tierney (1995) summarized much of the ethnographic literature and also conducted personal interviews with tribal members of various pueblos. They identified 304 plants known to have uses for food, medicine, cordage, construction, implements, and tanning within the Pueblo Province. The categories they found and percentages of plants within each use category for the Jemez are found in Table 4.3.

Using the list compiled by Dunmire and Tierney, Vierra and Foxx (2002) identified 215 of the 305 species as being present in the Jemez Mountains flora. Of the 215 species, many had multiple uses. Table 4.4 shows the groups of species most commonly used by various groups. Vierra and Foxx (2002) also analyzed the list to determine the plant community where plants used for food and beverages are most likely to occur (Table 4.5).

Table 4.3. Percentage of plants used for different activities (from Dunmire and Tierney 1995).

Activity	Percent
Food and Beverage	42.0
Medicine	59.0
Smoking or Chewing	5.0
Construction	5.0
Coloring, Tanning, Soap, Art, Crafts	12.0
Cordage, Fiber, Fine Matting	3.0
Implements	11.0
Total Number of Identified Plants	**304**

Table 4.4. Plant uses and numbers of plant species used from plant communities.

Activity	Riparian	Juniper Savanna	Piñon Juniper	Ponderosa forest	Mixed Conifer
Medicinal (*n* = 148)	18	82	111	73	35
Food (*n* = 108)	23	41	77	56	30
Implements (*n* = 28)	4	14	20	15	6
Coloring/Tanning (*n* = 37)	6	19	24	16	6
Construction (*n* = 16)	6	7	9	8	4
Smoking (*n* = 13)	0	8	11	3	9
Cordage (*n* = 6)	2	3	2	2	1

Additional information has been gleaned from macrobotanical analysis of remains recovered from archaeological excavations. Information discussed here is limited to two sources (Foxx 1982; Matthews 1990). Foxx (1982) identified macrobotanical material from sites excavated in the Cochiti flood pool, while Matthews (1990) examined materials recovered from Burnt Mesa Pueblo and Casa del Rito. Both charred and uncharred seeds were recovered from flotation samples.

Table 4.5. Species of plants used by multiple Native American cultures of New Mexico.

Plant	Common Name	Number Groups
Achillea lanulosa	yarrow	3
Alnus tenuifolia	alder	3
Amaranthus graezans	pigweed	3
Amaranthus retroflexus	amaranth	6
Artemisia filifolia	sand sage	4
Artemisia frigida	wormwood	3
Artemisia tridentate	big sagebrush	2
Atriplex canescens	four-wing saltbush	7
Croton texensis	doveweed	5
Fallugia paradoxa	Apache plume	4
Hedeoma nana	false pennyroyal	3
Ipomopsis aggregata	scarlet gilia	3
Juniperus monosperma	one-seed juniper	4
Lycium pallidum	wolfberry	4
Mirabilis multiflora	showy four o'clock	3
Monarda menthaefolia	beebalm	4
Cleome serrulata	Rocky Mountain beeplant	8
Pectis angustifolia	lemoncillo	4
Penstemon barbatus	scarlet bugler	3
Pinus edulis	piñon pine	4
Portulaca oleraceae	verdolaga	5
Quercus gambelii	Gambel oak	3
Rhus trilobata	lemonade berry	7
Ribes inebrians	gooseberry	3
Rosa woodsii	wild rose	3
Solanum elaeagnifolium	bullnettle	5
Solanum jamesii	wild potato	4
Yucca spp.	yucca	8

Animal Resources

Compared to plant use, there is far less ethnographic information available for animals. Most of the current knowledge regarding animals comes from analyses of animal remains found in archaeological excavations, from mythology and folk story collections, and through ceremonial uses. Henderson and Harrington (1914) published a comprehensive work on animals of the

Tewa province in the early 20th century. Their work provides one of the earliest listings of animals found in the area and also includes the Tewa names for animals. The purpose of the study was to determine the use and presence of various animal species found in, or that had previously been found, in the areas of El Rito de los Frijoles, the Valle Grande, and Painted Cave in 1910. Their identifications provide a glimpse of species that were common in the area early in the 20th century. Some of these species were extirpated or became extinct since the late 1800s (e.g., bighorn sheep, elk, and wolf). Henderson and Harrington's study was also conducted to help identify various bone fragments that were recovered from archaeological excavations in the Frijoles Canyon area. The taxa identified as a result of their study included deer, rabbit, fox, coyote, wolf, dog, raccoon, badger, wildcat, beaver, small birds, turkey, eagle, hawk, and owl.

Of the 48 mammals Harrington and Henderson (1914) identified, only 15 species were found to have a specific use as food, in ceremony, or within the mythology of the Tewa. Of the 46 bird species noted, only 10 species were used as food, in ceremony, or within the mythology of the Tewa. No reptiles or amphibians were used for food, and only turtles were used for ceremonial purposes. Insects had little importance as a food source, but Henderson and Harrington (1914) identify a number of species referred to by the Tewa.

Extensive excavations for Bandelier were conducted within the Cochiti Lake flood pool in the 1970s. The excavated sites included large multi-room sites, one- and two-room masonry sites, and caves. Guthrie (1982a, b) surveyed the area for present fauna and then identified the various animal remains within the sites. Guthrie determined that many of the faunal remains belong to species that may have used the rocky sites after abandonment by humans and were not used for food or implements. Only a few designated species had charring or knife cuts. Guthrie notes that the bones of other species were a normal part of the fauna of the Rio Grande or were migrants along the river.

During the Bandelier Survey, Trierweiler (1990, 1992) identified the non-human bone assemblages from Burnt Mesa Pueblo (LA 60372) and Casa del Rito (LA 3852), two sites hat were excavated within Bandelier National Monument. Trierweiler identified 16 taxa, including 14 mammal and two bird species. He also noted that although charring on the bones might indicate food preparation, edible species such as antelope, bison, prairie dog, blue grouse, porcupine, skunk, and mule deer did not always contain evidence for burning. Trierweiler identified 10 bone tools made from turkey and mule deer bones.

Faunal assemblages can inform about a number of aspects regarding animal use. The primary result tells of the use of animal resources by people. Another piece of information they can tell about is the occupation or use of a site by an animal after abandonment by humans. And, although a taxon may not be identified in an archaeological faunal assemblage, this does not indicate lack of use by humans. Trading of some remains such as pelts, bones, antlers, and horns may account for some discrepancies.

The list compiled from Henderson and Harrington (1914), and the excavation data were compared to a species list created for the Pajarito Plateau by Biggs et al. (1997) and habitat information by Findley (1987). The kit fox (*Vulpes velox*; reported by Trierweiler 1992) has not been reported for the Pajarito Plateau and because of their habitat requirements they may never have inhabited areas of the plateau or Jemez Mountains. Similarly, jackrabbits are not presently found in the area. Allen has tabulated the use of various species in 45 different excavations for the Jemez Mountains. Table 4.6 shows the species found in the various ruins and the numbers of faunal remains in descending order.

Table 4.6. Animal species identified from archaeological sites and the numbers of remains in descending order (after Allen 2004).

Common Name	Scientific Name	Number
Turkey	*Meleagris gallopavo*	531
Cottontail	*Sylvilagus audubonii*	460
Jackrabbit	*Lepus californicus*	317
Mule deer	*Odocoileus hemionus*	155
Prairie dog	*Cynomys ludovicianus*	81
Sheep/goat	*Ovis/Capra*	79
Cow	*Bos taurus*	75
Fish	Osteichthyes	53
Quail	*Callipepla/Lophyortyx* sp.	45
Sandhill crane	*Grus canadensis*	33
Bighorn	*Ovis canadensis*	24
Pronghorn	*Antilocapra americana*	24
Kangaroo rat	*Dipodomys* sp.	24
Toad	Bufonidae	10
Bear	*Ursus* sp.	9
Horse/burro	*Equus* sp.	8
Bison	*Bison bison*	7
Owl	Strigidae	5
Elk	*Cervus elaphus*	3
Frog	Ranidae	3
Beaver	*Castor canadensis*	2
Bobcat	*Felix rufus*	2
Pig	*Sus scrofa*	2
Ringtail	*Bassariscus astutus*	2
Dog/coyote	*Canis familiaris/latrans*	2
Sheep	*Ovis aries*	1
Goat	*Capra hircus*	1
Burro	*Equus asinus*	1

Kohler (1990) notes that faunal assemblages from sites excavated in the 1989 and 1990 seasons did not contain elk. Allen (1996) compiled ungulate (hoofed mammals) faunal remains from 45 archaeological sites in the Jemez Mountains. Of the 218 ungulate individuals (based on a total of 646 bones), he found that other ungulate remains—bighorn, pronghorn, and bison—exceeded elk, indicating low population numbers from 1200 to 1500 AD (Allen 1996). It should be noted that elk do not like densely forested sites and generally are found in open meadows like those of the Valle Grande. The last Merriam elk (*Cervus elaphus merriami*) were noted in the Jemez in the late 1800s. Rocky Mountain elk (*Cervus elaphus nelsoni*) were introduced in 1948 with 28 elk from herds in Jackson Hole, Wyoming; the herds now number into the thousands. The general patterns of movement of elk before the La Mesa fire were different than today and might more closely reflect the migration patterns at the time of prehistoric habitation of the Pajarito Plateau. The elk would summer in the Valle Grande when calving and nursing, and would move down in elevations to the upper mesas (e.g., Burnt and Escobas Mesas) during the winter months (White 1981). The patterns of migration have changed since the La Mesa, Dome, and Cerro Grande fires (Allen 1996; Biggs et al. 1999).

Fire on the Pajarito Plateau

The plant and animal communities discussed in this chapter represent elements of the environment that prehistoric and historic peoples have used and lived in for thousands of years. In the past 20 years there have been several major fires that substantially changed the nature of the plateau landscape:

- The La Mesa fire (1977) burned primarily ponderosa pine forest and some piñon-juniper woodland in Bandelier National Monument, Santa Fe National Forest, and LANL. Areas that were severely burned are now mostly grassland or shrubland; these areas were historically in ponderosa pine forests.

- The Dome fire (1996) burned higher-elevation ponderosa pine and mixed conifer forests in Bandelier National Monument and the Santa Fe National Forest.

- The Oso fire (1997) burned areas within Santa Clara Pueblo land and in the Santa Fe National Forest.

- The Cerro Grande fire (2000) burned much of the ponderosa pine and mixed conifer in the Santa Fe National Forest above 2438 m (8000 ft) behind the town of Los Alamos and Santa Clara Pueblo land. It also burned within LANL between about 2132 and 2438 m (7000 and 8000 ft); these areas were predominantly located within the community of Los Alamos. Much of the area was burned by a medium to low-intensity fire, which changed the overstory from ponderosa pine and mixed conifer to shrubland and aspen stands.

The number of fires on the Pajarito Plateau has been influenced by recent droughts. Table 4.7 shows the droughts in the Historic period in New Mexico. Year numbers in red in Table 4.7 represent fire scar years on tree ring samples collected by Foxx and Potter (1984). The year numbers in green represent recent large fires in the east Jemez Mountains and Pajarito Plateau that are not represented by tree ring sampling, and the year numbers in blue represent the 20 largest fires listed from a regional fire time series developed by Swetnam and Baisan (1996).

Table 4.7. Historic New Mexico droughts, 1542 to 1989 (Scurlock 1998).

16th and 17th Centuries	18th Century	19th Century	20th Century	21st Century
1542	1700 to 1709	1801 to 1803 1801, 1804 1801	1900 to 1904 1900	2000 to 2002 (2000)
1578 to 1580	1707	1805 to 1813 1806, 1814 1806	1907 to 1910 1907, 1908	
1598 to 1606	1714 to 1717 1715 to 1716	1817 to 1822, 1819	1917 to 1918 1919	
1620 to 1623	1719 summer 1724 to 1725	1824 to 1825 1830, 1833	1920 to1925 1921, 1922	
1625 to 1633	1727	1829 to 1830	1927 to 1928 1927	
1635 to 1640	1729 to 1730 1729	1841 to 1843 1842, 1842	1932 to 1937	
1651 to 1672	1734 to 1739	1845 to 1847, 1847	1939 to 1940	
1675 to 1680	1748 to 1759 1748, 1752, 1763, 1765	1849	1942 to 1948 1941, 1944	
1681 to 1680	1768	1851 to 1853 1851, 1861	1950 to 1956 (1954)	
1689 to 1699	1772 to 1774 1773	1873 to 1877 1870, 1878	1971 (1977)	
	1775 to 1785 1786	1877 to 1883 1879, 1883	1980	
	1787 to 1790	1886 to 1890	1989	
	1793; 1797; 1798	1892 Summer 1896 1893, 1896		
		1898 to 1900 1897	(1996, 1998)	

Hunter-gatherer populations actively manipulated vegetation to increase production of useable resources (Pyne 1999). Historically, there is no specific evidence that the native peoples of the upper Rio Grande deliberately set fires for the purposes of attracting game or foraging. There is evidence, however, that fire was used in the Southwest by certain Indian groups. The first Spaniard to enter the region, Cabeza de Vaca, recorded fire practices of the Indians in Texas. Pyne (1999) notes that Bernard DeVoto records that one of the first American columns into the Southwest during the Mexican War found that fire on the mountain was a Southwestern tradition. As their successors learned, it was a fire regime controlled equally by natural and cultural history.

The Apache used broadcast fire as did many tribes living within grasslands. They used smoke signals, burned to cover trails, and burned as an inducement for rain. W. A. Bell noted in 1870 that, “the Apaches also have a very destructive habit … of firing forests of their enemies.” Fire frequencies changed after the Apaches were subdued (Pyne 1999). The specific use of fire by

Puebloan peoples has not been recorded. There is some indirect evidence of use of fire through ethnobotanical studies. Lemonade berry (*Rhus trilobata*) has been used in historic Southwestern Indian basketry (M. Stevenson 1915). The branches however are not straight switches and thus ethnobotanists were puzzled by their use for basketry. However, ethnobotanist Vorsilla Bohrer (1983) observed the shrub in a burned area of the Navajo reservation regenerating with vigorous straight new shoots following a fire. She states,

> If ancient hunters were in the habit of burning vegetation to secure raw material for their offerings, they may have served themselves in another way. The burned patches of vegetation would foster increased abundance of game and annual plants like sunflower (*Helianthus*) and bugseed (*Corisperumum*).

Although there is no evidence that peoples of the area specifically set fire for the purposes of hunting or gathering, there is an attitude of understanding the rejuvenating aspects of fire mythology and ritual. At Zuni, fire is used in the rabbit hunt; at Cochiti, Nambe, Zuni, and Isleta, fire has taken the form of fostering new life and growth. Bohrer (1983) states,

> Although, our knowledge of formalized burning practices among Pueblo agriculturalists has been preserved erratically, an attitude toward fire as a fertile force still persists in ritual contexts.

Indeed, fire has a regenerating effect. Almost immediately after fire, shrubs sprout and plant species that have roots or underground stems regenerate quickly. Large game such as elk and deer are attracted to burned areas (Foxx 2001; Whelan 1995).

From fire scar data, it is shown that small and regional fires are correlated with times of drought. Between 1975 and 1977, Foxx and Potter collected 18 fire scarred ponderosa pine samples and calculated the fire frequency for samples dating from the early 1700s. Additionally, Swetnam and Baisan (1996) have extended fire scar data for the New Mexico and Arizona region. From 1709 through 1900 all 20 of the large regional fires identified were in drought years (Tables 4.7 and 4.8).

Because of the regenerating nature of burned areas, Foxx and Potter (1984) speculated that fire could be a source of food items in subsistence cultures. For example, wild onion, known to be collected for food and medicine by most or all Pueblos (Dunmire and Tierney 1995), generally is found as a single plant throughout forested areas. However, after fire large patches can be found within the ponderosa pine zone. Many shrubs are sprouters meaning that young straight shoots would be available (Table 4.9).

Table 4.8. Cross-section from a representative tree on Escobas Mesa sampled after the La Mesa fire (dates courtesy of Craig Allen).

Date	Drought Year	One of 20 Highest Fire Years
1637 Center	Yes	
1725	No	Yes
1737	Yes	

Date	Drought Year	One of 20 Highest Fire Years
1748	Yes	Yes
1757	No	
1763	No	Yes
1773	Yes	Yes
1797 (6)	Yes	
1801 (1)	Yes	Yes
1806 (5)	Yes	Yes
1814 (3)	Year after drought	
1833 (3)	No	
1842 (6)	Yes	Yes
1851	Yes	Yes
1858 (4)	No	
1878 (7)	Yes	
1893 (5)	Yes	
1965	No	
1977	Very early fire season	1977 La Mesa

Information is from one tree with fire scars from 1725 through 1977. Numbers in parenthesis () represent the number out of the other 18 fire scar trees sampled by Foxx and Potter and summarized in Foxx (1982). Column 2 represents those years that correspond to drought years on Table 4.7. Column 3 represents those years determined by Swetnam and Baisan (1996) to be the largest regional fires in New Mexico and Arizona.

Hill and Trierweiler (1986) discuss food stress and drought (Table 4.10). Although fire scar data for the most part is only from trees that were 350 years old (Allen et al. n.d.), extrapolating from available information, it is conceivable that burned areas may have been a source of some species when food stores were dwindling because of drought. Vierra and Foxx (2002) compared the listing of plants used for food, medicine, and other uses with information gained through succession studies after fire. From fire ecology studies we know that before 1900 there were frequent small fires within the ponderosa pine zone (see Table 4.9). We also know from observations and studies (White 1981) that these burned areas attract large game animals like elk and deer and small game animals such as turkey because of new and nutrient-rich forage. Although it presently cannot be proven, there is evidence of the usefulness burned areas might have been to subsistence peoples.

Table 4.9. Early succession plants in burned areas that may have been plant resources for early peoples.

Scientific Name	Common Name	Habitat	Primary Plant Community*				
			MC	PIPO	PJ	JS	Uses
Forbs							
Achillea lanulosa	yarrow	perennial	x	x			medicinal
Allium cernuum	wild onion	perennial	x	x			food/medicine
Amaranthus graezans	prostrate pigweed	annual		x	x		food
Chenopodium album	goosefoot	annual		x	x	x	food
Chenopodium leptophyllum	goosefoot	annual		x	x		food

Scientific Name	Common Name	Habitat	Primary Plant Community*				
			MC	PIPO	PJ	JS	Uses
Euphorbia spp.	thymeleaf spurge	annual			x	x	medicine
Physalis foetens	NM groundcherry	annual		x	x		food
Physalis hederaefolia	groundcherry	perennial		x	x		food
Thelesperma spp.	cota, Indian tea	annual			x	x	food/medicine
Sprouting Shrubs							
Amelanchier sp.	serviceberry	shrub	x				food
Archtostaphylos uva-ursi	bearberry	low shrub	x	x			smoking
Berberis fendleri	Colorado barberry	shrub	x	x	x		food
Berberis repens	Oregon grape	low shrub	x	x			food, coloring
Ceanothus fendleri	buckbrush	shrub		x			food
Quercus gambelii	Gambel oak	shrub					food, medicine, implements
Ribes cernuum	wild currant	shrub		x	x		food
Ribes inebrians	wild currant	shrub	x	x			food
Ribes inerme	gooseberry	shrub	x	x			food
Robinia neomexicana	New Mexico locust	shrub	x	x	x		food, implements
Rosa woodsii	wild rose	shrub	x	x	x		medicine
Rubus strigosus	raspberry	shrub	x				food
Rhus trilobata	Lemonade berry	shrub		x	x	x	food, medicine, smoking, coloring, implements
Prunus virginiana	chokecherry	shrub	x				food, medicine
Salix spp.	willow	shrub					medicine, construction, coloring
Yucca baccata	banana yucca	perennial		x	x		food, medicine, coloring, cordage, implements
Yucca glauca	narrowleaf yucca	perennial			x	x	food, medicine, coloring, cordage, implements
Sprouting Trees							
Acer glabrum	Rocky Mountain maple	tree/shrub	x	x			implements
Populus tremuloides	aspen	tree	x				medicine, construction, coloring

*MC = Mixed Conifer, PIPO = Ponderosa Pine, PJ = Piñon-juniper, JS = Juniper Savanna. Uses from Dunmire and Tierney (1995); Fire species from Foxx and Potter (1984), Foxx (1996); Personal observations in La Mesa, Dome, Oso, and Cerro Grande fires

Table 4.10. Years of severe food stress on the Pajarito Plateau, AD 1150 to 1600* (from Hill and Trierweiler 1986).

Early Coalition	Late Coalition	Early Classic	Middle Classic	Late Classic
1158	1252	1337	1417	1562
		1338	1418	1563
1188			1419	
1189		1342	1420	1581
				1582

Early Coalition	Late Coalition	Early Classic	Middle Classic	Late Classic
1216		1364	1424	1583
1217				1584
1218		1377	1457	1585
1226			1461	
			1475	
			1524	
			1525	

*Each year listed is the third (or later) sequential year of drought when food stores would have been exhausted.

Summary of Fire on the Pajarito Plateau

Today, as when the plateau was first inhabited, fire is a part of the natural cycle. Although the most recent fires (e.g., the Cerro Grande fire) have been caused by human activities, most fires in the mountainous west are caused by lightning. Over a 21-year period in the Santa Fe National Forest, officials recorded 68 lightning-caused fires per year. However, many of these fires remained as ground fires because crown fires only occur when forest and weather conditions are right for fires to get out of control. Studies show that fire was a frequent occurrence before the turn of the 20th century; trees were scarred by fire every five to ten years. The changes resulting from human settlement on, and use of, the Pajarito Plateau in the late 1800s caused suppression of fire, and today many places in the area have not had a fire in over 100 years.

Studies indicate that the last major fire in the 19th century on the Pajarito Plateau was in 1893. Through the ensuing years, without the cleansing of frequent low-intensity fires, forests of the plateau became heavily overgrown. In 1977, environmental and meterological conditions were right for the ignition of a wildfire, and this resulted in the La Mesa fire. This was the first large-scale wildfire on the Pajarito Plateau in the 20th century and burned over 15,000 acres of predominantly ponderosa pine forest. Twenty years later, the Dome fire burned 16,000 acres, and in 1998, the Oso fire burned another 5,000 acres. In May 2000, the Cerro Grande fire burned over 43,000 acres of the eastern slope of the Jemez Mountains. In total, over 80,000 acres of forested landscape on the Pajarito Plateau and in the east Jemez Mountains have been burned by wildfires in the last 23 years; some of these fires have been the result of human activities while others have resulted from natural processes.

METHODS FOR PLANT SURVEYS

During the summers of 2002 and 2003, surveys for the presence of plants within various elevation zones and transfer tracts were conducted for two reasons: 1) to provide plant community information for the archaeological excavations and 2) to provide modern plant information for the pollen identification from the excavated sites. Personnel collected pollen samples in an elevation transect from White Rock to the Pajarito Ski Hill. Photographs were taken at each pollen-collecting site and the major plants recorded. Additionally, the plant communities of the major excavation sites within the land transfer tracts were examined. The plant identification was checked in Foxx and Hoard (1993) and Martin and Hutchins (1984). Since the period of the survey was after the Cerro Grande fire, some areas were within the burn perimeter. A deepening drought in 2002 and 2003 caused many plants to be stunted (or not fully leafed). Additionally, much of the area was ravaged by the bark beetle and many piñons were dead and dying. These conditions made the diversity of plants normally in the various plant communities stressed and in some cases plants that would have been there were not blooming at the time of year we surveyed. Therefore a general description is based on the present survey information and historic survey information that may be pertinent to each area.

Results of the Plant Surveys for the Conveyance and Transfer Land Tracts

Airport Tract

The Airport Tract (A-3, A-7, and A-5-a) is located at the eastern end of the Los Alamos Airport. It is within the piñon juniper zone and generally has an understory of blue grama. Average rainfall is 12 to 14 inches. The site is relatively narrow and has limited vegetation that includes piñon pine and one-seed juniper with an understory of blue grama. Forbs included bitterweed, snakeweed, and cacti.

White Rock Tract

The White Rock Tract (A-19) is in the piñon-juniper woodland and has an understory of blue grama. The average annual precipitation at this elevation is 12 to 14 inches. The greatest number of edible plants has been found within this zone (Foxx and Tierney 1984; Vierra and Foxx 2002). The tract parallels State Route 4 and is directly across from the town of White Rock. The site is within the vicinity of Tsirege and is within lower Pajarito Canyon. An ephemeral stream flows through the canyon and springs likely provided water for the residents of Tsirege and a watering area for livestock. This tract, when examined, had been particularly hard hit by the bark beetle. Few piñons were still alive. Without an overstory cover the drought had taken a toll on the understory vegetation.

A cereal grain was noted in the vicinity of the site. The plant was most likely sorghum or another cereal grain but was not maize. In addition, some garden sunflowers were identified. Both sorghum and sunflower seeds are common in bird feeders. Scrub jays raid bird feeders for sunflower seeds. They carry the seeds to other trees and seeds also pass through their digestive system. The seeds probably lay dormant until rains provided conditions for sprouting. The thinning and death of so many trees in the area has opened up the tree canopy and such species can grow. There was very little understory vegetation due to the drought and opening of the canopy. To provide a more accurate indication of the plants within the canyon, studies by Foxx and Tierney (1980, 1984) were consulted. These sources also indicate the diversity of plant life when drought is not a factor.

Technical Area 74 Tract

The Technical Area 74 tract is primarily within Pueblo Canyon. The vegetation within this canyon is primarily piñon juniper with some ponderosa pine. There is a wetland area created from the effluent from the Los Alamos County sewage plant. In June of 2002, we noted plant habitats within Pueblo Canyon.

Rendija Tract

The Rendija Tract (A-14) is on the north side of Los Alamos County above Rendija Canyon. The sites were visited in July of 2003. Photographs were taken and plants were noted at both the Archaic and homestead sites. The homestead site had a large quantity of tomatillo, which usually indicates disturbance and is common on archaeological sites. Tomatillo is considered a camp follower taxon and is often found associated with archaeological sites. The cover found on homesteads within Rendija Canyon and near the pumice mine were used to supplement data collected during the survey (Foxx et al. 1997).

CHAPTER 5
PALEOENVIRONMENTS OF THE SOUTHERN ROCKY MOUNTAINS OF COLORADO AND NEW MEXICO: A SUMMARY FROM LAKE AND BOG SEDIMENTS

R. Scott Anderson

INTRODUCTION

Interest in the long-term history of climate, vegetation, and forest disturbance of northern New Mexico, and specifically the Jemez Mountains/Bandelier National Monument area, has grown steadily over the last decade. This may be due to several important events that have impacted the local area since the late 1990s. One of these—the creation of the Valles Caldera National Preserve (VCNP)—established a focus on preservation and study of a ca. 36,000-ha (88,900-ac) property, formerly part of the privately held Baca Ranch. Bills appropriating funding for, and establishing the boundaries of, the Preserve were passed in 1999 and 2000. Establishment of the Preserve has allowed land managers and scientists to craft management plans that provide for a significant research component in an area that previously existed in private hands.

A second event that focused interest on the region was the Cerro Grande fire, which burned as much as 19,400 ha (48,000 ac) within and near Los Alamos, New Mexico, in May 2000. The effects of this high-severity fire were devastating on ponderosa pine and mixed conifer stands primarily west of Los Alamos and east of the VCNP and focused attention on the history of forest disturbance and its effect on vegetation within the area. A third characteristic bearing directly on the local environmental history is the long record of human habitation within the region (see chapters in Vierra 2005b; Kohler 2004). Therefore, the juxtaposition of interest in understanding local environments and processes that have created those environments, with the history of human habitation and exploitation of this landscape, suggests that the Jemez Mountains may be an ideal location for investigation of the relationship between climate change, human habitation, and forest disturbance.

Former environments and climates can be deduced using a variety of proxies, including pollen and plant macrofossils from lakes, bogs, or meadows; plant macrofossils and pollen from packrat (*Neotoma*) middens; and the tree-ring record of live and dead trees. Each of these proxies has been used primarily to determine climate conditions and/or former vegetation types. Many other proxies exist that are equally as important in determining former environments, including geomorphic and alluvial histories, isotopic analysis of sediments and cave deposits, and the archaeological record of human activities and habitations, among others.

No one proxy can tell the entire story of environmental change; each has its advantages and limitations, and an integration of as many proxy records as possible provides us the best chance to determine the entire picture of former environments. For example, analysis of tree-ring series allows us to determine year-to-year variations of climate (e.g., temperature and precipitation) as well as fire histories for a site. Most often, the record from tree-rings is limited to a few hundreds of years, less often to several millennia (Grissino-Mayer 1996). Packrat midden deposits provide abundant plant macrofossils that allow us to determine—often to species level—the precise composition of the local flora (Betancourt et al. 1990). Addition of pollen analysis from middens allows for determining characteristics of the regional flora as well (Anderson and Van Devender 1991). But these glimpses of vegetation are most often separated by large blocks of time and are limited to the rocky substrate surrounding the site, as packrats primarily collect within several tens of meters from their nest only. Pollen and plant macrofossils from sedimentary deposits provide a longer, more continuous record than other proxies, but the source area for the pollen is often unclear, especially in areas of high relief (Markgraf 1980).

This chapter explores the history of vegetation change in north-central New Mexico and southern Colorado, centering primarily on the research that has been accomplished in the Jemez Mountains. The data proxies for reconstruction come primarily from analyses of sedimentary deposits that have accumulated in meadows, wetlands, bogs, and lakes over the last 15,000 years. These records document a series of vegetation and environmental changes that span a particularly intriguing time in southwestern North America, including the waning of the last great Laurentide and Cordilleran ice sheets in the northern hemisphere, the establishment of the warmer climates of the present interglacial (the Holocene), and the introduction of *Homo sapiens* into the continent. While the complete picture of paleoenvironmental change in this part of the southern Rockies has yet to emerge, the geographic distribution of sites for reconstructions has rapidly increased. Even so, most of this research on northern New Mexico exists today in the "gray" literature (e.g., project reports, master's theses, and conference abstracts and presentations).

For the general region of interest, Hall (1985) and Brunner-Jass (1999) summarized the paleoecological records from the Southwest and, more specifically, from northern New Mexico and southern Colorado before 2000 (ages presented in calendar years Before Present). A cluster of sites occurred in northwestern New Mexico, including the Chaco Canyon region (Hall 1977, 1985; Betancourt and Van Devender 1981), and the Chuska Mountains (Dead Man Lake region; Bent and Wright 1963; Wright et al. 1973). Other pollen records to the northwest come primarily from archaeological sites, and are of limited temporal extent. Additional sites had been analyzed from the San Juan Mountains of southwest Colorado, including Hurricane Basin (Andrews et al. 1975), Lake Emma (Carrara et al. 1984), Molas Lake (Maher 1963), Twin Lakes (Petersen and Mehringer 1976), and several sites in Mesa Verde (Martin and Byers 1965; Wyckoff 1977). By 1999, virtually nothing was known about the vegetation history of the southern Sangre de Cristo Mountains in New Mexico and Colorado.

From the Valles Caldera itself, a long pollen stratigraphy was recovered from the Valle Grande by Sears and Clisby (1952), which was presumed to be a pre-Wisconsin vegetation record. More recently, a second core was taken from this location, with radioisotope and paleoemagnetic stratigraphies documenting a ca. 50,000-year record spanning the OIS13–OIS14 transition (Fawcett et al. 2005). Closer to the present, Ensey (1997) produced two pollen records of the latest Holocene from Laguna de los Piños and Laguna de la Grulla, of which only the first was included in the report. Brunner-Jass (1999) undertook analysis of a sediment core from Alamo Bog in Alamo Canyon (western portion of the present Preserve), and from Chihuahueños Bog (immediately north of the Preserve in the Santa Fe National Forest). These records have proven to be the most detailed analysis of vegetation and fire histories for the region to date.

Since 2000 the number of sites within this region has increased substantially. For instance, new records have been produced for the San Juan Mountains (Toney 2004; Toney and Anderson 2006) and the southern Sangre de Cristo range (Armour et al. 2002; Bair 2004), as well as numerous sites stretching northward in highlands west of the Rio Grande (Anderson et al. 2004, 2005). Additional research has been completed on the original Chihuahueños Bog core, while new cores were taken and analyzed from Alamo and Valle Santa Rosa Bogs within the Preserve. With the exception of the last two, most of these records span the entire post-glacial period.

The present chapter is presented in two parts. In Part I, two new records from the Jemez Mountains are presented. These records document Holocene changes in vegetation and fire. Part II presents a summary of the paleoenvironmental data, primarily pollen, macrofossils, and charcoal particles from sediment cores in the Southern Rocky Mountains.

NEW RECORDS FROM THE JEMEZ MOUNTAINS

Alto Alamo Bog

Alamo Bog occurs along Alamo Creek within Alamo Canyon, which is a prominent feature of the western Jemez Mountains of the VCNP. Over the last three decades, several significant research projects have focused on the region, including archaeological investigations (the Baca Geothermal Anthropological Project [Baker 1981]), and an initial study of the vegetation and fire history of the region (Brunner-Jass 1999). The wetland that composes the central core of the bog is located at the intersection of Alamo Creek and an unnamed creek flowing north, at an elevation of 2630 m (8628 ft; location in Figure 5.1).

In 2000 an additional core was obtained from a section of the bog further upstream along Alamo Creek, named Alto Alamo Bog (AAB). Our reasoning for obtaining a second core location was to substantiate and validate the original Alamo Bog record, which suffered from potential problems in sediment dating. This is important because of the long history of human habitation of the region and the potential for human manipulation of the mixed conifer forest there. It was hoped that the AAB core would not be affected by the problems discovered at the site of the original study.

AAB is located at 2658 m (8720 ft) elevation, latitude 35^{o} 54’ 45” N, longitude 106^{o} 34’ 45” W on the Valle San Antonio 7.5’USGS Quad. Vegetation at AAB is much the same as at Alamo Bog proper. The bog surface is dominated by grasses (Poaceae) and sedges (Cyperaceae). Slopes surrounding both bogs are forested and strongly affected by aspect. On north-facing slopes, mixed conifer forests predominate, with Douglas-fir (*Pseudotsuga mensiezii*), white fir (*Abies concolor*), quaking aspen (*Populus tremuloides*), Colorado blue spruce (*Picea pungens*), and southwestern white pine (*Pinus strobiformis*). On xeric south-facing slopes, particularly around Alamo Bog, ponderosa pine (*P. ponderosa*) and Gambel oak (*Quercus gambelii*) dominates with lesser amounts of the more mesic common juniper (*Juniperus communis*) and many herbaceous species. Terminology follows Martin and Hutchins (1980).

Two Livingstone sediment cores (Wright 1991) were taken from AAB in 2001. Core 1, which was intensively analyzed, yielded a 3.75-m record. Each drive section was described in the lab, noting stratigraphy, sedimentary and organic content, and Munsell color under fluorescent light. Magnetic susceptibility measurements were made using a Bartington MS2E meter at 5-mm intervals. Magnetic susceptibility readings are reported as electromagnetic units per cubic centimeter (emu/cc).

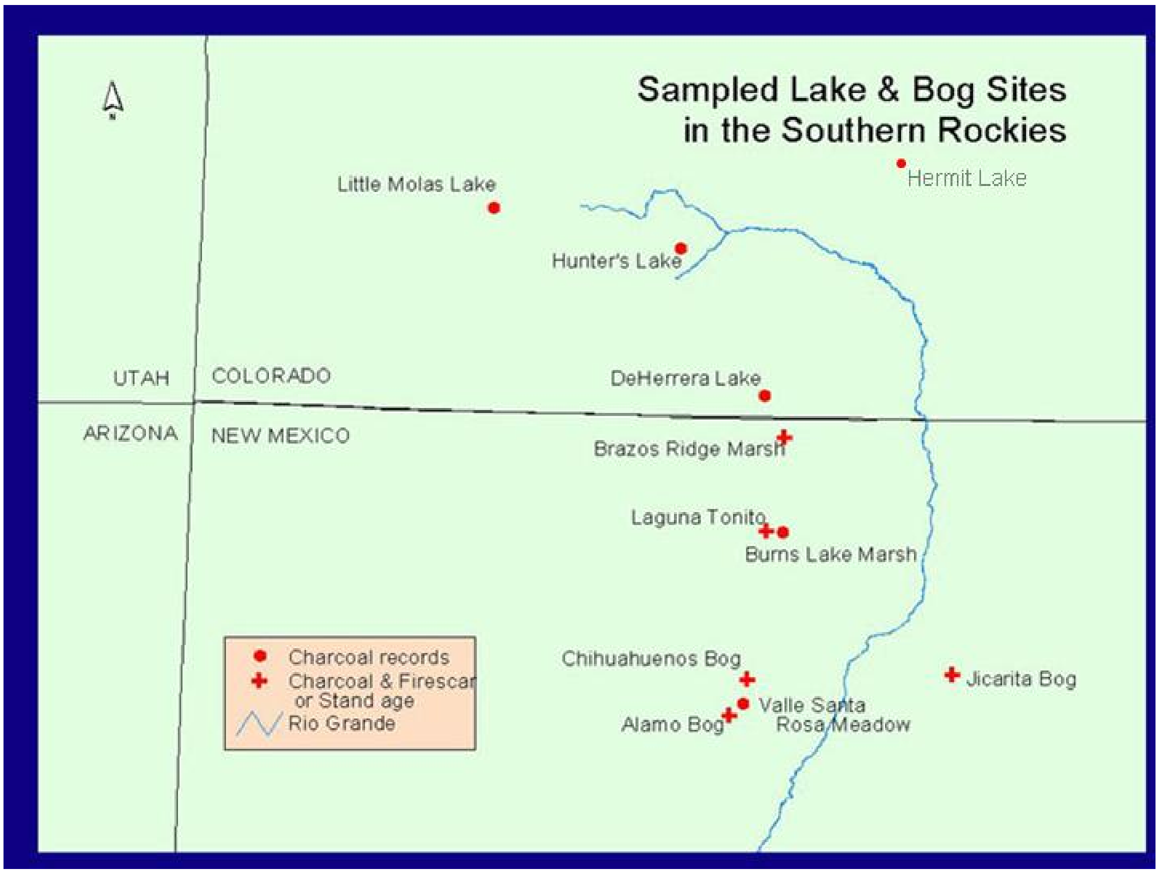

Figure 5.1. Sampled lake and bog sites in the southern Rockies.

Pollen was extracted from the sediments using standard methods (Fægri et al. 1989), including suspension in KOH, HCl, and HF. After acetolysis, pollen residues were stained and suspended in silicone oil. Many of the core samples required a 9-µ sieving step to remove additional clay and fine organics. Pollen counts per sample consisted of a minimum 300 non-Cyperaceae/non-Poaceae grains and a minimum of 50 non-*Pinus* terrestrial grains. *Pinus* grains were identified to subgeneric level when possible (Jacobs 1985a). Wetland (bog/riparian) types, excluding Poaceae, are graphed outside the pollen sum. Plant macrofossil samples for each core were recovered by washing the sample through stacked soil sieves. Macrofossils were also tallied during charcoal analysis (see below). Pollen types and macrofossils were identified using the comparative collection and manuals in the Laboratory of Paleoecology (LOP) at Northern Arizona University. Pollen data were plotted using Tilia View (Grimm 1992).

For the high-resolution sedimentary charcoal analysis we extracted a 0.5-cc sample from each linear cm of the core length. Sediment samples were sieved into 125-μm and 250-μm fractions. Charcoal particles were identified under a binocular microscope at 10x to 70x. Charcoal was identified by a uniformly black color, an iridescent sheen, and the presence of cellular structure. Macroscopic charcoal counts were standardized to 1-cc volume.

Radiometric ages for this core came from a combination of ^{210}Pb, ^{137}Cs, and ^{14}C analyses. Older sediments (below 42.5 cm depth) were dated by accelerator mass spectroscopy analysis of small sediment samples. ^{14}C ages were converted to calendar ages using CALIB 5.0 (Stuiver et al. 1998). To date the uppermost sediments we used both ^{210}Pb and ^{137}Cs (Appleby et al. 1979; Crusius and Anderson 1995). ^{210}Pb is suitable for dating the most recent 150 years, since its half-life is 22.26 ± 0.22 years (Blais et al. 1995; Olsson 1986). ^{137}Cs has a half-life of ca. 30 years and was produced in great abundance during nuclear atmospheric testing beginning in 1945 (Olsson 1986). The first pronounced increase of ^{137}Cs in sediment dates to AD 1954, with a maximum occurring in AD 1963 to 1964 and a decline by AD 1965.

The Sedimentary Record

The AAB record extends back in time to about 4750 calendar years ago (Figures 5.2 and 5.3), with continuous sedimentation to the present. The sediments consist primarily of silty peats (i.e., colluvium) for most of the record (Figure 5.3), except for a section of sand and pebbles near the core bottom and peat in the upper ca. one meter of the core. Although the sand and pebbles have been graphed as being deposited over several hundred years, this deposit is in all likelihood a nearly instantaneously deposited unit.

The dominant pollen types are pine (*Pinus*) and grass (Poaceae) throughout the record (Figure 5.2), but occurrence of other conifers, especially spruce (*Picea*), fir (*Abies*), Douglas fir (*Pseudotsuga*), and juniper (*Juniperus*) suggests that a rich mixed conifer forest existed adjacent to a grassy meadow for the entire record. The dominant pines were probably ponderosa pine (*Pinus ponderosa*) and southwestern white or limber pine (*Pinus strobiformis* or *P. flexilis*), as shown by macrofossil analysis (Figure 5.3), but macro-remains of spruce and Douglas fir also attest to their local presence. The occurrence of pollen from Colorado piñon (*P. edulis*) and oak (*Quercus*) suggests that these trees may have been present locally as well, or at least were important tree species within the general region, much as they are today.

Small changes in the pollen assemblages suggest that subtle differences in the vegetation history of AAB can be recognized. For instance, before 2200 years ago, herbs were more abundant in the record, including grasses, ferns, and members of the mustard family (Brassicaceae), as well as sedges (Cyperaceae) and meadow-rue (*Thalictrum*) (Figure 5.2). Pollen of spruce and Douglas fir was more common, while pollen of pine (including ponderosa pine) and fir was less abundant than in later time periods. After 2200 years ago, spruce and herb species declined, while pollen of ponderosa pine and fir increased.

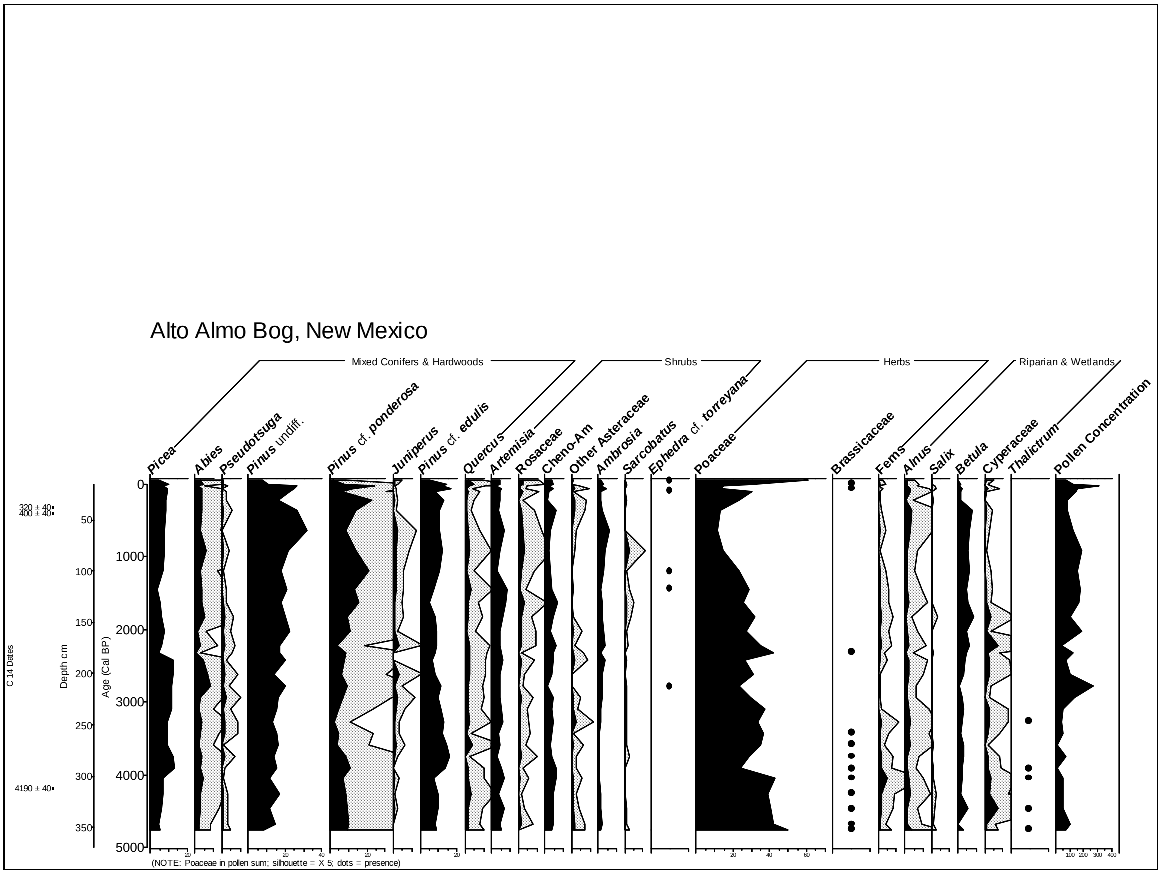

Figure 5.2. Pollen types at the Alto Alamo Bog, New Mexico.

Shrubby taxa, such as members of the rose family (Rosaceae), ragweed (*Ambrosia*), greasewood (*Sarcobatus*), and joint-fir (*Ephedra*) increased after 2200 years ago. Most other taxa do not vary significantly over this transition. Of interest from a biogeographic viewpoint is the occurrence during this period of birch (*Betula*), which is probably bog birch (*B. glandulosa*), whose only known occurrence during the Holocene is here in Alamo Canyon. Pollen changes in the uppermost levels of the core—the Historic period—include declines in pine pollen (especially noted in ponderosa pine) and birch, with increased in grass pollen percentages.

The charcoal stratigraphy (Figure 5.3) approximates the fire history of the site. Abundant charcoal was retrieved from sediments deposited before ca. 4000 years ago, but the amount of charcoal declines substantially between 4000 and 2200 years ago. Subsequently, charcoal concentration increases between ca. 2200 and 400 years ago and declines considerably. Sediments deposited during the 20th century contain virtually no charcoal (Figure 5.3).

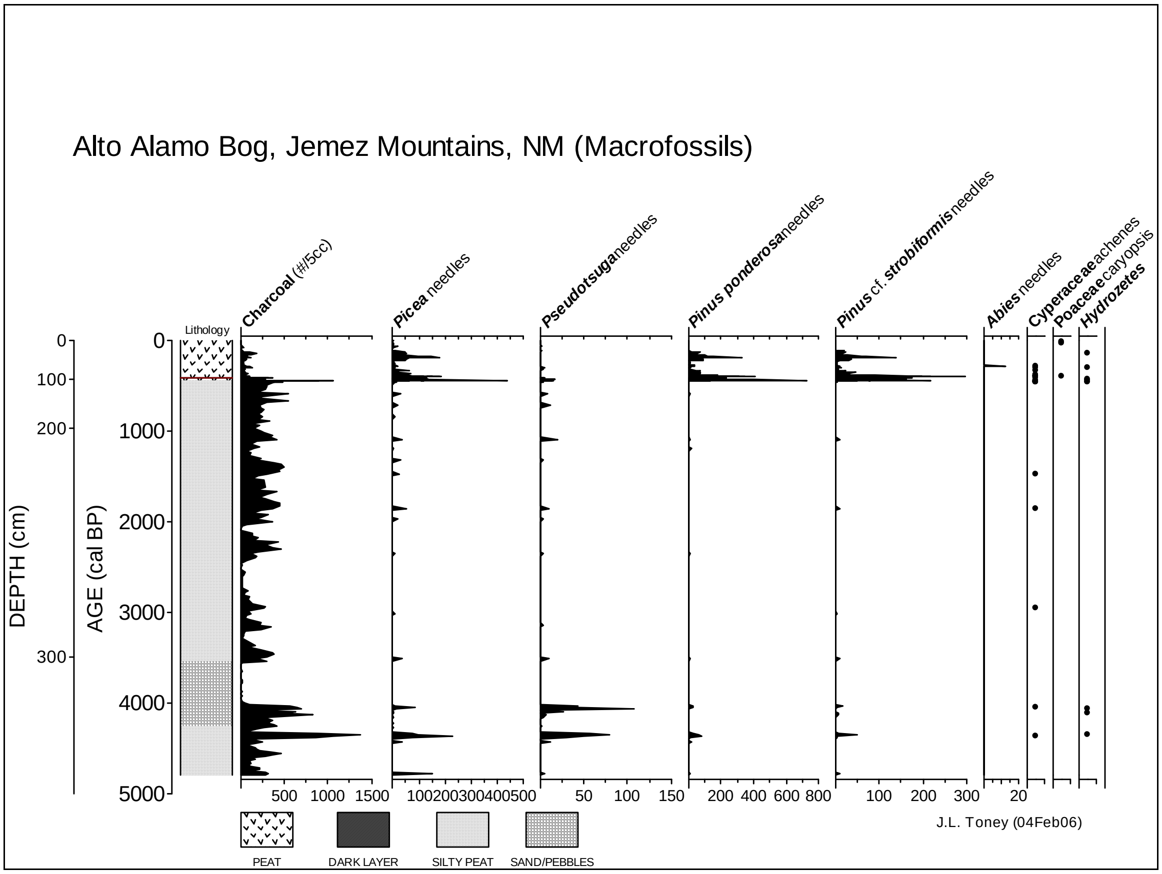

Figure 5.3. Charcoal stratigraphy from the Alto Alamo Bog, New Mexico.

Pollen and charcoal stratigraphies are consistent with an interpretation of occurrence of a mixed conifer forest surrounding an open meadow-like wetland, with frequent fire over the last 4750 years. Before 2200 years ago, however, the local environment may have been moister than subsequently, as shown by the greater abundance of spruce and wetland herbs, such as sedge. The fire record is also consistent with this interpretation for the early part of the record, with smaller concentrations of charcoal, except for the lowermost samples deposited before 4000 years ago. Beginning by 2200 years ago, however, an increase in ponderosa pine in the record, along with an increase in charcoal concentrations, suggests drier conditions with perhaps more frequent fire, at least in portions of the drainage basin. Further support for this comes from the increase in shrubs, although it is unclear if species like greasewood and joint-fir grew locally, or if these types represent long-distance transport of pollen from locations to the west of Alamo Canyon. The Historic period is seen in samples of both pollen and charcoal stratigraphies, with a decline in ponderosa pine pollen—probably due to logging locally—and an increase in grass pollen, which may be due to introduction of exotic grasses due to grazing.

Valle Santa Rosa Bog

A second new study in the VCNP comes from Valle Santa Rosa Bog (VSRB), located in Valle Santa Rosa near its confluence with Valle San Antonio in the northern portion of the VCNP (location in Figure 5.1). The coring site is located at 2590 m (8500 ft), latitude 35° 57' 45" N, and longitude 106° 31' 00" W, also on the Valle San Antonio 7.5' USGS Quad. Uplands around the bog are fairly open, but common trees include *Picea* sp., quaking aspen (*Populus tremuloides*), and ponderosa pine, with common juniper (*Juniperus communis*) as groundcover. The bog itself is covered by sedges and grasses. On the drier marginal meadow grow blue flag (*Iris missouriensis*), cinquefoil (*Potentilla* sp.), shrubby cinquefoil (*P. fruticosa*), dandelion (*Taraxacum officianale*), yarrow (*Achillea lanulosa*), pussytoes (*Antennaria* sp.), clover (*Trifolium* sp.), buttercup (*Ranunculus* sp.), and members of the pink family (Caryophyllaceae) (terminology after Martin and Hutchins 1980).

Two sediment cores were taken with a Livingstone corer in 2001 on the western margin of the Bog. Core 2 was selected for study and measures 1.8 m long. Our reasoning for studying this site was to obtain a record from the northern portion of the VCNP that could be compared with the Alamo Canyon records.

Essentially the same procedures were followed for analysis of VSRB sediments as for AAB. These included description of core stratigraphy, sedimentary and organic content, and Munsell color, as well as magnetic susceptibility. Pollen and charcoal particle stratigraphy methodology followed the same procedures as for AAB as well (see above). Radiometric ages for this core also came from a combination of ^{210}Pb, ^{137}Cs, and ^{14}C analyses. Older sediments (below ca. 62 cm depth) were dated by accelerator mass spectroscopy analysis of small sediment samples. ^{14}C ages were converted to calendar ages using CALIB 5.0 (Stuiver et al. 1998). ^{210}Pb and ^{137}Cs ages determined the upper 39 cm of the core.

The Sedimentary Record

According to our chronology accepting the bottommost age of the core, the VSRB record extends back in time to over 9000 calendar years ago (Figure 5.4). The upper 8.5 cm of the core is dark brown peat. Below the peat, to ca. 125 cm depth is organic silts (colluvium) alternating with sand layers. Sand units increase below 125 cm, but primarily return to organic silts to the core bottom. Unlike the AAB record, however, sedimentation at this site has not been continuous, and a number of unconformities, or periods of severe drying, are apparent in the pollen record. The most extensive unconformity occurs between 125 and 140 cm depth, encompassing perhaps 1375 to 8500 years ago, or most of the record. Thus, the VSRB pollen record includes only a short period in the late Holocene and one in the early Holocene. Each of these will be treated separately.

As at AAB, the dominant tree pollen type at VSRB is pine (*Pinus*) throughout the record. Unlike AAB however, grass (Poaceae) is not as abundant anywhere in the record. Early Holocene pollen spectra include spruce (*Picea*), ponderosa pine (*Pinus ponderosa*), and other pines, as well as some fir (*Abies*). Shrubs are dominated by sagebrush (*Artemisia*), saltbush-type (*Atriplex*; cheno-am), and other members of the aster family (Asteraceae). Riparian plants, such as willow (*Salix*), carrot family (Apiaceae), and meadow-rue (*Thalictrum*) are most important in this period, suggesting the site may have been a streamside location during the early Holocene.

Pollen deposited during the most recent 1375 years shows that pines, spruce, and fir continued to be important here, and Douglas fir (*Pseudotsuga*) increased in importance during this time (Figure 5.4). Sediments in the upper 40 cm show an increase in juniper (*Juniperus*) and oak (*Quercus*). In addition, pollen indicators of local land clearance and cattle ranching are evidenced here, beginning with the occurrence of introduced species associated with grazing (filaree, *Erodium*; dock, *Rumex*), followed by increased grass (Poaceae) pollen, perhaps a result of non-native introductions. In the uppermost sediments, pine pollen declines although the proportion of ponderosa pine pollen does not. At the same time, an increase is seen in sedge (Cyperaceae) pollen, suggesting higher groundwater tables in the most recent century.

The preliminary charcoal record shows generally highest concentrations of charcoal in the early Holocene section of the core (Figure 5.5). Charcoal concentrations trend to zero during the period encompassing the unconformity, then rebounds in the late Holocene to amounts not exceeding those from the early Holocene. Charcoal declines about 33-cm depth, and falls to zero above 16-cm depth.

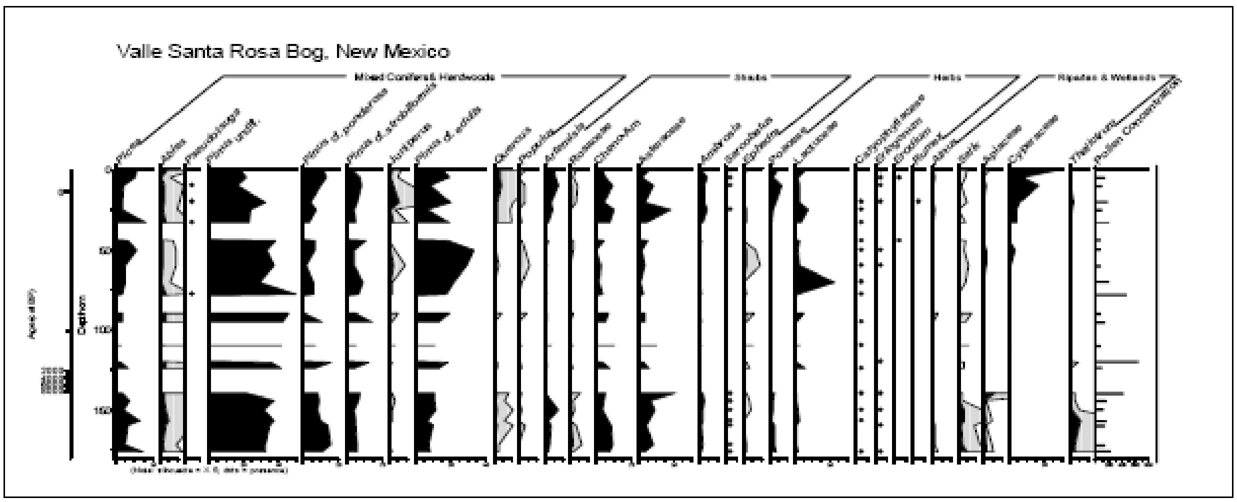

Figure 5.4. Pollen cores from the Valle Santa Rosa Bog, New Mexico.

Pollen and charcoal stratigraphies are considerably more difficult to interpret from VSRB than from AAB due to the considerable portion of the record that is missing. Still, the overall pollen record suggests a similar mixed conifer forest surrounding an open meadow-like wetland for both the early and late Holocene. One major difference between the two sites is the general paucity of grass in the VSRB record compared to the AAB record. This is a little puzzling, since the Valle Santa Rosa today is primarily a grassland, with open forest on the upper-side slopes. The fire history records of the two sites are generally similar, however, with similar amounts of charcoal (on a /cc basis) and a declining amount of charcoal deposited during the 20th century fire suppression period.

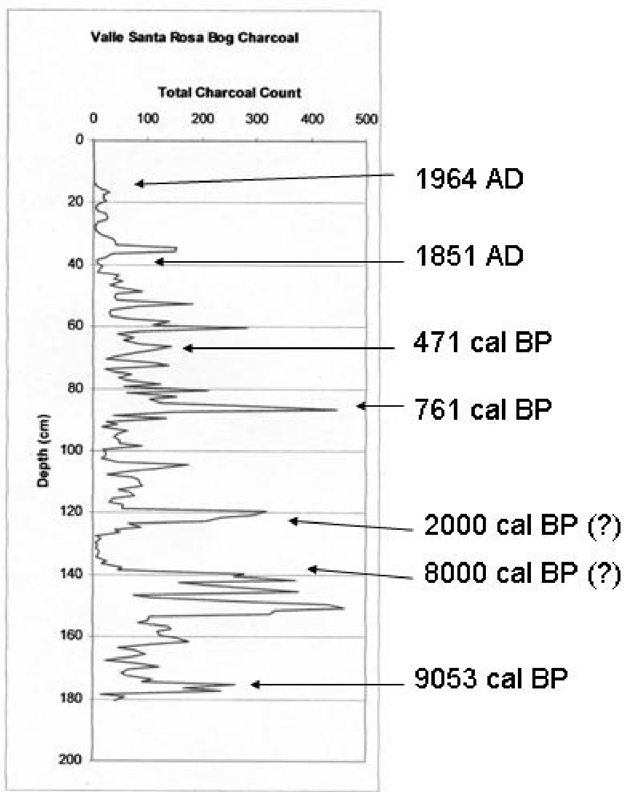

Figure 5.5. The charcoal record from the Valle Santa Rosa Bog, New Mexico.

Vegetation Change in the Southern Rockies

As discussed in the introduction above, our knowledge of the post-glacial paleoenvironmental history of the southern Rockies—including the San Juan and Sangre de Cristo ranges—is meager, but recent efforts have begun to tackle the temporal and spatial history of vegetation change there. Study has tended to concentrate around several themes, including the 1) characteristics of vegetation and climate change during deglaciation in the highlands, 2) understanding the development of the southwestern monsoon and its influence on vegetation, 3) the characteristics of the late Holocene, a time of particular interest in the archaeological record, and 4) fire histories of the present interglacial, among others. In reality, each of these individual subjects is part of a continuum of change that has occurred over the course of the last ca. 15,000 years.

Full- and late-glacial paleoecological studies from the southern Rocky Mountains indicate that treeline was up to 500 m lower during the Pinedale glaciation (Legg and Baker 1980; Maher 1963; Markgraf and Scott 1981). Highest-elevation sites were glaciated, while alpine vegetation found above 3300 m today occupied areas around 2800 m elevation (Legg and Baker 1980). Similarly, subalpine forests found between 2700 and 3300 m elevation today occupied sites below 2300 m elevation (Markgraf and Scott 1981). High-elevation sites reflect late-glacial conditions with cold winters and increased winter precipitation and drier than present summers (Vierling 1998) and enhanced winter storms originating in the Pacific Ocean (Markgraf and Scott 1981). Models suggest summer precipitation was at a minimum during this period (COHMAP 1988; Kutzbach et al. 1998).

The Late Glacial and Younger Dryas

The southern Rocky Mountains were extensively glaciated during the Pleistocene (Pierce 2004). However, the timing of deglaciation varies from place to place. For instance, in the Park Ranges of northern Colorado, insect assemblages suggest deglaciation before 16,440 cal BP (13,800 yr BP) (Elias 1996), which also suggest mean annual temperatures were only 3 to 4°C cooler than present, but mean winter temperatures were considerably colder (ca. 19 to 21°C cooler than present). Similar evidence (Elias 1996) suggests the Front Range of Colorado underwent deglaciation before ca. 13,860 cal BP (12,000 yr BP) (Elias 1996; Menounos and Reasoner 1997). Deglaciation in the San Juan range may have been somewhat later. Elias et al. (1991) reported ^{14}C basal dates suggesting that deglaciation was complete there by 11,480 cal BP (10,000 yr BP). This was recently confirmed at Little Molas Lake with deglaciation by 11,200 cal BP (Toney and Anderson 2006). In the southern Sangre de Cristo range, near Jicarita Peak, Bair (2004) suggested a much earlier deglaciation, by ca. 15,300 cal BP.

Of great interest has been recent research confirming that the environments of the Southwest were affected by events centered in the North Atlantic during deglaciation. The Younger Dryas stadial (YD; ca. 13,000 to 11,600 cal BP) was a brief period of climatic deterioration in the overall warming of the post-glacial (Yu and Wright 2000). While effects centered primarily on both sides of the North Atlantic, recent evidences suggests that the YD oscillation resulted in rapid vegetation responses at high-altitude sites in the southern Rockies as well. For instance Armour et al. (2002) documented periglacial activity during the YD in the Winsor Creek Basin of the southern Sangre de Cristo Mountains, New Mexico. Nearby at Jicarita Bog on Jicarita Peak, Bair (2004) documented minor vegetation changes associated with cooler conditions at that time. In Colorado at the Sky Pond site, glacio-lacustrine sediments probably associated with a glacial re-advance characterize the YD there (Menounos and Reasoner 1997). Reasoner and Jodry (2000) compared the Sky Pond record with that from Black Mountain Lake in the San Juan Mountains of Colorado and found major vegetation boundaries corresponding with onset and termination of the YD.

The Early to Middle Holocene and Development of the Arizona Monsoon

Subsequent to the YD cooling, extensive warming of climate commenced at the beginning of the present interglacial—the Holocene. The number of sites covering the transition to the Holocene is becoming substantial. Along the Front Range of Colorado, change to organic gyttja deposition with terrestrial macrofossils overlying the YD clastic sediments at Sky Pond signifies elevated biological activity within the lake and increased vegetation cover on land (Menounos and Reasoner 1997). The fossil insect record indicates that the postglacial warming maximum occurred between 12,930 and 10,180 cal BP (11,000 and 9000 yr BP) in the Rocky Mountains. At the La Poudre Pass, Colorado site, the warmest mean July temperatures occurred at 11,255 cal BP (9850 yr BP), and were 3.7 to 6.7°C warmer than present (Elias 1983, 1996). Four sites above 3000-m elevation in the Front Range show an early Holocene warming between ca. 10,180 to 7830 cal BP (9000 to 7000 yr BP), based on ratios of forest species to tundra species, and the presence of conifer macrofossils (Elias 1985).

In central Colorado, Fall (1997) examined a pollen record from Cottonwood Pass Pond (3670 m), presently above the treeline. However, sediments dating between 9840 and 4480 cal BP (8800 and 4000 yr BP) contains conifer macrofossils and high percentages of *Picea* and *Abies* pollen, indicating a subalpine forest grew at the location then. Climate reconstructions based on modern lapse rates and using an estimated treeline rise of 270 m suggest mean July and mean annual temperatures were ca. 1.9°C and 1.6°C warmer than present, respectively. In south-central Colorado, Anderson et al. (2004) demonstrated establishment of post-glacial, subalpine forests at Hunter's Lake (Wiminuche Wilderness Area, north of Pagosa Springs) by ca. 12,500 cal BP, and at DeHerrera Lake (south-central Colorado) by ca. 13,000 cal BP.

In the San Juan Mountains, Maher (1963) documented fluctuations in pollen ratios of high-elevation conifers—*Picea* and *Pinus*—that suggested higher treeline in the early Holocene at Molas Lake. This was a period of warmer, dry conditions favorable to the upslope migration of trees. Elias et al. (1991) also observed *Picea* and *Abies* krummholz fragments identified by their small size and contorted annual-ring pattern in Lake Emma, Colorado. Sediments indicate that the krummholz vegetation was at least 70 m higher than today throughout much of the early and middle Holocene (Elias et al. 1991), while Toney (2004) and Toney and Anderson (2006) documented early Holocene establishment of spruce forest at Little Molas Lake.

In northern New Mexico, the record from Chihuahueños Bog (north of the VCNP) spans the last ca. 15,000 years (Anderson et al. 2004). Unlike other sites in the region, this area was not glaciated during the late Pleistocene, since it was well below the elevational limit for permanent ice (2925 m). An open spruce forest grew around a small pond until ca. 11,500 cal BP when ponderosa pine became established. Further to the southeast, at Jicarita Bog in the Sangre de Cristo range of New Mexico, warming commenced by 12,000 cal BP and intensified after ca. 11,700 cal BP. Warmest and driest conditions probably existed from ca. 9000 to 4400 cal BP there.

Several studies have documented the establishment of the Arizona Monsoon by the opening of the Holocene. The monsoon is important since it brings moisture to the Southwest during the driest part of the growing season. Anderson (1989) suggested the establishment of ponderosa pine across the southern Colorado Plateau signified expansion of the Arizona Monsoon, since today ponderosa pine is found in locations where summer precipitation is important. Using deuterium (δD) of wood cellulose at Lake Emma, Friedman et al. (1988) suggested that summer monsoonal precipitation dominated in the San Juan Mountains in the early Holocene, but shifted to a greater mix of Pacific frontal storms and monsoons after 4400 cal BP (Carrara et al. 1991). Changes in δD indicate changes in moisture source, the seasonality of precipitation, or a combination of both. Precipitation from air masses originating over the Gulf of California reach the San Juan Mountains without first passing over high mountains; higher D level are expected relative to those originating in the Pacific Ocean that must travel over high mountain ranges before reaching the southern Rocky Mountains. Models suggest that summer radiation decreased from 9000 years ago to the present (COHMAP 1988; Kutzbach et al. 1998). Because the summer monsoons are driven by heating of land masses, a corresponding decrease in monsoon activity was predicted for the remainder of the Holocene.

Though the early Holocene was warm enough to drive the intensification of the Arizona Monsoon, at least one study from New Mexico suggests that the transition between the early and middle Holocene was particularly dry. Chihuahueños Bog dried out completely between ca. 8500 and 6200 cal BP, as groundwater tables fell in response to warm and dry climates (Anderson et al. 2004). Few other sites have shown such a drastic response to climatic drying. One such site is VSRB (this report), which also shows a lack of sediment accumulation beginning about 8500 years ago. However, the VSRB record does not resume until about 1375 years ago, with most of the Holocene record missing. At Little Molas Lake in the San Juan Mountains, warm conditions prevailed from 10,570 to 6700 cal BP, culminating in a shallow lake phase from 6230 to 5900 cal BP. This falls within the mid-Holocene period of higher treeline documented by Elias et al. (1991).

A site nearby to the Chihuahueños and VSRB—Alamo Bog—also within the VCNP, spans the last 9000 years, but shows a continuous record during this period (Brunner-Jass 1999). Apparently this site had sufficient soil moisture to remain wet during the entire Holocene. The pollen spectra of the entire record is dominated by mixed conifer species, with alder (*Alnus*), sedge (Cyperaceae) and *Spagnum* growing locally on and around the bog.

The Middle to Late Holocene

The middle to late Holocene period is one of substantial transition within the Southwest, and indeed, worldwide. This period is characterized by a general cooling trend relative to the early Holocene, with an increase in effective moisture. Even so, the late Holocene is punctuated by substantial droughts, both recognized in the sedimentary record as well as the tree-ring record.

Physical evidence for effectively cooler conditions is shown in the Winsor Creek Basin cores of northern New Mexico (Armour et al. 2002). The cores document four episodes of magnetic susceptibility spikes congruent with increases in clastic sediment deposition, interpreted as indicative of periglacial activity. These events occur at ca. 5640, 4390, 2870, and 130 cal BP (4900, 3945, 2770, and 120 yr BP, respectively) (Armour et al. 2002).

Palynological evidence of cooling is ubiquitous, but the actual period of transition differs between locations. For instance, effectively more moist conditions occur at Chihuahueños Bog by 6000 to 5000 years ago, as shown by the increase in fir (*Abies*), followed by piñon (*Pinus edulis*) pollen. Moist meadow conditions prevailed at Jicarita Bog, New Mexico, after 5000 years ago, with the development of a sedge meadow at the site. Sediments at Brazos Ridge Marsh (northern New Mexico, 3222 m) did not begin to accumulate in the shallow basin until 5000 years ago, presumably due to lower groundwater tables before that time. At Alamo Bog, grass (Poaceae) expanded at the expense of all other pollen types by ca. 4800 years ago. We interpret this as an expansion of the wet meadow—also due to rising groundwater tables—forcing the mixed conifer forest to grow further away from the middle of the bog as increasingly wetter conditions prevailed. In central Colorado, both the lower treeline (controlled by precipitation) and the upper treeline (controlled by temperature) contracted after ca. 4990 cal BP

(4400 yr BP) (Fall 1997; Markgraf and Scott 1981). And warmer and drier climates than today transition to effectively moister climates at Little Molas Lake in the San Juan Mountains by ca. 4100 years ago. Timberline lowering around Lake Emma in the San Juan range reflected presumed cooling after ~3100 cal BP (Elias et al. 1991). These data document that sites respond to climate changes individualistically, depending upon the sensitivity of sites, and to a lesser extent, the accuracy of the chronology.

Some sites not only document broadscale changes in vegetation and climate during the late Holocene, but the records can be interpreted as being sensitive enough to register drier and wetter periods internal to the long-term late Holocene trend toward cooler conditions. For instance, summer and annual precipitation decreased after 2800 cal BP at Beef Pasture and Twin Lakes in the La Plata Mountains, as indicated by a decrease in *P. edulis* and a narrowing of the *Picea* zone, respectively (Petersen 1981). From 2500 to 1500 cal BP the Twin Lakes data indicate cooler temperatures, but drier summers (Petersen 1981). The upward shift of *Picea* to modern elevations due to warming occurs in the Lost Park record after 1800 cal BP, as higher sagebrush (*Artemisia*) and lower goosefoot (cf. *Atriplex*; Cheno-am) pollen percentages indicate drier summers (Vierling 1998). Modern climate and vegetation conditions were established at Jicarita Bog by 1700 years ago (Bair 2004). Additional evidence for a variable climate during the late Holocene comes from studies of fire histories, as documented below.

Undoubtedly the most detailed tree-ring series published to date for northern New Mexico comes from El Malpais National Monument. Grissino-Mayer (1996) constructed a 2129-year record based on long-lived live and dead Douglas fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*) trees in this habitat that was largely protected from grazing and lumbering. Grissino-Mayer's analysis for the last 1900 years documents at least seven major long-term trends in rainfall. Above normal rainfall occurred during the periods AD 81–257, 521–660, 1024–1398, and 1791–1992, while below normal rainfall occurred during AD 258–520, 661–1023, and 1399–1790. The most intense drought during this time period was during AD 258-520. The precision of these data are unmatched by any of the pollen records obtained to date in the Southwest.

Fire Occurrence During the Holocene

Until recently, little was known about the long-term (Holocene-length) fire history of high elevation forests in the Southwest. Anderson et al. (2004, 2005) has reported on a fire history reconstructions from lake and bog sediments from seven sites in southern Colorado and northern New Mexico, which includes data on Little Molas Lake (Toney 2004) and Jicarita Bog (Bair 2004). More recently, Toney and Anderson (2006) have compared the long-term fire history records from Little Molas Lake with several from California to examine sub-continental patterns of burning during the Holocene.

High-resolution sampling—usually every 0.5 to 1.0 cm of linear core—is conducted to deduce the temporal patterns of fire at an individual site. This allows the investigator to construct the raw charcoal record (usually in particles/unit volume). Using the CHAPS program (Long et al. 1998) allows for calculation of charcoal deposition rates (CHAR), and separation of local fires (peaks) from non-local fires (background). This allows for calculation of a metric relating fire occurrence to time, often number of fires/1000 years. For high-elevation spruce-fir forest types, fire event frequency is usually measured in multiple decades to centuries (Alington 1998; Kipmueller and Baker 2000; Sherriff et al. 2001; Veblen et al. 1994), while for mixed conifer and ponderosa pine forest types it is years to decades (Swetnam and Baisan 1996).

Presently long-term data for the entire Holocene exist for Little Molas Lake, Hunter's Lake, and DeHerrera Lake in southern Colorado and from Jicarita Bog and Chihuahueños Bog in northern New Mexico. Shorter records have been analyzed for Brazos Ridge Marsh, Alamo Bog, and VSRB in northern New Mexico. Two time periods occur in these records where fire event frequency is higher than the Holocene average. Four sites—Little Molas, Hunter's, and DeHerrera Lakes, and Chihuahueños Bog—show higher fire event frequency between ca. 10,000 and 12,000 years ago (Anderson et al. 2004, 2005). The peak in fire activity for Jicarita Bog is displaced to ca. 12,000 to 14,000 years ago. We believe that there are two explanations for this. First, this was the time of highest post-glacial summer insolation, as modeled by Kutzbach and Guetter (1986) and others. This led to much warmer summers, with perhaps 7 percent to 8 percent greater insolation than today. With the initiation of the summer monsoon at this time came an ignition source as well—lightning. Second, this was also a period of rapidly changing vegetation, with the replacement of spruce woodland by spruce-fir forest or of spruce-fir forest by mixed conifer forest. Theoretically, the landscape would have contained abundant dead wood and other necromass for burning, assuming an ignition source was present.

The second period that witnessed a greater than average fire event frequency was during the late Holocene, between ca. 2000 and 1000 years ago. This pattern is present at Hunter's Lake, Brazos Ridge Marsh, and Chihuahueños Bog, with Alamo Bog showing higher fire event frequencies somewhat earlier at ca. 2500 years ago. Several explanations can be advanced for this (Anderson et al. 2004, 2005). First, Mayewski et al. (2004) demonstrated numerous records worldwide that document rapid climate changes as being more frequent during the late Holocene than before. Rapid fluctuations in climate may have placed additional stresses on plant communities that were not as apparent earlier in the record. It is likely that the late Holocene witnessed greater drought frequency. Within the limits of our dating, this late Holocene period is nearly contemporaneous with the AD 258–520 drought period documented from tree-rings at El Malpais (Grissino-Mayer 1996), which also documents additional extended periods of drought in the area during the most recent 2000 years. Second, most of the pollen evidence presented above suggests that mid- to high-elevation forest development reached its maximum extent during the late Holocene. This may have been a result of increased late Holocene winter precipitation, a result of the strengthening of El Niño over the last ca. 5000 years (Anderson and Smith 1997; McGlone et al. 1992; Menking and Anderson 2003; Rodbell et al. 1999). A climatic linkage between drought and climate for the Southwest has been established by Swetnam and Baisan (1996) who clearly showed from tree-ring evidence that the largest fire years are also those with the deepest drought, as measured by the Palmer Drought Severity Index. Therefore, we might expect with increased biomass, periods of drought would witness more frequent fire.

SUMMARY

The number of paleoecological sites with pollen and charcoal data within the southern Rocky Mountains of Colorado and New Mexico has grown considerably in the last decade. Research in this region has been driven by the desires of land managers to understand the history of vegetation change and long-term fire history. For most of the post-glacial period, climate has been the driver of vegetation and fire histories. However, human activities have had an increasingly important impact on the landscape of the region, as shown by the results of the Cerro Grande fire of 2000.

Two new records of vegetation and fire in the Jemez Mountains include AAB and VSRB. Although the record from VSRB is of limited use, the AAB record spans most of the late Holocene, a period of considerable interest to land managers and archaeologists. Pollen and macrofossil evidence demonstrate that forest of this elevation was one of mixed conifers throughout the period, but the characteristics of the forest transitioned about 2200 years ago to one including more ponderosa pine, with greater fire. It is unclear whether an increase in fire frequency allowed for greater ponderosa pine, or vice versa, from these data. It is also unknown at this time whether this change was driven by climatic or human causes. Further investigation is warranted on these issues.

Much of our knowledge of the long-term history of the region remains unpublished, or is found in “gray” literature publications. However, this may soon change, as the numbers of articles from a large USGS-BRD study become published (e.g., Toney and Anderson, 2006). Of great interest to paleoecologists is the occurrence of definitive evidence of a major cooling event—the YD—in the Southwest in several studies. Research has also demonstrated that the Arizona Monsoon developed by the early Holocene and may have been instrumental in providing the ignition source (i.e., lightning) that caused higher fire event frequencies during the major vegetation changes of the early Holocene. At several locations, the late to middle Holocene was the driest time of the record, when lake levels were lower and bogs dried out completely. This phenomenon was not universal, however, and probably depended upon the reliability of sufficient groundwater to maintain moisture in the basin center. Generally cooler climates of the late Holocene allowed an increase in biomass in mid- to high-elevation forests, and favored the expansion of low- (e.g., *Pinus edulis*) and high- (*Abies*) elevation conifers. Climate change during the late Holocene was not unidirectional, though, as the period was punctuated by numerous droughts of centennial duration.

Evidence of human modification of vegetation and fire regimes in the southern Rockies is not obvious until the late 19th and early 20th century. The establishment of grazing is shown at several locations by increases in grasses and introduced herbaceous species. Similarly, the effect of fire suppression is shown at most sites by the cessation of sedimentary charcoal deposition. Paleoecologists continue to examine the record for the impact of native populations on the forests of the southern Rockies, but, with our present understanding of the history of the region, climate appears to be the primary driving force on southwestern forests until the most recent centuries.

CHAPTER 6
MODERN POLLEN ANALOG STUDY, LOS ALAMOS NATIONAL LABORATORY

Susan J. Smith

INTRODUCTION

This report documents the results of a modern pollen study in Los Alamos National Laboratory (LANL). The main goal of this research is to develop an analog that can be used to study archaeological sites. Archaeological pollen data can be compared to natural pollen spectra and unique separated signatures that might reflect cultural activities. The analog is constructed from bulk sediment samples collected during June 2002 from 20 sites arrayed along a vegetation gradient from mixed conifer forests above 9000 ft to piñon and juniper below 7000 ft.

Archaeological sites at LANL are concentrated in transition zone ponderosa pine and piñon-juniper forests, where most of the sites date to the Coalition period (ca. AD 1150–1325) (Vierra et al. 2002a:6–29). The extent and persistence of agriculture on the Pajarito Plateau is impressive and is not limited to the prehistoric period. During the AD 1900s, there were about 35 homesteads on the plateau (Foxx et al. 1997:7). The homesteaders were grazing stock and farming grain, beans, orchards, and vegetables. An important research theme for the modern pollen study is to explore the pollen nature of disturbance. Can past agriculture be recognized from unique pollen assemblages or any key indicator types? A special class of disturbance is created by wildfire, and large tracts of forest have burned in the last 100 years, notably the 2000 Cerro Grande fire. Are there distinct pollen signatures in burned and unburned plots from different forest types? Do pollen spectra from burned sites share any traits with disturbed sites?

MODERN ENVIRONMENT

Detailed information about LANL vegetation is documented in geographic information system databases (Balice et al. 1997; Balice et al. 2000) and a botanical inventory (Foxx and Tierney 1984). LANL is sited on approximately 50,000 ac on the Pajarito Plateau, a broad piedmont off the east slope of the Jemez Mountains characterized by east-west-trending canyons and intervening mesas. The Sierra de los Valles, with three mountain peaks greater than 10,000 ft high, form a dramatic landscape west of Los Alamos and the Rio Grande Valley lies to the east. The elevation gradient from the crest of the Sierra to the Rio Grande (5350 ft elevation) is greater than 5000 ft over a horizontal distance of less than 15 miles.

The regional elevation gradient and diverse local physiography generate a variety of microclimate niches. The corresponding modern vegetation is a complex mosaic that Balice et al. (1997) have categorized into the following five main (Level 1) cover types: juniper savannah, piñon-juniper woodlands, ponderosa pine forests, mixed conifer forests, and spruce-fir forests. Figure 6.1 is a generalized model of the elevation range of the main vegetation types (Balice et al. 1997:13). The boundaries between vegetation communities are diffuse transition zones, moderated by slope aspect and the many canyons that carry linear stringers of higher-elevation species through lower-elevation communities.

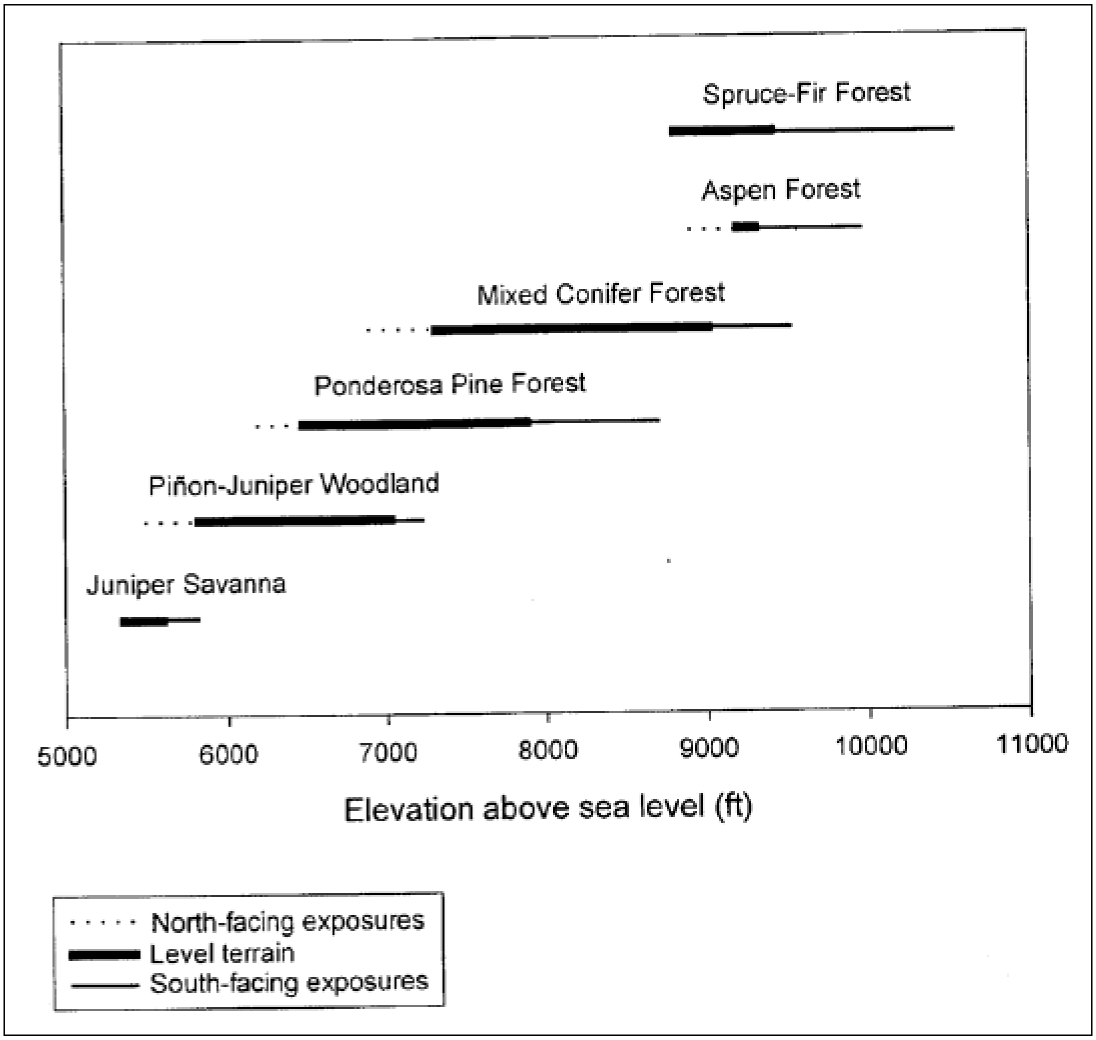

Figure 6.1. Elevational range of main vegetation types (Figure 4 in Balice et al. 1997:13).

During the June 2002 field work, Teralene Foxx identified plant species in the field at 12 of the 20 pollen stations, which is a feat that only an experienced Los Alamos botanist could attempt in the record-breaking drought year of 2002. Several of the herb and forb species were recognized by a stub of stem and a dry piece of curled leaf picked from the soil around the plant base. The plant species identified at each station are listed in Table 6.1. The detailed lists, station descriptions, and pictures for 11 of the stations are documented in Appendix B. A list of all the plant species identified and frequency as a percent of the 20 stations is presented in Table 6.2. A total of 114 plant species were documented, which included 14 species of trees, 25 shrubs, 54 herbs and forbs, 17 grasses, three aquatic species, and one fern. The variety of plants would undoubtedly have been higher, but for the extreme 2002 drought conditions.

Table 6.1. Plant species list for the Los Alamos pollen stations (June 12 to 14, 2002).

Pollen Station Number			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**17**	**18**	**19**	**25**	**26**	**27**	**28**	**29**
Plant Taxa Richness (number plant species)			**16**	**17**	**9**	**24**	**7**	**13**	**12**	**20**	**12**	**13**	**10**	**21**	**12**	**14**	**15**	**11**	**11**	**7**	**9**	**7**
Family	**Taxon**	**Common Name**																				
Aceraceae	*Acer glabrum*	rocky mountain maple								x				x								
Betulaceae	*Betula*	Birch												x								
Cupressaceae	*Juniperus monosperma*	one seed juniper	x	x	x							x	x		x		x			x	x	x
Elaeagnaceae	*Elaeagnus angustifolia*	Russian olive						x				x										
Fagaceae	*Quercus gambelii*	gambel oak				x	x	x	x					x	x		x	x				
Fagaceae	*Quercus spp.*	oak	x																	x		
Pinaceae	*Abies concolor*	white fir								x				x								
Pinaceae	*Picea pungens*	blue spruce									x											
Pinaceae	*Pinus edulis*	Colorado piñon	x		x							x	x		x		x			x		x
Pinaceae	*Pinus flexilis*	limber pine							x													
Pinaceae	*Pinus ponderosa*	ponderosa pine		x		x	x	x	x			x	x	x			x				x	
Pinaceae	*Pseudotsuga menziesii*	douglas fir							x	x	x			x								
Salicaceae	*Populus angustifolia*	narrow leaf cottonwood												x				x				
Salicaceae	*Populus tremuloides*	aspen				x				x	x											
Anacardiaceae	*Rhus trilobata*	lemonade berry	x					x				x	x			x				x		
Asteraceae	*Artemisia tridentata*	big sagebrush										x	x						x			
Asteraceae	*Chrysothamnus nauseosus*	rabbitbrush		x								x				x			x		x	
Asteraceae	*Chrysothamnus* sp.	rabbitbrush																	x			

Pollen Station Number			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**17**	**18**	**19**	**25**	**26**	**27**	**28**	**29**
Plant Taxa Richness (number plant species)			**16**	**17**	**9**	**24**	**7**	**13**	**12**	**20**	**12**	**13**	**10**	**21**	**12**	**14**	**15**	**11**	**11**	**7**	**9**	**7**
Family	**Taxon**	**Common Name**																				
Asteraceae	*Gutierrezia sarothrae*	snakeweed			x										x	x	x					x
Asteraceae	*Hymenoxys richardsoni*	bitterweed			x	x		x														x
Berberiaceae	*Berberis fendleri*	fendler barberry				x	x							x								
Caprifoliaceae	*Sambucus microbothrys*	elderberry									x											
Celastraceae	*Pachystima myrsinites*	mountain's lover							x													
Cupressaceae	*Juniperus communis*	common juniper				x																
Ericaceae	*Arctostaphylos uvaursi*	bearberry							x													
Fabaceae	*Robinia neomexicana*	New Mexico locust				x		x	x					x				x				
Oleaceae	*Forestiera neomexicana*	New Mexico olive										x										
Ranunculaceae	*Actaea arguta*	baneberry								x												
Ranunculaceae	*Clematis pseudoalpina*	clematis												x								
Rhamnaceae	*Ceanothus fendleri*	buckbrush																				
Rosaceae	*Cercocarpus montanus*	mountain mahogany	x												x		x			x		
Rosaceae	*Fallugia paradoxa*	Apache plume	x																x	x		
Rosaceae	*Rosa spp.*	wild rose				x								x								
Rosaceae	*Rubus strigosus*	raspberry									x											
Salicaceae	*Salix*	willow				x								x								
Saxifragaceae	*Jamesia americana*	cliff bush												x								
Saxifragaceae	*Philadelphus microphyllus*	mock orange												x								

Pollen Station Number			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**17**	**18**	**19**	**25**	**26**	**27**	**28**	**29**
Plant Taxa Richness (number plant species)			**16**	**17**	**9**	**24**	**7**	**13**	**12**	**20**	**12**	**13**	**10**	**21**	**12**	**14**	**15**	**11**	**11**	**7**	**9**	**7**
Family	**Taxon**	**Common Name**																				
Saxifragaceae	*Ribes cernuum*	wax currant												x								
Vitaceae	*Parthenocissus inserta*	Virginia creeper												x								
Apiaceae	*Osmorhiza obtuse*	bluntseed cicely								x												
Apiaceae	*Pseudocymoptris montanus*	mountain parsley									x											
Asteraceae	*Achillea lanulosa*	yarrow				x				x												
Asteraceae	*Ambrosia*	ragweed																	x			
Asteraceae	*Antennaria parviflora*	pussytoes				x	x	x														
Asteraceae	*Artemisia carruthii*	wormwood		x																	x	
Asteraceae	*Artemisia dracunculus*	false terragon	x	x	x							x	x							x	x	x
Asteraceae	*Artemisia* spp.	wormwood															x		x			
Asteraceae	*Aster* spp.	aster						x								x	x					
Asteraceae	*Atremisia ludoviciana*	wormwood	x		x						x									x		x
Asteraceae	*Cirsium* spp.	thistle									x			x				x				
Asteraceae	*Conyza canadensis*	horseweed				x																
Asteraceae	*Erigeron divergens*	fleabane				x																
Asteraceae	*Helianthus* sp.	sunflower																				
Asteraceae	*Heterotheca*	golden weed	x													x			x	x		
Asteraceae	*Senecio* spp.	groundsel				x									x	x						
Asteraceae	*Solidago* spp.	goldenrod						x														
Asteraceae	*Taraxacum officinale*	dandelion								x	x			x								
Boraginaceae	Boraginaceae	borage species														x						
Brassicaceae	*Sisymbrium*	tumble mustard																x	x			

Pollen Station Number			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**17**	**18**	**19**	**25**	**26**	**27**	**28**	**29**
Plant Taxa Richness (number plant species)			**16**	**17**	**9**	**24**	**7**	**13**	**12**	**20**	**12**	**13**	**10**	**21**	**12**	**14**	**15**	**11**	**11**	**7**	**9**	**7**
Family	**Taxon**	**Common Name**																				
Cactaceae	*Opuntia* spp.	prickly pear	x										x		x		x			x		
Chenopodiaceae	Chenopodium	Cheno-Am															x					
Chenopodiaceae	*Kochia scoparia*	summer cypress		x				x													x	
Chenopodiaceae	*Salsola* sp.	tumbleweed																	x			
Euphorbiaceae	*Euphorbia seryllifolia*	thymeleaf spurge	x																	x		
Fabaceae	*Lupinus caudatus*	lupine		x																	x	
Fabaceae	*Lupinus* sp.	lupine																				
Fabaceae	*Melilotus* spp.	sweetclover		x												x		x			x	
Fabaceae	*Thermopsis pinetorum*	golden pea								x												
Fabaceae	*Vicia americana*	American vetch								x												
Geraniaceae	*Geranium* sp.	wild geranium							x													
Iridaceae	*Iris*	iris (ornamental)				x																
Iridaceae	*Iris missouriensis*	blue flag									x											
Lamiaceae	*Monarda pectinata*	ponymint		x																	x	
Liliaceae	*Allium cernuum*	wild onion				x				x												
Liliaceae	*Yucca baccata*	broadleaf yucca	x												x		x			x		
Loasaceae	*Mentzelia* spp.	blazing star		x																	x	
Malvaceae	Sphaeralcea	globemallow															x		x			
Polemoniaceae	*Ipomopsis aggregata*	scarlet gilia	x													x				x		
Polygonaceae	*Eriogonum cernuum*	buckwheat		x																	x	
Polygonaceae	*Eriogonum jamesii*	antelope sage	x																	x		
Polygonaceae	*Eriogonum racemosum*	buckwheat		x																	x	
Polygonaceae	*Polygonum* sp.	knotweed																x				

Pollen Station Number			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**17**	**18**	**19**	**25**	**26**	**27**	**28**	**29**
Plant Taxa Richness (number plant species)			**16**	**17**	**9**	**24**	**7**	**13**	**12**	**20**	**12**	**13**	**10**	**21**	**12**	**14**	**15**	**11**	**11**	**7**	**9**	**7**
Family	**Taxon**	**Common Name**																				
Primulaceae	*Dodecatheon* spp.	shooting star								x												
Ranunculaceae	*Thalictrum fendleri*	meadowrue								x												
Rosaceae	*Fragaria americana*	wild strawberry								x												
Rosaceae	*Potentilla* spp.	cinquefoil				x				x	x											
Rubiaceae	*Galium* sp.	bedstraw								x												
Scrophulariaceae	*Othocarpus purpureo-albus*	purple owlclover			x																	x
Scrophulariaceae	*Penstemon* spp.	penstemon		x					x												x	
Scrophulariaceae	*Verbascum thapsus*	mullein		x		x						x				x		x	x		x	
Solanaceae	*Physalis* sp.	groundcherry														x						
Violaceae	*Viola*	violet								x												
Violaceae	*Viola canadensis*	Canadian violet								x												
Polypodiaceae	*Pteridium* sp.	bracken fern									x	x										
Poaceae	*Agropyron smithii*	wheatgrass				x																
Poaceae	*Aristida* spp.	three awn													x	x						
Poaceae	*Bepharoneuron tricholepis*	pinedropseed							x													
Poaceae	*Bouteloua gracilis*	blue grama	x	x	x								x		x		x			x	x	x
Poaceae	*Bromus* spp.	brome				x				x				x								
Poaceae	*Dactylis glomerulata*	orchard grass										x										
Poaceae	*Danthonia intermedia*	timber oatgrass										x										
Poaceae	*Hilaria* sp.	galleta													x	x						
Poaceae	*Koleria cristata*	june grass				x	x	x	x													

Pollen Station Number			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**17**	**18**	**19**	**25**	**26**	**27**	**28**	**29**
Plant Taxa Richness (number plant species)			**16**	**17**	**9**	**24**	**7**	**13**	**12**	**20**	**12**	**13**	**10**	**21**	**12**	**14**	**15**	**11**	**11**	**7**	**9**	**7**
Family	**Taxon**	**Common Name**																				
Poaceae	*Muhlenbergia montanus*	mountain muhly				x	x	x	x					x								
Poaceae	*Muhlenbergia torreyi*	ring muhly											x									
Poaceae	Other Poaceae	other grasses																x				
Poaceae	*Poa fendleri*	bluegrass			x												x					x
Poaceae	*Schizachyrium scoparius*	little bluestem	x	x		x		x							x	x	x			x	x	
Poaceae	*Sitanion hystrix*	squirreltail				x	x															
Poaceae	*Sporobolus* spp.	sand dropseed		x										x							x	
Poaceae	*Stipa (Oryzopsis) micrantha*	littleseed ricegrass											x									
Cyperaceae	*Carex* spp.	sedge								x												
Cyperaceae	*Scirpus* sp.	bulrush																x				
Typhaceae	*Typha*	cattail																x				

Table 6.2. List of plant species.

	Family	Species	Common Name	Frequency as percent of *n* = 20 Stations
	Trees			
1	Betulaceae	*Betula*	birch	5
2	Cupressaceae	*Juniperus monosperma*	one seed juniper	40
3	Elaeagnaceae	*Elaeagnus angustifolia*	Russian olive	10
4	Fagaceae	*Quercus gambelii*	gambel oak	55
5	Fagaceae	*Quercus* spp.	oak	5
6	Pinaceae	*Abies concolor*	white fir	10
7	Pinaceae	*Picea pungens*	blue spruce	5
8	Pinaceae	*Pinus edulis*	Colorado piñon	35
9	Pinaceae	*Pinus flexilis*	limber pine	5
10	Pinaceae	*Pinus ponderosa*	ponderosa pine	55
11	Pinaceae	*Pseudotsuga menziesii*	douglas fir	20
12	Salicaceae	*Acer glabrum*	rocky mountain maple	10
13	Salicaceae	*Populus angustifolia*	narrow leaf cottonwood	10
14	Salicaceae	*Populus tremuloides*	aspen	15
	Shrubs			
15	Anacardiaceae	*Rhus trilobata*	lemonade berry	25
16	Asteraceae	*Artemisia tridentata*	big sagebrush	15
17	Asteraceae	*Chrysothamnus nauseosus*	rabbitbrush	20
18	Asteraceae	*Chrysothamnus* sp.	rabbitbrush	5
19	Asteraceae	*Gutierrezia sarothrae*	snakeweed	25
20	Asteraceae	*Hymenoxys richardsoni*	bitterweed	15
21	Berberiaceae	*Berberis fendleri*	fendler barberry	15
22	Caprifoliaceae	*Sambucus microbothrys*	elderberry	5
23	Celastraceae	*Pachystima myrsinites*	mountain's lover	5
24	Cupressaceae	*Juniperus communis*	common juniper	5
25	Ericaceae	*Arctostaphylos uvaursi*	bearberry	5
26	Fabaceae	*Robinia neomexicana*	New Mexico locust	25
27	Oleaceae	*Forestiera neomexicana*	New Mexico olive	5

	Family	**Species**	**Common Name**	**Frequency as percent of *n* = 20 Stations**
28	Ranunculaceae	*Actaea arguta*	baneberry	5
29	Ranunculaceae	*Clematis pseudoalpina*	clematis	5
30	Rhamnaceae	*Ceanothus fendleri*	buckbrush	0
31	Rosaceae	*Cercocarpus montanus*	mountain mahogany	15
32	Rosaceae	*Fallugia paradoxa*	Apache plume	10
33	Rosaceae	*Rosa* spp.	wild rose	10
34	Rosaceae	*Rubus strigosus*	raspberry	5
35	Salicaceae	*Salix*	willow	10
36	Saxifragaceae	*Jamesia americana*	cliff bush	5
37	Saxifragaceae	*Philadelphus microphyllus*	mock orange	5
38	Saxifragaceae	*Ribes cernuum*	wax currant	10
39	Vitaceae	*Parthenocissus inserta*	Virginia creeper	5
	Herbs and Forbs			
40	Apiaceae	*Osmorhiza obtuse*	bluntseed cicely	5
41	Apiaceae	*Pseudocymoptris montanus*	mountain parsley	5
42	Asteraceae	*Achillea lanulosa*	yarrow	10
43	Asteraceae	*Ambrosia*	ragweed	10
44	Asteraceae	*Antennaria parviflora*	pussytoes	15
45	Asteraceae	*Artemisia carruthii*	wormwood	5
46	Asteraceae	*Artemisia dracunculus*	false terragon	30
47	Asteraceae	*Artemisia* spp.	wormwood	15
48	Asteraceae	*Aster* spp.	aster	15
49	Asteraceae	*Atremisia ludoviciana*	wormwood	15
50	Asteraceae	*Cirsium* spp.	thistle	15
51	Asteraceae	*Conyza canadensis*	horseweed	5
52	Asteraceae	*Erigeron divergens*	fleabane	5
53	Asteraceae	*Helianthus* sp.	sunflower	5
54	Asteraceae	*Heterotheca*	golden weed	15
55	Asteraceae	*Senecio* spp.	groundsel	15
56	Asteraceae	*Solidago* spp.	goldenrod	5
57	Asteraceae	*Taraxacum officinale*	dandelion	15
58	Boraginaceae	Boraginaceae	borage species	5
59	Brassicaceae	*Sisymbrium* sp.	tumble mustard	10
60	Cactaceae	*Opuntia* spp.	prickly pear	20
61	Chenopodiaceae	*Chenopodium* sp.	Cheno-Am	15
62	Chenopodiaceae	*Kochia scoparia*	summer cypress	10
63	Chenopodiaceae	*Salsola* sp.	tumbleweed	10

	Family	Species	Common Name	Frequency as percent of *n* = 20 Stations
64	Euphorbiaceae	*Euphorbia seryllifolia*	thymeleaf spurge	5
65	Fabaceae	*Lupinus caudatus*	lupine	5
66	Fabaceae	*Lupinus* sp.	lupine	5
67	Fabaceae	*Melilotus* spp.	sweetclover	15
68	Fabaceae	*Thermopsis pinetorum*	golden pea	5
69	Fabaceae	*Vicia americana*	American vetch	5
70	Geraniaceae	*Geranium* sp.	wild geranium	5
71	Iridaceae	*Iris* sp.	iris (ornamental)	5
72	Iridaceae	*Iris missouriensis*	blue flag	5
73	Lamiaceae	*Monarda pectinata*	ponymint	5
74	Liliaceae	*Allium cernuum*	wild onion	10
75	Liliaceae	*Yucca baccata*	broadleaf yucca	15
76	Loasaceae	*Mentzelia* spp.	blazing star	5
77	Malvaceae	*Sphaeralcea* sp.	globemallow	15
78	Polemoniaceae	*Ipomopsis aggregata*	scarlet gilia	10
79	Polygonaceae	*Eriogonum cernuum*	buckwheat	5
80	Polygonaceae	*Eriogonum jamesii*	antelope sage	5
81	Polygonaceae	*Eriogonum racemosum*	buckwheat	5
82	Polygonaceae	*Polygonum* sp.	knotweed	5
83	Primulaceae	*Dodecatheon* spp.	shooting star	5
84	Ranunculaceae	*Thalictrum fendleri*	meadowrue	5
85	Rosaceae	*Fragaria americana*	wild strawberry	5
86	Rosaceae	*Potentilla* spp.	cinquefoil	15
87	Rubiaceae	*Galium* sp.	bedstraw	5
88	Scrophulariaceae	*Othocarpus purpureoalbus*	purple owlclover	5
89	Scrophulariaceae	*Penstemon* spp.	penstemon	15
90	Scrophulariaceae	*Verbascum thapsus*	mullein	30
91	Solanaceae	*Physalis* sp.	groundcherry	5
92	Violaceae	*Viola*	violet	5
93	Violaceae	*Viola canadensis*	Canadian violet	5
	Fern			
94	Polypodiaceae	*Pteridium* sp.	bracken fern	5
	Grasses			
95	Poaceae	*Agropyron smithii*	wheatgrass	5
96	Poaceae	*Aristida* spp.	three awn	10
97	Poaceae	*Blepharoneuron tricholepis*	pine dropseed	5
98	Poaceae	*Bouteloua gracilis*	blue grama	40
99	Poaceae	*Bromus* spp.	brome	15
100	Poaceae	*Dactylis glomerulata*	orchard grass	5

	Family	Species	Common Name	Frequency as percent of *n* = 20 Stations
101	Poaceae	*Danthonia intermedia*	timber oatgrass	5
102	Poaceae	*Hilaria jamesii.*	galleta	10
103	Poaceae	*Koleria cristata*	june grass	20
104	Poaceae	*Muhlenbergia montanus*	mountain muhly	25
105	Poaceae	*Muhlenbergia torreyi*	ring muhly	5
106	Poaceae	Other Poaceae	other grasses	5
107	Poaceae	*Poa fendleri*	bluegrass	10
108	Poaceae	*Schizachyrium scoparius*	little bluestem	45
109	Poaceae	*Sitanion hystrix*	squirreltail	10
110	Poaceae	*Sporobolus* spp.	sand dropseed	10
111	Poaceae	*Stipa (Oryzopsis) micrantha*	littleseed ricegrass	5
	Riparian/Aquatic			
112	Cyperaceae	*Carex* spp.	sedge	5
113	Cyperaceae	*Scirpus* sp.	bulrush	5
114	Typhaceae	*Typha latifolia*	cattail	5

POLLEN STATIONS

The modern pollen analog is constructed from 20 stations that sample the main vegetation types, examples of disturbance, meadow and riparian sites, and paired stations in burned and unburned plots from the 2000 Cerro Grande fire. Station descriptions are listed in Table 6.3, organized generally by elevation and vegetation type. The estimated percent cover of three overstory layers (trees, shrubs, and grasses and herbs) and the dominant tree species are included in Table 6.3. Stations selected to represent a burned forest stand, disturbed or riparian site, or meadow are viewed as openings within forest. This perspective is particularly relevant to pollen studies in forests, because conifer trees produce literally tons of wind-dispersed pollen (Fægri et al. 1989:14) that dominate the regional pollen rain. Thus, at the coarsest level, the stations occur in four vegetation types: mixed conifer (*n* = 4), ponderosa pine (*n* = 5), transition ponderosa pine and piñon-juniper (*n* = 5), or piñon-juniper (*n* = 3).

Table 6.3. Modern pollen sampling stations.

Pollen Station (S No.)		Vegetation Type	Description	Elevation		Percent Cover			Ranked Dominant Trees & Plant Taxa Richness[a]
				ft	m	Trees	Grasses	Shrubs	
MC	9	Meadow, High Elevation	Camp May above ski lodge; natural meadow near ski run.	9419	2871		90	10	12

Pollen Station (S No.)		Vegetation Type	Description	Elevation		Percent Cover			Ranked Dominant Trees & Plant Taxa Richness[a]
	12	Riparian (Canyon)	Los Alamos Canyon upstream from ice skating rink	7276	2218	75		25	Douglas Fir, White Fir, Cottonwood, Ponderosa Pine, Birch, Willow, Maple, 21
	8	Mixed Conifer	Pajarito Ski Lodge	9240	2817	90			Douglas Fir, Aspen, White Fir, Maple, 20
	7	Transition Ponderosa Pine to Mixed Conifer	Pajarito Ski Area road, south-facing, steep (60%) slope in mixed conifer. sandy grus-like soils & bedrock (welded tuff). One of few sites within LANL with Limber Pine.	8451	2576	80			Ponderosa Pine, Limber Pine, Douglas Fir, 12
Ponderosa Pine	6	Ponderosa Pine, Burned	Hwy 501 & Pajarito Ski Area junction. Cerro Grande 2000 fire at this station was only ground fire; modern thinning.	7767	2367	50			Ponderosa Pine, 13
Ponderosa Pine	5	Ponderosa Pine	Forest around S 4, old pond site; downslope Cerro Grande fire boundary; history of thinning from 1800s homesteading to 1970s forest management.	7704	2348	70			Ponderosa Pine, 7
Ponderosa Pine	4	Disturbance/Pond Ponderosa Pine	Historic ice house pond now dry & growing wheatgrass. Just downslope of 2000 Cerro Grande fire boundary; pond filled with sheetwash soil & charcoal from July monsoons after May fire. Depression ca. 30 m diameter opening in pine forest (S 5). Cattails used to grow in pond.	7706	2349		100		Ponderosa Pine, Willow, 24
Ponderosa Pine	27	Ponderosa Pine, Burned	Rendija Canyon near gun club. Cerro Grande 2000 fire burn intense near this station with dead stands in canyon	6992	2131	85	40		Ponderosa Pine, 7

Pollen Station (S No.)		**Vegetation Type**	**Description**	**Elevation**		**Percent Cover**			**Ranked Dominant Trees & Plant Taxa Richness**[a]
			bottom & fringe of live trees adjacent to road.						
	28	Ponderosa Pine, Unburned	Rendija Canyon near gun club & boundary Cerro Grande 2000 fire (S 27).	6992	2131	85	25		Ponderosa Pine, 9
Transition Ponderosa to Piñon-Juniper	10	Meadow	Pueblo Canyon, sewage effluent area. Water has been reclaimed & diverted to golf course.	6456	1968		100		13
	11	Transition (Canyon) Ponderosa Pine & Piñon Juniper	Pueblo Canyon, forest adjacent S 10.	6468	1972	25	25		Juniper, Piñon, Ponderosa Pine, 10
	17	Piñon Juniper, Burned	Mesa top south of Mortandad Canyon. Cerro Grande 2000 fire burned tree canopy. Oak & yucca second growth form significant cover.	7079	2158	20	70	10	Oak, 12
	18	Disturbed	approx. 1 acre area of mechanical disturbance between S 17 & 18.	7077	2157		80		14
	19	Piñon Juniper, Unburned	Mesa top south of Mortandad Canyon near S 17.	7093	2162	50	35		Piñon, Juniper, Ponderosa Pine, Oak,15
Piñon Juniper	3	Piñon Juniper	Hwy 4 NW of Bandelier Nat. Monument entrance.	6829	2082	65	25		Juniper, Piñon, 9
	1	Piñon Juniper	Highway 4 south of White Rock.	6508	1984	45	5		Equal Piñon & Juniper, 16
	2	Disturbed/Field?	Ancho Canyon, Hwy 4. Possible old field on first terrace. Weeds & grasses dominate gopherized bottomland. Perimeter forest is ponderosa pine with piñon & juniper along canyon bottom to piñon & juniper on side slopes.	6238	1901		100		Ponderosa Pine, Piñon, Juniper, 17
	25	Wetland	Pajarito Canyon wetland, cattails & bulrush ringed by willows.	6669	2033		100		Willow, Ponderosa Pine, 11
	26	Disturbed	Road shoulder adjacent	6675	2034		55	20	11

Pollen Station (S No.)		Vegetation Type	Description	Elevation		Percent Cover			Ranked Dominant Trees & Plant Taxa Richness[a]
			S 25.						
	29	Disturbed/Field	Romero homestead field on Pajarito Mesa. Detailed description and plant list in Foxx and Tierney (1999).	7248	2209		100		7

a. Ranked dominant trees lists all the trees identified at a station in the order of abundance. Plant taxa richness from Appendix B is the number of plant species identified at each station.

Subdivisions within the forest types follow. Stations 11 and 12 represent canyon bottoms characterized by mixed forests, and station 9 is an example of a high-elevation meadow within a mixed conifer forest. There are four examples of disturbance: a road shoulder (S 26), an area of mechanical disturbance (S 18), a possible historic field (S 2), and an historic (ca. AD 1900s) bean field (S 29) at the Romero homestead. The Romero homestead was the subject of a field succession study and archaeobotanical study (Foxx and Tierney 1999; McGehee et al. 2006). There are two sets of paired sites (four stations) sampling the Cerro Grande fire: one pair from burned and unburned ponderosa pine (S 27 and 28) and one set in piñon and juniper (S 17 and 19). Examples of riparian environments were sampled at stations 4, 10, 12, and 25.

METHODS

One to three separate bulk sediment samples were collected at each station by taking 15 to 20 pinches of soil from the top 1.0 to 0.5 cm of soil across an approximately 50- by 50-m area (Adam and Mehringer 1975). The vegetation at each station was characterized by estimating the percent cover of the dominant trees, shrubs, and ground cover. Although only one of the multiple samples from each station was processed and analyzed, the analog could be expanded in future studies to examine the degree of variability between multiple samples.

In the laboratory, subsamples (20 cc volume) were taken from the sample bags, weighed, and spiked with a known concentration (25,084 grains) of tracers (*Lycopodium* spores). Addition of tracers allows pollen concentration to be calculated, which estimates the raw number of pollen grains in a sample. The samples were processed with acids (overnight hydrochloric and hydrofluoric), followed by a heavy liquid gravity separation (zinc bromide 1.9 specific gravity) and acetolysis, which reduces organics. The extracted samples are stored in glycerol.

Pollen assemblages were identified by counting slides from the processed samples on a Reichert, Microstar IV microscope. Entire slides were examined by counting transects at 400x magnification to a 300-grain pollen sum, then scanning remaining transects at 100x magnification to record additional taxa. Pollen aggregates (clumps of grains of the same taxon) were included in the pollen sum as one grain per occurrence and a separate tally made of the number of grains within each aggregate. The occurrence of pollen aggregates in modern surface samples is generally ignored in ecological studies, but is a useful class of data in archaeological pollen studies (e.g., Gish 1991).

Another type of data documented from the slides is the percent cover of background charcoal particles. Trends in microscopic charcoal abundance from lake core samples have been used to infer fire history. However, the micro charcoal data are generally useful only for long-term regional patterns (MacDonald et al. 1991; Patterson et al. 1987). Pollen extraction procedures filter the possible size range of charcoal to dust or smoke size particles (approximately 200 to <10 µm), which can be blown into a site. Macroscopic charcoal from sediment profiles is a better proxy for local fire history. The purpose in examining the micro charcoal matrix in the LANL samples is to test for any differences at burned and unburned paired sites.

Pollen identifications were made to the lowest taxonomic level possible based on comparison to the Northern Arizona University, Laboratory of Paleoecology pollen reference collection and published references (Faegri et al. 1989; Kapp 2000; P. Moore et al. 1991). The separation between piñon pine and other pines was based primarily on size measurements (Jacobs 1985b). Piñon pine was found to be the least reliable predictor of vegetation in the LANL pollen assemblages. There is significant overlap in the size gradient between small ponderosa pine grains and larger piñon pine (Martin 1963:20–21), and it is likely that there are misidentified grains in both pine categories. Haploxylon pine grains greater than 70 µm were also documented, and these probably represent limber pine (*Pinus flexilis*), a rare conifer growing at higher elevation.

The broad sunflower family group was separated into seven types: sagebrush (*Artemisia*), thistle (*Cirsium*), chicory tribe (Liguliflorae), sunflower family (Asteraceae or Compositae Hi-Spine), the ragweed/bursage type (*Ambrosia* or Low-Spine Compositae), Long Spine, and Broad Spine. The separation between the high and low spine Compositae categories was based on the height of spines, using 2 µm as a cutoff (Hevly et al. 1965). The Long Spine and Broad Spine are unique categories in this analysis.

The Long Spine type is defined as a grain with spines greater than 3.0 µm and a tricolporate aperture system with pores aligned transverse to furrows. The Long Spine probably represents sunflower (*Helianthus*), but other northern Colorado Plateau genera with the same grain morphology include *Layia*, fetid marigold (*Pectus*), coneflower (*Rudbeckia*), marigold (*Tagetes*), crown-beard (*Verbesina*), and *Viguiera*. The broad spine grain morphology is similar to ragweed/bursage, but the spines are distinct with bases twice as wide as long. A possible candidate for the broad spine is *Dicoria*; however, this genus is not listed in Foxx and Tierney (1984), and some other sunflower family member may be represented.

Three numerical parameters were calculated from the pollen counts: taxa richness, pollen percentages, and pollen concentration. Taxa richness is the number of different pollen types identified in each sample. Pollen percentages are a smoothing transformation that represent the relative importance of each taxon in a sample ([pollen counted/pollen sum]*100). Percentages are the main parameter used to discriminate trends in the LANL modern pollen samples.

Pollen concentration is a measure of the absolute number of grains or the density of pollen grains in a sample. Concentration was calculated for each sample by taking the ratio of the pollen count to the tracer count and multiplying by the initial tracer concentration. Dividing this result by the sample weight yields the number of pollen grains per gram of sample sediment, abbreviated gr/g. Concentration may also be calculated by volume—both sample weight and volume are documented in Appendix C. Pollen concentrations can be used to gauge several processes. In natural settings, concentrations can reflect sediment accumulation rates, and in cultural contexts, concentrations can relate to the amount of plant material handled.

RESULTS

All of the pollen data are documented in Appendix C. A total of 43 pollen types were identified, and these are listed in Table 6.4 by common and taxa name and organized into two main categories, trees and shrubs and the ground cover plants (forbs, herbs, grasses, and weeds). The sample frequency for each pollen type is also included. The results are presented in two parts. First, the correspondence between pollen spectra and the main forest types is analyzed, and second, the disturbance, riparian, burned sites, and other unique locations are discussed.

Table 6.4. Pollen types identified and sample frequency.

	Common Name	Taxa Name	Frequency as percent *n* = 20 Samples
	Trees & Shrubs		
1	Douglas Fir	*Pseudotsuga*	25
2	Spruce	*Picea*	55
3	Fir	*Abies*	100
4	Pine	*Pinus*	100
	Pine Aggregates		55
5	Piñon	*Pinus edulis* type	100
	Piñon Aggregates		10
6	Juniper	*Juniperus*	100
	Juniper Aggregates		10
7	Oak	*Quercus*	100
	Oak Aggregates		10
8	cf. Limber Pine	cf. *Pinus flexilis* = Haploxylon Pine>70 µm	30
9	Mistletoe	Loranthaceae	15
10	Maple	*Acer*	5
11	Walnut	*Juglans*	5
12	Birch	*Betula*	10
13	Willow	*Salix*	10
14	cf. Snowberry	Caprifoliaceae, cf. Symphoricarpos	5
15	Other Rose Family	Roseaceae	10
16	Cliffrose, Mountain	Rosaceae, *Cercocarpus/Purshia*	70

	Common Name	Taxa Name	Frequency as percent *n* = 20 Samples
	mahogany type	type	
17	Buckthorn Family	Rhamnaceae	5
18	Lemonadeberry	*Rhus*	10
19	Mormon Tea	*Ephedra*	45
20	Sagebrush	*Artemisia*	100
21	Yucca	Liliaceae	5
22	Prickly Pear	*Opuntia*	15
23	Greasewood	*Sarcobatus*	15
	Forbs, Herbs, Weeds, & Grasses		
24	Cheno-Am	Cheno-Am	100
	Cheno-Am Aggregates		5
25	Sunflower Family	Asteraceae	95
	Sunflower Family Aggregates		5
26	Bursage/Ragweed type	*Ambrosia*	90
27	Thistle	*Cirsium*	30
28	Long Spine type	cf. *Helianthus*	25
29	Broad Spine type	cf. *Dicoria*	35
30	Grass Family	Poaceae	90
	Grass Aggregates		15
31	Large Grass type	Large Poaceae	10
32	Buckwheat	*Eriogonum*	20
33	Purslane	*Portulaca*	5
34	Spurge Family	Euphorbiaceae	30
35	Mustard Family	Brassicaceae	30
36	Globemallow	Sphaeralcea	5
37	Evening Primrose	Onagraceae	10
38	Pea Family	Fabaceae	10
39	Figwort Family	Scrophulariaceae	10
40	Knotweed	*Polygonum viviparum*	5
41	Four O'clock Family	Nyctaginaceae	5
42	Russian Olive	Elaeagnaceae	5
43	Cattail	*Typha latifolia*	5

Pollen Correspondence to Forest Composition

The stations are grouped by the main forest types: mixed conifer, ponderosa pine, transition forests of mixed piñon-juniper and ponderosa pine, and piñon-juniper. Three stations are grouped separately (S 25, 26, and 29) as unique, primarily disturbed sites. Station 12, a riparian site in Los Alamos Canyon at 2217 m (7276 ft), was listed with the high-elevation mixed conifer sites because the dominant tree is Douglas fir. Station 12 is an example of the more mesic environments created in canyons.

One pattern in the LANL pollen data is the trend for more diverse assemblages at higher elevations, especially in the mixed conifer and ponderosa pine forests. Pollen taxa richness ranges between 15 to 20 pollen types above 2133 m (7000 ft) and less than 15 taxa in the transition and piñon-juniper forests. The exceptions are either high-elevation transition zone sites (S 17, 18, and 19) or unique situations (S 2, 4, 25, 26). This pattern is not evident in the plant species richness at each site (Table 6.1 and Table 6.2), except for a greater number of species from the high-elevation mixed conifer stations. However, the variety of taxa identified in the field is probably low due to the 2002 drought.

The mixed conifer stations produced distinct pollen assemblages, with high values of fir (4% to 34%), high taxa richness (15 to 20), and presence of some rare types, such as honeysuckle, birch, and maple. Low percentages of Douglas fir and limber pine are associated with the mixed conifer stations. Spruce pollen surprisingly was not a good indicator of the higher-elevation stations. Spruce was identified in 11 of the 20 samples analyzed, including S 1 in piñon-juniper.

There is no significant pattern in pollen concentrations, except for low pollen abundance at two disturbed sites (S 26 and 29) and the high-elevation meadow (S 9). Pollen concentration in surface soil is sensitive to the dynamic influx of pollen and sediment. Pollen deposition increases concentration and sediment deposition dilutes pollen density. Generally, pollen concentration is high in the analog samples, which reflects the abundant production from the wind-pollinated conifers.

The distribution of pollen aggregates was not diagnostic of vegetation types. Aggregates from most pollen taxa were rare occurring in only one to three samples, except for pine (Appendix C). Aggregates of pine occurred at 11 of the 20 stations. Oak pollen aggregates were documented at two sites (S 18 and 19), and, at S 18, oak was the primary tree.

The pollen types sensitive to forest composition are fir, pine, and juniper. Piñon pine is included in the summary diagram (Figure 6.2), but this type is not diagnostic, even in the piñon and juniper forest. Disturbed sites and small meadows are generally characterized by high representation of grass or cheno-am, sunflower family, and herb types. The best summary measure of forest types is a ratio between pine (excludes piñon) and juniper. In Figure 6.2, the pine/juniper ratio is highest (19 to 60) from stations in the ponderosa pine forests. Juniper frequencies rise at stations from the transition forests and are highest in the piñon and juniper forests, which is reflected by the minimum pine/juniper ratio of 1. The pine/juniper ratio is suppressed at the high-elevation mixed conifer sites because pine is not the dominant tree at these stations. Pollen taxa that are not particularly good indicator pollen types, with a few exceptions, are oak, rose family, cliffrose/mountain mahogany type, sagebrush, and grass.

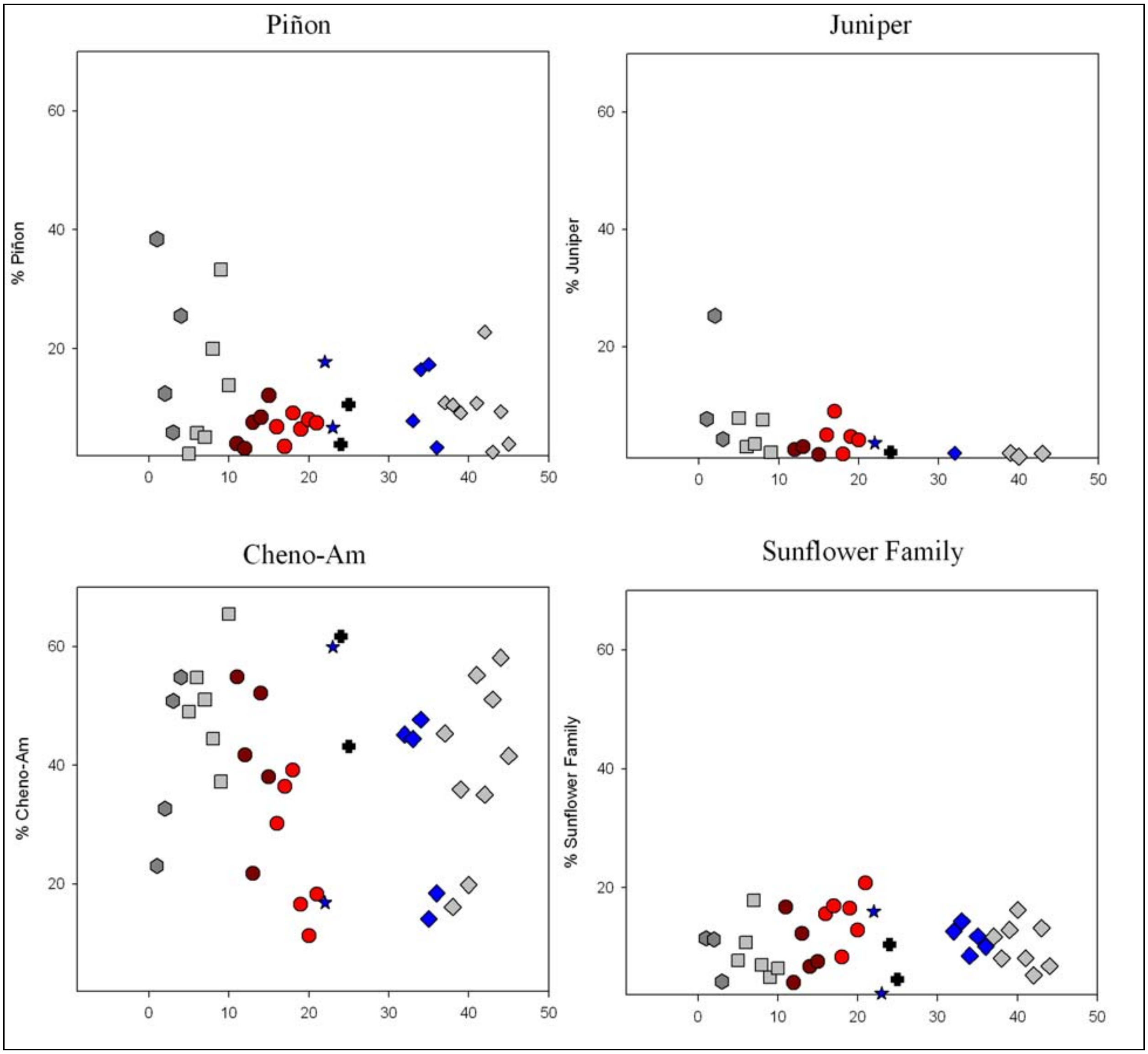

Figure 6.2. Modern pollen analog summary percentage diagram.

Pollen Indicator Types at Disturbance and Riparian Sites

In this section, patterns are discussed that discriminate subdivisions within the main forest types. Summary data for each station are listed in Table 6.5, including general station descriptions, plant taxa richness, pollen concentration, pollen taxa richness, and other key variables.

Table 6.5. Summary pollen results.

Pollen Station (S No.)		Vegetation	Plant Taxa Richness	Elevation ft.	Micro Charcoal[a]	Pollen Concentration gr/gm	Pollen Taxa Richness	Percent Fir	Percent All Trees[b]	Ratio Pine - Juniper	% Cheno-Am & Sunflower Family	Other Key Pollen Types
Mixed Conifer	9	Meadow	12	9419	10 to 20	5785	15	4	46	2	15	Grass 11%, Chicory 6%, Limber Pine
	12	Canyon Riparian	21	7276	<10	24100	15	34	88	13	1	Birch, Douglas Fir, Limber Pine
	8	Mixed Conifer	20	9240	<10	117630	20	11	76	15	6	Douglas Fir, Maple, 6% Spruce, Limber Pine
	7	Ponderosa & Limber Pine	12	8451	<10	444544	16	7	82	14	5	Douglas Fir
Ponderosa Pine	6	Ponderosa Burned	13	7767	<10	122323	15	5	82	30	10	Thistle
	5	Ponderosa	7	7704	10 to 20	68765	15	4	78	31	7	
	4	Pond in Ponderosa	24	7706	20 to 30	40715	11	8	84	28	5	Limber Pine
	27	Ponderosa Burned	7	6992	20 to 30	214926	16	2	83	19	5	
	28	Ponderosa	9	6992	20 to 30	91290	13	1	82	60	8	
Transition Ponderosa Pine to Piñon-Juniper	10	Wet Meadow in Canyon	13	6456	30 to 40	31622	13	2	69	20	10	
	11	Piñon-Juniper & Ponderosa in Canyon	10	6468	<10	92471	13	2	79	4	8	
	17	Piñon-Juniper Burned	12	7079	<10	66647	15	3	70	4	12	
	18	Disturbed Piñon-Juniper	14	7077	10 to 20	154033	22	2	63	11	9	Limber Pine Thistle
	19	Piñon-	15	7093	<10	21762	16	2	86	3	6	Limber

Pollen Station (S No.)		Vegetation	Plant Taxa Richness	Elevation ft.	Micro Charcoal[a]	Pollen Concentration gr/gm	Pollen Taxa Richness	Percent Fir	Percent All Trees[b]	Ratio Pine - Juniper	% Cheno-Am & Sunflower Family	Other Key Pollen Types
		Juniper & Ponderosa										Pine
	3	Piñon-Juniper	9	6829	<10	34570	13	1	73	1	17	Thistle
	1	Piñon-Juniper	16	6508	<10	47093	14	0	76	1	9	
Piñon-Juniper	2	Field in Canyon, Piñon-Juniper & Ponderosa	17	6238	<10	51877	20	2	40	1	40	Thistle
	25	Canyon Wetland in Ponderosa	11	6669	20 to 30	48070	17	5	78	22	4	Cheno-Am
	26	Disturbance Road in Ponderosa	11	6675	<10	11399	17	1	40	2	31	Thistle
	29	Disturbance Romero Field	7	7248	10 to 20	9349	19	2	38	3	18	Sagebrush

a. Micro Charcoal is an estimate of the percent cover of microscopic charcoal in the background matrix of slides made from the processed pollen samples; b. Percent all trees is the sum of pollen percentages from the following trees: Pine, Piñon, Juniper, Douglas Fir, Fir, and Spruce.

Disturbed Sites: Road Shoulder (S 26), Fields (S 2, 29), and Mechanical Disturbance (S 18)

An important research theme explored in this study is the sensitivity of pollen to vegetation changes due to disturbance, which typically occurs in small (1 to 100 acre) areas that have been cleared of trees. Homestead era agriculture during the AD 1900s and modern development at LANL have created a wide range of disturbed sites to choose from. The historic Romero field (S 29) on Pajarito Mesa, a possible historic field (S 2) on the floodplain in Ancho Canyon, a bulldozed area (S 18) on Pajarito Mesa, and a road shoulder (S 26) were sampled. Except for the Romero field (S 29), each disturbed site is matched with samples from adjacent undisturbed forests. Foxx and Tierney (1999) have intensively studied the botany of the old Romero Homestead, including a field succession study in the old bean field. Field succession botany has also been studied at eight other historic fallow fields in the LANL region (Foxx et al. 1997), and these studies provide invaluable information about historic land use and vegetation response to disturbance.

Three of the pollen stations produced pollen signatures distinct from matching samples in surrounding forest. The two field sites (S 2 and S 29) and the road shoulder (S 26) are characterized by the project maximum percentages of cheno-am and sunflower family pollen (combined values 18% to 40%) and the lowest frequencies of tree pollen (all tree taxa combined range from 38% to 40%). The cheno-am and sunflower family encompass a broad range of weedy plant species, and the high representation from disturbed sites is probably related to opportunistic weeds colonizing new habitat.

The variety of pollen types is also high at disturbed sites; taxa richness ranges from 17 to 22 at stations 2, 18, 26, and 29. This diversity is due to a higher representation of herbs and forbs in open areas, compared to the sparse ground cover plants under forest canopies. Pollen from weedy plants, such as thistle and sunflower (Long Spine *Helianthus* type), is documented more frequently from the disturbed sites. At the Romero field site (S 29), sagebrush pollen was over 20 percent of the pollen count. Two sage plant species, carruth sage and false tarragon (*Artemisia carruthii* and *A. dracunculus*), were identified as good indicators of disturbance in the field succession study completed by Foxx et al. (1997), and both sages are also abundant in the Romero field (Foxx and Tierney 1999). Broad spine, another unknown type from the sunflower family, is more frequent at the disturbed sites than forest sites.

Station 18, the one example of mechanical disturbance, did not produce a pollen assemblage distinct from adjacent forest (S 17 and 19). Station 18 is a small, less-than-one-acre opening in burned piñon-juniper forest that is also within the transition ponderosa pine to piñon-juniper zone. Shrub size oaks that root-sprouted after the Cerro Grande fire killed the piñon and juniper trees common around S 18, and oak pollen is high at S 18 and S 17, which are separated by less than 300 feet. High pollen concentration (greater than 150,000 gr/g) and high percentages of conifer pollen (63% combined from all conifers) indicate the small opening is an efficient collector of abundant pine pollen. Acre-scale clearings will capture more wind-blown conifer pollen than ground inside a forest due to the dynamics between pollen dispersal and wind (Faegri et al. 1989:14–15; Jackson and Smith 1994:191).

Riparian Sites, Stations 4, 10, 12, and 26

Four sites were selected to sample riparian situations; however, wet sites are rare at LANL. The two best examples are the Pajarito Canyon wetland (S 25) and a riparian site in Los Alamos Canyon (S 12). The other two riparian sites are historic wetlands—a pond (S 4) that is now dry and an area in Pueblo Canyon that was a sewage effluent wetland (S 10), but now is dry. The reclaimed water in Pueblo Canyon has been diverted to the golf course.

The pollen assemblage from the dry pond at S 4 did not correspond to the site vegetation. Western wheatgrass was the dominant plant in the old pond site, but grass pollen was only three percent of the pollen assemblage. Pine pollen from the surrounding ponderosa pine forest overwhelmed the assemblage. Sheetwash sediments from burned forest stands upslope of S 4 filled the depression, and the collected pollen sample is probably not representative of pond sediments. Willow trees grow around S 4 and willow pollen was documented from S 5, which represents the pine forest surrounding S 4. The Pueblo Canyon site (S 10) is now a meadow area. The pollen assemblage from S 10 is dominated by tree pollen (69% combined conifers), but there is a component of grass pollen (7%) and cheno-am and sunflower family (10% combined values) that correlate with the wet meadow environment.

The water indicators were cattail and willow pollen recovered from S 25, the Pajarito Canyon wetland. This site is a perennial wetland with bulrush, cattails, and willow. Pine pollen was high from S 25, which reflects the surrounding pine forest in the canyon. No riparian pollen types were identified from S 26, the road shoulder site that is within 100 feet of the Pajarito Canyon wetland. The limited occurrence of cattail pollen is consistent with other research that has shown that, although a wind-pollinated plant, cattail pollen is not dispersed far from source plants (Hevly 1974; Krattinger 1975).

2000 Cerro Grande Fire Paired Pollen Stations

Two pairs of stations were sampled within the Cerro Grande burn, an intense wildfire that burned several thousand acres around Los Alamos in 2000. Stations 27 and 28 are in Rendija Canyon near the gun club and represent burned (S 27) and unburned (S 28) stands of ponderosa pine forest. The fire burned hot in Rendija Canyon, although at S 27, the fire was a ground fire and the trees were not killed. The tree composition and cover are comparable between S 27 and 28, and the main vegetation difference is greater cover of grasses and weeds at the burned site. Stations 17 and 19 represent burned (S 17) and unburned (S 19) transition ponderosa pine to piñon and juniper. The tree canopy was killed at S 17 and there is a greater contrast in the vegetation cover between the two stations (Table 6.3). Shrub size oaks, probably root-sprouted from fire-killed trees, yucca, and grasses and herbs characterize S 17, compared to 70 percent pine, piñon, and juniper tree cover at S 19.

The pollen results from the paired stations show some weak patterns (Table 6.5) that are related to the different plant composition and architecture at the two sites. The percentage of pine pollen was 10 percent less at the burned ponderosa pine S 27 compared to the unburned S 28, but the combined cheno-am and sunflower family percentages were higher at the unburned site S 28, compared to S 27. There is a greater contrast between S 17 and S 19, which is a more mixed forest (Table 6.2). Low percentages of pine and high frequencies of cheno-am and sunflower family were calculated from the burned site (S 17), compared to high pine and juniper values and lower cheno-am and sunflower family at the unburned site (S 19). Oaks are the dominant tree at S 17 and oak pollen was high at 8 percent in the S 17 sample and aggregates of oak pollen were recovered, whereas oak was low (2%) at S 19.

The percent of microscopic charcoal (ca. 200 to less than 10 μm long) in slide preparations was estimated in all 20 LANL modern analog samples to test whether samples from burns had higher amounts of charcoal than unburned sites. The estimated charcoal cover is listed in Table 6.5. Microscopic charcoal was present in all 20 samples at a minimum of less than 10 percent of the background matrix. The maximum percent cover was 30 percent to 40 percent in the sample from S 10, the Pueblo Canyon meadow. Four samples produced charcoal values of 20 percent to 30 percent: S 4 (disturbed pond), S 25 (Pajarito Canyon wetland), and the paired samples S 27 (burned ponderosa pine forest) and S 28 (unburned forest). The samples from S 17 and S 19, the burned and unburned pair in piñon and juniper forest, were characterized by less than 10 percent charcoal. No definitive relationship is interpreted from these data, although there is some indication that charcoal is concentrated in alluvial and sheetwash sediments (S 4, 10, and 25).

CONCLUSIONS

The modern vegetation at LANL is a mosaic that has been modified by a long history of cultural use including prehistoric settlement and agriculture, historic grazing and timber harvest, AD 1900s homesteaders, and modern development and land management practices, such as burning, thinning, and manipulation of water resources. Wildfire is also a significant natural architect of vegetation, as evidenced by the catastrophic effects of recent forest fires. The LANL modern pollen analog developed in this study contributes important baseline information for interpreting pollen data from fossil and archaeological sites. The constructed pollen spectra are sensitive to the natural elevation and vegetation gradient at LANL and to finer-scale compositions that reflect the local site history. However, there is no formula of values that can be applied to filter unique pollen signatures from generic sites—archaeological or natural. The potential for high-resolution pollen analysis can be realized by using the analog to compare to pollen results from specific study sites.

The different forests are characterized by relative differences in fir, pine, and juniper pollen. Cheno-am, sunflower family, and sagebrush (*Artemisia* spp.) characterize old fields. Cheno-am, sunflower family, and grass pollen distinguished the two meadows sampled (S 8 and 10). Riparian sites are rare at LANL, but the only station where cattail was growing (S 25) yielded the only cattail pollen recovered in the study. Other potential indicator pollen types are Douglas fir and cf. limber pine from mixed conifer forests, maple and birch from mesic sites, willow from riparian environments, and sagebrush, thistle, and long spine (cf. sunflower type) from disturbed sites.

CHAPTER 7
THE CURRENT STATUS OF ARCHAEOLOGICAL DENDROCHRONOLOGY AND DENDROCLIMATOLOGY OF THE PAJARITO PLATEAU, NEW MEXICO

Ronald H. Towner

INTRODUCTION

Dendrochronology, or tree-ring dating, has played a significant role in the development of archaeology in the U.S. Southwest; it has also provided important information regarding past environmental variability in the area. This document discusses two subfields of dendrochronology—dendroarchaeology and dendroclimatology—in terms of their impact of studies of human use of the Pajarito Plateau and past environments in the same area. It should be viewed as a summary of what has been accomplished and as a potential guide for further elucidation of human/environment interaction.

Dendrochronology, the science of tree-ring dating, is the most accurate and precise non-documentary dating method available to researchers studying the recent past. Tree-ring dates are accurate and precise to the year, and some times to the season, and have no associated statistical uncertainty or standard error. Other prominent archaeological dating techniques that use natural materials (e.g., radiocarbon, archaeomagnetism, etc.) have been calibrated using dendrochronological samples. It is this precision and accuracy that has allowed archaeologists working in the U.S. Southwest to construct the most detailed chronologies in the world and to explore a plethora of environmental, social, and behavioral questions regarding the past human adaptation to the region.

Dendroarchaeology is the use of tree-ring data from archaeological contexts to provide Christian-calendar dates for archaeological phenomena such as rooms, sites, and cultures, to delineate aspects of past human behavior, such as tool use, wood harvesting and modification practices, and the social strategies used to exploit past wood resources, and to illuminate aspects of past environments, such as species composition of past landscapes and past precipitation and temperature regimes (Dean 1996a; Towner et al. 2001). Dendroclimatology is the use of tree-ring data from living and dead trees—including archaeological timbers—to examine past climate fluctuations and patterns in terms of precipitation and temperature at various temporal and spatial scales (Bradley 1999).

This overview has three main objectives. First, it is a synthesis of all archaeological tree-ring data derived from historic and prehistoric sites on the Pajarito Plateau. Although many of the dates have been published elsewhere (Robinson et al. 1972), this is the most extensive compilation and interpretation of the tree-ring data (not simply dates) from the Pajarito Plateau. Second, it is a synthesis of the existing dendroclimatic data relevant to the area. Such data are not point-specific or constrained by political boundaries and, therefore, the discussion encompasses much of the northern Rio Grande area, not simply the Pajarito Plateau. Finally, the syntheses will be used to suggest possible avenues for future research in the area using both fields. Therefore, this document will be important both as a detailed summary of the existing data and as a guide for future dendroarchaeological and dendroclimatological research.

A BRIEF HISTORY OF DENDROCHRONOLOGY

Andrew Ellicott Douglass is considered the founder of dendrochronology. Trained as an astronomer, Douglass immigrated to Flagstaff, Arizona, in the late 19th century to develop Percival Lowell's observatory that was designed to explore the possibility of canals on Mars (Webb 1983). Douglass, however, was interested in chronicling sunspot activity as a method to document past and predict future climate. The historical climate records in the Flagstaff area were virtually nonexistent (about 20 years in length), so Douglass searched for some proxy measure of climate with which to compare sunspot cycles. At that time, the great ponderosa pine forests of the Flagstaff area were being actively logged. By examining the stumps, and some times cross-sections, of ponderosa pine trees, Douglass identified the "Flagstaff signature" ring series that contained small rings at specific years in the late 1880s, 1890s, and early 1900s. The first test of Douglass's method occurred in 1904 when he deduced that a tree was cut 10 years previously, in 1894; Douglass checked his deduction with the farmer who had cut the log, who confirmed its cutting date (Towner 2000; Webb 1983).

Douglass continued to develop his chronology from living trees, but in 1914 his research attracted the attention of archaeologists working in the Southwest (Nash 1999). Subsequently, archaeological samples collected by Douglass and others from sites such as Pueblo Bonito in Chaco Canyon and Aztec Ruin on the Animas were cross-dated to form a "floating" or relative chronology some 585 years in length (Douglass 1921). Unfortunately, this chronology did not overlap in time with Douglass' modern tree specimens, and therefore, even though the temporal relationships between the sites were known in annual terms, they were not yet known in terms of the Christian calendar. Archaeologists had learned that Aztec Ruin was approximately 45 years younger than Pueblo Bonito, but whether both sites were built 1,000, 2,000, or 3,000 years ago was still undetermined (Nash 1997, 1999; Webb 1983).

During the 1920s, archaeologists and the dendrochronologist (Douglass) were working to solve the problem of the "gap" between the live-tree and floating chronologies (Haury 1962). Fortunately, archaeologists in the Southwest had developed a pottery seriation based on historic and prehistoric period sites (Colton and Hargrave 1937). Thus, the archaeologists knew the relative temporal position of many sites, if not their absolute ages. Throughout the decade, numerous "beam" expeditions traveled to the Colorado Plateau and Rio Grande area to collect archaeological specimens to further Douglass' tree-ring research (Nash 1999). Using the pottery seriation, these expeditions focused on specific sites thought to represent occupations during the "gap" between the chronologies. Finally, on June 22, 1929, a burned beam (HH-39) from the Whipple Ruin allowed Douglass to combine the two chronologies into a single master record more than 1000 years in length (Haury 1962). After "the gap" was bridged in 1929, dendrochronology experienced a brief florescence with research laboratories established in Tucson, Flagstaff, and Globe, Arizona, and Santa Fe, New Mexico; additional research was conducted on the High Plains in Kansas and North Dakota, in the southeastern United States, and in Alaska.

Dendrohistory in the Northern Rio Grande

As Douglass developed his living tree and archaeological ring sequences for the Four Corners area and Colorado Plateau, he soon realized that the northern Rio Grande area contained a different climatic signal (Douglass letter to Judd date June 24, 1927; cited in Nash 1999:185). Under Douglass' direction, Jeançon and Ricketson collected Rio Grande samples, including some from San Idlefonso, as part of the first Beam Expedition (*El Palacio* 1923a, 1923b). Douglass had worked with samples from Pecos Pueblo excavated by Alfred Kidder, but was unsure of their chronological position. Indeed, the omission of any Rio Grande site, including the famous Pecos Ruin, from his seminal article "The Secret of the Southwest Solved by Talkative Tree-Rings" (Douglass 1929) was glaring (Nash 1999).

After the "gap" in the Central Pueblo chronology was bridged, the most pressing problem in Southwestern dendrochronology became dating the Rio Grande archaeological sequence. Eager to move quickly on the problem, the newly formed Laboratory of Anthropology (LAH) established a tree-ring dating program and Jesse Nusbaum, director of LAH, hired a young Douglass student, W. S. Stallings, to direct it in 1931 (Nash 1999).

Stallings had already collected samples from the area and immediately spent four months in the field collecting living-tree, dead wood, and archaeological tree-ring samples; many of the archaeological samples came from sites on the Pajarito Plateau, such as Puyé, Tsankawi, and Tyuonyi (see below). By the end of 1931, Stallings had collected more than 300 wood and charcoal specimens and by early 1932 had dated the Palace of the Governors and several other historic structures and established a chronology for the Jemez Mountains and Pajarito Plateau back to the early 1500s. Paralleling Douglass' research design, Stallings used the Rio Grande ceramic glazeware sequence established by H. P. Mera (1939) to target specific sites for sampling (Nash 1999).

By the end of 1932, Stallings had developed a ring sequence—predominantly using ponderosa pine—that extended back to AD 1200 and in the process dated Pecos Pueblo for Kidder (Stallings 1933, 1937). In 1934, Stallings and Stanley Stubbs collected numerous samples from Pindi Pueblo that extended the chronology to AD 1100 (Stallings 1934). By 1935, Stallings had established dates for some of the Glaze Wares of the upper Rio Grande and dated numerous historic and prehistoric period sites (Stallings 1937). Thus, within a span of only five short years, Stallings had developed the Rio Grande ring sequence back to AD 1100 and provided Christian-calendar dates for sites and artifact sequence.

This promising beginning, however, soon faltered. Nusbaum's move to Mesa Verde, Stallings' desire to complete his Ph.D. and subsequent military service, and a lack of institutional support resulted in the abrupt decline of tree-ring dating in the northern Rio Grande area. Although additional samples were collected by Stubbs, and E. T. Hall dated many samples from Awatovi, and Stallings even dated some samples for the Taylor Museum in Colorado Springs, dendrochronology at the LAH simply "faded away" in the early 1940s (Nash 1999). Every other tree-ring laboratory in the country except the Tucson Laboratory of Tree-Ring Research (LTRR) facility suffered this same fate. Fortunately, through the foresight of Terah Smiley, the LTRR acquired the LAH collection and accompanying documentation in the early 1950s. Just as importantly, a young scholar used the collection for his first major dendrochronology project, reanalyzed the samples, and published the Rio Grande chronological sequence—an unfinished goal of Stallings (Bannister, personal communication, 2002; Smiley et al. 1953). All samples collected in the area since the 1950s (see below) have been analyzed and are curated at the LTRR in Tucson, and thus there is a coherent collection available for additional research.

The transfer of collections and expansion of the LTRR in the 1960s resulted in significant advances in dendrochronology and southwestern archaeology (and other fields). Bannister refined the dating of several of the larger ruins in Chaco Canyon and developed theoretical approaches to dendroarchaeology (Bannister 1962, 1965); Robinson began using tree-ring data to examine past human behavior by delineating the impact of stone ax use on Basketmaker III (AD 600-750) society and wood-use practices, and initiated dendroclimatic research using archaeological samples (Robinson 1967; Dean and Robinson 1977). Other researchers examined the dendroarchaeological remains of other southwestern cultural groups (Towner 1996, 1997), refined the theoretical basis of dendroarchaeology (Ahlstrom 1985, 1997) and studied the impact of the field on American archaeology in the 20th century (Nash 1997, 1999).

Jeffrey S. Dean, however, has conducted the most significant research in archaeological dendrochronology in the past few decades. His research on Kayenta Anasazi cliff dwellings used dendrochronological and archaeological data to posit testable hypotheses about the nature of prehistoric social organization and adaptation to southwestern environments (Dean 1969). His 1978 article, "Independent Dating in Archaeological Analysis," elucidated the theoretical basis of various dating techniques and their application to the interpretation of past human events (Dean 1978). Finally, he described three types of information that can be gleaned from tree-ring data: chronological, behavioral, and environmental (see below) (Dean 1996a).

METHODS AND TECHNIQUES OF DENDROCHRONOLOGY

Dendrochronology is based on the fact that many trees, particularly in temperate and high-latitude zones, produce an annual growth layer (cambium). This cambial layer is typically composed of two visually distinct parts—early wood and latewood (Figure 7.1). Early wood consists of large, open, thin-walled trachial cells that appear light in cross-section. Early wood is produced during the first part of the growing season (which varies by species), when the factors that limit growth, such as moisture, temperature, nutrients, and growth hormones are at their optimal levels. Latewood, on the other hand, is comprised of progressively smaller, thicker-walled, trachial cells that appear dark in cross-section. At the end of the growing season, the tree becomes dormant and ceases to produce cambium; a distinct boundary between the previous year's latewood and the current year's early wood is clearly visible, particularly in conifers.

The variability of annual ring width reflects variation in some climatic variable (e.g., precipitation, temperature). In low-elevation conifers, precipitation is the factor most responsible for ring-wide variability. In dry years, trees produce thin cambial layers, but in wet years water ceases to limit growth and a thicker cambial layer is produced. It is this variability in ring width that is the basis of crossdating and dendrochronology. False rings, also known as intra-annual growth bands, result from a water deficit during the growing season that causes the tree to produce latewood-like cells. If the water deficit is ameliorated, such as by summer monsoon moisture in the Southwest, the tree again produces early wood-like cells until near the end of the growing season. Micro-rings occur in drought years when the tree produces cambium on only specific areas; if samples are taken from areas that lack the cambial layer, the rings appear locally absent or "missing." Crossdating tree-rings, assigning specific years to individual growth rings, accounts for both missing and false rings, and thus is fundamentally different from merely counting rings.

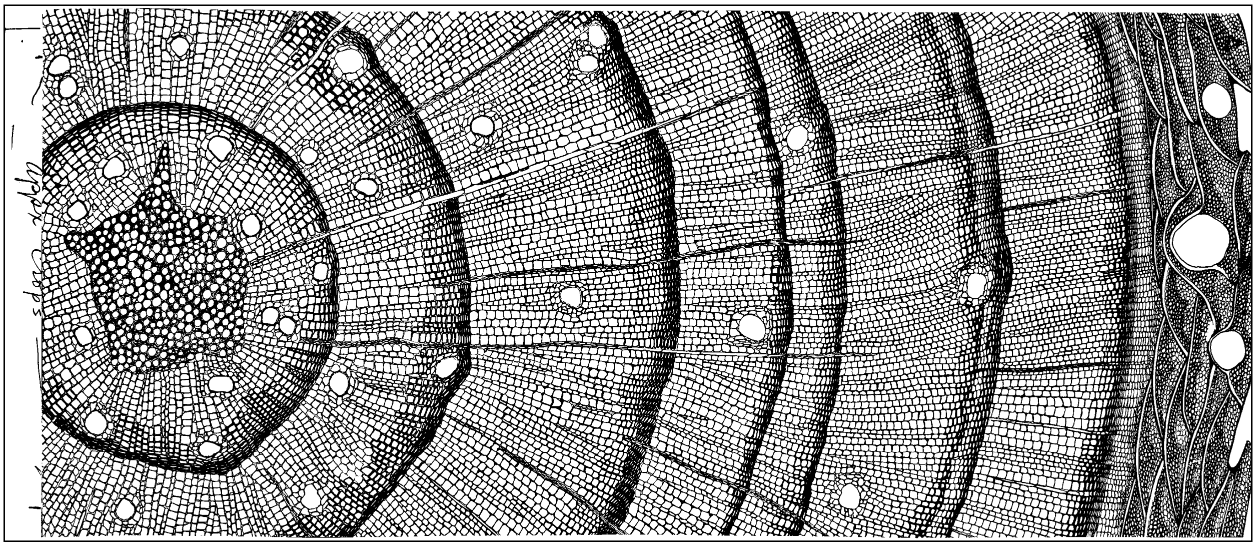

Figure 7.1. Schematic of conifer tree rings.

Crossdating is the most fundamental principle of dendrochronology. If samples do not cross date, temporal control is lost and any interpretations of the tree-ring data become mere estimates. The most common crossdating method used in American archaeology is skeleton plotting. Skeleton plotting is a visual analog technique wherein each ring on a sample is represented by a line on a piece of 1-mm graph paper. The small rings on a sample are noted by drawing a vertical line on the graph paper at the appropriate ring number; the smaller the ring—relative to the surrounding rings—the longer the vertical line drawn on the graph paper. Thus, the skeleton plot visually represents the pattern and "narrowness" of the small rings on a sample. Drawn lines do not represent large and “average” rings. By precisely matching the small-ring pattern between samples, each ring can be assigned to a specific calendar year. Although similar ring-wide patterns have occurred in the past, a sample of 50 to 100 years is usually sufficient for crossdating in the Southwestern United States. An interactive computer crossdating program can be viewed at http://tree.ltrr.arizona.edu/skeletonplot/introcrossdate.htm.

Tree-ring chronologies are built using live trees, dead snags, remnant wood, and archaeological specimens (Figure 7.2). Starting from a known point in time (usually the present), dendrochronologists precisely match and overlap ring-width patterns from successively older samples to create a year-by-year chronology. Typically, chronologies are initiated with a sample of at least 40 increment cores from 20 trees and strengthened with additional specimens and by comparison with other chronologies in the area. When sample depth for any chronology drops below 10 trees, the dating is considered tentative. The spatial extent of tree-ring chronologies varies according to factors such as topography, elevation, and dominant climatic pattern. For example, extant chronologies from many areas of the Colorado Plateau crossdate with each other even though they are separated by more than 100 miles. In contrast, a chronology from Rayado Creek in the eastern foothills of the Sangre de Cristo Mountains does not crossdate with the Taos chronology less than 30 miles away on the other side of the mountains (Towner 2000). In this case, different climate patterns in each area have resulted in different ring-width patterns in trees on different sides of the mountains.

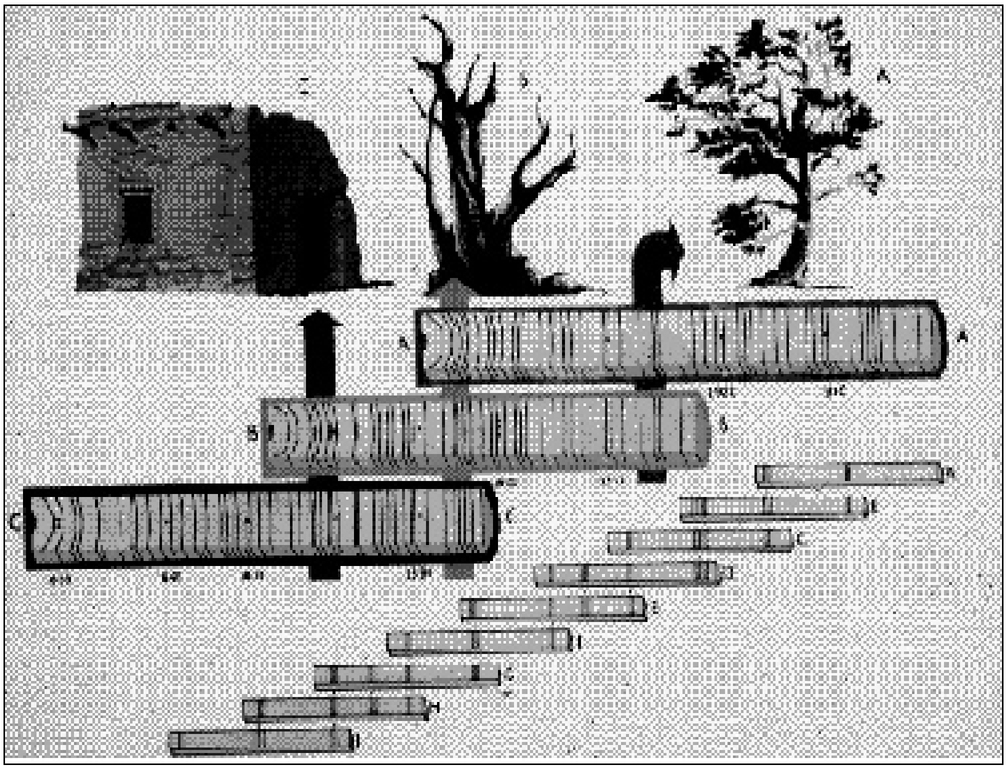

Figure 7.2. Schematic of chronology building with tree rings.

Tree-Ring Requirements

Trees must exhibit four attributes in order to be dendrochronologically useful. First, they must produce distinguishable annual growth layers (rings). Second, an individual ring must grow in a uniform manner around the bole of the tree, or branch (i.e., it must exhibit circuit uniformity). Third, the rings must exhibit some type of annual variability (e.g., ring width, ring density). Finally, a sample must contain a sufficient number of rings to permit the identification of variability patterns; in southwestern conifers, 50 to 100 rings are usually sufficient, but in some areas and with other species like European oak, 200+ rings may be necessary.

Dendrochronology is probably best known as a technique that provides absolute Christian calendar dates for archaeological sites in the American Southwest. The most fundamental principle of dendrochronology is crossdating—matching patterns of annual variability among local or regional tree populations. In the Southwest, the skeleton plot method of crossdating has been used successfully for decades. If the variability patterns on a sample do not exactly match the tree population, the sample does not crossdate and cannot be used in dendrochronology. In this fundamental respect, crossdating is significantly different than simply counting rings or estimating tree age.

Crossdating allows dendrochronologists to assign a single calendar year to each and every ring on a sample. Unfortunately, not all trees or archaeological samples, even in the Southwest, produce dates. Some trees produce cambium in response to microenvironmental factors that are not reflected in the overall tree population; others respond to non-climatic factors such as nutrient availability, and still others do not produce annual rings.

In order to construct a chronology, the skeleton plotted samples from living trees, standing snags, remnant wood, and archaeological samples are combined into a master skeleton plot. By overlapping the plots of individual specimens, the chronology can be extended backwards in time until a lack of sample depth precludes crossdating. Specific small "marker rings" that occur on a large proportion (usually >75%) of samples in a collection help establish the basic pattern, which is then tested against additional samples and other nearby chronologies. In addition to small size, marker rings may be identified by internal features such as frost-damaged cells, false or double rings, unusually wide or narrow latewood bands, or other microscopically visible attributes.

Collecting and Analyzing Archaeological Tree-Ring Samples

As discussed below, past human behavior is the most significant factor affecting archaeological tree-ring dates. Past people did not select wood for its dendrochronological properties, and not all archaeological specimens will produce dates. Some samples will exhibit little ring-width variability (complacent ring series) and some will show extreme variability outside the range of the normal tree population (erratic ring series) (Stokes and Smiley 1968). Archaeologists and dendrochronologists can mitigate these factors by collecting all samples that display any potential for dating, or, which are the appropriate species and contain 50+ rings (Towner 2000). Even experienced dendrochronologists cannot date samples in the field, however, so selecting only the "best" samples is often self-defeating.

Samples can be collected using several different methods. Live trees are sampled using a Swedish Increment Borer that removes a small pencil-shaped core from the tree (Figure 7.3). Depending on the specific site circumstances, archaeological samples are collected as cross-sections sawn from beams, cores extracted from beams using a specially adapted hole saw, or as charcoal; approximately 80 percent of the 4000 samples annually processed by the LTRR are charcoal from excavated contexts.

Figure 7.3. Photograph of A. E. Douglass collecting a live-tree core near Pinedale, Arizona.

Sample preparation in the laboratory differs depending on the type of material collected. Wood samples, either cores or cross-sections, are sanded with fine-grit sandpaper until the individual cells are visible under a binocular microscope at 10x to 50x magnification. Charcoal is not sanded, but broken to expose a fresh surface. Each sample is then examined under the microscope and the ring series is skeleton plotted on graph paper. The skeleton plots are compared to each other to identify internal crossdating between samples and compared to local and regional master chronologies to determine Christian calendar dates. Discrepancies among samples are resolved using the wood (or charcoal) as the basic unit of analysis; the paper skeleton plots are only representations of the sample ring series. As the only repository of archaeological tree-ring samples in the western United States, the 300,000 samples and 70,000 dated specimens housed at the LTRR provide an unmatched comparative research collection.

Attributes of Archaeological Tree-Ring Dates

Even when samples produce dates, they must still be interpreted, and not all archaeological tree-ring dates are the same. Because archaeological tree-ring samples are the result of past human behaviors, specific sample attributes and the archaeological context must be considered in any interpretation of the chronological materials. Sample attributes can be used to identify cutting, near cutting, and noncutting tree-ring dates.

Cutting dates, also known as tree death dates, retain the last cambial layer grown by the tree and indicate that the tree was cut in a specific year (assuming tree death resulted from human harvesting). Evidence on the sample that it is a cutting date includes the presence of bark, beetle galleries, a shiny patina, or a continuous ring around the sample (denoted by B, G, L, c, or r in LTRR reports) (e.g., Robinson et al. 1972); a sample can also be considered a cutting date if the symbol "v" accompanies the date—noting that in the opinion of the analyst, the last ring on the sample is the last ring grown by the tree (Ahlstrom 1985). Samples that retain the last cambial layer can also be assigned a cutting (death) season. Samples that exhibit a terminal ring with a full complement of latewood were cut after that growing season for that particular year ended; samples that show only early wood cells were cut during the growing season. Because different tree species have different growing seasons, cutting dates in a structure in the same year from different species can define construction of a building or room to relatively short time period, as little as 4 to 6 weeks in some cases (Dean and Warren 1983; Towner and Dean 1992).

Samples that yield near cutting dates also retain the last ring grown by the tree; however, these particular samples may (or may not) contain a locally absent or missing ring near the end of the sample ring sequence, and are denoted by a "+" symbol (Towner 1997). For example, a sample that dates 1630 to 1748+B retains bark that indicates no exterior ring loss. However, AD 1748 was one of the driest years in the Southwest and the 1748 ring is locally absent on many samples throughout the region. This hypothetical sample may crossdate from AD 1630 to 1744 and contain four additional rings after its last small "marker ring" of 1744. Because 1748 is typically small and often locally absent on other samples, it may also be missing from this hypothetical sample; therefore the last cambial layer on the sample may have actually grown in AD 1749, but there is no way to verify the absence (or presence) of the AD 1748 ring because the ring sequence does not extend far enough beyond AD 1748 to determine if it is locally absent or simply not small on this particular sample. Near cutting dates, therefore, should be considered within a year or two of tree death dates.

Noncutting dates result from two different processes: exterior ring loss or ring counts near the outside of the sample ring sequence (and are denoted by "vv" or "++," respectively). Samples that do not retain the last ring grown by the tree (vv dates) have suffered exterior ring loss either through natural processes, such as erosion, or cultural processes, such as beam shaping. Thus, a sample dated AD 790 to 957vv could not have been cut before AD 957, but because it may be missing one, 10, or even 100 exterior rings, the harvesting date cannot be determined with any degree of confidence, unless a specific heartwood-sapwood ratio has been developed for a particular species in a particular area (Dean and Ravesloot 1993; Nash 1997). Partially ring counted specimens (++ dates) result from a lack of crossdating on the sample beyond a specific year. Consider again our hypothetical AD 1630 to 1748 specimen. If it cross-dates from 1630 to 1720, it can be dated, but there are an additional 28 rings on the sample that do not match the master ring sequence. In addition to the typically small 1748 ring, many other typically small rings, including 1722, 1724, 1729, 1733, 1735, 1737, 1739, and 1744 may also be missing from the sample. Therefore, it would be labeled 1630 to 1748++B and considered a noncutting date. If all of these rings are missing, the sample would date to at least 1756, but there is no way to determine if all, some, or none of these rings is absent. Ahlstrom (1985) suggests that "++" dates may indicate deadwood use. Such an inference is tenable because as trees die a slow natural death, they respond less and less to macroenvironmental conditions and produce more sporadic cambial growth layers. Noncutting dates (both vv and ++) provide only a *terminus post quem*, a date before which tree death could not have occurred; a noncutting date may predate the actual use of a beam by years, decades, or even centuries.

Deriving Chronological Information from Tree-Rings

The key to interpreting archaeological tree-ring dates is the identification of anomalous dates. Anomalous dates are defined as those dates that do not date the event of interest and are therefore dependent upon the archaeological context and research question (Dean 1978). The tree-ring dates themselves are precise and accurate; they date the last ring on the sample, but may not date the event of interest. For example, if one is interested in dating the construction of Spruce Tree House, the most visited cliff dwelling in the world, the 1932 cutting dates from Kiva C are clearly anomalous. If on the other hand, the event of interest is dating the stabilization work, the 100+ dates in the AD 1200s are considered anomalous. Obviously, dates are only anomalous within a context, and all dates may be anomalous in different contexts.

Identifying anomalous dates requires (a) an adequate sample of dates and (b) defining date clusters. An adequate number of dates is a relative term that depends on the number of samples available for collection, the number of samples collected, and the number of dates derived. A large number of dates certainly increases the probability of identifying date clusters, but may actually increase the difficulty of interpreting them—it will also make the process much more interesting. Ahlstrom (1985) has defined a date cluster as "three or more dates falling in a brief time interval," but definitions vary among researchers and from collection to collection. Ahlstrom has adapted the stem-and-leaf technique to plotting tree-ring dates in order to provide a detailed visual representation of each date in a distribution. Applying the technique to archaeological tree-ring dates, he identified an "ideal" date distribution as a single line on the plot consisting of entirely cutting dates in the same year (Ahlstrom 1985). I enlarged this concept (Towner 1997, 2000) and proposed that different date distributions could be used to identify different wood use behaviors. Although stem-and-leaf plots separate the dates from their archaeological contexts, they delineate the temporal attributes of samples and allow an initial assessment of the relationships among them. Because the stem-and-leaf technique ignores the archaeological context of tree-ring dates, however, it does not always adequately explain past human behavior.

Deriving Environmental Information from Archaeological Tree-Ring Samples

The precise chronological data provided by tree-ring dates—even well-provenienced cutting date clusters—illuminate more than simply the temporal aspects of an occupation. Embedded in the samples and their interrelationships is also important environmental information. Environmental information can be derived from archaeological tree-ring samples in at least two ways. First, the tree species exploited by past peoples may indicate aspects of local species availability and, thus, environmental composition. Second, archaeological tree-ring samples can be used to reconstruct past precipitation and/or temperature regimes and identify past "extreme" climatic events (see below).

The tree species present in archaeological tree-ring collections are the result of several factors. First, site occupants often exploited the most available species; thus, archaeological samples can be used to assess past species distributions and forest composition (at least at the genus level). For example, the Black Mesa Archaeological Project (BMAP) in northern Arizona collected more than 5000 tree-ring samples from Navajo archaeological sites that were occupied between AD 1800 and 1972. The modern vegetation community of Black Mesa consists predominantly of piñon-juniper forest, isolated stands of ponderosa pine and Douglas fir, and various undatable non-coniferous species. The Navajo BMAP dendroarchaeological samples mirror this distribution both in terms of species availability and spatial distribution (e.g., in areas with higher concentrations of one species, that species is most often used in structure construction; Dean and Russell 1978). These data indicate little ecological change in the composition of Black Mesa forests over the past 200 years.

Species distributions in archaeological collections are affected by more than species availability, however. Human social and economic systems also impact the presence and proportions of species in collections. For example, copious research concerning the Chacoan use of timbers in the Great Houses in Chaco Canyon demonstrates that people may have expended tremendous amounts of labor and energy to acquire and use specific trees for specific structures and functions (Dean and Warren 1983; English et al. 2001).

Deriving Behavioral Information from Archaeological Tree-Ring Data

That chronological and environmental information is present in archaeological tree-ring samples is usually obvious; behavioral information, however, is often overlooked. Data concerning how past people treated wood as a resource by selecting specific tree species or sizes of trees, choosing specific harvesting and beam modification techniques, or using deadwood, stockpiling or reusing beams all reflect how, and some times why, past populations adapted to their physical and social environments.

The behavioral information inherent in archaeological tree-ring samples is directly impacted by two major factors: the behavior of past peoples and the behavior of archaeologists and dendrochronologists. Past peoples must have (a) used wood as a resource for building structures, making artifacts, and as fuel; (b) they must have exploited species that are appropriate for dendrochronological analysis; and (c) they must have used wood in ways that insured its preservation in the archaeological record. Archaeologists influence tree-ring data by (a) selecting sites for study that contain dendrochronological materials, (b) precisely recording the provenience and surface attributes of samples, and (c) properly collecting and submitting the samples for analysis. Dendrochronologists must correctly date the samples and describe their microscopic attributes (e.g., terminal ring characteristics, false and micro-rings).

Certainly, the above-described species selection and economic procurement systems represent past human behaviors. It is at the individual beam, room, structure, and site level, however, that most detailed human behaviors can be identified. Such behaviors include species selection preferences, deadwood use, beam stockpiling, beam reuse, structure repair and remodeling, structure abandonment, and beam harvesting, preparation, and modification. When data from many beams, rooms, and sites are combined, broad-scale patterns of how specific groups treated wood as a resource can be delineated.

This is one area where dendroarchaeology differs from other subfields of dendrochronology. Single samples or site collections are related to specific past human activities and may not contain information relative to larger spatial and temporal issues. For example, the collection and analysis of 130 high-altitude bristlecone pine specimens from the San Francisco Peaks (SFP) of northern Arizona has had important ramifications for reconstructing temperature variability in the entire Southwest and across western North America for the past 2000 years (Salzer 2000a). In contrast, the collection of 1121 archaeological samples from Long House Ruin in Mesa Verde informs us about the activities of a specific group of people in a specific time. Simply put, archaeological tree-ring specimens are part of a specific human behavioral context that may (or may not) be directly related to broader patterns.

The first level of analysis for deriving information about past human behavior is at the individual beam or sample level. Precise provenience and sample attribute information can reveal aspects of beam function, procurement, and preparation (Dean 1969; Towner et al. 2001; Windes and Ford 1996). Beam function includes information about the architectural element and its use (e.g., is the roof beam a primary or secondary beam, a door lintel, or jamb). As in the Chaco case cited above and others, specific species and sizes may have been preferred for specific architectural elements (Windes and McKenna 2001). Beam procurement methods include cutting with a stone or various types of metal axes or saws, breaking, or burning. Noting the procurement method evident on a sample may indicate the use of deadwood (e.g., breaking, burning) or provide a temporal framework for undated samples (e.g., different saw marks relate to technological innovations in saw technology). Beam preparation may include removing limbs, bark, shaping a beam, and preparing the beam ends using various tools. Tools commonly used in beam preparation include various types of axes and saws as well as draw knives, adzes, and grinding tools. Identifying the types of tools used to procure and prepare timbers may have implications for interpreting anomalous dates, distinguishing technological traditions, or recognizing cultural interaction. Other attributes of individual beams that should be recorded, if appropriate, include the degree of sooting or blackening to recognize potentially reused beams, charring as a potential aid in determining room, structure, or site abandonment mode, the presence of twisted grain or root flares to aid in identifying deadwood use, and any other noticeable attributes.

At the room and structure level, it is necessary to document the architecture as completely as possible. Such characteristics as the bond-abut relationships of walls, changes in wall construction materials or plastering, changes in room function denoted by sealed doorways or covered hearths, and other architectural attributes can help in determining when the room was built (as opposed to when the beams were harvested) and provide clues to the nature of the occupation. When combined with beam attributes and dates, such information can help to identify anomalous dates, the use of deadwood, the reuse of older beams from other rooms or sites, the stockpiling of beams, the repair and remodeling of rooms and structures, and can yield information relative to the duration of occupation and mode of abandonment of a room or structure (Ahlstrom 1997; Dean 1969). Finally, these combined data can help illuminate aspects of human social organization, such as the use of a room or structure by a family or supra-family group; they may also contribute to understanding the dynamics of that group through time, such as changing structure use in response to generational changes in family size, the immigration of new families into a settlement, and many others.

At the site and regional levels, tree-ring data provide the temporal control necessary to delineate broad patterns of human behavior. At the site level, the initial founding of a site can often be determined through tree-ring analysis, and the duration of the occupation may also be delineated. An excellent example of the former is Douglass' dating of the Mesa Verde cliff dwellings. Before the advent of dendrochronology, archaeologists debated whether the structures were hundreds or thousands of years old. Douglass' precise dating of these ruins to the 13th century had profound implications for archaeological and anthropological theories of the rate of human cultural development in the New World (Nash 1999). Similarly, before large-scale sampling efforts and detailed analysis documented the duration of occupation of the Kayenta Anasazi cliff dwelling of Betatakin at less than 40 years, many people assumed such structures had been occupied for hundreds of years. Again, such temporal compression has required anthropologists to reexamine their theories of cultural evolution and has forced archaeologists to consider the importance of settlement mobility patterns in interpretations of population demographics and history.

At the regional level, tree-ring data contribute to understanding population dynamics, culture change, and interaction in a variety of ways. For example, recent dendroarchaeological analysis of several Navajo pueblito structures in Palluche Canyon, New Mexico, reveals very similar initial construction, remodeling, and abandonment dates (Ababneh et al. 2000). These small three- to five-room structures were all apparently constructed, temporarily abandoned, reoccupied, and finally abandoned within a period of about 20 years. The archaeological and dendrochronological data suggest all the sites were occupied by the same extended family group, and this inference is supported by ethnographic data and Navajo oral traditions. Thus, these sites have become much more than simply interesting ruins on the landscape; they can now be related to a specific period in Navajo history, a specific form of social organization, and perhaps to a particular descendent group of Navajos (Ababneh et al. 2000).

On an even larger scale, dendroarchaeological data have been used to illuminate aspects of significant migrations both during the prehistoric period and during the early historic period. As discussed above, the archaeological and climatic information indicate a climatic gradient that may have influenced the timing and direction of the Mesa Verde Anasazi movements out of the Four Corners area and into the Rio Grande Valley (Ahlstrom et al. 1995). More recently, I have suggested that the Navajo emigration out of their Dinétah homeland in northwest New Mexico and into northeastern Arizona during the late 1800s was a social and economic process unrelated to the single-year drought of 1748 (Towner 1997). These large databases enable archaeologists and dendrochronologists to investigate important questions concerning how humans—as individuals, families, and supra-family groups—colonized landscapes, exploited their environments, interacted with their neighbors, and responded to changes in their physical, social, and technological environments.

PREVIOUS ARCHAEOLOGICAL DENDROCHRONOLOGY ON THE PAJARITO PLATEAU

The results of almost 80 years of archaeological tree-ring research on the Pajarito Plateau are presented below. A summary of the dated sites is presented in Table 7.1 and all samples from Pajarito Plateau sites are listed in Appendix D. Before they are discussed, however, a couple of caveats must be offered along with the interpretations. If the two most important factors in a dendroarchaeological date distribution are (a) the behavior of past site occupants and (b) the behavior of archaeologists and dendrochronologists (Dean 1996a; Towner 2000), it is clear that the latter has had a profound influence on the Pajarito Plateau database. Certainly the site occupants' choices of tree species for construction and fuel have helped shape the database. More important, however, has been the research interests, excavation of specific structures and site, and species-specific collection strategies of archaeologists and dendrochronologists, particularly before about 1980.

The interpretations of individual rooms and sites offered below are based on the dendroarchaeological data and minimal provenience information. No site maps or detailed notes are located in the LTRR files, and may not exist for some sites. Because of the limited nature of the accompanying provenience information and site description, however, any such interpretations should be tested against the archaeological and documentary record. Only by placing the tree-ring dates in their archaeological contexts (cf. Towner et al. 2001) can anomalous dates (Dean 1978) be identified and true behavioral events, such as construction, repair, and remodeling, be delineated.

The site presentation is organized in accordance with the LTRR site file system. All sites on the Pajarito Plateau are in the New Mexico "I" quadrangle—a one-degree by one-degree geographic unit, in this case from 35 to 36 degrees N and 106 to 107 degrees W—although the Pajarito Plateau does not encompass this entire range. The archaeological sites included in the synthesis are bounded on the north by Santa Clara Creek, on the south by Borrego Canyon, on the east by the Rio Grande, and on the west by the crest of the Jemez Mountains (Figure 7.4). If known and identified in the LTRR files, sites are also noted by names and LA numbers. Collections with a large number of dates are also shown as stem and leaf plots (Ahlstrom 1985), where the three-digit column on the left indicates the decade (128 indicates the 1280s, for example) and the numbers on the right indicate individual years.

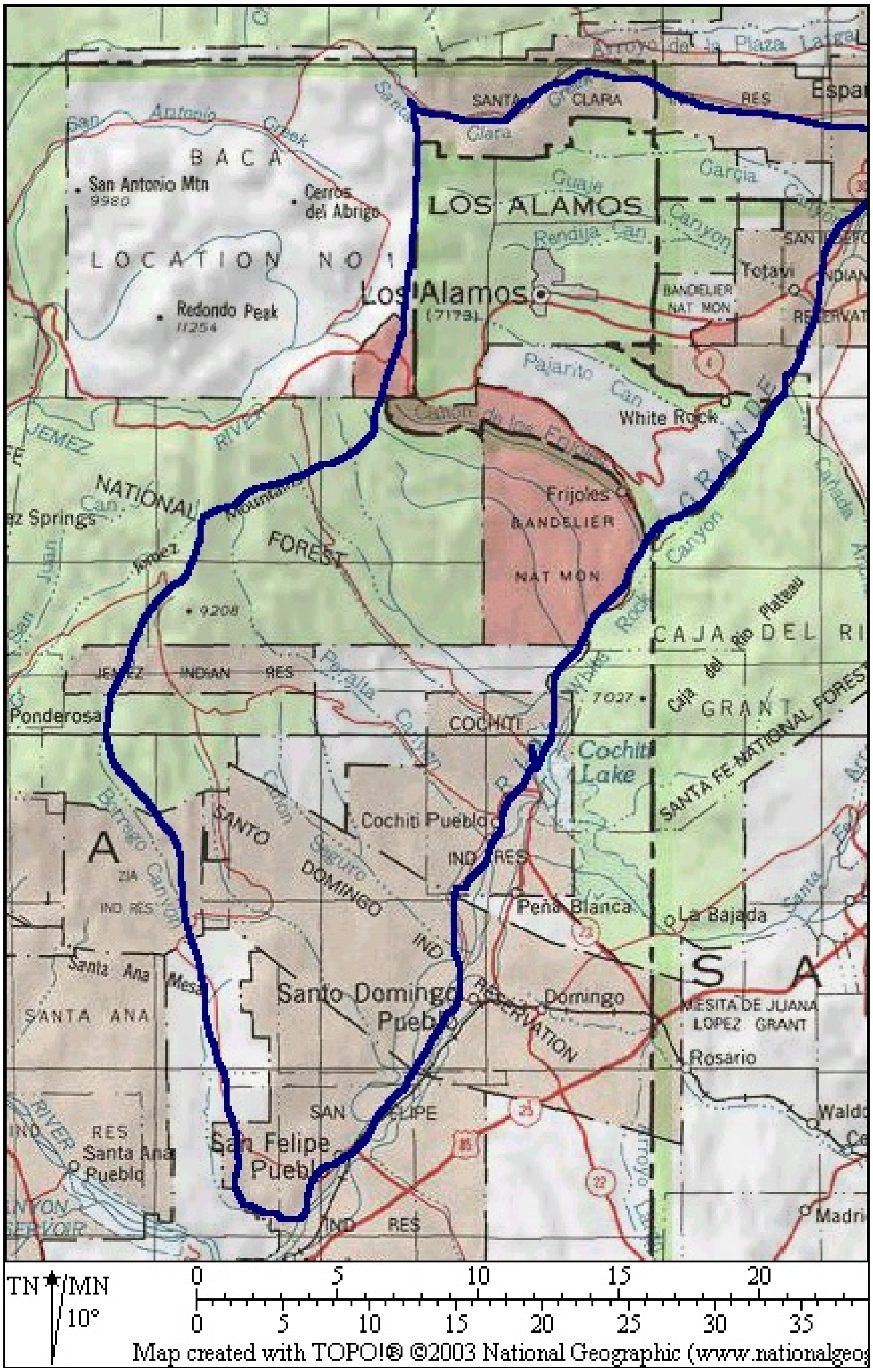

Figure 7.4. Map of the Pajarito Plateau and project area.

Table 7.1. Summary of tree-ring data from all archaeological sites on the Pajarito Plateau.

LTRR Acc#	Site #	Site Name	Number of Samples	Number of Independent Samples	Number of Dates	Submitted by*	Sample Type(s)	Species	Earliest Inside Date	Earliest Cutting Date	Latest Outside Date	Clusters	*Comments*
2	LA 47	Puye	71	71	41	Reuter, Stallings	Char frags	PP, DR, Pnn	1329p	1526v	1577r	1540s, 1570s	*Mostly noncutting*
3	LA 170	Tsirege	59	52	30	Stallings	Char, wd frags	PP, DF, WF	1344fp	1559r	1581vv	1420s, 1510s, 1580s	*Mostly noncutting*
4	LA 8681	Fulton's 190	50	50	20	LAAS (Young)	Char frags	Pnn	1026fp		1218+vv	1190s	*All noncutting*
9		San Ildefonso	2	2	1	1st beam expedition	Wd ½ sects	PP	1661p		1787vv	None	
18	LA 295	Cochiti Church	2	2	2	Kubler/ Taylor Museum	Wd 1" cores	PP	1662np		1745vv	None	*Both noncutting*
25	LA 84/295	Kotyiti	42	41	32	Stallings	Char frags	PP, DF	1487p	1684r	1691v	1650s, 1680s, 1690s	*4 cutting*
30	LA 545	Water Canyon Ruin	28	20	14	Stallings	Char frags	PP, DF	1111fp	1302v	1447v	1300s	*5 cutting*
39	LA 257	Navawi	1	1	0	Stallings	Char frags	PP					
40	LA 708	Los Alamos School	16	16	0	Stallings	Char frags	PP, DF					*All short*
44		Bandelier Group M	5	5	1	Hendron NPS	Char frags	PP	1352fp	1494rG	1494rG comp		*Duplicates?*
45	LA 82	Tyuonyi	125	122	55	Stallings/ NPS	Char frags	PP, DF, Jun	1240np	1386r	1521r comp	1380s, 1420s, 1460s, 1520s	*13 cutting*
46	LA 217	Rainbow House	34	20	18	Worman/ NPS	Char frags	PP	1377p	1449v	1546v	1451	*8 cutting*
47	LA 78	Frijolito	13	13	12	Stallings	Char frags	PP	1315	1426r	1460	1440s	*6 cutting*

LTRR Acc#	Site #	Site Name	Number of Samples	Number of Independent Samples	Number of Dates	Submitted by*	Sample Type(s)	Species	Earliest Inside Date	Earliest Cutting Date	Latest Outside Date	Clusters	*Comments*
48	LA 169	Otowi	11	11	4	Stallings	Char frags	PP	1375fp		1491vv		*1 near cutting*
49	LA 42	Hewett's Ruin 12	7	7	5	Stallings	Char frags	PP	1796fp		1871vv	1830s	*1 cutting*
50	LA 211	Tsankawi	4	4	2	Stallings	Char frags	PP	1373fp		1439vv		*No cutting*
51	LA 3852		3	3	1	NPS	Char frags	PP, Pnn	1006		1085+vv		
	LA 60372	Burnt Mesa Pueblo	25	25	13	WSU/NPS	Char frags	PP, Pnn	1098		1317B		*2 cutting*
	LA 53148		3	3	0	NPS	Wd x-sect	PP					*Branches*
	LA 71155		1	1	0	NPS	Wd x-sect	PP					*Branches*
	LA 71090		3	3	0	NPS	Wd frag	PP, Jun					*Branches*
	LA 84067		1	1	0	NPS	Wd frag	PP					*Branches*
	LA 71081		1	1	0	NPS	Char frag	PP					*Branches*
	LA 4497	Saltbush Pueblo	4	4	3	Snow/MNM	Char frags	Pnn	1151fp		1241vv	None	*No cutting*
	LA 2987		1	1	0	NPS/MNM?	Char frag	Pnn					
	LA 2990		1	1	0	NPS/MNM?	Char frag	Pop					*Navajo midden?*
	LA 2994		1	1	0	NPS/MNM?	Char frag	Jun					
	LA 2998		1	1	0	NPS/MNM?	Char frag						
	LA 3852		1	1	0	WSU/NPS	Char frag	Jun					
	LA 50972	Cavate M 77	1	1	0	WSU/NPS	Char frag	Pnn					
52	LA 70	Pueblo	222	213	163	Lange	Char,	PP,	1184	1401r	1790vv	1420s,	*96 cutting*

LTRR Acc#	Site #	Site Name	Number of Samples	Number of Independent Samples	Number of Dates	Submitted by*	Sample Type(s)	Species	Earliest Inside Date	Earliest Cutting Date	Latest Outside Date	Clusters	*Comments*
		del Encierro					wd frags	DF, Pnn				1440s, 1460s, 1450s	
	LA 34		1	1	0	Lange	Char frag	DF					
	LA 272		6	6	0	Lange	Char frag	PP, Pop					
	LA 3446		5	5	0	Lange	Char frag	Jun, Pop					
	LA 6178		1	1	0	Lange	Char frag	Jun					
	LA 6455	Alfred Herrera Site	137	65	28	Lange	Char frags	PP, DF, Pnn	1197p	1457v	1497 r inc	1490s	*5 cutting*
	LA 6461	Red Snake Hill Site	5	5	0	Bussey	Char, wd frags						
	LA 6462	North Bank Site	258	221	98	Lange	Char, wd frags	PP, Pnn, Jun	1022p	1128r	1280rB	1280	*53 cutting*
	LA 9139		5	4	2	OCA	Char frag	PP	1534fp		1767vv		*No cutting*
56		Bandelier Big Kiva	105	37	15	Stallings/ NPS	Char frag	PP, DF	1320	1522r	1525r	1520s	
61	LA 12121	Alamo Canyon Group	17	17	14	NPS	Char x-sect	Pnn, Jun, PP	1101p	1149v	1177r	1170s	
	LA 13659	Alamo Canyon Group	2	2	0	NPS	Char x-sect	PP					*Short*
	LA 12119	Alamo Canyon Group	36	32	5	NPS	Char x-sect	Pnn, Jun, PP	1116		1419vv		*No cutting*
	LA 12578		1	1	0	NPS	Wd frag	Pnn					
	LA		1	1	0	NPS	Wd frag	Quer					*Oak,*

LTRR Acc#	Site #	Site Name	Number of Samples	Number of Independent Samples	Number of Dates	Submitted by*	Sample Type(s)	Species	Earliest Inside Date	Earliest Cutting Date	Latest Outside Date	Clusters	*Comments*
	12567												*discard*
	LA 12581		1	1	0	NPS	Char x-sect	Jun					*Short*
70		Pajarito Group				UCLA							
		Cavate East Mesa	1	1	1	UCLA	Wd x-sect	PP	1628p		1674vv		
		Site 118 Kiva-I	1	1	1	UCLA	Wd frag	PP	1792	1830r	1830r		
		Site 127 Cavate	2	2	0	UCLA	Char frag	PP					
		Site 128 Cavate	1	1	0	UCLA	Wd x-sect	Pnn					
		Site 252	12	12	1	UCLA	Wd/char frags	PP, Pnn, Jun	1797p		1844+vv		*Also fir and pop*
71		La Mesa Fire Site	3	3	2	Traylor/ NPS	Char frags	PP	1347		1412+vv		*No cutting*
74	LA 3824		7	7	0	Snow/MNM	Char frags	PP, DF					
77		Los Alamos Cabins											
	LA 86643	Gomez Hmstead	8	8	0	LANL	Wd x-sect	Jun, PP					
	LA 16808	Anchor Ranch	10	10	5	LANL	Wd x-sect	PP	1790p	1929 GB comp	1933r LGB comp	1933	
	LA 16808b	D. Romero Hmstead	10		10	LANL	Wd/char frags	PP	1787p	1908rG	1908v	1908	
	LA 70028	Vigil Y Montoya Hmstead	20	19	5	LANL	Wd x-sect	PP, Jun, Pnn	1562		1963++G		
	LA	Hmstead	3	3	1	LANL	Wd x-	PP	1783p		1899++		

LTRR Acc#	Site #	Site Name	Number of Samples	Number of Independent Samples	Number of Dates	Submitted by*	Sample Type(s)	Species	Earliest Inside Date	Earliest Cutting Date	Latest Outside Date	Clusters	*Comments*
	89826	Bridge					sect				rLGB		
	LA 89770	Hmstead Fence	9	9	6	LANL	Wd x-sect	PP	1767p		1890vv		
	LA 21334	Montoya Hmstead	8	7	5	LANL	Wd x-sect	PP, Pnn	1687p		1915++ vv		
	LA 85407	Serna Hmstead	4	4	4	LANL	Wd x-sect	PP	1685		1826vv		
79	LA 16806	Romero Cabin	95	93	79	LANL	Wd s-sect	PP, DF	1644	1894r inc	1966rLB comp	1890s, 19112, 1930s, 1960s	*Same site as above?*
83	LA 51912	Archaic site	8	8	0	MNM/Lent	Char frags	Jun, Pnn					
84	LA 3444	Kuapa	2	2	0	SAR/Haas	Char frags	PP					*Other samples discarded?*
93	LA 3840	Shohakka Pueblo	2	2	1	NPS/ Ruscavage-Barz	Char frags	PP	1387		1441vv		
	LA 118345		2	2	0	NPS/ Ruscavage-Barz	Char frags	PP					
Total			*1528*	*1290*	*700*								

***** LAAS = Los Alamos Archaeological Society; WSU = Washington State University; MNM = Museum of New Mexico; OCA = Office of Contract Archaeology; UCLA = University of California, Los Angeles; SAR = School of American Research.

LTRR NM-I-2, Puyé (LA 47)

A total of 71 samples have been collected from Puyé (Table 7.1; Appendix D), predominantly as a result of Reuter's excavations at the site in the 1930s (Smiley et al. 1953). The samples were initially analyzed by W. S. Stallings at the LAH and dating confirmed by the LTRR in the 1960s. All of the samples are charcoal or wood pieces from excavated contexts. Ponderosa pine (n = 57) dominates the collection, followed by Douglas fir (n = 10), and piñon pine (n = 3). Such dominance by ponderosa (80%) undoubtedly reflects a species preference on the part of the site occupants; selection biases on the part of the collectors, however, may contribute to the species differences, particularly the absence of juniper in the collection.

Forty samples yielded dates, a success rate of 58.6 percent. Douglas fir specimens yielded the highest ratio (9/10), followed by piñon pine (3/4), and ponderosa (29/57). Cutting dates were derived from only eight of the samples; three yielded near cutting dates, and 30 produced noncutting dates. The terminal ring attributes indicate that most tree harvesting occurred in early to mid summer. The mixture of complete and incomplete Douglas fir terminal rings indicates harvesting some time between early May and late June; the ponderosa pine growing season is somewhat later in the summer, but the combination suggests mostly early-season tree procurement (Fritts 1991), although construction may have occurred at any time during the year.

The overall date distribution (Figure 7.5) suggests a site occupation from the late 1400s through the 1570s, although the cutting dates span only 1526 to 1577. The stem-and-leaf plot notes the prefix with year date (e.g., 141 36, represents 1413, 1416). At such a large site, however, the relatively small sample of tree-ring dates probably does not represent the true duration or intensity of the occupation. Although the provenience information for the samples is minimal, if viewed in their archaeological contexts (Towner et al. 2001), the dates suggest the following. First, an initial occupation some time in the late 1400s based on noncutting dates from "the E, S, and W sides of the ruin" (RG-327-12), the "S House 5th N-S line of Rooms from W" (RG-545), the "fill of Deric's Room" (RG-546-3, 15, 22, 23 and RG-547-1, 2), and unprovenienced samples (RG-49, 328, and 625-627). Second, there is a weak cluster of unprovenienced noncutting dates in the 1520s (RG-546-4, 5, RG-653, RG-5306) supported by a 1529v cutting date (RG-48). In addition, a single 1526v cutting date (RG-551) from the "8th N-S line of rooms, 2nd from W," three noncutting dates (1521vv, 1526vv, 1528vv) from the "Fill of Deric's Room," and two noncutting dates (1525vv, 1526vv) from the "E, S, and W sides of Ruin," support the possibility of site expansion in the 1520s. Four areas (E, S, and W sides of Ruin, Fill of Deric's Room, dump, and unprovenienced) contain 1530s noncutting dates—and a 1536+r near cutting date—that indicate a possible site expansion in the 1530s. The mid-1540s are represented by five dates, including three cutting dates from the "dump" (Appendix D), which indicate some activity at the site during that decade. The 1550s and 1560s are represented by single noncutting (1554++vv) and near cutting (1562+v inc) dates, respectively. Five dates, including two cutting and one near cutting date fall in the 1570s. The different proveniences of the samples (E, S, and W sides of Ruin, Fill of Deric's Room, and Dump) suggest tree-cutting activities occurred in several areas of the site in the 1570s.

141	36
***	
143	27
144	5
145	24
146	6
147	4
148	8
149	88
***	
151	6
152	1156666689
153	14679
154	334678
155	4
156	2
157	22457

Figure 7.5. Stem-and-leaf plot of dates from Puyé (underline indicates cutting or near cutting date).

The small sample size relative to the size of the site, meager provenience information, and paucity of cutting dates make interpretation of the Puyé tree-ring data difficult. Nonetheless, it is probable that (a) the site occupants preferred ponderosa pine for construction, (b) they occupied the site at least as early as the late 1400s, (c) they conducted major expansion of the site between the 1520s and the 1540s, (d) there was little construction in the 1550s and 1560s, and (e) major site expansion occurred in the 1570s. If Walpi Pueblo can be used as a model of wood use at a long-lived pueblo (Ahlstrom et al. 1991), such interpretations would change dramatically with the addition of more tree-ring samples from known proveniences.

LTRR NM-I-3, Tsirege (LA 170)

The tree-ring collection from Tsirege was procured by Stallings in the early 1930s (Smiley et al. 1953). Some provenience information accompanied the samples when they were transferred to Tucson, but it is extremely limited considering the size and complexity of the site. Stallings collected a total of 59 samples from the site, including seven duplicates (Table 7.1; Appendix D); one sample for which there are notes was lost in the transfer of the collection to the LTRR. Thus, 44 independent samples are available from the site. The species distribution includes ponderosa pine (*n* = 24), Douglas fir (*n* = 18), and white fir (*n* = 2). Certainly, Stallings selection bias influenced the species distribution, but the relatively large number of Douglas fir and presence of white fir probably reflect at least some prehistoric selection preferences. It may be important to identify the nearest modern stand of white fir as an estimate of procurement distance.

The 44 samples produced 30 dates, but only three cutting dates (Figure 7.6). The date range is 1411+vv to 1581vv and the cutting date range is 1559r inc to 1581v inc. The overall distribution suggests that there may have been some occupation in the early 1400s (seven noncutting dates before 1427), and additional activity in the 1510s (four noncutting dates 1514 to 1516). The few cutting dates, however, suggest that the occupation was predominately during the 1570s to 1600 timeframe. Other data, such as ceramics and architecture, indicate that the site was occupied for much longer than 30 years. Clearly, sampling in only one area of the site biased the dating toward the end of the occupation.

141	126
142	1236
143	5
144	02
145	7
***	
147	79
***	
149	226
150	24
151	4556
***	
154	0
155	<u>9</u>
***	
157	<u>4</u>88
158	<u>1</u>11

Figure 7.6. Stem-and-leaf plot of dates from Tsirege (underline indicates cutting or near cutting date).

LTRR NM-I-4, Fulton's 190 (LA 8681)

Fifty charcoal samples were collected from Fulton's Site 190 during excavations in the 1950s by the Los Alamos Archaeological Society (Table 7.1; Appendix D). There are no duplicates in the collection. The species exploited include piñon (n = 42), juniper (n = 5), Douglas fir (n = 2), and ponderosa pine (n = 1). The almost total lack of ponderosas makes Fulton's 190 different than most other sites on the Pajarito Plateau, but it may be a result of collection bias. Only the piñon samples yielded dates.

The samples yielded 20 dates, but no cutting dates, and range from 1060vv to 1218+vv. The date distribution (Figure 7.7) shows weak clusters in the 1090s (n = 2), 1160s (n = 3), 1180s (n = 2), 1190s (n = 4) and 1200s (n = 2) that indicate the possibility of a 140+ year occupation. It is most likely, however, that the site was constructed and occupied in the late 1100s until some time in the 1220s. The only date cluster—three noncutting dates of 1190vv, 1191vv, and

1191vv—that supports a late 12th century occupation is from Room 5. No other single provenience contains more than two non-cutting dates within a five-year time span.

106	0
***	
108	1
109	57
110	6
***	
112	4
***	
114	9
115	3
116	248
***	
118	23
119	0117
120	45
121	8

Figure 7.7. Stem-and-leaf plot of dates from Fulton's 190 (underline indicates cutting or near cutting date).

LTRR NM-I-9, San Ildefonso

Only two samples have been collected from San Ildefonso. Both are ponderosa pine cross-sections collected by the First Beam Expedition in 1923 (Nash 1999). Only one sample provided a noncutting date (1661p-1787vv) (Smiley et al. 1953) (Appendix D). Although the sample fits with the known occupation, it is completely inadequate for assessing the occupation of this large, extensive pueblo.

LTRR NM-I-18, Cochiti Church (LA 295)

Two ponderosa pine samples were collected as cross-sections from Cochiti Church by George Kubler of the Taylor Museum in Colorado Springs (Smiley et al. 1953). Both samples dated (1697vv and 1745vv) (Appendix D), but neither yielded a cutting date, probably because they were adzed and missing outside rings. They offer little interpretive value other than that they were not used before the 18th century.

LTRR NM-I-25, Kotyiti (LA 84)

A total of 42 samples, including one duplicate, were collected by Stallings in the 1930s (Table 7.1; Appendix D). All but one of the samples is charcoal; 37 are ponderosa pine, four are

Douglas fir, and the single wood fragment is a juniper specimen. None of the samples is provenienced beyond the site level. Thirty-two of the samples (76%) dated, but only four yielded cutting or near cutting dates. The overall date range is 1547vv to 1691vv, and the cutting date range is 1684r comp to 1690rB inc. Most of the dates, including all of the cutting and near cutting dates, cluster in the 1680s and early 1690s. Obviously, the area of the site where the specimens were collected dates shortly after the Pueblo Revolt but before the Spanish Reconquest.

LTRR NM-I-30, Water Canyon Ruin (LA 545)

Twenty-eight charcoal samples were collected from the site by W.S. Stallings in the 1930s (Smiley et al. 1953). There are eight duplicates in the collection, and thus 20 independent samples (Table 7.1; Appendix D). All but two of the samples were collected from the "Northeast Side of the Court," and the other two were collected from the "Southwest Corner of the Court." The species present include 17 ponderosa pine and three Douglas fir specimens.

The 20 samples yielded 14 dates, including five cutting dates. The dates range from 1165vv to 1447v, and the cutting dates range from 1302rB to 1447v. It is possible, given the small sample size and limited provenience information, that the site was occupied for 150+ years. The current tree-ring data, however, suggest two separate occupational episodes. The first, 1302 to 1303, is denoted by four cutting and one noncutting dates; the second, in 1447, is indicated by a single cutting date and two early 15^{th} century noncutting dates. Such a small, unrepresentative sample, however, makes any inferences somewhat tentative. The mid-1400s activities appear to have been contemporaneous with events at Frijolito.

LTRR NM-I-39, Navawi (LA 257)

A single ponderosa pine sample was collected from Navawi by W. S. Stallings in the early 1930s. The sample did not date (Table 7.1; Appendix D).

LTRR NM-I-40, Los Alamos School (LA 708)

Sixteen charcoal fragments were collected from the site by W. S. Stallings in the 1930s. All but one of the samples is ponderosa pine and the other is a Douglas fir specimen (Table 7.1; Appendix D). None of the samples dated because all contain too few rings for crossdating.

LTRR NM-I-44, Bandelier Group M

Five wood fragment samples were collected from Rooms 1, 2, and 5 of the site by Hendron of the National Park Service (NPS) during stabilization work in the 1930s (Smiley et al. 1953). All the samples are ponderosa pine and only one yielded a date (1352p to 1494rG comp) (Table 7.1;

Appendix D). The date indicates tree procurement in the fall/winter of 1494, but offers little other information about the site occupation.

LTRR NM-I-45, Tyuonyi (LA 82)

The tree-ring collection from Tyuonyi was procured by Stallings, but apparently derived from either Hewett's School of American Research excavations or Hendron's NPS stabilization work in the 1930s and 1940s (Smiley et al. 1953). All of the material was transferred to the LTRR in the 1950s, but one sample (TYU-80) was lost in the transfer.

A total of 125 samples, including only two duplicates, was collected from the site. The 122 independent samples include 97 ponderosas, 16 Douglas firs, five junipers, two *Populus*, and single specimens of piñon and oak (Table 7.1; Appendix D). The species distribution clearly reflects Stallings' collection goals of developing a Rio Grande chronology,

The samples yielded 55 dates, a 45 percent success rate; 20 of the dates are cutting or near cutting dates. The date range is 1327vv to 1521vv and the cutting date range is 1369+r inc to 1521r comp. The date distribution (Figure 7.8) suggests that the site was founded some time in the late 1300s, probably in the 1380s and occupied until the 1520s; most construction appears to have occurred in the 1420 to 1430 period, with repair or remodeling in the 1330s, 1460s, and first two decades of the 1500s.

132	7
***	
134	0
***	
136	69
***	
138	356789
139	458
140	0178
141	559
142	111122223677777
143	19
144	22237
145	178
146	26679
***	
149	46
150	9
151	7
152	11

Figure 7.8. Stem-and-leaf plot of dates from Tyuonyi (underline indicates cutting or near cutting date).

Samples were collected from 20 different areas, only four of which did not produce dates (Tier 4, Tier 5, Tier 6, and Trench 1). If the earliest cutting date or cutting date cluster and latest date from each provenience are taken as guides, the following sequence can be inferred. Tier 13, dated 1369+r inc, may be the earliest area sampled. Other areas with their latest (noncutting) dates in the 1300s include Tier 7 (1385vv) and Tier 11 (1386vv), but they probably date to the early 1400s. Several areas indicate construction in the second or third decades of the 15th century, including Tier 12 (1415+vv), Tier 14 (1415+B inc to 1457vv), Tier 10 (1421v to 1496vv), Tier 16 (1419+r comp to 1469vv), Tier 17 (1422+r comp), Tier 18 (1422+r comp), Tier 8 (1431v inc), and Tier 9 (1427r inc to 1451vv). Although not all the areas are supported by cutting dates, it is clear that the 1420s were a period of major site expansion. The 1440s may have also seen some site expansion, particularly in Tier 1 (1443vv), Tier 2 (1442+v), and Tier 3 (1442r comp to 1458vv). Sector C contained a 1466r comp date that indicates activities in the 1460s, contemporaneous with activities in Tier 16 (1466v, 1467r, 1469vv). There may have been some construction at the site in the 1490s, as evidence by a 1496vv date from Tier 10 and a 1494vv date from the site surface. The latest construction at the site was apparently in Tier 15 (1509v inc) and Sector B (1521r comp). It is apparent from both the date distribution and the provenience of different dated timbers that the site was occupied for more than 100 years. Additional samples from different proveniences can be expected to strengthen the existing date clusters and possibly extend evidence of the occupation further.

LTRR NM-I-46, Rainbow House (LA 217)

A total of 34 charcoal samples, including 14 duplicates, was collected from Rainbow House by Worman/NPS in the 1930s (Table 7.1; Appendix D). Nineteen of the independent samples are ponderosa pine and one is Douglas fir, undoubtedly a reflection of the collection bias of the time. One sample is unprovenienced and two were collected from Kiva 1; the remaining 17 samples were excavated from Room 1-18.

Eighteen of the samples yielded dates, including nine cutting dates. The single date from Kiva 1 (1458v) is the latest date from the site. The strong cluster of 1451 cutting dates leaves no doubt that Room 1-18 was built in that year. In addition, the mixture of complete (n = 4) and incomplete (n = 2) terminal rings on the piñon specimens indicates that the structure was built in the late summer/fall of 1451 when some trees had stopped growing and others had not. The subsequent noncutting dates of 1453vv and 1454vv probably represent repair beams procured at the same time Kiva 1 was built (1458). The small cluster of 1420s dates, including two near cutting dates (1422+v and 1427+v) probably represent beams reused from other proveniences or sites. Rainbow House, or at least Room 1-18, appears to be one of the shortest occupations on the plateau and may contribute significantly to ceramic seriation and other studies (Montgomery and Reid 1990).

LTRR NM-I-47, Frijolito (LA 78)

Thirteen ponderosa pine charcoal samples were collected from Frijolito by W. S. Stallings in the early 1930s (Table 7.1; Appendix D); no duplicates were identified in the collection. Five of the samples were collected from a room on the north side of the pueblo, but the remaining samples are unprovenienced. Twelve of the samples dated and six yielded cutting dates. The dates range from 1385vv to 1460r; the cutting dates range from 1426r to 1460r. The distribution of dates suggests some construction in 1426, 1447, 1452 to 1454, and 1460. The limited provenience information suggests that the room on the north side was built in 1447 and repaired in 1460, or built in 1460s with at least one reused timber. Interestingly, all of the dates, except those in 1447, indicate fall/winter tree harvesting. Frijolito was apparently occupied for a relatively brief time—approximately 35 to 40 years (one or two generations), and thus may be an important site for determining ceramic relationships among plateau assemblages. It also appears to be at least partially contemporaneous with the late occupation of Water Canyon Ruin (LA 545).

LTRR NM-I-48, Otowi (LA 169)

Eleven charcoal samples have been collected from Otowi. The site was excavated by L. W. W. Wilson for the Philadelphia Commercial Museum between 1915 and 1917, but the samples were apparently collected by Stallings in the early 1930s. Unfortunately, the data from Otowi are scant and insufficient to asses the internal site dynamics. Five of the samples are duplicates, leaving five independent samples. Four of the samples are ponderosa pine and one is Douglas fir (Table 7.1; Appendix D). Four of the samples yielded dates, including a cutting date of 1414r comp. Although completely inadequate to assess the occupation of such a large complex site, the cutting date of 1409r and noncutting date of 1491vv suggest almost a century of occupation. Additional samples would undoubtedly contribute significantly to understanding the site occupation and external relationships.

LTRR NM-I-49, Hewett's Ruin 12 (LA 42)

The tree-ring laboratory currently curates seven ponderosa pine charcoal samples from Hewett's Ruin 12 that were apparently collected by Stallings in the 1930s. None of the samples is provenienced beyond the site level and two did not date (Table 7.1; Appendix D). The five dated samples yielded four noncutting dates (1830vv to 1871vv) and one cutting date (1867v). Obviously, the samples do not date the prehistoric occupation and there is some suggestion that they came from the "Blumenthal modern house;" they indicate some building activity at the house in the late 19th century (Robinson et al. 1972).

LTRR NM-I-50, Tsankawi (LA 211)

Stallings collected four ponderosa pine charcoal samples from Tsankawi in the 1930s. None of the samples are provenienced beyond the site level and only two dated (Table 7.1; Appendix D).

The two noncutting dates of 1436vv and 1439vv suggest activities in the mid-15th century, but are inadequate for assessing this large pueblo.

LTRR NM-I-51

LA 3852

Three charcoal samples were collected from two structures at the site by NPS (Carlson and Kohler 1989a; Table 7.1, Appendix D). Neither the ponderosa nor the piñon pine sample from Room 6 area 1 dated. A piñon sample (BNM-84) from Pit structure Area 4 yielded a noncutting date of 1006 to 1085+vv and indicates some activity at the site after 1085.

Burnt Mesa Pueblo (LA 60372)

A total of 25 samples, 22 charcoal fragments and three wood fragments, was collected from the site (Kohler 1989; Kohler and Root 1992a, 1992b) (Table 7.1; Appendix D); no duplicates were identified. The majority of the samples are ponderosa pine (n = 16), followed by Douglas fir (n = 7), and piñon (n = 2). It is probable that this species distribution approximates the prehistoric occupants' selection preferences.

The samples yielded 13 dates, including three cutting dates. The overall date range is 1189vv to 1317B inc, and the cutting date range is 1250B inc to 1317B inc. If the dates are combined with their provenience data, the following sequence is inferred. Room 2 appears to be the earliest with a 1250 cutting date; however, other data may indicate this single date is anomalous. Room 1 was constructed some time in the mid-1270s and Room 10 is probably contemporaneous with it. The three noncutting dates from Room 4 only indicate it was occupied some time after 1207; again, archaeological and architectural data may refine the temporal placement of the room. Interestingly, Pit Structure 1, built in 1317, is the latest construction on the site. The dendroarchaeological and provenience data suggest that two separate occupations occurred at the site, one in the mid-1270s and the other approximately 40 years later.

LA 53148

Three wood cross-section samples were collected from the surface of Cavate 1 by NPS. All the samples are ponderosa pine, but none dated (Table 7.1; Appendix D).

LA 71155

A single wood cross-section sample of ponderosa pine was collected from this rockshelter site by the NPS in 1994. It did not date (Table 7.1; Appendix D).

LA 71090

Three wood fragment samples were collected from this cavate and camp site by the NPS in 1994. Two of the samples are juniper and one is ponderosa pine, but none dated (Table 7.1; Appendix D).

LA 84067

A single wood fragment sample of ponderosa pine was collected from a "bedrock pit" at the site by the NPS in 1994. It did not date (Table 7.1; Appendix D).

LA 71081

A single wood charcoal fragment of ponderosa pine was collected from this small surface structure by the NPS in 1994. It did not date (Table 7.1; Appendix D).

Saltbush Pueblo (LA 4497)

Four piñon pine charcoal samples were collected from the site by D. Snow of Museum of New Mexico (Table 7.1; Appendix D). One sample from the "trash" did not date; a sample from the "general fill" dated 1241vv, a sample from the kiva dated 1194vv, and a sample from the kiva floor dated 1215vv. The three noncutting dates indicate activity in the early to mid-thirteenth century, but are inadequate for gleaning any additional temporal information.

LA 2987

A single charcoal sample of piñon pine was collected from the general surface of this site by the NPS or Museum of New Mexico. It did not date (Table 7.1; Appendix D).

LA 2990

A single charcoal sample of *Populus* spp. (probably cottonwood) was collected from this site by the NPS or Museum of New Mexico. It did not date (Table 7.1; Appendix D).

LA 2994

A single charcoal sample of juniper was collected from this site by the NPS or Museum of New Mexico. It did not date (Table 7.1; Appendix D).

LA 2998

A single charcoal sample of *Populus* spp. (probably cottonwood) was collected at this site by the NPS or Museum of New Mexico. It did not date (Table 7.1; Appendix D).

LA 3852

A single charcoal sample of piñon pine was collected from the general surface of this site by Washington State University. It did not date (Table 7.1; Appendix D).

Cavate M 77 (LA 50972)

A single charcoal sample of piñon pine was collected from the general surface of this site by Washington State University (Carlson and Kohler 1989b). It did not date (Table 7.1; Appendix D).

LTRR NM-I-52

Pueblo del Encierro (LA 70)

Pueblo del Encierro was excavated as part of the Cochiti Dam Project by Lange (Table 7.1; Appendix D) and the samples were submitted to the LTRR in the 1960s (Snow 1976). All of the samples are charcoal fragments and all but two are associated with features. A total of 222 samples was collected, including nine duplicates. The 213 independent samples include 94 Douglas fir, 68 ponderosa pine, 39 piñon, seven juniper, three *Populus*, and two non-coniferous specimens that could not be identified to the species level. The species distribution probably reflects prehistoric selection preferences and may indicate some nonlocal procurement of Douglas fir beams. All of the dates were derived from the Douglas fir, ponderosa, and piñon beams; none of the juniper, cottonwood, or other nonconiferous specimens dated.

The 213 samples yielded 163 dates (77%), including 114 cutting dates. The overall date range is 1292vv to 1787vv and the cutting date range is 1401r inc to 1520r inc. The site was certainly not continuously occupied from the late 1200s through the end of the 1700s, but different areas of the site undoubtedly were used at different times. The date distribution (Figure 7.9) suggests that the site was founded in the early 1400s, possibly in the first decade of the century. Major construction began almost immediately in the 1410s and 1420s. Although there is a slight drop in the number of cutting dates in the 1430s, tree harvesting remained relatively constant from the 1440s through the 1480s. The late 15th and early 16th centuries show little activity, but major timber procurement again marked the 1510s until the summer of 1520. The site was probably disused shortly after 1520, and the few, scattered noncutting dates in the 1600s and 1700s may relate to some use in the late 18th century.

129	2
***	
132	7
****	
134	1568
135	07
136	4788
137	4

138	11888
***	
140	12669
141	123456
142	0112223344455667788888
143	4589
144	1113456679
145	01114558
146	2334677888999
147	469999999
148	00666
149	4
150	78
151	33344555555555555555555555555566666689
152	00000000
***	
169	1
170	2
***	
172	4
***	
174	2
***	
176	6
177	01
178	67
179	0

Figure 7.9. Stem-and-leaf plot of dates from Pueblo del Encierro (underline indicates cutting or near cutting date).

Tree-ring samples were collected from 41 features and one non-feature area. Samples from 17 of the features did not yield any dates, including Features 29, 33, 42, 62, 78, 79, 90, 93, 100, 107, 123, 140, 167, 179, 181, 229, and 280. Several features yielded single noncutting "vv" dates that may or may not be applicable to construction events. Several potentially early, but poorly dated, features are Feature 92 (1341vv), Feature 87 (1345vv), Feature 213 (1346vv), Feature 223 (1327++vv and 1350vv), Feature 29 (1364vv), and Feature 101 (1381vv); these features may indicate occupation during the 14th century, but the tree-ring evidence is equivocal. By the 15th century, several features contained cutting dates or small date clusters that indicate occupation, including Features 200 (1402+vv), 25 (1416v), 136 (1425+r) , 132 (1427r), 169 (1428vv), 130 (1441r), 292 (1446vv), and 2 (1458vv). Three other features contain disparate cutting dates that are not easily interpreted. Feature 69 contains three dates (1411r, 1423r, and 1427r) from the general fill; they may represent occupation in the 1410s and 1420s, but the earlier beams may have been reused as well. Feature 80 contains four dates (1374vv, 1428r, 1439r, and 1469r) from the general fill; it is unlikely the feature was used for 40+ years, but identifying a construction or repair episode is impossible. Finally, Feature 83 yielded five dates (1388vv, 1406+r, 1412r, 1415r, and 1494r) from the floor fill and general fill; the feature may have been used in the 1410s, but the 1494r date is from the floor fill and may date some repair activity, but it is unlikely that the feature was used for more than 80 years.

Four features contain abundant cutting dates and date clusters and illustrate complex wood use behaviors. Feature 152 yielded 19 dates (Figure 7.10), including 13 cutting dates. The most parsimonious explanation for the date distribution is that CDP-164 (1414r) and CDP-154 (1422r) are reused beams, that the feature was constructed in 1445 using one new and several stockpiled timbers, and that the feature was repaired or remodeled in the summer of 1451 using freshly cut and stockpiled beams. Other interpretations are possible, including construction in 1451 with new, stockpiled, and reused beams and construction over a multi-year period in the 1440s.

135	7
***	
138	8
***	
140	6
141	4
142	26
143	48
144	113456
145	00111

Figure 7.10. Stem-and-leaf plot of tree-ring dates from Feature 152 at Pueblo del Encierro (underline indicates cutting or near cutting date).

Feature 186 yielded 18 dates, including 14 cutting dates (Figure 7.11). The most parsimonious explanation for the date distribution is that CDP-190 (1455v) is a reused beam, that the feature was constructed in the summer of 1480 using freshly cut timbers and at least seven beams stockpiled from the previous year, and that it was repaired or remodeled in 1486. Alternatively, the structure may have been built in 1486 with mostly reused beams, but it seems unlikely.

134	8
***	
144	9
145	5
146	3
147	469999999
148	00666

Figure 7.11. Stem-and-leaf plot of tree-ring dates from Feature 186, Pueblo del Encierro.

Feature 128 yielded the abundant dates (n = 31) and many cutting dates (n = 27), yet is the most complex dating situation at the site. The date distribution (Figure 7.12) suggests at least two major construction episodes with several minor repairs as well. The feature may have been constructed as early as 1401, but initial construction in 1424 with reused (1401, 1409, 1413) beams, stockpiled timbers (1420, 1421, 1422, 1423), and freshly cut trees (1424) is considered most likely. Repairs were apparently performed in 1428 and again in 1435. A major rebuilding episode occurred in the 1460s, probably in the fall of 1469; freshly cut, stockpiled, and reused beams from other proveniences were apparently used in the remodeling. Additional repairs were then performed in 1513 and some time in the 1520s. Feature 128 is one of the longest-lived individual structures on the Pajarito Plateau with an occupation of quite possibly more than 100 years. Alternative interpretations of the tree-ring data are possible, such as an extended construction time in the 1460s with mostly reused beams, construction earlier than 1424, or even construction in 1513, although the latter is considered extremely unlikely.

136	8
***	
140	19
141	3
142	012344488
143	5
144	7
145	45
146	23467788899
***	
150	8
151	3
152	0

Figure 7.12. Stem-and-leaf plot of tree-ring dates from Feature 128, Pueblo del Encierro (underline indicates cutting or near cutting date).

Feature 279 was one of the latest construction episodes during the prehistoric occupation of the site. It also yielded the most dates and most cutting dates of any feature on the site (see Table 7.1). Unlike Feature 128, however, the interpretations of Feature 279 are relatively straight-forward. The 1507r cutting date is probably a reused beam. The large number of timbers that date to the summer of 1515 (n = 27) were probably procured and stockpiled for construction in 1516 when and additional six trees were cut. The feature apparently needed minor repairs in the summer of 1518, as evidence by CDP-214. Again, an alternative interpretation of the dates is possible, including a multi-year construction period.

Two other features also date to the early 1500s. Feature 124 contained a single roof beam dated 1515rB inc, and Feature 183 contained a single near cutting date of 1518+r. Both of these features appear to be contemporaneous with Features 128 and 279.

Finally, eight samples from Feature 129 and two samples from the doorway between Features 129/123 date to the late 1780s or 1790s. These are the latest dates from the site and none are cutting dates. Certainly they indicate post-abandonment activities at the site, but their significance remains problematic.

LA 34

A single Douglas fir charcoal fragment was collected from FE 13 of the site by Lange. It did not date (Table 7.1; Appendix D).

LA 272

Six charcoal samples were collected from Feature 1 (CDP-2) and Feature 2 (CDP-3-7) by Lange. Four of the samples are *Populus* spp. (probably cottonwood) and two are ponderosa pine. None of the samples dated (Table 7.1; Appendix D).

LA 3446

Five charcoal samples were collected from Squares 7, 8, 9, 10 or 11, and 13 by Lange. Four of the samples are juniper and one is a ponderosa pine (Table 7.1; Appendix D), but none dated.

LA 6178

A single juniper wood fragment was collected from Feature 21 by Lange. It did not date because it contained too few rings for crossdating (Table 7.1; Appendix D).

Alfred Herrera Site (LA 6455)

The Alfred Herrera Site samples were collected as part of the Cochiti Dam project by Lange (Table 7.1; Appendix D). All of the samples are charcoal collected during the excavations, but some lack detailed provenience information. A total of 137 samples, including 72 duplicates, was collected. The species present include ponderosa (*n* = 27), piñon (*n* = 21), Douglas fir (*n* = 12), juniper (*n* = 2), *Populus* (*n* = 2), and one unidentified specimen. The species distribution may reflect prehistoric selection preferences.

The 65 independent samples yielded 28 dates, including five cutting dates (Figure 7.13). The date range is 1281vv to 1497r inc, but the cutting date range is much shorter (1457v to 1497r inc). Thirteen features were sampled, but none of the samples from Features 1, 14, 23, 28, 33, and 59 yielded dates. Likewise, none of the samples from Feature 68 dated, but one is a duplicate of RG-4734, which dates to 1469rB inc. Feature 10 yielded a single noncutting date of 1318vv as did Feature 17, but it is not the same sample. The only date from Feature 24 is 1342vv. The majority of samples and dates were derived from Feature 52, including from rooffall, floor contact, general fill, and floor fill contexts. The latest date, and only cutting date from the floor fill context, is 1457v; there are no dates from the floor contact, but several samples are part of RG-4734, which dates to 1469rB inc. Feature 52 rooffall includes cutting dates in 1469, 1470, 1496, and 1497; it is probable that the roof was constructed in 1469 to 1470 and repaired almost 30 years later. The latest date from Feature 54 is 1478vv and the latest date from Feature 251 is 1382vv.

In general, the dates and proveniences suggest that the entire site was built in the 1470s, possibly as early as 1457, and remodeled or repaired in the late 1490s; the occupation was probably continuous during that time. The weak cluster of noncutting dates in the 1340s, however, suggests that there may have been an earlier occupation. If the cutting dates are used as a guide, the site occupation was approximately 40 years in duration.

128	1
***	
130	2
131	488
132	0
***	
134	24689
135	7
***	
137	02
138	0124
***	
140	4
141	0
***	
143	9
***	
145	77
146	9
147	08
***	
149	67

Figure 7.13. Stem-and-leaf plot of dates from the Alfred Herrera Site (underline indicates cutting date).

Red Snake Hill Site (LA 6461)

Five charcoals samples, all juniper, were collected from the general fill of Feature 3 at the site by Bussey (1968a; Table 7.1, Appendix D). None of the samples dated and all exhibited erratic ring-growth patterns.

North Bank Site (LA 6462)

The North Bank Site collection was procured as part of the Cochiti Dam Project (Bussey 1968b; Lange 1968a) and contains 258 samples, 37 of which were duplicates (Table 7.1; Appendix D). All of the samples are charcoal fragments and all have at least some provenience information. The species present in the collection include piñon (n = 92), ponderosa (n = 56), juniper (n = 42), *Populus* (cottonwood) (n = 24), Douglas fir (n = 4), two unidentified specimens, and one *Atriplex* spp. (possible saltbush) specimen. The species distribution probably reflects prehistoric selection preferences and local species availability. The paucity of Douglas fir and abundance of both juniper and cottonwood are a result of procurement of low-elevation, local timbers.

The 221 independent samples yielded 98 dates (44%), including 63 cutting or near cutting dates. No dates were derived from Douglas fir, cottonwood, unidentified, or *Atriplex* specimens, and only one juniper sample dated. The low proportion of juniper dates may be related to species growth patterns that create erratic ring series and/or prehistoric selection of small timbers with too few rings for dating.

The overall date range is 1109vv to 1280vv and the cutting date range is 1128r comp to 1280rB inc, approximately a 150-year occupation. The date distribution (Figure 7.14) suggests several episodes of tree harvesting, and probably construction, at the site. The site may have been founded in the late 1120s or 1130 (three cutting dates). There are a few cutting dates in the 1140 to 1174 period that may indicate construction, or they may be reused beams. The first decade of the 13th century saw some construction as evidenced by three 1206 cutting dates and two noncutting dates in 1209. The next significant date cluster occurs in the 1240s and includes cutting dates in 1244, 1246 (*n* = 2), and 1247. The few cutting dates between 1248 and 1277 may indicate construction, but they are probably reused beams. The largest and tightest date cluster contains 47 cutting dates and two noncutting dates between 1277 and 1280; it clearly indicates construction in 1280 with freshly cut and stockpiled beams. The mixture of complete and incomplete terminal rings in 1280 indicates fall procurement. This large terminal date cluster is not followed by any other dates and thus may indicate abandonment of those areas of the site within a decade of 1280 and almost certainly by 1300.

Tree-ring samples were collected from 24 features at the site and 15 features yielded dates. Samples from Features 21, 27, 30, 33, 41, 43, 87, 88, and 109 did not date. Features 37 and 38 are the earliest features, dating to 1130v and 1128r, respectively; Feature 37 also exhibits some activity in 1146. Six samples from Feature 103 dated, including cutting dates in 1140, 1148, and 1174. Feature 85 produced two dates, the latest date and only cutting date is 1165v. These features, 37, 38, 85, and 103 are the only features that indicate a 12th century occupation, although Feature 84 and Feature 12 yielded noncutting dates of 1118vv and 1191vv, respectively.

The remaining features all date to the 13th century. Feature 106 is relatively well dated with three 1206 cutting dates; the terminal rings (two complete, one incomplete) indicate construction in the fall of 1206. Feature 108 is not well dated, but the latest date is 1223+vv from the general fill. Feature 1 yielded only two noncutting dates, the latest of which is 1239vv. It may be associated with Feature 34, which yielded a single cutting date of 1244rB inc, Feature 10 which yielded a single cutting date of 1246r comp, and Feature 20 which yielded three noncutting dates, the latest of which is 1248vv; the 1246 to 1247 cutting dates from Feature 37 may be part of this same building episode. Feature 99 was apparently built in the 1260s, as evidenced by two cutting and one noncutting date. Feature 65 may be contemporaneous, it contains a single noncutting date of 1275vv, or it may relate to the large construction event in Feature 45. Feature 45 is the best-dated feature with 46 cutting and five noncutting dates. The largest cluster is in 1280 with smaller cutting date clusters in 1277 and 1278. The feature was clearly built in 1280 with freshly cut and stockpiled timbers; the terminal rings indicate it was built in the late summer/early fall of 1280.

110	9
111	788
112	4<u>8</u>89
113	<u>00</u>0
114	<u>08</u>
115	22
116	3<u>5</u>8
117	<u>4</u>
118	2
119	1
120	<u>666</u>99
121	5
122	239
123	29
124	1<u>4</u>4<u>667</u>8
125	5
126	<u>1</u>24<u>6</u>79
127	<u>2</u>556<u>778888889</u>9
128	<u>0000000000000000000000000000000000000</u>0

Figure 7.14. Stem-and-leaf plot of dates from the North Bank Site (underline indicates cutting date).

LA 9139

Five charcoal samples, including one duplicate, were collected from Feature 1 of the site by the Office of Contract Archaeology (Table 7.1; Appendix D). Four of the samples are ponderosa and one is piñon. Two of the samples dated, but yielded only noncutting dates of 1675vv and 1767vv, respectively. The duplicate sample from the rooffall of the feature replicates the 1675vv date. The dates suggest some use of the feature in the late 1700s.

LTRR NM-I-56, Bandelier Big Kiva

The Bandelier Big Kiva samples were collected as part of Hewett's excavations and the stabilization of the site by Hendron of the NPS in the 1930s. Initially analyzed by Stallings as part of the Rio Grande chronology, they were transferred to the LTRR in the 1950s. All of the samples are charcoal from the excavations, but some (presumably Hewett's) lack detailed provenience information. A total of 105 samples was submitted, 68 of which are duplicates (Table 7.1; Appendix D). Interestingly, some of the duplicate samples, such as RG-5156 and RG-223, were collected from different proveniences (the west entrance and south fill, respectively); a detailed map of the excavations may indicate the significance (if any) of the duplicates (e.g., multiple uses of the same timber). The species used in the kiva include ponderosa pine (22 independent samples that yielded 8 dates), Douglas fir (14 samples that yielded 7 dates), and one unidentified specimen (that did not date). Other species were probably present, but were not collected.

The 37 independent samples yielded 15 dates, including six cutting or near cutting dates (Table 7.1; Appendix D). The dates range from 1383vv to 1525+vv; the cutting and near cutting dates are slightly more restricted and span 1505+r to 1525r. Eleven of the dates, and all but one of the cutting or near cutting dates, were procured from the "south fill" of the kiva. The Frijoles Canyon (Hewett?) and "Project 1 West Entrance" samples all yielded "vv" dates that do not date construction episodes. The 1505+r date (RG-5165) from the "West Entrance" may indicate construction, but it may also be a reused beam or piece of dead wood. The dates from the "south fill of the kiva" form a relatively tight cluster in the early 1520s. Based on the terminal cluster, it is most likely that the kiva was built in the fall/winter of 1525, with some freshly cut beams (RG-5191) and timbers that had been stockpiled in 1522 (RG-5178), 1523 (RG-5173, 5206), and 1524 (RG-5193). Another possibility, however, is that the structure was built during three to four consecutive winters, much like Kiva I at Long House in Mesa Verde (Street 2001).

LTRR NM-I-61

Alamo Canyon Group

LA 12121

Seventeen piñon pine samples have been collected from the three different rooms on the site, including charcoal samples and wood cross-sections. Fourteen of the samples yielded dates, including seven cutting dates (Table 7.1; Appendix D). Clearly, Room 4 was built during the growing season of 1177 as indicated by five cutting dates with incomplete terminal rings for that year. The 1162r cutting date probably represents a reused beam and the 1180 noncutting date from the fill indicates that the room was occupied for at least three years. Room 3 was probably constructed in 1150 as indicated by the 1150+v cutting date and three 1149 noncutting dates; the 1154 noncutting date suggests the room was used for a least four years. The only date from Room 2, 1148vv, suggests it may be contemporary with Room 3. It is probable that the site was continuously occupied from 1150 until at least 1180, but it is also possible that there are two separate occupations represented in these rooms. The apparently short-lived nature of the occupation (30+ years) may be important for ceramic seriation and other studies.

LA 13659

Two ponderosa pine charcoal fragments were collected from this cavate site by NPS. Neither sample yielded a date (Table 7.1; Appendix D).

LA 12119

A total of 36 charcoal samples were collected from the site by NPS; four of the samples are duplicates, leaving 32 independent samples from the site (Table 7.1; Appendix D). The species represented include piñon pine (*n* = 18), juniper (*n* = 11), ponderosa pine (*n* = 2), and Douglas fir (*n* = 1). The preponderance of piñon pine and paucity of ponderosa is somewhat unusual. Only five of the samples dated (three piñons, one juniper, and one ponderosa), and all yielded noncutting dates. The range of dates (1191+vv to 1419vv), lack of cutting dates or date clustering, and different proveniences documented makes interpretation difficult. It is probable, but rather speculative, that both Kiva 1 and Kiva 2 were occupied in the 15th century or later. Room 14 may date somewhat earlier, but the single noncutting date of 1203vv is scant evidence for such an inference.

LA 12578

A single piñon pine wood fragment was collected from the surface of this site by NPS. It did not date (Table 7.1; Appendix D).

LA 12567

A single oak (probably Gambel oak) charcoal fragment was collected from this site by NPS. It did not date (Table 7.1; Appendix D) and has not been curated for future analysis.

LA 12581

A single juniper charcoal fragment was collected from Room 1 of this site by NPS. It did not date (Table 7.1; Appendix D).

LTRR NM-I-70

Pajarito Group

This group of samples consists of those submitted by J. Hill of the University of California, Los Angeles (UCLA) in the 1970s. Limited provenience information is available for the samples and the interpretations are relatively weak.

Cavate East Mesa

A single cross-section of ponderosa pine was collected from this cavate site by UCLA. It yielded a date of 1628p to 1674vv (Table 7.1; Appendix D). Although this is limited chronological information, it indicates use of the structure in the 17th or 18th centuries.

Site 118 Kiva 1

A single ponderosa wood fragment was collected from this cavate site by UCLA. It yielded a cutting date of 1792 to 1830r (Table 7.1; Appendix D). Without detailed provenience information or additional knowledge of the site configuration, interpretation of the date is not possible.

Cavate Site 127

Two ponderosa charcoal fragments were collected from this cavate site by UCLA. Neither sample yielded a date (Table 7.1; Appendix D).

Cavate Site 128

A single cross-section of piñon pine was collected from this cavate site by UCLA. It did not date (Table 7.1; Appendix D).

Site 252

Twelve samples, including three charcoal fragments, four wood fragments, and five wood cross-sections were collected from the site by UCLA. The species represented include five juniper, three *Populus* spp., two fir, and two ponderosa pines (Table 7.1; Appendix D). Only one of the ponderosa samples yielded a noncutting date (1797p to 1844++vv).

LTRR NM-I-71, La Mesa Fire Site

Three ponderosa charcoal fragments were collected from this site by the NPS. Two samples, both "north of Room 1," yielded noncutting dates of 1401+vv and 1412+vv, respectively (Table 7.1; Appendix D). This small sample size suggests some use of the site in the early 15th century.

LTRR NM-I-74, LA 3824

Seven charcoal samples, including four Douglas fir and three ponderosa specimens, were collected from this site by David Snow of the Museum of New Mexico. None of the samples yielded a date (Table 7.1; Appendix D).

LTRR NM-I-77

Los Alamos Cabins

The Los Alamos Cabins samples were collected by LANL archaeologists in 1981, 1990, and 2002. There was apparently some confusion of site names and numbers for the Romero Homestead and two separate LTRR designations were assigned to the site (NM-I-77 and NM-I-79). The entire site is discussed here under the designation NM-I-79.

Gomez Homestead (LA 86643)

Eight juniper samples were collected from the site by LANL archaeologists (Table 7.1; Appendix D). Seven samples are cross-sections and one is a beam end that exhibits metal-ax cut marks. The samples were apparently collected from the same structure, with the exception of LAC-31, which was a fence post. None of the samples dated.

Anchor Ranch (LA 16808)

Ten independent samples were collected from the site by LANL archaeologists (Table 7.1; Appendix D). All of the samples are ponderosa wood cross-sections. Five samples dated and four are cutting dates. The Ice House was undoubtedly built in the fall/winter of 1933 as indicated by three 1933 cutting dates with complete terminal rings. Sample LAC-57, which dates 1896++LGB, is probably a piece of dead wood; sample LAC-53, which dates 1896++LGB, is a duplicate of LAC-34 from the Homestead Bridge and may have been reused in that structure as a piece of dead wood. The only date from Structure 1, 1929GB comp, indicates tree felling in the fall/winter of 1929. Additional archaeological and tree-ring data are necessary to determine if it represents the building of Structure 1, however.

Vigil y Montoya Homestead (LA 70028)

A total of 20 samples, including one duplicate, was collected as wood cross-sections or beam ends from the site by LANL archaeologists (Table 7.1; Appendix D). The 19 independent samples include 16 ponderosas, one juniper, one piñon, and one Douglas fir specimen. Only five of the samples (four ponderosas and one piñon) yielded dates, all of which are noncutting dates. The latest date from the site, 1963++G, may indicate activity at the site in the 1960s, but its provenience "near the loaf pan" and "++" designation suggest it is a piece of dead wood that may not date the occupation. The 1911++G date from Feature 4 may indicate construction in the 1910s, but again a single, noncutting (possibly dead wood) date is not strong evidence for inferring an occupation of the site. Likewise, the earlier noncutting dates (1720vv, 1830vv, 1855+vv) contribute little to the site interpretation. More samples are needed to delineate the parameters of the Vigil y Montoya site history.

Homestead Bridge (LA 89826)

Three ponderosa wood cross-sections from the Homestead Bridge were collected by LANL archaeologists (Table 7.1; Appendix D). Two of the samples did not date because they contained too few rings (LAC-32) or exhibited erratic growth patterns (LAC-33). Sample LAC-34 yielded a near cutting date of 1783p to 1899+rLGB. Interestingly, the sample is a duplicate of LAC-53, a door lintel in the Ice House at Anchor Ranch (see above). Because the Ice House dates to 1933, there are two alternative interpretations of the bridge. First, it may have been built in 1899 (or 1900) and part of it used to build the Ice House 30 years later. Alternatively, the date may not apply to the bridge, but to some other structure; in which case the bridge and Ice House may have been built in 1933 with a piece of reused or dead wood.

Homestead Fence (LA 89770)

Nine ponderosa samples were collected from the boundary fence by LANL archaeologists. Eight of the samples are beam ends and one is a cross-section. Three samples did not date because they contained too few rings or lacked ring-width variability (Table 7.1; Appendix D). The six dated samples all yielded noncutting dates because exterior rings have eroded from the samples. The noncutting dates do not form any sort of terminal cluster, so the most parsimonious explanation is that the fence was constructed some time after 1890.

Montoya Homestead (LA 21334)

A total of eight samples, including one duplicate, was collected from the site by LANL archaeologists (Table 7.1; Appendix D). Six of the independent samples are ponderosas and one is piñon; all were collected as wood cross-sections or beam ends. Five samples dated, but none yielded cutting dates. The latest sample (LAC-38) dates 1915++vv and may date the occupation to the 1910s or later. The samples collected from the Canyon Fence provide little data with which to interpret construction other than that the homestead was built some time after 1915.

Serna Homestead (LA 85407)

Four samples, all ponderosa pine, were collected from the site by LANL archaeologists (Table 7.1; Appendix D). Three of the samples are beam ends (one charred) and the other is a wood cross-section. Two samples were collected from the wood pile, one from a structure, and one from a fence. All samples dated, but all yielded noncutting dates that resulted from erosion of exterior rings; indeed, no sapwood rings are present on any of the samples. The noncutting dates indicate construction at the site some time after 1826 and the lack of sapwood rings suggests that the trees were cut some time in the late 1800s or early 1900s.

LTRR NM-I-79, Romero Cabin and Homestead (LA 16806 and 16808B)

The Romero Homestead is the best-dated site on the Pajarito Plateau. A total of 105 samples, including two duplicates, was collected from the site by LANL archaeologists over the past 20 years (Table 7.1; Appendix D). The majority of the samples are wood cross-sections, although a few half-inch cores and charcoal fragments were collected as well. Ninety-nine of the samples are ponderosa pine, three are Douglas fir, and one (a fence post) is juniper. The species distribution clearly reflects (a) preferences by the site occupants and (b) local species availability.

A remarkable 96 percent (n = 94) of the samples dated and 65 samples yielded cutting dates. The overall date range is 1853vv to 1966rB comp and the cutting date range is 1894r inc to 1966rB comp. The date ranges, however, are much less important than the combination of dates and provenience data. Five different proveniences have been sampled: Feature 4, a fence post east of the corral, the corral, the hog pen, and the cabin. The only sample from Feature 4 yielded a noncutting date of 1906vv and the fence post east of the corral yielded a noncutting date of 1894vv. Neither date accurately dates activities at the site.

There are eight dated samples from the corral (Figure 7.15). Although only two are cutting dates, the strong terminal cluster indicates that the structure was built in 1908. Incomplete terminal rings on the two 1908 cutting dates indicate that the corral was built during the ponderosa pine growing season (summer) of 1908.

185	3
***	
188	34
189	88
190	6688888

Figure 7.15. Stem-and-leaf plot of dates from the corral at the Romero Homestead (underline indicates cutting or near cutting date).

There are 31 samples from the hog pen, 27 of which dated. The total includes 23 cutting dates (Figure 7.16). The large cluster of cutting dates in 1912 (*n* = 18) leaves little doubt that the hog pen was built in that year. The mixture of complete (*n* = 3) and incomplete (*n* = 15) terminal rings indicates that the structure was built in the late summer/early fall of 1912 when some trees had ceased growth for the year but others had not. The earlier cutting dates in 1894, 1895, 1906, 1908, and 1910 indicate tree harvesting in the area before construction of the hog pen, but do not date the structure itself. The two later noncutting dates (1922++vv, 1933vv) are evidence of structure repair, probably in conjunction with the construction of the cabin (see below).

189	458
190	678
191	00222222222222222222
192	2
193	1

Figure 7.16. Stem-and-leaf plot of dates from the hog pen at the Romero Homestead (underline indicates cutting or near cutting date).

Sixty-one samples have been collected from the cabin, 56 of which dated; fifty-one of the samples yielded cutting or near cutting dates (Figure 7.17). The dates indicate a major construction episode followed by four repair or remodeling events. The single 1913G cutting date is undoubtedly a beam reused from another structure. The cabin was built early in the ponderosa growing season (spring) of 1934. The two 1933 cutting dates exhibit complete terminal rings indicating that they were cut after the 1933 growing season but before the initiation of growth in 1934. All of the 1934 dates, however, exhibit incomplete terminal rings, indicating growing season procurement. The 1935 to 1938 cutting dates (*n* = 4) suggest a repair episode probably in the summer of 1938; additional provenience and attribute information is necessary to determine if there was one or more repair episodes. The cabin was apparently abandoned for a period of more than 20 years before a reoccupation occurred in the 1960s. Minor repairs were conducted in 1960 to 1961; because all the 1960 and 1961 dates are near cutting "+" dates, it is possible, indeed probable, that these beams were procured during the growing season of 1961. The nine 1966 cutting dates all exhibit complete terminal rings and indicate a major remodeling episode in the fall/winter of 1966.

Interestingly, the three well-dated structures at the Romero Homestead date to different years. Although there are several cutting dates that indicate tree felling in the 1890s and early 1900s, construction occurred only in 1908, 1912, and 1934—and the cabin was the last structure built. Where people were living before construction of the cabin should be investigated using archaeological and documentary sources. Repairs to the cabin in 1938 suggest the occupation lasted more than five years, but the precise duration cannot be determined from the tree-ring data. The 1960s repair and remodeling episodes indicate reuse of the cabin, but not necessarily reuse of the site as an economic entity. Additional tree-ring data from other features may contribute to understanding the internal site dynamics of the Romero Homestead, but more detailed archaeological and historical data are needed as well.

189	2
190	88
191	3
192	6
193	2<u>334444444444444444444444444444444445778</u>
***	
196	<u>00011666666666</u>

Figure 7.17. Stem-and-leaf plot of dates from the cabin at the Romero Homestead (underline indicates cutting or near cutting date).

LTRR NM-I-83, Archaic Site (LA 51912)

Eight charcoal samples, six juniper and two piñon, were collected from the site by Steve Lent of MNM in 1988. Features 1, 12, 14, and 18 were sampled, but none of the specimens dated.

LTRR NM-I-84, Kuapa (LA 3444)

Two ponderosa pine charcoal samples were collected from the site by Haas. Neither sample yielded a date (Table 7.1; Appendix D).

LTRR NM-I-93

Shohakka Pueblo (LA 3840)

Two ponderosa charcoal samples were collected from Feature 3, Area 1 of the site by Ruscavage-Barz of NPS. One sample yielded a noncutting date of 1387 to 1441vv and the other sample did not date (Table 7.1; Appendix D).

LA 118345

Two ponderosa pine charcoal samples were collected from FE 1 Area 1 of the site by Ruscavage-Barz of NPS. Neither sample yielded a date (Table 7.1; Appendix D).

A SUMMARY OF DENDROARCHAEOLOGICAL DATA FROM THE PAJARITO PLATEAU

Tree-ring samples have been collected from archaeological sites on the Pajarito Plateau for almost 80 years and the results are presented below. Before they are discussed, however, a couple of caveats must be offered along with the interpretations. As mentioned above, the two most important factors in any dendroarchaeological date distribution are (a) the behaviors of past site occupants and (b) the behaviors of archaeologists and dendrochronologists (Dean 1996a, 1996b; Towner 2000). It is clear that the latter has had a profound impact on the structure of the Pajarito Plateau dendroarchaeological database.

Certainly the site occupants' choices of different tree species for construction and fuel have helped structure the distribution. We need only examine the species differences between the Romero Homestead, where ponderosa pine was used almost exclusively and the North Bank Site, where there is a mixture of piñon, juniper, ponderosa, Douglas fir, and even cottonwood, to see that the site occupants influenced the date distribution. It is abundantly clear, however, that, particularly for the large prehistoric pueblos that were sampled before the Cochiti Dam Project, the species-specific collection strategies and minimal recording efforts of the archaeologists and dendrochronologists have structured the data far more than the site occupants' behaviors. Therefore, the summaries presented below should be viewed as preliminary and subject to testing with archaeological, documentary, and other data.

A total of 1528 samples have been collected from Pajarito Plateau archaeological sites, including 238 duplicates (Table 7.1; Appendix D). The 1290 independent samples include 678 ponderosa, 253 piñon, 197 Douglas fir, 108 juniper, 40 cottonwood, and many fewer oak ($n = 2$), fir ($n = 2$), white fir ($n = 2$), undifferentiated non-coniferous species ($n = 2$), unidentified species ($n = 5$), and a single *Atriplex* spp. specimen. Only the Douglas fir, piñon, ponderosa, juniper, and white fir yielded dates. The Douglas fir had the highest ratio of dates/samples (68.9%), followed by the piñon (65.4%), ponderosa (59.7%), white fir (50%, but $n = 2$), and juniper (1.8%). Most of the lack of dating in the pines and Douglas fir is probably a result of samples with too few rings for crossdating. The extremely low proportion of juniper dates, however, is probably a result of small samples with too few rings and erratic growth patterns. As discussed below, however, a more carefully designed research and sampling strategy should enable us to delineate the juniper growth patterns and date many more samples. In many other areas of the Southwest, juniper dates well and in some cases the proportion of juniper dates exceeds that of ponderosa (cf. Towner 1997).

Figure 7.18 presents all the dates, cutting and noncutting, derived from Pajarito Plateau archaeological samples. The distribution of cutting and near cutting dates (see below) certainly can be used to infer tree-harvesting activities. The overall date distribution, however, provides additional information concerning the use of the area.

106 0
***
108 155

109	57
110	69
111	788
112	44889
113	000
114	0889999
115	022234
116	22345588
117	477777
118	02239
119	01111347
120	3445666799
121	558
122	2239
123	29
124	11446678
125	05
126	124567789
127	01225555677888888899
128	000000000000000000000000000000011
129	12
130	1222233
131	46788
132	077
***	
134	24566889
135	077
136	467889
137	024
138	01112334556788889
139	4568
140	0111246678899
141	001122223344555666999
142	011111112222222223333444556666666777777778888 9
143	11124555677899999
144	0111112222334556667777777 99
145	0111111111122234444557777888
146	0223346666777888 99999
147	004467899999999
148	006668
149	12244446667888
150	2445789
151	333444555555555555555555555555555556666666788889
152	000000001111123345556666689
153	14679
154	03346778

155	49
156	2
157	22445788
158	111
159	9
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161	6
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164	2
165	12479
166	16
167	45
168	0001233344555889
169	01117
170	2
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172	04
173	7
174	256
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176	67
177	017
178	677
179	012
***	
181	59
182	26
183	0012347
184	048
185	35
186	7
187	1
188	34
189	04568889
190	666788888
191	0012222222222222222222235
192	29
193	13334444444444444444444444444445778
***	
196	000113666666666

Figure 7.18. Stem-and-leaf plot of all Pajarito Plateau tree-ring dates (underline indicates cutting or near cutting date).

Although there are a few dates in the AD 1000s, the first dendroarchaeological evidence of pueblo construction is in the early to mid-1100s. A small "bulge" in the distribution between approximately 1130 and 1210 supports this inference. A large peak in the 1260 to 1280 period indicates significant construction in the area; whether this peak is related to the immigration of people into the area (cf. Ahlstrom et al. 1995), or is an artifact of sampling bias, is an archaeological question.

The low number of dates in the 1281 to 1380 period (*n* = 37, or one date every three years) indicates little tree harvesting activity. The tree-ring data certainly do not support the concept of a large immigration of people onto the Pajarito Plateau immediately following the depopulation of the Four Corners area (cf. Ahlstrom et al. 1995).

The tree-ring data indicate that the major occupation of pueblos on the Pajarito Plateau began in the late 1300s and continued at least until the 1540s. The majority of dates fall between the late 1300s and early 1540s and suggest major construction and expansion of pueblos. The slight drop in the number of dates between ca. 1480 and 1510 may indicate a slowing of site expansion, but is not an indication of depopulation or abandonment of the area.

With the exception of a small peak in the 1570s, the period from 1545 to 1680 shows very few tree harvesting episodes. The paucity of dates in the early part of the period, perhaps 1545 to 1610, may be a result of epidemic disease inhibiting new construction (Dobyns 1983; Ramenofsky 1987; Reff 1991); the low level of activity during the latter era—speculatively 1610 to 1680—may be a result of the Spaniards' demands for tribute and labor from the pueblos (Kessell 1979; Scholes 1937).

The sharp peak in the 1680 to 1690 period is probably related to the Pueblo Revolt of 1680 and Spaniards' reconquest the following decade. The low number of dates in the 1700s and early 1800s indicates a cessation of construction and probable depopulation of many sites in the area.

The next peak in the dendroarchaeological data relates to the Hispanic expansion onto the Pajarito Plateau in the 1890s. Interestingly, after significant activities ca. 1890 to 1913, there is apparently a 20-year gap in the data until the early 1930s. Similarly, more than 20 years passed before additional dates indicate activities in the early to mid-1960s. The tree-ring data for the Hispanic occupation indicate that individual families, not larger corporate groups, exploited the area during the 20th century.

The distribution of cutting dates from the Pajarito Plateau (Figure 7.19) shows similar, but more restricted, trends. The earliest cutting date is 1128 and the tree-ring data cannot be used to infer an earlier occupation of the area. Minor levels of tree cutting in the early to mid-1100s suggest that the area was initially settled at that time. There is no substantial increase until the 1170s. The 1170s tree-cutting episodes were followed by almost 30 years of no activity; likewise, the three trees cut in 1206 were followed by an almost 40-year gap in the distribution. Thus, with the possible exception of the 1170s and 1206, the dendroarchaeological evidence suggests small, discontinuous use of the Pajarito Plateau from the early 1100s until the 1270s. The distribution shows a major expansion of tree felling activities in the late 1270s and 1280, but it should be remembered that those cutting dates were derived from a single feature at the North Bank Site. After 1280, there are only eight cutting dates until the turn of the 15th century. This extremely low number of tree-harvesting events—an average of one every 15 years—indicates that there was not a major influx of people onto the Pajarito Plateau during the 1300s.

112 8
113 00
114 08
115 0
116 25
117 477777
***
120 666
***
124 46667
125 0
126 16
127 2778888889
128 0000000000000000000000000000000
***
130 2233
131 67
***
136 9
***
138 6
***
140 169
141 123445569
142 011122222664445578
143 159
144 1112234577779
145 01111111112445578
146 02346667778889999
147 069999999
148 00666
149 44678
150 579
151 35555555555555555555555555555666668889
152 000000012334569
153 16
154 334
155 9
156 2
157 4457
158 1
***
168 49

169	01
183	0
***	
186	7
***	
189	459
190	6888
191	02222222222222222223
192	9
193	33344444444444444444444444444445778
***	
196	00011666666666

Figure 7.19. Stem-and-leaf plot of all Pajarito Plateau cutting and near cutting dates.

The major prehistoric occupation of the area was clearly during the 1400s and early 1500s. Beginning in the first decade of the 15th century, tree cutting reached substantial levels in every decade of the century, except the 1430s. The lower level of activity in the 1430s may be a result of sampling bias, a pause in site founding or growth, or some other factor; it is an archaeological issue that deserves further scrutiny. The end of the 1400s witnessed a slow decline in tree harvesting that may be related to out-migration, a lack of site expansion, or both. The large "bulge" in the distribution in the 1510s and 1520s indicate significant tree harvesting in the early 16th century. This bulge, unlike the 1280s one, includes a number of large sites, including Puyé, Tsirege, Tyuonyi, Pueblo del Encierro, and the Bandelier Big Kiva.

The low number of dates from 1530 to 1870 (*n* = 18, or 1 every 14 years), indicates limited occupation and/or use of the area. There may have been a minor resurgence in the 1570s and reuse of the area in the 1680s in response to the Pueblo Revolt, but in general the area appears to have been little used until the Hispanic occupation of the 20th century.

The Hispanic occupation was fundamentally different, however. These single-family groups selected different tree species, mostly ponderosa pine, and constructed different types of structures to accomplish different economic goals (e.g., the hog pen). The 20-year gap between the different structures at the Romero Homestead (and some of the other sites) should be investigated with documentary and oral history sources. Perhaps the most interesting aspect of the Hispanic tree-ring data are the cutting date clusters in the 1960s, after the area became restricted due to LANL priorities. How, who, and why the Romero Homestead was remodeled are interesting questions.

DENDROCLIMATOLOGY AND PAST ENVIRONMENTAL VARIABILITY IN THE PAJARITO PLATEAU AREA

Dendroclimatology is the use of tree-ring data to retrodict past climate patterns. The subfield has a long history within dendrochronology, but has grown exponentially in the past few decades. In part because of Douglass' interest in sunspot activity, tree-rings and climate have been linked since the beginning of dendrochronology. Indeed, one of the obstacles to "bridging the gap" was the severe drought of the late 1200s on the Colorado Plateau. Douglass (1935) was the first scientist to suggest a connection between the "Great Drought" and the Anasazi abandonment of the Four Corners area, a question that is still debated in southwestern archaeology. Schulman (1956) was actually the first dendrochronologist to develop a climate reconstruction, but it was not until Fritts' (1976, 1991) efforts that dendroclimatology became a quantitative endeavor. It was not until the 1970s, however, that dendroclimatology was used in the northern Rio Grande region.

A dendroclimatic reconstruction involves developing a mathematical model of the relationship between the environment and the cambial growth of trees (LaMarche 1974; Schulman 1954, 1956). Trees are natural archives of information about past environments, and because many are older than the oldest historical documents, they can be used to illuminate aspects of prehistoric climate (Dean 1988; Swetnam and Betancourt 1998). Such archives, however, contain information on a number of different aspects of the environment, and it is necessary to isolate the variables one wishes to study. Specific field collection, laboratory analysis, and statistical procedures are designed to eliminate the "noise" in the tree-ring series and highlight the environmental "signal of interest" (Fritts 1991; Salzer 2000a). In some instances, the signal of interest is long-term trends in precipitation, in others it is long-term temperature variability, and in still others it is the short-term spatial differences and identification of extreme events, such as floods or very dry years in specific areas (Graybill 1989). For detailed discussions of the methods and techniques of dendroclimatology, see Fritts (1976, 1991).

Dendroclimatic reconstructions can provide annual estimates of various climatic variables and are the most precise method for doing so. Dendroclimatology, however, is not without its limitations. First, the technique can only be used for those time periods encompassed by the tree-ring samples; in the Southwest, the time frame is limited to the past two and one-half millennia. Climate variation before about 2600 years ago must be examined using other methods. Second, dendroclimatic reconstructions tend to underestimate the extreme values of particular years. Tree rings tend to underestimate the magnitude of high-precipitation (wet) years because in those years water ceases to become the most limiting factor in cambial growth (Fritts 1991). In other words, trees have an adequate supply of water, but some other factor (e.g., temperature, nutrient supply, genetics) prevents uncontrolled cell division and cambial growth (Fritts 1976). In extremely dry years, something of the opposite problem occurs in the Southwest. If a tree does not receive adequate moisture to initiate growth, the result is a locally absent or "missing" ring. The tree, in effect, has recorded "0" moisture for that year even if some precipitation may have fallen. Another potential problem is the 'short-segment' curse (Cook et al. 1995; Sheppard et al. 1997). In some instances, it appears that trees have adapted their growth patterns to "short-term" climatic norms, that is, conditions prevalent during their lifetimes. Thus, it is best to collect extremely long-lived trees (Grissino-Mayer 1996; Salzer 2000a), but that strategy is not always possible. In many cases, including the northern Rio Grande region, archaeological chronologies have been combined with live-tree chronologies to extend the dendroclimatic record into the first millennium AD (Rose et al. 1981). Despite these caveats, tree-ring based reconstructions of climate are the most accurate and precise methods available for examining the past climate variability of the Pajarito Plateau during the past two millennia.

Reconstructions of Precipitation in the Northern Rio Grande

The first dendroclimatic reconstruction in the Southwest was developed by Dean and Robinson in 1977. As a dendroclimatic reconstruction for the Colorado Plateau, this early work is not a reconstruction of annual temperature or precipitation. It is a reconstruction of decadal departures from mean ring-widths for 25 specific tree-ring stations, including the Jemez Mountain chronology. The modern and archaeological tree-ring data used span the period AD 623 to 1978, and have been used predominantly to reconstruct relative variability in annual ring-width on a decadal scale (Appendix E). No climate data were used in this qualitative reconstruction. The reconstruction was certainly adequate for its time and purpose. The qualitative nature of the reconstruction was based on the relative change in decadal ring-width averages; thus, it indicated that tree-growth at the Jemez Mountain locality in the AD 960s, for example, was 1.3 standard deviations greater (Figure 7.20) than the mean and that growth in the AD 1420s was 1.2 standard deviations below the mean at the same site (Figure 7.21).

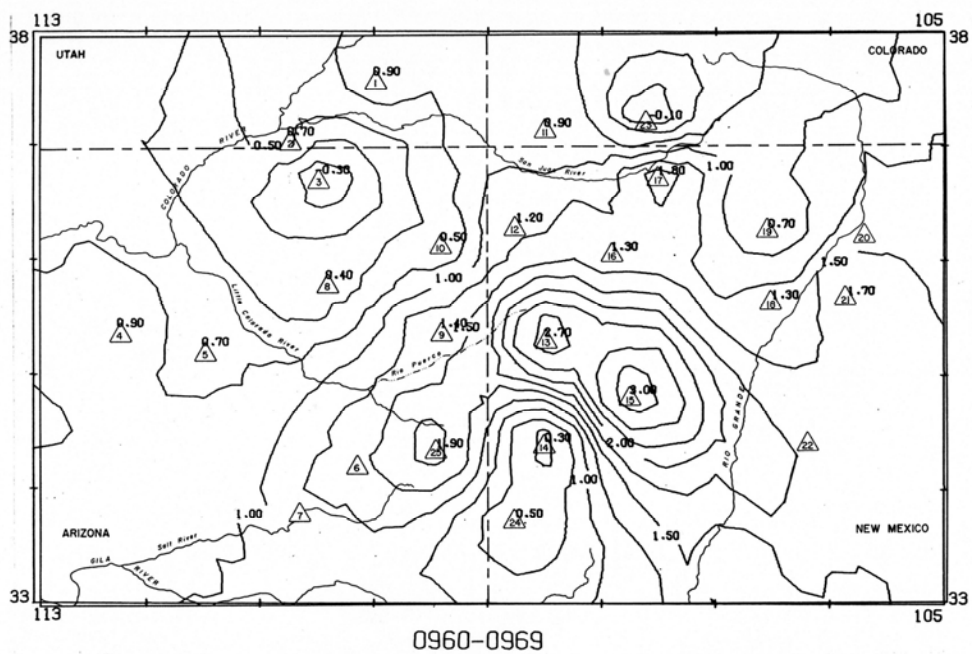

Figure 7.20. Isopleth of growth anomalies in the 960s (from Dean and Robinson 1977).

It did not, however, estimate the environmental factors responsible for the growth departures. Certainly, precipitation is major component of growth in southwestern conifers, but it is by no means the only factor in tree growth (Fritts 1991). The decadal summaries, based on Christian calendar decades, undoubtedly smoothed some between-decade variation and minimized high-frequency annual values. Thus, Dean and Robinson's (1977) research illuminated broad temporal and spatial patterns of ring-width change, but provided no quantitative data concerning annual precipitations or temperature responsible for those changes.

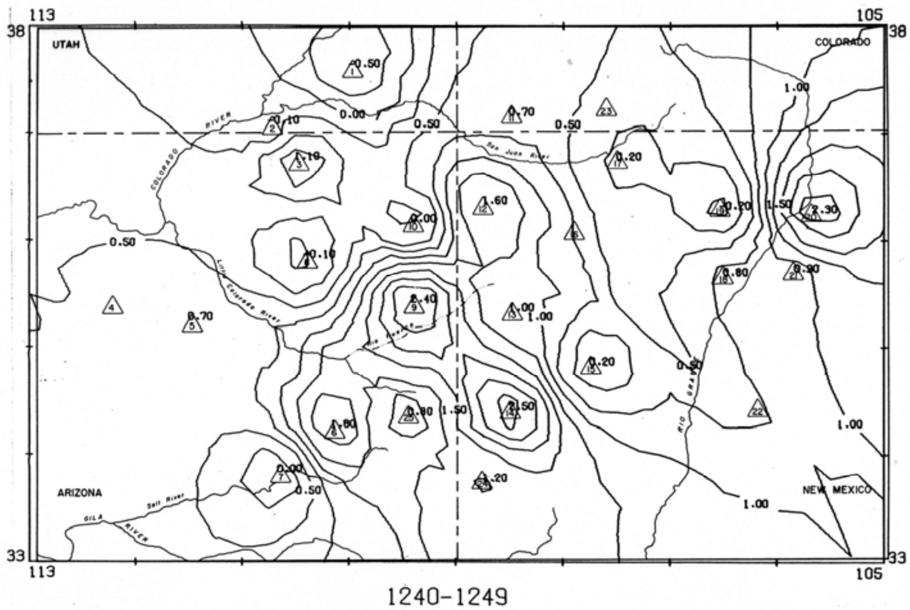

Figure 7.21. Isopleth of growth anomalies in the 1420s (from Dean and Robinson 1977).

Shortly thereafter, Rose et al. (1981) produced a quantitative reconstruction in the northern Rio Grande that extended back to AD 985. Rose and his colleagues used live piñon samples from Glorieta Mesa and archaeological samples from Arroyo Hondo and other sites to reconstruct both annual and spring (March-June) precipitation in the area. Because of the uncertainty as to whether the living trees and archaeological specimens reflected the same climatic variables (e.g., were derived from the same population), Rose et al. (1981) conducted extensive statistical analyses to demonstrate the coherence of the database.

The resulting reconstructions (Appendices F and G) indicate important aspects of precipitation in the area as well as illuminate trends over long time scales. The Arroyo Hondo analysis indicates that the mean annual precipitation for the area is 13.337 inches and the standard deviation is 2.16; the spring mean is 4.21 and spring standard deviation is 1.81. Probably most importantly, their analysis of both the tree-ring and modern climate data indicates that spring precipitation is more variable than annual precipitation. In short, the late-summer (monsoonal) and early-winter precipitation is somewhat consistent—and therefore predictable over the long term—but spring precipitation varies from year to year, decade to decade, and probably century to century. Thus, spring precipitation typically accounts for approximately one-third of the annual rainfall. As they state, "spring is the period of seed germination of traditional Pueblo crops.... And if late summer rainfall is stable as suggested, germination may have been the controlling factor in successful farming..."(Rose et al. 1981:106).

The period from AD 990 to 1430 was characterized by high-amplitude and high-frequency changes in both spring and annual precipitation. Such a trend may have facilitated adaptational strategies such as storage, trade, and "alliance formation" as mechanisms to mitigate the effects of rapid and severe fluctuations in rainfall. The period from AD 1430 to 1735 was somewhat the opposite with low frequency, low amplitude fluctuations; and the period from AD 1735 to 1970 exhibited low frequency changes of somewhat moderate amplitude.

On a more detailed level, the 1295 to 1335 period was consistently above average and 1335 to 1400 was variable with high amplitude in 1335 and 1370 but low amplitude in 1365 and 1380. Consistently high precipitation characterized the 1400 to 1415 years, but there was a very low point in 1420. The early 1500s were consistently high, with a low in 1520, and a return to high precipitation until about 1560. The "mega drought" of the late 1500s was particularly severe. Low precipitation characterized the early Hispanic period, 1875 to 1900, but consistently high precipitation persisted from about 1900 to 1950. The 1950s drought was severe in the northern Rio Grande, but not as severe as in the south.

Although the Dean and Robinson (1977) qualitative reconstruction included a spatial component (see above), it was not until the 1990s that an extensive, quantitative precipitation reconstruction of the spatial and temporal variability within the Southwest was developed. Dean and Funkhouser (1995) used 27 tree-ring chronologies spread from the Grand Canyon to the Pecos River and central Utah to the Gila River to characterize precipitation over the past 1400+ years. They identified two spatially discrete principal components, predominantly to the north and west and the other to the south and east (Figure 7.22). This configuration resembles the modern precipitation regime whereby the north and west is characterized by bimodal distribution with both winter and summer precipitation, and the southeast area exhibits a unimodal, summer-dominant precipitation pattern. The same pattern characterizes much of the prehistoric period, except the 1250 to 1450 period when the northwest area experienced "a totally aberrant" pattern. "The only stable characteristic of this period is the persistence of the southeastern component" (Dean and Funkhouser 1995:94), which includes the Pajarito Plateau. The relationship of this aberrant climatic pattern on the Puebloan peoples of the Colorado Plateau and Rio Grande area has not yet been delineated.

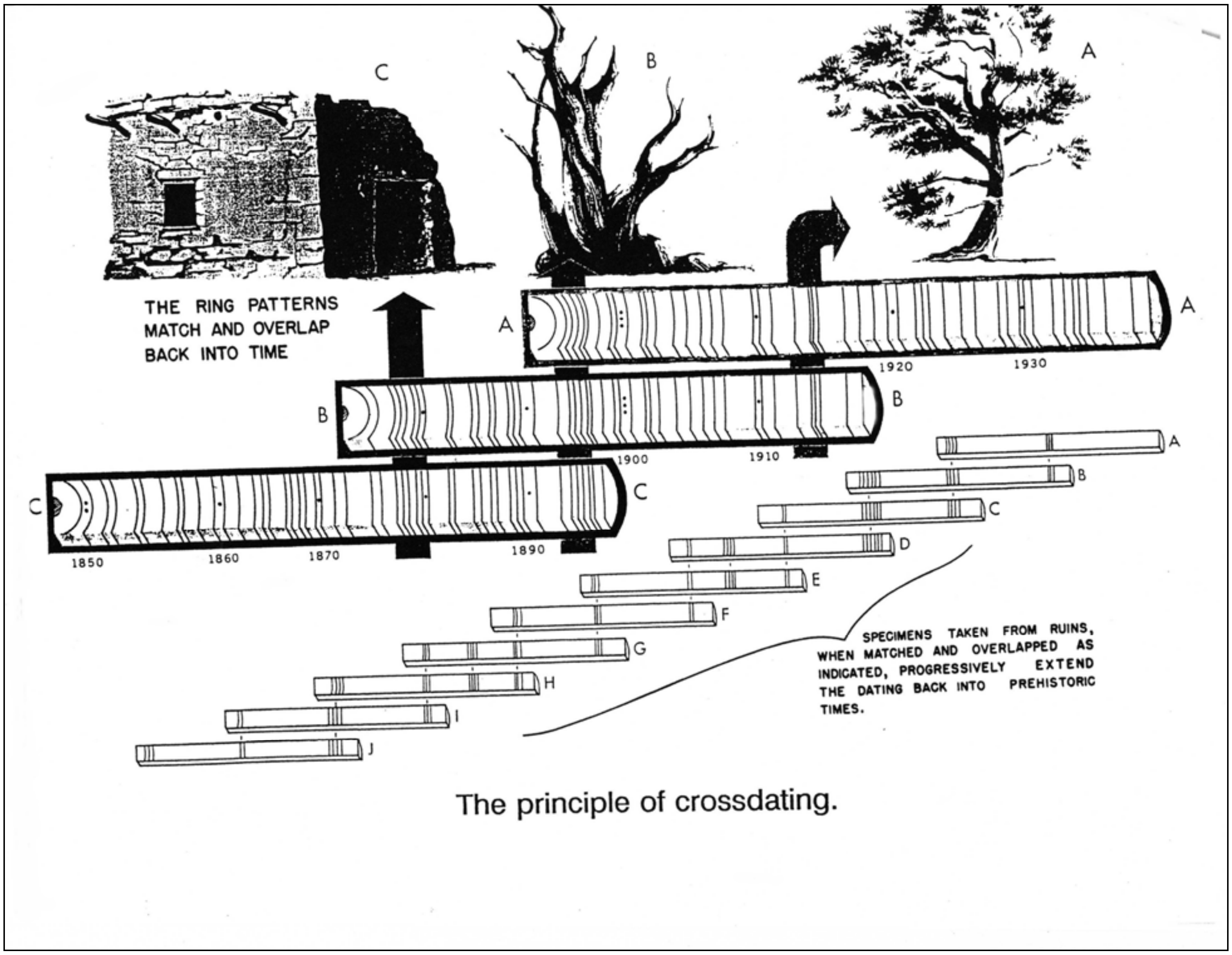

Figure 7.22. Map showing principal components of southwestern precipitation (from Dean and Funkhouser 1995).

Reconstructions of Temperature in the Southwest

Salzer (2000a) had developed the only tree-ring based, quantified temperature reconstruction currently available in the Southwest. Using high-altitude bristlecone pine trees from the SFP in northern Arizona, he retrodicted monthly mean-maximum annual temperature from 663 BC to AD 1997; only the AD 660 to 1997 period is used herein. Details of the reconstruction methods and results can be found in Salzer (2000a) and subsequent articles (Salzer 2000b).

A few comments about Salzer's reconstruction are necessary, however. As mentioned above, relative temperature is more or less uniform across the Colorado Plateau, although extremely local micro-environments may be exceptions to the trends. The Rio Grande and other areas east of the Continental Divide undoubtedly have different temperature influences, so the Colorado Plateau temperature record may only weakly reflect conditions in the northern Rio Grande. Temperature also varies with elevation. The SFP reconstructed temperature values represent temperatures at 2240 m above sea level. Using modern temperature data from several different climate stations and published regression equations, Salzer (2000a) suggests an adjustment of 2 degrees centigrade per 305 m change in elevation. Finally, mean-maximum temperature is an indicator of daily high temperatures. Salzer's (2000a) analysis indicates that the highest correlation of temperature with tree growth is during January to December of the year before the growth year (Year t-1). Thus, a lag of t-1 was used in his reconstruction.

Temperature may be a very important variable to reconstruct in terms of understanding the adaptation of agriculturalists to the Pajarito Plateau. Particularly, if a seasonal (spring) temperature signal can be obtained, we may be able to elucidate more clearly the maize growing season in specific years and over longer time spans.

RECOMMENDATIONS AND CONCLUSIONS

Dendroarchaeology

Dendroarchaeology has made significant contributions to the understanding of past human behavior, occupation, and adaptation to the Pajarito Plateau environment. The dendroarchaeological resources can continue to contribute important information concerning past human/environment interaction in the area if various types of data collection and research are targeted toward specific goals. The information contained in dendroarchaeological samples is a non-renewable resource that is at risk from natural threats, such as fire and erosion of exterior rings, and cultural impacts, such as vandalism and illegal collecting. The following recommendations provide a strategy for more fully exploiting the dendroarchaeological resources of the Pajarito Plateau.

First, all available tree-ring samples from previously excavated and unexcavated contexts should be submitted for analysis. Samples may exist in archaeological collections curated at various museums around the country, and analyzing the samples may yield new information without any additional fieldwork or impact to the resources. Such a strategy was recently used by the field Museum of Natural History in reassessing their Paul S. Martin Collection, and the reanalysis resulted in the dating of previously undated sites and a substantial increase in the number of data and other information from the samples. Many different institutions and individuals have been involved in archaeological excavations on the Pajarito Plateau over the past 100+ years, and it is unlikely that all of the wood or charcoal specimens collected have been submitted for analysis. Analyzing these "old" samples, therefore, may have tremendous benefits.

Second, all newly collected samples should be submitted for analysis. Whether through research projects or Cultural Resource Management-mandated testing and excavation, <u>all</u> such samples need to be analyzed. Pre-selection of samples in the field (e.g., choosing those that "look best") is often a self-defeating exercise. Although trained dendrochronologists <u>may</u> be able to tell if a sample dates in the field, not even they can be certain if a sample will not date. All such samples should be treated as cultural artifacts, which they are, and recorded properly, including precise provenience information, assumed function, size, and tool marks present. The LTRR requires that specific information accompany the samples (Figure 7.23) and additional information (Figure 7.24) is critical for properly interpreting the samples.

TREE-RING SAMPLES SUBMISSION FORM

Date:

Site Name/Number	**Total Number of Samples**

UTM Zone: **Elevation:**

Easting:

Northing:

Map Reference:

Site Location

Estimate of Total Number of Architectural Units:

Type of Architecture (surface masonry, pithouses, etc):

Aspect of Site (open or sheltered):

Phase/Period:

Site Description

Name:

Institution:

Address:

City, State, ZIP:

Send Results to

Figure 7.23. Laboratory of Tree-Ring Research sample submission form.

TREE-RING SAMPLE INVENTORY **Page of**

Date:

____
(Site)

		For TRL Use ONLY		
Provenience	**Field Sample No(s)**	**TRL #**	**Species**	**Comment**

Figure 7.24. Laboratory of Tree-Ring Research tree-ring sample inventory.

Third, a concerted effort should be made to more adequately develop the juniper ring sequence in the area. Traditionally, juniper was not collected because it was difficult to crossdate and not valuable for dendroclimatic purposes. Indeed, the low proportion of dates (2/113) from Pajarito Plateau juniper samples attests to its difficult nature. Many of those samples, however, were collected in the 1960s when the ring sequences had not been intensively analyzed. In other areas, new juniper chronologies are contributing important chronometric data to understanding the past. The development of juniper chronologies and reanalysis of samples from Long House in Mesa Verde, for example, has resulted in a more than threefold increase in the number of dates from that structure (Street 2001). Certainly, such a task will not be easy or quick, but the dividends will be substantial.

Fourth, a serious effort should be made to exploit the "arboreal" dendroarchaeological record. Isolated cultural features, such as ax-cut limbs and stumps, peeled trees, and intentionally burned stumps have been used elsewhere (Montorano 1988; Swetnam 1983; Towner et al. 1998) to date past human activities, even in the absence of high-quality architectural samples. The inhabitants of the Pajarito Plateau, both prehistoric and historic, have exploited the wood resources of the area in various ways. Sampling such features (Figure 7.25) will have at least two benefits (a) it will increase the number of juniper samples and aid in the development of a juniper ring sequence and (b) it will help date land-use patterns through time by the different occupants of the area.

Figure 7.25. An axe-cut juniper limb in the Rio Puerco Valley.

Finally, samples should be collected from all extant historic and prehistoric structures and features exposed to the elements. Such samples can be collected as half-inch or five-eighth-inch cores with minimal impacts to the resource. The wood in these structures is seriously threatened by natural erosion of the outer rings, fire, vandalism, insect infestations, and a variety of other natural and cultural factors. As a non-renewable resource, the information contained in these wood samples is in danger of being lost forever if action is not taken to preserve it.

Dendroclimatology

Dendroclimatology has been used for more than 20 years to characterize past precipitation on the Pajarito Plateau and throughout the northern Southwest. Live-tree and archaeological samples have been combined in various ways to delineate (a) patterns of annual precipitation for more than 1000 years, (b) patterns of spring precipitation in the northern Rio Grande for more than 1000 years, and (c) changes in the spatial distribution of precipitation for almost 1500 years. Reconstructing temperature, on the other hand, has been much more difficult. Only a single temperature reconstruction, albeit 2600 years long, exists for the entire Southwest. Unlike archaeological tree-ring data, dendroclimatological samples do not reflect "points" on the landscape, they reflect broad-scale patterns. Therefore, the recommendations for future research below extend beyond LANL and the Pajarito Plateau.

The most pressing need in southwestern dendroclimatology is another temperature reconstruction with which to compare Salzer's (2000a) SFP reconstruction. Certainly, temperature is more spatially coherent than precipitation, but the SFP are located west of the Continental Divide in the northwest part of the Colorado Plateau and therefore may not accurately reflect temperature trends in the Rio Grande area. Trees that contain a temperature signal, however, are unlikely to be found in the Jemez Mountains or LANL lands. The most likely area to search for such trees is at extreme timberline in the Sangre de Cristo Mountains east of the Rio Grande.

A second important issue for archaeological and other research is more adequately delineating the seasonal patterns of precipitation on the Pajarito Plateau. Annual precipitation patterns have been well documented and Rose et al. (1981) identified spring precipitation variability. Identifying additional seasonal variability in precipitation will aid not only archaeological research, but other fields as well. One possible way to accomplish this goal is to (a) reassess the dendroarchaeological collections for suitable samples and (b) develop chronologies from different tree species along an elevational gradient from the Rio Grande to the crest of the Jemez or Sangre de Cristo Mountains. If appropriate trees are located, we may be able to reconstruct variables such as winter snowpack, as has been done elsewhere (Woodhouse 2002).

Finally, one task that has not been accomplished, but which had important implications for human use of the area, past, present, and future, is the reconstruction of stream flow for rivers in the area. Stream flow depends on many factors (Stockton 1990), but can be modeled using tree-ring data. Three rivers in the area might be amenable to stream flow reconstructions: the Jemez, the Chama, and the Rio Grande. The Jemez may be the easiest to reconstruct because it has a limited watershed with few major tributaries. The Rio Chama, although larger, may be amenable to reconstructions if trees in the upper portions of the watershed and its tributaries can be located. Stream flow in the upper Rio Grande would be the most difficult to model because of the length and numerous climatic factors that influence its flow—trees from the San Juan and Sangre de Cristo Mountains in Colorado, as well as those in New Mexico would be needed to develop such a reconstruction.

Tree-ring reconstructions of various climatic parameters—precipitation, temperature, snowpack, stream flow-- can contribute significantly to archaeological research on LANL properties, the Pajarito Plateau, and the northern Rio Grande in general. As noted above, however, dendroclimatological data are not point data and they have broad interdisciplinary applicability. It is unrealistic, therefore, to expect archaeological or Cultural Resource Management-related projects to fund such research. A broad coalition of pubic and private interest groups is needed to identify the variability in climate that has and will continue to impact the human and non-human populations of the Pajarito Plateau.

CONCLUSIONS

Dendrochronology has a long and distinguished history on the Pajarito Plateau. Beginning with the 1st Beam Expedition and Stallings' development of the Rio Grande chronology, tree-ring data have helped date many archaeological sites and cultural phenomena. Beginning in the 1970s, archaeological and live-tree samples have been used to illuminate various aspects of past climate variability. Pan-southwestern tree-ring data have helped identify aspects of past population movements and adaptations to local and regional environments, as well as help us understand past climate variability over the past two millennia.

Despite the successes of the past 80 years, much work remains to be done. The reanalysis of previously collected archaeological samples, more detailed documentation of new samples, development of an adequate juniper chronology, and collection of non-architectural samples will materially enhance our understanding of the human use of the Pajarito Plateau landscape. New, geographically dispersed live-tree collections, combined with carefully selected archaeological samples will help us document past seasonal precipitation patterns, snowpack amounts, temperature fluctuations, and stream flow in the rivers of the area. These are ambitious goals, but they can be accomplished with dedicated researchers, adequate public and private funding, and continued institutional support.

CHAPTER 8
DENDROCLIMATIC RECONSTRUCTIONS IN THE NORTHERN RIO GRANDE

Ronald H. Towner and Mathew W. Salzer

INTRODUCTION

One of the goals of archaeology is to provide a long-term perspective on human/environment interaction. Humans, like all other species, live in and interact with the environment, and these interactions involve the extraction of both biotic and abiotic resources and respective adaptations to them. The environment—both biotic and abiotic—is constantly changing and does so at many difference scales (e.g., day, month, year, decade, century, and millennium). Through the medium of culture, humans have the ability to modify their environment, but they must also cope with both long- and short-term trends and perturbations in that environment. Thus, understanding past environments helps us understand how past human groups adapted to the ever-changing environment using technology, social organization, and even ideology. This chapter uses recent data to develop new paleoclimatic reconstructions for the Pajarito Plateau in an effort to better understand prehistoric interactions between Pajaritans and their environment (Figure 8.1).

Understanding the past environment of the area is critical for comprehending the adaptations of the past inhabitants to their physical environment. This chapter examines only one aspect (precipitation) of past environments on the Pajarito Plateau. The data and interpretations presented herein have important implications for understanding the Ancestral Puebloan, Puebloan, Hispanic, and Anglo occupations of the area. They may also help illuminate aspects of the AD 700–1100 period when few people lived in the area and will provide insights into the modern climate variability as well. The dendroclimatic reconstruction data presented here are only one component of the human/environment interaction matrix, and it is hoped that it will spur other researchers to investigate other aspects of the matrix.

BACKGROUND AND PREVIOUS RESEARCH

Dendroclimatology was chosen as the method to examine paleoclimate in the project area for several reasons. First, the project area is part of the vast piñon-juniper forest of the Colorado Plateau and Rio Grande (Figures 8.2 and 8.3). In addition, the appropriate tree species such as ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*), piñon pine (*Pinus edulis*), and Southwestern white pine (*Pinus reflexa*) are plentiful in the project area, and are excellent natural archives of past environmental and climatic information. Thus, the wood resources are available for many kinds of analysis. Second, dendroclimatology, the study of climate based on annual growth rings in trees, is the most precise and accurate method of reconstructing climate in the prehistoric period. Dendroclimatic reconstructions provide statistically reliable estimates of annual precipitation and/or temperature for each and every year in the study. No other method of studying long-term climate variability can make such a claim.

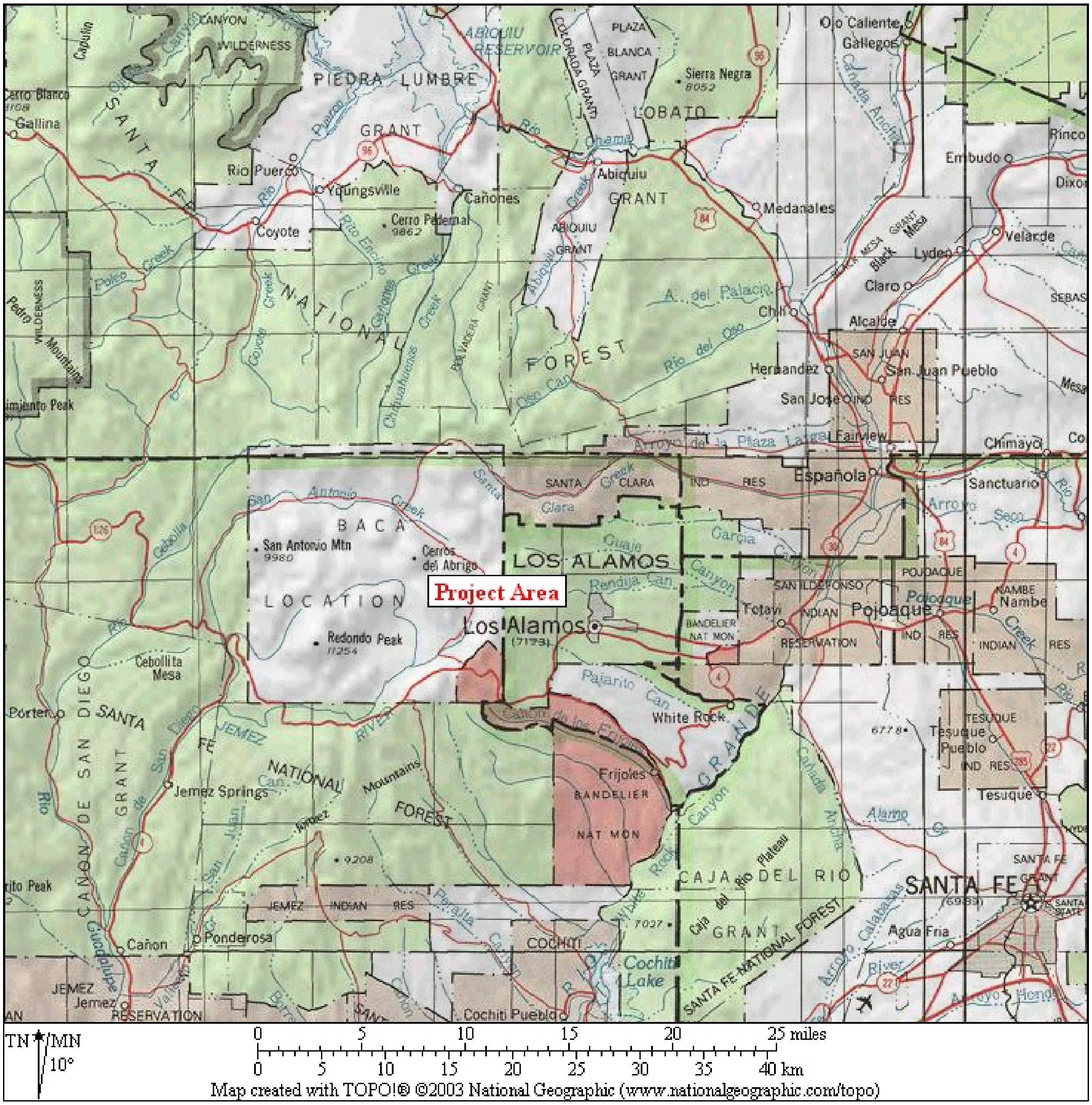

Figure 8.1. Map of the project area.

Figure 8.2. Photo of project area.

The trees of the project area have proven to be quite useful in dendrochronology (tree-ring dating) because they add a single annual layer of cambium (a tree ring) that varies in width depending on climatic conditions in a particular year. The presence of these environmentally sensitive tree species in both the modern vegetation mosaic and archaeological record of the area enables us to use dendroclimatology to examine aspects of past precipitation variation. This study will significantly enhance understanding of past climatic change in the project area and allow archaeologists to better incorporate climatic variations into their interpretations of past cultural adaptations.

A dendroclimatic reconstruction involves developing a mathematical model of the relationship between the environment and the cambial growth of trees (LaMarche 1974; Schulman 1956). Trees are natural archives of information about past environments, and because many are older than the oldest historical documents, they can be used to illuminate aspects of prehistoric climate (Dean 1988; Swetnam and Betancourt 1998). Such archives, however, contain information on a number of different aspects of the environment, and it is necessary to isolate the variables one wishes to study. The specific field collection, laboratory analysis, and statistical procedures described below are designed to eliminate the "noise" in the tree-ring series and highlight the "signal of interest." In some instances, the signal of interest is long-term trends in precipitation, in others it is long-term temperature variability, and in still others it is the short-term spatial differences and identification of extreme events, such as floods or very dry years in specific areas.

Figure 8.3. Photo of project area.

Dendroclimatic reconstructions can provide annual estimates of various climatic variables and are the most precise method for doing so. Dendroclimatology, however, is not without its limitations. First, the technique can only be used for those time periods encompassed by the tree-ring samples; in the Southwest, the time frame is limited to the past two and one-half millennia (Salzer 2000a). Climate variation before about 2600 years ago must be examined using other methods. Second, dendroclimatic reconstructions tend to underestimate the extreme values of particular years. Tree rings tend to underestimate the magnitude of high precipitation (wet) years because in those years water ceases to become the most limiting factor in cambial growth (Fritts 1991). In other words, trees have an adequate supply of water, but some other factor (temperature, nutrient supply, genetics, etc.) prevents uncontrolled cell division and cambial growth (Fritts 1976). In extremely dry years, something of the opposite problem occurs in the Southwest. If a tree does not receive adequate moisture to initiate growth, the result is a locally absent or "missing" ring. The tree, in effect, has recorded "0" moisture for that year even if some precipitation may have fallen. Despite these caveats, tree-ring based reconstructions of climate are the most accurate and precise methods available for examining the past climate variability of the Rio Grande and Colorado Plateau during the past two millennia (Grissino-Meyer 1996; Salzer 2000b).

Dendroclimatology has been used for more than 20 years to characterize past precipitation throughout the northern Southwest (see Chapter 7, this volume for a detailed discussion of past efforts in the northern Rio Grande). On a local and archaeologically oriented level, Orcutt (1999) used many of the previously collected data to retrodict the Palmer Drought Severity Index (PDSI) in the Bandelier area as part of the Bandelier Archaeological Survey. Although not strictly a dendroclimatic reconstruction, Orcutt's detailed examination of the AD 1150–1610 period and use of proxy paleoclimate data have been a major contribution to studies of human/environment interaction in the northern Rio Grande. Orcutt's Agricultural Risk Model is discussed in more detail below.

The following are reasons why a new climate reconstruction was needed:

1. Both the tree-ring and climate data for the previous reconstructions end in the late 1970s (Dean and Robinson 1977; Rose et al. 1981). The addition of 30 years of both tree-ring and climate data resulted in an almost 20 percent increase in the period of overlap needed to calibrate the tree-ring/climate relationship. This longer period of overlap is critical and resulted in much stronger correlation coefficients and increased our confidence in the results significantly.
2. By using climate data from individual stations, instead of divisional data, the reconstruction much better reflects the conditions in the local project area.
3. Using these climate station data and new tree-ring chronologies also enabled us to document spatial variability within the project area.

THE PAJARITO DENDROCLIMATIC RESEARCH DESIGN

Developing new chronologies and retrodictions of past precipitation were the bases of this project. Certainly, other aspects of past climate, such as temperature, played a role in human use of the Pajarito Plateau. Precipitation, however, is the most direct measure available and was probably the most important for prehistoric and historic period agriculturalists.

This project had four specific goals for elucidating past aspects of human/environment interaction through the retrodiction of past precipitation: low-frequency variation, high-frequency variation, spatial variability, and evaluating agricultural risk. We wanted to

1. Examine the low-frequency variability in the precipitation signal. Low-frequency variation is important because it is the climatic condition adapted to by human groups;
2. Examine high-frequency variation in the dendroclimatic record. High-frequency variation is important because it contains the signal of extreme events that may have seriously impacted local populations on a short-term basis;
3. Document the spatial variability in precipitation within the project area. For example, we wish to examine geographic areas that were affected differently than others;

4. Evaluate the climatic variability aspects of the Agricultural Risk Model developed for the area by Orcutt (1999).

METHODS AND PROCEDURES

Field Research and Methods

An important component of this project was to collect samples from living trees in the project area. Initially, our goals were to collect long-lived trees throughout the project area in order to provide data relevant to both past temporal and spatial retrodictions of two climate parameters: precipitation and temperature. As we conducted the field work, however, it became clear that we would have to modify our goals.

Our first problem is that there are very few long-lived trees in the area; most trees are less than 500 years old. We observed few trees that exhibit characteristics of old age, such as stripped bark, spiral grain, and spiked tops (cf. Schulman 1954). Indeed many of the trees in the area appear to have germinated in the early 1600s following a massive die-off during the mega-drought of the 1560s to 1590s (Swetnam and Betancourt 1998). This pattern, massive die-off in the late 1500s and extensive tree recruitment in the early 1600s, has been documented in many areas of the Southwest (Allen et al. 1998; Betancourt et al. 1993; Savage et al. 1996).

Second, the lack of high-altitude temperature-sensitive trees prevents us from retrodicting Pajarito temperature variability. Salzer's (2000b) San Francisco Peaks, Arizona, retrodiction may be relevant, but a Rio Grande area temperature retrodiction is badly needed.

Field Methods

The field work component of the project included extracting 318 cores and cross-sections from 166 climatically sensitive old trees at 11 sites (Table 8.1).

Table 8.1. Description of live-tree collections.

Collection Site	Species	Trees	Cores	Date Range	Measured?	Previous Chronology	Old Measurements?	Used in Reconstruction
Alta Mesa DF	DF	16	26	1652–2005	Y	N	N	YES
Alta Mesa PP	PP	15	30	1621–2005	N	N	N	NO
Alta Mesa WP	WP	15	31	1540–2005	Y	N	N	NO
Alta Mesa PNN	PNN	18	35	1533–2005	Y	N	N	YES
Bland Canyon	PP	12	23	n/a	N	Y	Y	NO
Los Alamos Canyon	PP	20	41	1786–2005	Y	Y	Y	YES

Collection Site	Species	Trees	Cores	Date Range	Measured?	Previous Chronology	Old Measurements?	Used in Reconstruction
Caja del Rio	PNN	5	4	n/a	N	Y	Y	NO
Upper Los Alamos	PP	16	32	1658–2005	Y	N	N	YES
Paliza Campground	PNN	16	31	1645–2005	Y	Y	Y	YES
Rio de los Frijoles	PP	16	31	n/a	N	Y	Y	NO
Pine Springs Resample	PP	17	34	1767–2005	Y	Y	Y	YES
Totals		**166**	**318**					

No juniper trees were sampled as part of this project because they exhibit more variability within individual rings and are much more difficult to measure accurately. Using a Swedish increment borer (Figure 8.4), cores were taken from the lowest practical location on the tree bole in order to maximize the number of rings available for analysis.

Figure 8.4. Photo of sampling with increment borer.

When possible, two cores were collected from each tree in order to minimize the within-tree variation in ring width; likewise, multiple trees were sampled at a single site (always more than 10 trees if possible) in order to reduce the between-tree variation in growth. These sampling strategies help ensure that the resulting site-specific ring sequences reflect a common growth parameter, in our particular case, precipitation, and that other "noise" is averaged out of the chronologies (Fritts 1976).

Collected during November 2005, our samples are distributed on and around the Pajarito Plateau (Figure 8.5). Six of the live-tree sites have been collected previously but the data were never used due to funding shortages; the data, however, existed in paper form at the Laboratory of Tree-Ring Research (LTRR) and were entered into a computer database for use during this project. Our re-sampling at these sites was designed to update the ring sequences and provide an additional 30 years of ring-width data against which to calibrate the precipitation data.

Our five new chronologies were distributed throughout the project area, although four species-specific chronologies are all located on Mesa Alta; the only new chronology on the Pajarito Plateau is Upper Los Alamos. Table 8.1 presents some descriptive data for these chronologies and merits additional explication. Although we attempted to collect two cores per tree, some cores were unsuitable because of breakage, interior heartwood rot, pitch pockets, or other idiosyncratic abnormalities. The table also illustrates that trees greater than 500 years old are difficult, if not impossible, to locate in the project area. In addition, the Caja del Rio live tree site could not be adequately re-sampled because the trees died during the recent drought and beetle infestation.

Laboratory Research and Methods

After the end of field work, the first step in chronology development and climatic reconstruction is cross-dating each of the live-tree samples. Each of the chronologies used in the reconstruction was developed completely independently of the others; thus, each can be considered an independent test of the cross-dating method. By cross-dating the cores against each other and the "New Mexico I" master chronology (Robinson et al. 1972), we were able to determine the year each and every ring grew. Although different cross-dating methods are used in different parts of the world, the LTRR uses the ‘skeleton plot’ method of cross-dating (Stokes and Smiley 1968). Skeleton plotting is an analog method of representing the narrow rings on a sample using graph paper (Figure 8.6). By comparing skeleton plots of many different samples, a master skeleton plot can be developed that extends further back in time and contains more information than any single sample. Area l master plots are developed and extended further back into the past by overlapping samples from living trees, dead snags, and archaeological specimens (Figure 8.7).

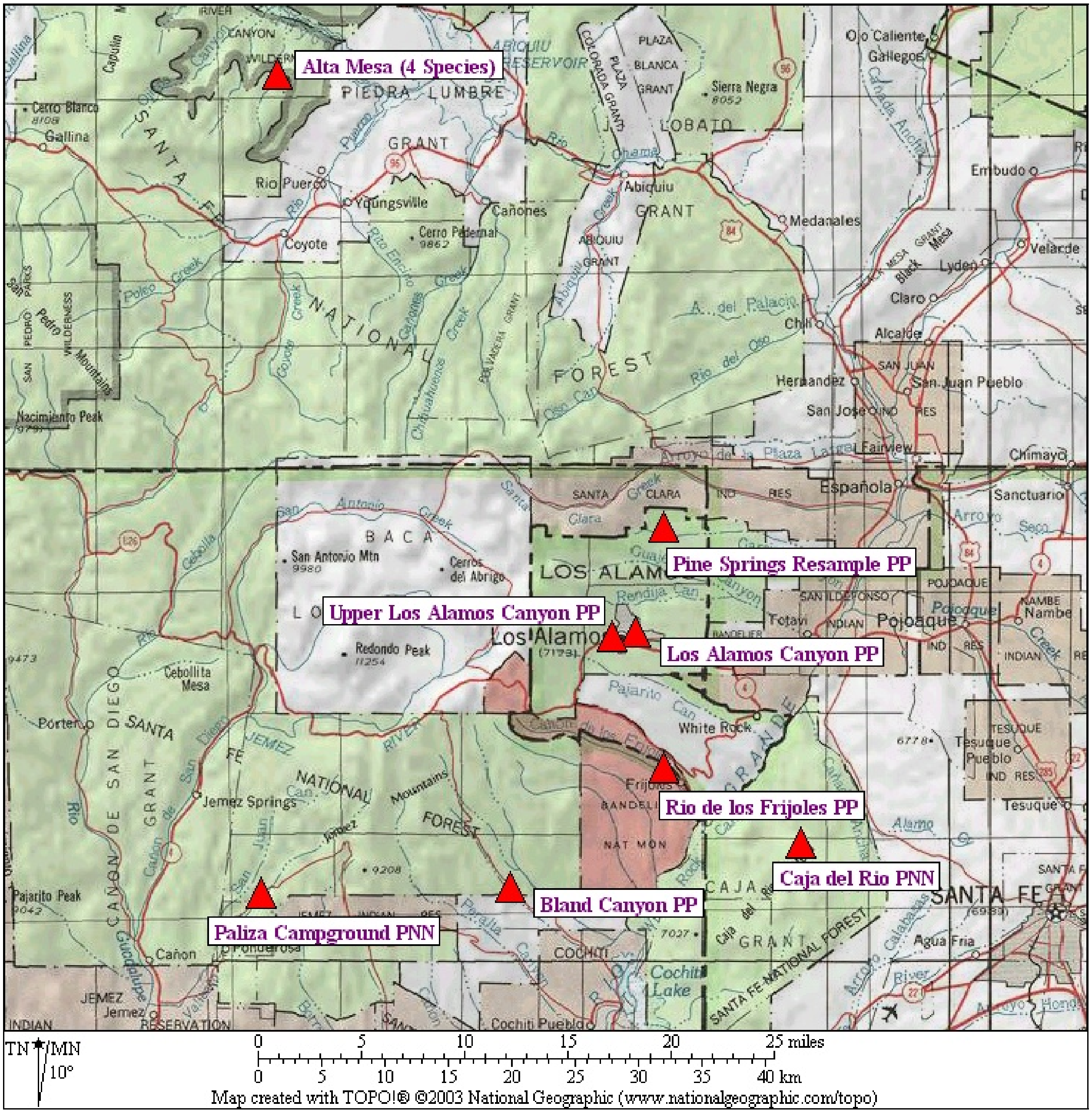

Figure 8.5. Map of live-tree sample locations.

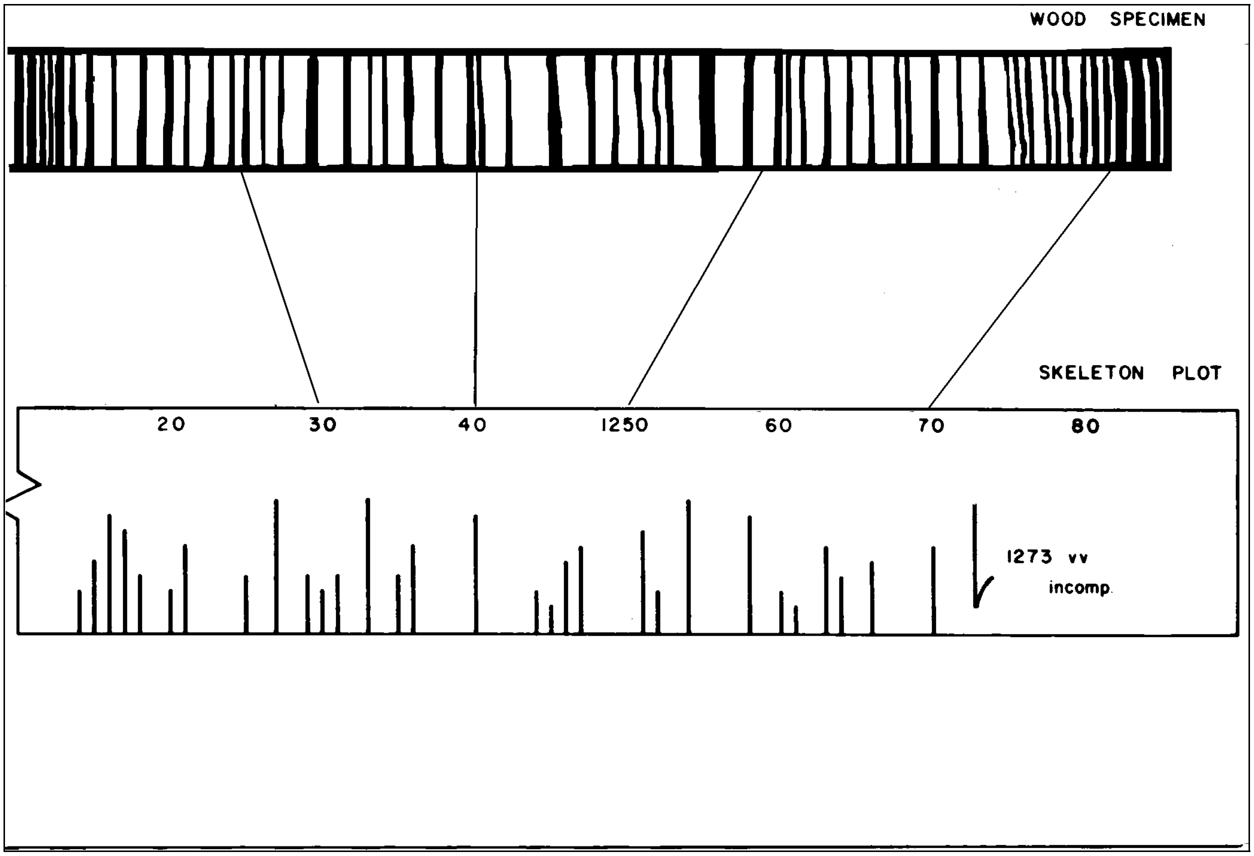

Figure 8.6. Skeleton plotting technique.

Statistical Methods: Building Quantitative Tree-Ring Chronologies

A master skeleton plot is not a tree-ring chronology, however; it is simply a graphical representation of relative ring widths—very useful for dating, but less useful for reconstructing climate. In order to develop a quantitative chronology of the cross-dated ring series, each ring on each sample must be measured to the nearest 0.01 mm. The LTRR uses a Velmax microscopic measuring system (Figure 8.8) that automatically inputs the measurements onto a computer disk. For this project, we measured 33,004 individual rings from the live-tree samples (Table 8.2); other samples used in the reconstruction (see below) had been measured previously.

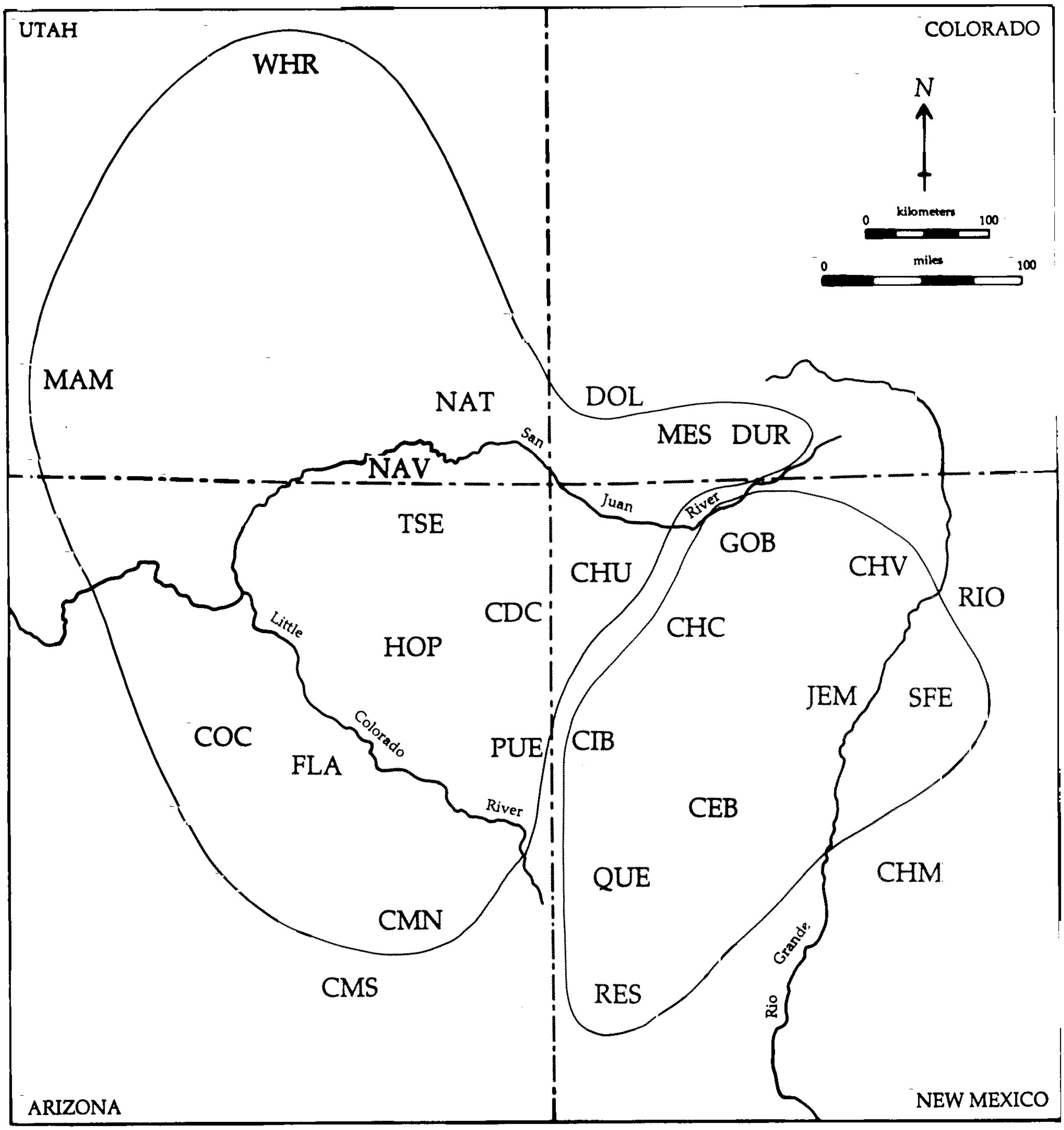

Figure 8.7. Chronology building process.

Figure 8.8. Measuring tree rings.

Table 8.2. Descriptive statistics of the live-tree chronologies.

Chronology Name	**Elevation**	**Aspect**	**Species**	**Number of Samples**	**Dates**	**Number of Measured Rings**	**Series Intercorrelation**	**Mean Sensitivity**	**Percent Missing Rings**
Alta Mesa PNN	8000'	WSW	PNN	24	1534–2005	7140	0.779	0.426	2.52
Alta Mesa DF	8000'	WSW	DF	19	1652–2005	3258	0.882	0.599	1.16
Pine Springs PP	7260'	N	PP	24	1777–2005	4418	0.805	0.609	4.54
Upper Los Alamos PP	7250'	SSE	PP	27	1659–2005	6238	0.824	0.499	1.96
Los Alamos C PP	6680'	N	PP	30	1786–2005	5693	0.833	0.511	1.58
Paliza CG PNN	6750'	SE	PNN	25	1645–2005	6257	0.773	0.559	4.24
Totals				**149**		**33004**			

Measuring the samples provides more information than simply ring width. By using the computer program COFECHA we were are able to evaluate the accuracy of our cross-dating and determine the strength of our chronologies (Holmes 1983). The computer program also enables us to measure the within- and between-tree variation, and compare the mathematical correspondence of each of our chronologies.

Table 8.2 shows the descriptive quantitative data that guided our sample and chronology selection. The variables shown in the last three columns of the table show the utility of the chronologies for dendroclimatic purposes. The series intercorrelation is a measure of how much variability in individually dated rings exists in the chronology (i.e., how much variability is seen in the AD 1729 ring among the trees at the same site). Simply put, the series intercorrelation indicates how much ring-width variation in the series is common to all trees—and presumably due to climate. Therefore, the higher the series intercorrelation, the stronger the climate signal in our chronologies. The correlations are similar, but the Alta Mesa Douglas-firs show the highest correlation.

Mean sensitivity is a statistic developed in dendrochronology that considers the frequency of missing rings, series intercorrelation, and other factors. In theory, mean sensitivity can vary between "0" and "2." A mean sensitivity of "0" indicates no ring-width variability meaning that all rings are exactly the same size. Conversely, a means sensitivity of "2" indicates that every other ring in the series is missing (50% missing rings). In practice, neither of these extremes is reached because such samples cannot be cross-dated—the "0" series because there is no variability and the "2" series because there is too much variability. Typically, mean sensitivity varies between 0.25 and 0.75, depending on the species, tree age, and site location. Again, our chronologies are similar, although the Pine Springs chronology is the most sensitive.

The percent of missing rings is also a general indicator of site growing conditions and contributes to mean sensitivity. Whereas Upper Los Alamos, Los Alamos Canyon, and Alta Mesa are relatively mesic sites, Pine Springs and Paliza Campground are relatively arid and the trees are subject to more water stress. Finally, Douglas-firs tend to have fewer missing rings than other tree species. This attribute of Douglas-firs is important because it allows us to cross-date more samples and verify the cross-dating of samples with more missing rings. After initial evaluation using COFECHA, some trees and cores were deemed unsuitable for quantitative analysis and were not included in the reconstruction.

Standardization

The next step in the reconstruction process is to standardize each ring series and create tree-ring indices for the samples. Standardization is accomplished using a curve-fitting equation and results in all series having a mean of "0" and a standard deviation of "1." This process eliminates the size- and age-related ring-width variability (i.e., rings near the pith are larger than those near the outside of the tree), retains the climate signal, and makes the ring series comparable. In the initial chronology building procedure, we standardized the ring series using the computer program ARSTAN. All measured ring-width series were standardized conservatively through the fitting of a modified negative exponential curve, a straight line, or a negatively sloped line to the series. This process removes the age/size related growth trend and transforms the ring-width measurement values into ring-width index values for each individual ring in each series (Fritts 1976). By averaging the annual standardized indices of tree growth, we created mean site chronologies for each site. In general, these conservative standardization techniques and the use of long series preserve low-frequency information in the resulting chronologies (Cook et al. 1994). This process resulted in six independent, quantitative tree-ring chronologies that could be selected for the climate reconstructions**.**

Calibration of the Tree-ring/Climate Relationship

The next step in the reconstruction is calibrating the tree rings against modern climate data and assessing the strength of that relationship. This step necessitates (a) testing the association between the modern part of the chronology and instrumental climate data to determine the strength and seasonality of the climatic influence on tree growth with correlation analysis; (b) calibrating the climate data and the tree-ring chronology using a statistical scaling technique; and (c) retrodicting past climate for the length of the tree-ring chronologies. See Fritts (1976) for more details on developing dendroclimatic reconstructions. Two calibrated and verified reconstructions of wet-season (previous October through June) precipitation were developed from the tree-ring chronologies—one for the northern region (Chama) and one for the southern region (Jemez Springs). Each of these reconstructed time-series of past precipitation was then smoothed using a 20-year cubic smoothing spline. The final products are four time series: two for the northern part of the study area (one to emphasize high-frequency [annual] variability and one to emphasize low-frequency variability) and two for the southern part of the study area (similarly, one high frequency [annual] and one low frequency).

We compared the tree-ring indices for the modern period with instrumental precipitation data from the United States Historical Climatology Network (USHCN). These data are part of a quality-controlled network and are considered highly reliable. In the southern section, we compared four tree-ring series to USHCN data from Jemez Springs, New Mexico. In the northern section, we compared USHCN data from Chama, New Mexico, to the two tree-ring series. In both cases, correlation analysis showed a strong positive correlation between wet-season (previous October through June) precipitation and tree-ring index. There is negligible correlation between summer precipitation and tree growth. This is consistent with other tree-ring based precipitation reconstruction studies in the U.S. Southwest ((D'Arrigo and Jacoby 1991). For each "year" the precipitation amounts for previous October to June were totaled. These amounts form the basis for the calibration with the tree-ring data.

Growth processes of lower-elevation trees in the Southwest often are limited by climatic conditions during a period before the actual growing season (Fritts 1976). Ring-width variability can reflect changes in precipitation amounts from the fall/winter seasons before the trees' growing season through the growing season of ring formation. The period from the previous October through June of the growing season is the seasonal climatic interval most highly correlated with annual tree-ring width and was determined to be the interval when precipitation had the greatest effect on tree growth. Monthly values for this period were summed for the individual years to create the final climate series used in the reconstructions. Consequently, the variable being reconstructed is prior-October through current June precipitation.

In total, there are six new (seven modern living-tree) and two archaeological tree-ring series used in the reconstructions. Because of the absence of long-lived trees in the project area, previously measured ring-width series of beams from archaeological sites (LTRR files) were appended to the earlier portions of measured series from living trees near the sites in order to substantially lengthen the records. In both the northern and southern portions of the study area, the archaeological chronologies are shown to be consistent with the modern living-tree chronologies used in the calibration (Figures 8.9 and 8.10). This is an important point and suggests that the new living-tree chronologies are an adequate analog for what occurred in the past—the earlier portion of the reconstructions. The southern and northern chronologies were lengthened in the following manner.

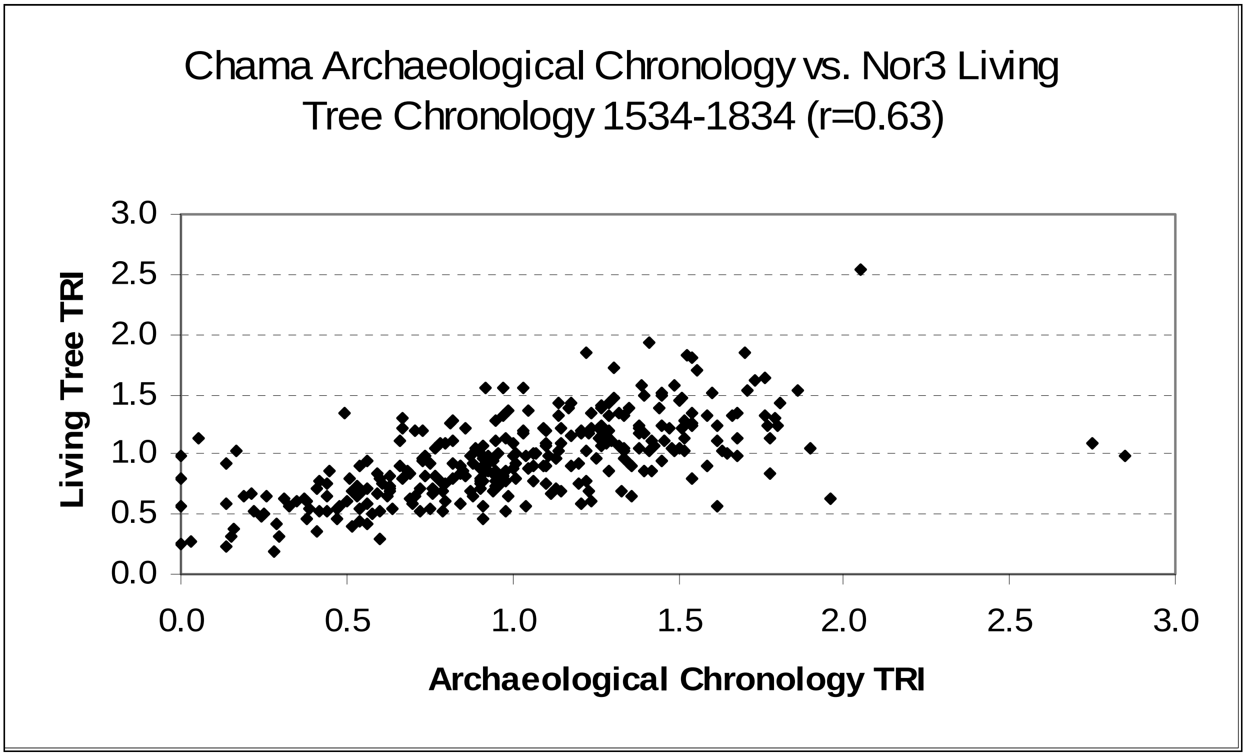

Figure 8.9. Correlation of archaeological and living tree samples from Chama.

At Jemez, we took an average of the tree-ring indices from four new sites: Paliza Campground (piñon), Upper Los Alamos, Los Alamos Canyon, and Pine Springs (all ponderosa pine). This process of combining or compositing several chronologies into a single series reduces non-climatic "noise" in the tree-ring data and strengthens the climatic signal. The new tree-ring average chronology extends back to AD 1645 and correlates very well with the Jemez Springs USHCN previous October to June precipitation series (r = 0.78, 1911–2002). Before AD 1645 (AD 598–1644), the Jemez archaeological chronology was used.

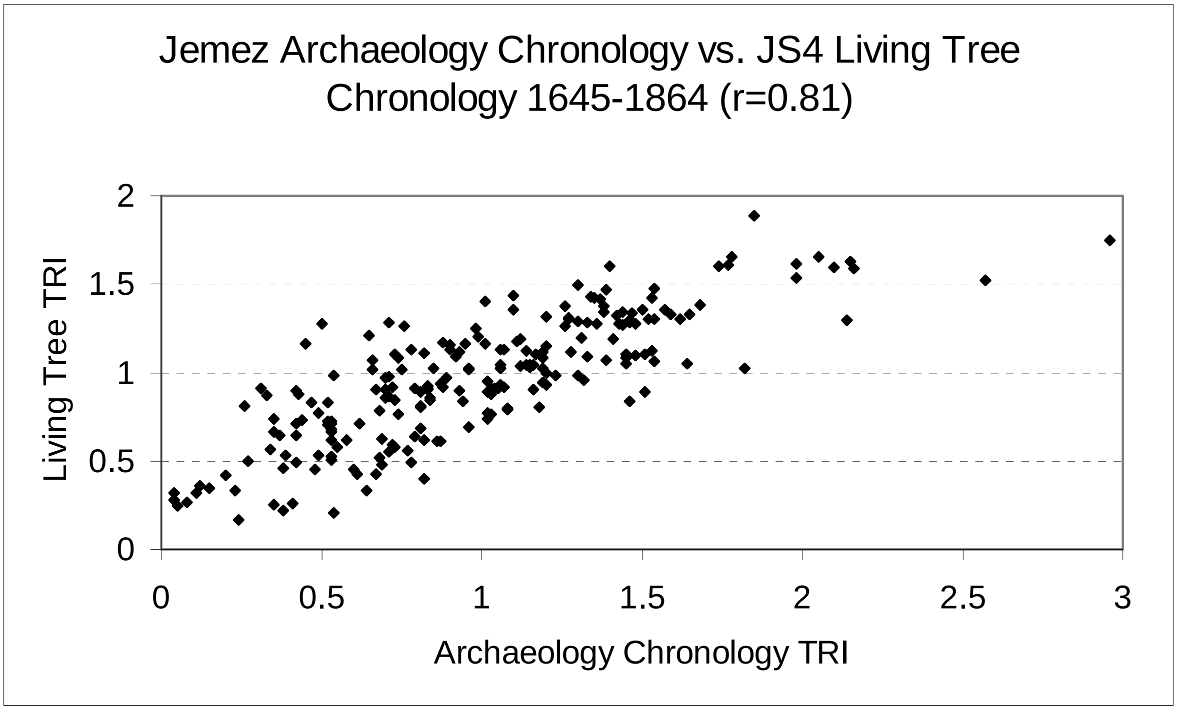

Figure 8.10. Correlation of archaeological and living tree samples from the Jemez.

For the northern reconstruction at Chama, we used two new tree-ring chronologies, both from Alta Mesa, New Mexico (Douglas-fir and piñon). These extend back to AD 1534 and correlate well with modern USHCN precipitation data from Chama (r = 0.66, 1889–2002). The tree-ring series used in the northern reconstruction is a more complicated composite than that used in the southern reconstruction. In the earliest part, AD 759–1361, it consists only of the Chama archaeological chronology (LTRR files); from 1362 to 1533, it is the archaeological chronology combined with the Echo Amphitheatre living tree chronology collected in the 1970s (Dean and Robinson 1977); from 1534 to 1834 it is an average of the new Alta Mesa chronologies and the Chama/Echo chronologies; from 1835 to 1972 it is an average of the Alta Mesa and Echo chronologies without any archaeological wood; and from 1973–2002 only the new Alta Mesa average was used.

For both Jemez and Chama, we scaled the tree-ring width index values to the previous October to June precipitation instrumental data for the period of record to equate their means and standard deviations (Figures 8.11 and 8.12). Scaling in this manner has been used as a calibration device in some recent multi-proxy reconstructions of past temperature (Moberg et al. 2005). This type of calibration, as opposed to regression techniques, tends to maintain rather than suppress amplitudes. It is clear that the ring-width variability and reconstructed precipitation anomalies co-vary in both their interannual and decadal-scale frequencies.

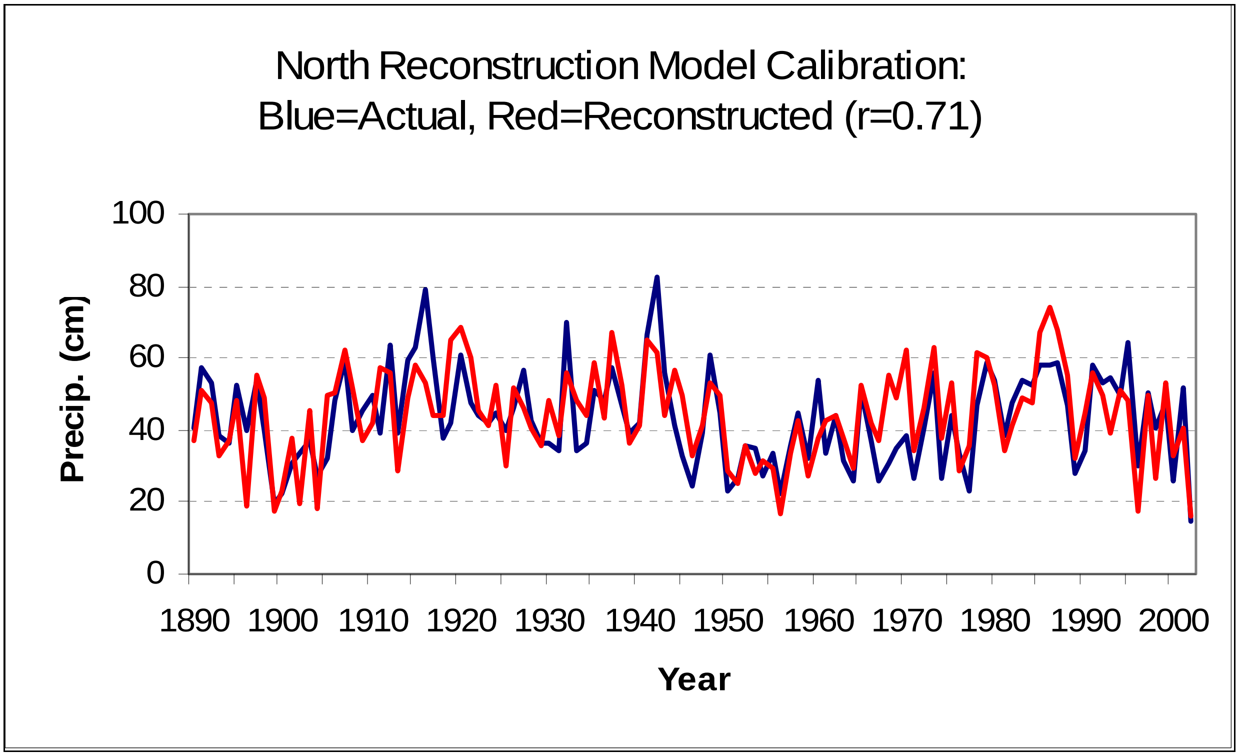

Figure 8.11. Calibration period comparison of Chama tree growth and historical data.

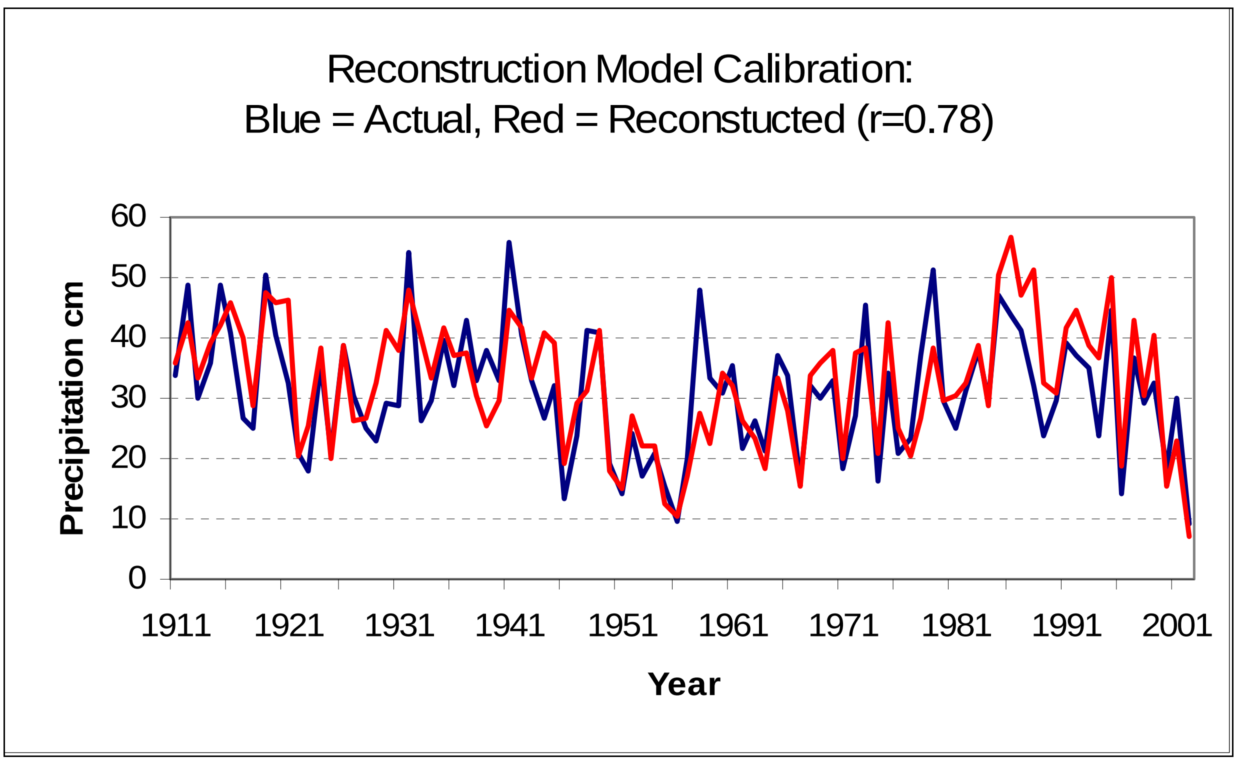

Figure 8.12. Calibration period comparison of Jemez tree growth and historical data.

The calibration followed Moberg et al. (2005) and can be formally expressed as follows:

$$P(t) = f \cdot R(t) + c ,$$

where P is the instrumental precipitation data, R is the ring-width index chronology, f is a variance scaling factor, c is a constant that adjusts the mean, and t is time. The factor f and constant c are derived by:

$$f = S_P/S_R \qquad \text{and} \qquad c = P_{(mean)} - f \cdot R_{(mean)}$$

where S_P and S_R are the respective standard deviations of the instrumental precipitation data and the ring-width index chronology in the overlapping interval and $P_{(mean)}$ and $R_{(mean)}$ are the corresponding means. The long Jemez and Chama tree-ring chronologies were scaled in this manner to produce the southern (Jemez) and northern (Chama) precipitation reconstructions (see below).

RESULTS

Jemez Chronology: Long-Term, Low-Frequency Precipitation Trends

The Jemez reconstruction of low- and high-frequency trends in precipitation in the Pajarito Plateau area is shown in Figure 8.13; the raw data are presented in Appendix H. The long-term precipitation mean for the area is 31.32 cm per tree-year, and the standard deviation is 10.49 cm per year. For any substantial period of time (100+ years) over the course of the reconstruction, the mean changes very little. Several aspects of the reconstruction merit detailed discussion.

First, overall, Figure 8.13 shows the most variable precipitation between AD 600 and approximately AD 900; the extremes are both higher and lower during this period than during most other periods. Another period of significant variability is the late 1400s through the early 1600s. Extreme highs in the early and late 1500s are contrasted with deep lows in the mid to late 1500s. In contrast, periods of generally low variability include the late 1200s through the early 1400s and the 1700s and early 1800s.

If variability is measured in overlapping 20-year increments, however, a different picture emerges. The AD 600 to 900 period shows variability, but most of the fluctuations are near or above the mean. Beginning in the late 800s, a significant decline in precipitation lasts through the early 10th century. Temporal variability changes about AD 1000 and lasts until the beginning of the 15th century. The peaks and valleys of the graph are farther apart, indicating precipitation was variable at longer time scales, even if mean precipitation was lower. This low-frequency variation is typically the type of change to which human societies adapt (Doyel and Dean 2006; Dean et al. 1994). The period from about 1500 though the late 1800s is characterized by higher frequency changes, particularly after AD 1700. Lower-frequency changes returned in the 20th century.

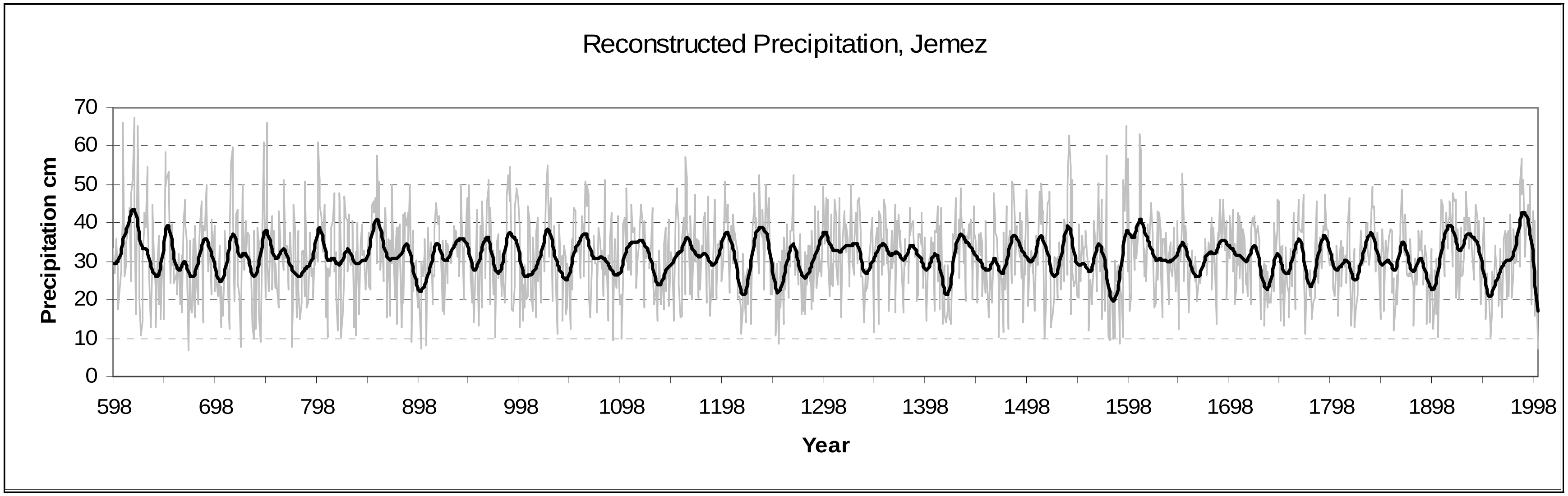

Figure 8.13. Annual and splined precipitation graph for the Jemez chronology.

In terms of absolute precipitation, high precipitation periods tend to be slightly more common in the early part of the reconstruction and low precipitation periods more common after AD 1200. Notable droughts are centered on the late 800s, the late 1000s to early 1100s, the late 1200s, the early 1400s, the late 1500s, the late 1800s, and the mid-1900s. Wetter intervals include the early 600s, the late 700s, the mid-800s, the early 1200s, the early 1400s, the early 1600s, the early 1900s, and the late 1900s.

Jemez Chronology: High-Frequency Variation

By statistical definition, any year within one standard deviation of the mean (e.g., between 20.83 and 41.81 cm of precipitation per year) would be considered normal. Embedded in the annual precipitation values is information concerning high-frequency variation and extreme years that may have significantly impacted human groups in the Pajarito area. If a year with a precipitation value within a single standard deviation of the mean is considered normal, those outside of the range can be considered extreme to some degree. Towner (1997) suggests that "Good" and "Bad" years can be defined as more than one standard deviation from the mean and "Very Good" and "Very Bad" years defined as two standard deviations above or below the mean, respectively.

Most century-long periods exhibit similar numbers of extremely good and extremely bad years. This pattern is an illustration of the variability and short-term unpredictability of precipitation on the Colorado Plateau (cf. Euler et al. 1979). Indeed, over the length of the reconstruction, slightly more than 30 percent of the annual values are more than one standard deviation from the long-term mean. In human terms, these data indicate that almost one in every three years was either ‘Good,’ ‘Bad,’ ‘Very Good,’ or ‘Very Bad.’ Given the human propensity for remembering stressful times, it is not surprising, therefore, that historical documents and even oral traditions have recorded more "drought" times than times of plenty (Reeve 1958, 1959).

It is instructive to examine extreme years on a century by century basis (Table 8.3) keeping in mind that the century designation are an artificial division based on the Christian calendar. Several centuries stand out as unusual.

Table 8.3. Extreme years by century, Jemez chronology.

Century	Century Mean	Very Good	Good	Average	Bad	Very Bad
600–699	32.62	7	12	62	18	1
700–799	30.42	5	8	67	16	4
800–899	32.43	3	12	69	13	3
900–999	31.82	2	15	62	18	3
1000–1099	30.24	1	11	66	20	2
1100–1199	31.47	1	10	72	17	0
1200–1299	30.83	1	14	67	17	1
1300–1399	32.27	0	13	77	10	0
1400–1499	30.89	0	11	69	19	1
1500–1599	30.83	**6**	**13**	**59**	**17**	**5**
1600–1699	32.34	3	4	82	11	0
1700–1799	30.27	0	8	77	17	0

Century	Century Mean	Very Good	Good	Average	Bad	Very Bad
1800–1899	29.77	0	6	81	13	0
1900–1999	32.69	1	14	69	16	0
2000–2002	n/a	0	0	1	1	1
Total		**30**	**151**	**980**	**223**	**21**

The 600s exhibited the second highest century mean and had equal numbers of extreme years. The high number of 'Very Good' years (n = 7) were all concentrated in the first 52 years of the century. Strings of consecutive 'Good' years occurred in 616–619 and 649–653, and only one consecutive string of 'Bad' years occurred (627–628).

The 700s were below the long-term precipitation average and experienced 20 'Bad' or 'Very Bad' years and five 'Very Good' years (all in the first half of the century). Consecutive 'Good' years occurred in 714–716 and there was never a string of three consecutive 'Bad' years. Thus, the last half of the AD 700s were certainly not optimal for rainfall-dependent agriculturalists. We leave it to Pajarito area archaeologists to discuss the potential cultural adaptations to this extremely dry period.

The following century (AD 800s) is notable for a return to higher precipitation values, and a "normal" number of extreme years. 'Good,' 'Bad,' 'Very Good,' and 'Very Bad' years occurred in almost the same frequency and were more or less evenly distributed throughout the century. Three 'Good' years (AD 800–802) started the century and is the only three-year period of either extreme.

The AD 900s had a relatively high number of extreme years (n = 38) and slightly above average precipitation. Consecutive extreme years occurred three times, all late in the century (AD 966–968, AD 986–989, and AD 994–997). In general, the century was drier early and wetter late.

The AD 1000s were, on average, the driest century in the reconstruction period, and contained 34 extreme years; there were only two 'Very Bad' years, but 20 'Bad' years. All but one of the 'Good' years occurred before AD 1067, but there were two 'Good' consecutive-year periods (AD 1024–1026 and AD 1063–1066). In general, the latter half of the century was drier than the first half.

The AD 1100s exhibit near mean precipitation and slightly fewer extreme years; no consecutive-year extremes were noted in the century. The mid-1130s were dry. Six of the 10 years in the decade were 'Bad,' but in general, extreme years were distributed more or less evenly throughout the century. This period coincides with the "Chaco drought" farther west, but does not appear to have been extreme in the northern Rio Grande area

The AD 1200s exhibited below average precipitation, some extreme years (n = 33), but positive and negative departures from the mean were more or less equal. The only string of 'Good' years occurred in AD 1216–1218, and no bad strings were identified. In general, the AD 1230–1250 period was wet, as was the AD 1290–1299 period, but the middle of the century was dry. The Great Drought (AD 1276–1299) of the Four Corners area appears to have been much shorter and less severe in the Pajarito area

The AD 1300s present a very different story. They were one of the wettest centuries in the reconstruction, had the most average years, and contained no 'Very Good' or 'Very Bad' years; nor were there any consecutive three-year periods of extreme precipitation. In short, the AD 1300s were relatively wet and consistent. Extreme years, 'Good' or 'Bad,' were distributed more or less evenly and never occurred for long periods of time.

The AD 1400s were much drier and experienced more 'Bad' years than 'Good' and there were two multi-year extreme periods (AD 1418–1420 and AD 1422–1424). In particular, the early part of the century was much drier than normal, and wet years occurred only infrequently.

The AD 1500s were also quite dry, but contained the highest frequency of extreme years in the entire reconstruction (n = 41). 'Very Good' years were offset by 'Very Bad' years. Consecutive multi-year 'Good' periods include AD 1519–1521, AD 1539–1541, and AD 1594–1597; 'Bad' periods include AD 1522–1524 and AD 1579–1561. It is interesting to note that some of the wettest years in the entire reconstruction occurred when Coronado was encamped in New Mexico (AD 1539–41) and just before Oñate's colonization of the Rio Grande (AD 1594–1597). The megadrought of the AD 1570s–1590s noted elsewhere appears to have been shorter (AD 1573–1593) and less severe in the Pajarito area; it contained six 'Bad' and three 'Very Bad' years that were only partially mitigated by one 'Very Good' year. Because the annual means were consistently low, even if not extreme, the dry years probably had a more deleterious effect on the local environment.

The AD 1600s contained fewer extreme years than any other century in the reconstruction and there were no three-year extreme periods. The latter half of the century was certainly more variable than the early part, but exhibited many 'Good' years. The idea that a drought played a major role in the Pueblo Revolt of 1680 is not supported by the dendroclimatic data. The year of the revolt (AD 1680) was an average year (41.55 cm) in the Pajarito area, and no 'Bad' years occurred between AD 1676 and AD 1684. Historical references to drought, therefore, are probably better interpreted as food shortages caused by severe disruptions in trade, labor, scheduling, and tribute responsibilities of the Rio Grande pueblos. Clearly, the causes of the Pueblo Revolt lie in the social and economic policies of the Spanish Colony, not in environmental perturbations

The AD 1700s were relatively dry; mean precipitation was 30.27 cm, but the century contained neither 'Very Good' nor 'Very Bad' years. 'Bad' years (n = 17) far outnumber 'Good' years (n = 8), and there were two strings of 'Bad' years (AD 1737–1739 and AD 1779–1782), but no strings of 'Good' years. The latter half of the century was probably drier than the first half, but some wet years did occur.

The AD 1800s were the driest century in the reconstruction (mean precipitation 29.77 cm), but contained neither 'Very Good' nor 'Very Bad' years. The only consecutive string of extreme years was the AD 1839–1841 dry period.

The AD 1900s are notable for two trends. The century mean is the highest in the reconstruction (32.69 cm), and there was significant variability. The first few years of the AD 1900s were marked by drought as were the mid-1950s. In contrast, the late 1910s and mid-1980s were wet.

Jemez Chronology: Extreme Events

Extreme events can have serious impacts on human societies. Extreme droughts may lead to crop failures, changes in storage technologies and agricultural strategies, site abandonments and migrations, and many other sociological and technological changes. Likewise, high precipitation years or events may lead to flooding and crop failure, increased erosion and arroyo cutting, and even such phenomenon as increased disease-carrying rodent populations (e.g., hantavirus).

Table 8.4 presents the 25 highest and 25 lowest precipitation years in the Jemez reconstruction. The range of precipitation is quite impressive, ranging from a low of 6.91 cm in AD 672 to a high of 67.42 in AD 618. Nine of the driest years and eight of the wettest years fall within the Bandelier chronology periods defined by Orcutt (1999; see below).

Table 8.4. Twenty-five wettest and driest years in the Jemez reconstruction.

Jemez		Jemez	
Year	**Driest**	**Year**	**Wettest**
672	6.91	618	67.42
901	7.15	608	66.20
2002	7.15	749	65.96
723	7.89	622	65.47
774	7.89	1596	65.47
907	8.13	621	63.27
1254	8.62	1610	63.03
1590	8.62	1540	62.79
743	9.11	800	61.08
892	9.11	746	60.83
1580	9.35	715	59.61
1090	9.59	649	58.64
736	9.84	858	57.66
1099	9.84	1611	57.66
1516	9.84	1577	57.42
1583	9.84	1162	57.17
823	10.08	1599	56.93
975	10.08	1986	56.64
1585	10.08	714	55.95
1904	10.32	1026	54.98
809	10.33	989	54.73
1471	10.33	631	54.49
1579	10.33	1541	54.49

Jemez		Jemez	
Year	Driest	Year	Wettest
1593	10.33	1597	53.76
1956	10.43	652	53.27

In terms of centuries, the AD 1500s stand out as unique with seven of the 25 driest years as well as six of the 25 wettest years. Such variability almost certainly was a challenge for the Puebloan occupants of the area. However, the centuries from AD 800–1500 were relatively free of these extreme years; particularly the period from AD 1100–1500, which experienced two extremely dry years and a single extremely wet year. As noted above, critical years of the Spanish exploration and colonization of New Mexico were quite favorable. Coronado experienced two wet years in AD 1540 and AD 1541; Oñate marched up the Rio Grande on the heels of wet years in AD 1596 and AD 1587 and experienced a wet year in AD 1599; later, he moved the capital during the two wettest years, AD 1610–1611, of the 17th century. We present the raw data in Appendix H so that Pajarito area archaeologists may explore any possible relationships between extreme events and cultural changes.

Jemez Chronology: The Bandelier Archaeological Periods

Orcutt (1999) developed an archaeological chronology of the Bandelier area based primarily on seriation of ceramics. Because we are interested in the entire human occupation of the area, we added several periods to the Orcutt chronology (see below). These periods are defined based on political events in New Mexico history and may or may not correlate with the archaeological or climatic records.

Period 1 (AD 1150–1190)

This period is defined as the Early Coalition and represents the initial settlement of the Bandelier area (Orcutt 1999). The period has a mean of 31.91 cm and standard deviation of 11.26 cm, both of which are greater than their long-term counterparts. ‘Bad’ years outnumber ‘Good’ years and there is only one ‘Very Good’ year (AD 1162), which ranks as the 16th wettest year in the chronology. ‘Good’ and ‘Bad’ years are distributed about evenly throughout the period and there are no consecutive strings of extreme years. In general, the period was slightly wetter than normal, but had more variable precipitation than normal as well.

Period 2 (AD 1190–1220)

This period remains part of the Early Coalition in Orcutt’s (1999) archaeological chronology. It has a period mean of 31.24 cm and standard deviation of 9.85 cm, both of which are lower than the long-term values. The only consecutive string of extreme years is the AD 1216–1218 period; however, the initial years of the 13th century (AD 1200–1203) include three ‘Good’ years and a normal year, but the AD 1214–1218 period includes four ‘Bad’ years and one normal year. The period was slightly drier than normal and exhibited less variability than normal.

Period 3 (AD 1220–1235)

This short period is still part of the Early Coalition. It has a mean of 31.05 cm, slightly lower than the long-term mean and a standard deviation of 11.63 cm, which is substantially higher than the long-term standard deviation. 'Good' years and 'Bad' years were equal in frequency and there were no signs of extreme years. In general, the period was slightly drier than normal, but had a wider variation in precipitation. With such a short period, however, these statistics may not be very meaningful.

Period 4 (AD 1235–1250)

This period brings the Early Coalition to a close. It has a mean of 35.40 cm and a standard deviation of 10.48. There were no 'Bad,' 'Very Bad,' or 'Very Good' years, and four 'Good' years, but not in a consecutive string. All four 'Good' years occurred before AD 1245, however. The period appears to have been the wettest period in the reconstruction, but its small size makes such an inference uncertain.

Period 5 (AD 1250–1290)

This is the first period in the Late Coalition (Orcutt 1999). It has a mean of 28.15 cm and a standard deviation of 9.52, both of which are substantially lower than their long-term values. 'Bad' and 'Very Bad' years outnumber 'Good' and 'Very Good' years 11 to 2, but there are no consecutive strings of extreme years. The early part of the period (AD 1251–1258) had four 'Bad,' one 'Very Bad,' and three normal years (all of which were low precipitation years); the 'Very Bad' year (AD 1254) ranks as the seventh driest year in the chronology. The late part of the period encompasses much of the Great Drought (AD 1276–1299) and contains five 'Bad' years. In general, the period was dry and not variable.

Period 6 (AD 1290–1325)

This period represents the end of the Late Coalition. It has a mean of 34.43 cm and a standard deviation of 9.97. 'Good' years far outnumber 'Bad,' but there are neither 'Very Good' nor 'Very Bad' years, nor are there any consecutive strings of extreme years. The early portion of the period, AD 1290–1302, contained six 'Good' years and seven normal years, but the remainder of the period was mostly within the normal range of variation. The period was wet and not extremely variable.

Period 7 (AD 1325–1375)

This period encompasses much of the Early Classic (Orcutt 1999). It has a mean of 32.26, higher than the long-term mean, and a standard deviation of 9.15, lower than the long-term value. The frequency of 'Good' and 'Bad' years is about equal, and there are no 'Very Good' or 'Very Bad' years; neither are there any consecutive strings of extreme years. The period was slightly wetter than normal with less variability, but the measures are not extreme.

Period 8 (AD 1375–1400)

This short period marks the end of the Early Classic period of the archaeological chronology. It has a mean of 30.23 cm and a standard deviation of 8.57, both of which are substantially lower than the long-term values. There are four 'Bad' years and one 'Good' year, but no consecutive strings of 'Very Good/Very Bad' years. The period was apparently dry with little variability, but the short duration of the period makes such measures suspect.

Period 9 (AD 1400–1440)

This period is the early part of the Middle Classic period. It has a mean of 29.90 cm and a standard deviation of 10.27, both of which are lower than the long-term values. 'Bad' years (n = 10) outnumber 'Good' (n = 5) and there were two strings of 'Bad' years, AD 1418–1420 and AD 1422–1424; indeed, the AD 1415–1424 period contained seven 'Bad' years and three normal years (all of which were below the period mean). The period was generally dry and not very variable.

Period 10 (AD 1440–1525)

This is a large portion of the Middle Classic period in the archaeological chronology. It has a mean of 31.44 cm and a standard deviation of 10.54, both of which are very close to the long-term values. There are only two consecutive strings, both near the end of the period; AD 1519–1521 was 'Good,' but AD 1522–1525 was 'Bad.' In general, the early two-thirds of the period was dry or normal, and only the AD 1510–1521 period was wet. One of the 'Very Bad' years (AD 1516) ranks as the 15th driest year in the chronology.

Period 11 (AD 1525–1610)

This period encompasses the end of the Late Classic period and beyond in the archaeological chronology. It has a mean of 30.46 cm, substantially lower than the long-term mean, and a standard deviation of 13.07 cm, significantly greater than the long-term value. The period is notable for the greatest frequency of 'Very Good' and 'Very Bad' years of any period in the chronology. Consecutive 'Good' years occurred in AD 1539–1541 and AD 1594–1597, and consecutive 'Bad' years occurred in AD 1579–1581. All six 'Very Bad' years in this period (AD 1579, AD 1580, AD 1583, AD 1585, AD 1590, and AD 1593) rank in the top 25 driest years in the chronology, and likewise, all six 'Very Good' years (AD 1540, AD 1541, AD 1577, AD 1596, AD 1597, AD 1599, and AD 1610) rank in the top 25 wettest years in the chronology. In general, the period was dry but highly variable.

Period 12 (AD 1610–1680)

This period is defined by the founding of the Spanish capital in Santa Fe and ends with the Pueblo Revolt. As such, it encompasses much of the early Spanish colonization era. The precipitation mean for the period is 32.11 cm, which differs from the long-term mean by +0.79 cm, and the period standard deviation is 9.11, which differs from the long-term standard deviation by –1.38. There are no three-year strings of extreme years (see Table 8.4). The first two years of the period (AD 1610–1611) were 'Very Good,' however, and may have facilitated the Spaniards' move to Santa Fe. Indeed, both AD 1610 and AD 1611 rank in the top 14 wettest years in the chronology. Two two-year periods (AD 1624–1625 and AD 1666–1667) were 'Bad,' but in general much of the period experienced normal amounts of precipitation. 'Bad' years were distributed relatively evenly throughout the period. Notably, AD 1680 was relatively wet (41.55 cm), but is not classified as a 'Good' year (41.71 cm); in addition, none of the 12 years before AD 1680 was 'Bad.' Thus, a precipitation deficit probably had little to do with the Pueblo Revolt.

Period 13 (AD 1680–1692)

This short period is defined by the Pueblo Revolt and ends with the Spaniards' return to the north. The period mean is 33.94 cm, compared to the long-term mean of 31.32, and the period standard deviation is 8.95, compared to the long-term standard deviation of 10.49. There was only one 'Bad' year (AD 1685) and two 'Good' years (AD 1689 and AD 1692). The later good year may have impacted de Vargas' return to New Mexico in some fashion.

Period 14 (AD 1693–1753)

This period is defined by the Reconquest and ends with the rise of Ute and Comanche threats in the north and the attack on Abiquiu. The period mean is 30.0 cm, compared to the long-term mean of 31.32, and the period standard deviation is 8.97 compared to the long-term standard deviation of 10.49. There is one period of consecutive extreme years, the 'Bad' years of AD 1737–1739; in addition, the AD 1729–1739 period included six 'Bad' and five normal years. Thus, the period was generally drier and less variable than normal.

Period 15 (AD 1754–1821)

This period is defined by the rise of the Ute/Comanche threat and ends with Mexican independence. The period mean is 30.29 cm and standard deviation is 8.63; both measures are below their long-term counterparts. There is only one string of extreme years—the 'Bad' years of AD 1779–1782. There were no 'Very Good' or 'Very Bad' years, and 'Good' and 'Bad' years are distributed throughout the period. In general, the period was dry and not very variable.

Period 16 (AD 1822–1849)

This is the period from Mexican independence until the U.S. acquisition of New Mexico. The period mean is 31.49 cm, slightly above the long-term mean, and the standard deviation is 8.65, significantly below the long-term measure. There is only one consecutive string of extreme years—the 'Good' years of AD 1839–1841; the first two years of the period (AD 1822–1823) were 'Bad' years.

Period 17 (AD 1850–1912)

This period is defined by the US acquisition of New Mexico and ends with Statehood. The period mean is 29.43 cm , significantly lower than the long-term mean, and the standard deviation is 9.00, also below the long-term measure. There were no consecutive strings of extreme years, but 'Bad' years (*n* = 11) outnumbered 'Good' (*n* = 4), and most of the 'Bad' years occurred between AD 1861–64 (three 'Bad' and one normal) and between AD 1893–1904 (six 'Bad' years and six normal years). The 'Very Bad' year of AD 1904 ranks as the 20th driest year in the chronology.

Period 18 (AD 1913–2002)

This period is defined by New Mexico statehood and ends with the end of the reconstruction. The period mean is 32.45 cm and the standard deviation is 10.40. There were two 'Good' strings (AD 1919–1921 and AD 1985–1988) and one 'Very Bad' string (AD 1955–1957). The 1950s included five 'Very Bad' and five normal years. In general, the period was normal or wet until the 1950s, dry from the 1950s through early 1970s, and wet throughout the remainder of the 20th century. The drought of the 2000s has included two 'Very Bad' years (AD 2000 and AD 2002). Two 'Very Bad' years (1956 and 2002) and one 'Very Good' year (1986) rank in the top 25 driest and wettest years, respectively (Table 8.5).

Table 8.5. Extreme years in the Bandelier archaeological periods, Jemez reconstruction.

Period	Dates	Mean	Standard Deviation	Very Good	Good Year	Average Year	Bad Year	Very Bad	Consecutive Strings
1	1150–1190	31.91	11.26	1	5	25	9	0	None
2	1190–1220	31.24	9.85	0	3	23	4	0	1216–1218 (-)
3	1220–1235	31.05	11.63	0	3	9	3	0	None
4	1235–1250	35.40	10.48	0	5	10	0	0	None
5	1250–1290	28.15	9.52	1	1	27	10	1	None
6	1290–1325	34.43	9.97	0	10	24	2	0	None
7	1325–1375	32.26	9.15	0	7	38	5	0	None
8	1375–1400	30.23	8.57	0	1	20	4	0	None
9	1400–1440	29.90	10.27	0	5	25	10	0	1480–1422 (-) 1422–1424 (-)
10	1440–1525	31.44	10.54	0	12	57	14	2	1519–1522 (+) 1522–1524 (-)
11	1525–1610	30.46	13.07	7	7	83	12	6	1539–1541 (+) 1579–1581 (-) 1594–1597 (+)
12	1610–1680	32.11	9.11	3	2	57	8	0	None
13	1681–1694	33.94	8.95	0	2	10	1	0	None
14	1695–1753	30.00	8.97	0	4	43	11	0	1737–1739 (-)
15	1754–1821	30.29	8.63	0	5	52	9	0	1779–1782 (-)

Period	Dates	Mean	Standard Deviation	Very Good	Good Year	Average Year	Bad Year	Very Bad	Consecutive Strings
16	1822–1849	31.49	8.65	0	3	21	3	0	1839–1841 (-)
17	1850–1912	29.43	9.00	0	4	46	11	0	
18	1913–2002	32.45	10.40	1	12	61	14	1	1919–1921 (+) 1957–1955 (-) 1985–1988 (+)

Chama Chronology: Long-Term, Low-Frequency Precipitation Trends

The Chama reconstruction of low- and high-frequency trends in precipitation in the northern area is shown in Figure 8.14; the raw data are presented in Appendix I. The long-term precipitation mean for the area is 43.34 cm per tree-year, and the standard deviation is 11.42 cm inches per year. For any substantial period of time (100+ years) over the course of the reconstruction, the mean changes very little. Although the Chama mean is substantially higher than the Jemez mean, the trends in the two chronologies are similar—as one would expect. There are however, some important differences that are discussed below.

The Chama reconstruction shows relatively consistent variability (i.e., the low-variability and high-variability periods are usually short). High-variability predominates in the late 800s and early 900s, and again in the late 1400s to early 1500s, whereas low variability is typical in the mid-1300s and late 1500s/early 1600s periods.

Using 20-year overlapping periods, however, shows a different trend. From the beginning of the chronology through the late 900s, variability over this longer term is relatively low. A period of high variability begins about AD 1000 and continues until the early 1100s. Low long-term variability again predominates from about AD 1150 through the mid-1400s. High variability typifies the period from the 1700s to the present.

In terms of absolute precipitation, there are several periods of high and low precipitation. High precipitation periods occur in the early 1000s, mid-1000s, mid-1300s, early 1600s, and throughout much of the 20th century. Low periods include late 1000s, early and mid-1200s, mid-1400s, late 1500s, and mid-1900s. Several well-known periods are different in the Chama area. For example, the “Chaco drought” of the mid to late 1100s shows low variability, but mostly average precipitation. The “Great Drought” of the late 1200s was neither lengthy nor severe in the Chama area. The most prolonged downturn in rainfall occurred during the 1400s—a drought that was long, but not extremely severe and extremely favorable precipitation dominated in the 1600s, a factor which may have aided the Spaniards colonization of northern New Mexico. Likewise, with the exception of the 1950s, which was the most severe drought in the

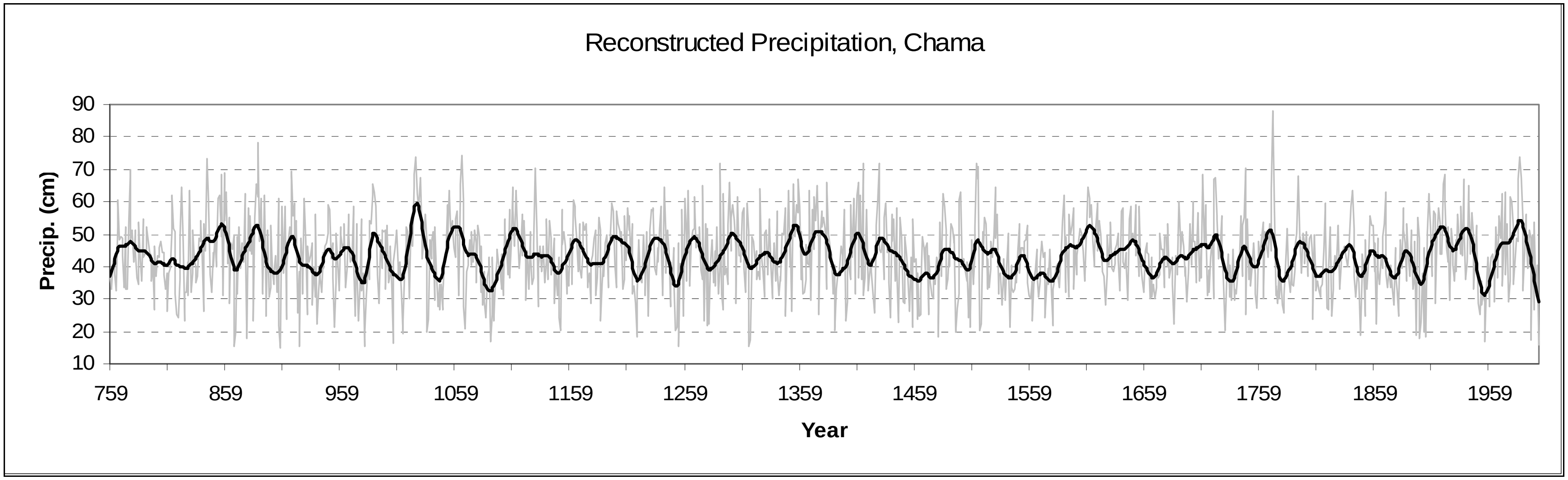

Figure 8.14. Annual and splined precipitation graph for the Chama chronology.

reconstruction, the 20th century shows high precipitation that many Anglos have come to regard as "normal" conditions.

Chama Chronology: High-Frequency Variation

Examining the Chama chronology in terms of individual centuries yields additional interesting results (Table 8.6). Because the reconstruction does not begin until AD 759, however, the AD 700s are not included in the discussion.

Table 8.6. Extreme years per century, Chama reconstruction.

Century	Century Mean	Very Good	Good	Average	Bad	Very Bad
600–699	--	n/a	n/a	n/a	n/a	n/a
759–799	--	0	2	37	1	0
800–899	44.63	4	17	61	15	3
900–999	42.48	1	15	69	12	3
1000–1099	43.04	4	11	68	13	4
1100–1199	44.16	1	14	75	9	1
1200–1299	43.40	1	16	67	14	2
1300–1399	44.98	1	23	63	10	3
1400–1499	42.54	2	17	60	19	2
1500–1599	41.09	3	6	76	14	1
1600–1699	44.01	0	12	80	8	0
1700–1799	43.58	6	9	68	16	1
1800–1899	41.07	0	7	81	10	2
1900–1999	45.17	5	15	64	12	4
2000–2002	--	0	0	2	0	1
Total		**28**	**164**	**871**	**153**	**27**

In terms of individual years, the AD 800s are the second-most variable century in the Chama reconstruction; they also have a relatively high century mean. The AD 840s to AD 860s period was wet, as was the AD 880s, although the only consecutive string of above average years was AD 885–888. Below average years were spread more or less evenly throughout the century and the only string of bad years was AD 816–818; the AD 867–870 period, however, included two 'Very Bad,' an average, and a 'Bad' year.

The AD 900s have a relatively low century mean and about an average number of extreme years. After a string of 'Good' years (AD 917–919), most of the century was relatively dry, including the 'Very Bad'/'Bad' string of AD 980–982—until the upturn of four 'Good' years in AD 987–990.

The AD 1000s may be the most "average" century in the reconstruction. The century average (43.04 cm) is very close to the long-term mean and the number of extreme years (n = 32) is about average. The only consecutive strings of extreme years are both 'Good' (AD 1063–1066) and include the longest and wettest series of years in the entire reconstruction (AD 1023–1029).

After AD 1066, however, there were no 'Good' years, seven 'Bad' years, and one 'Very Bad' year. Thus, the first two-thirds of the century were wet, but the last three decades were either "normal" or dry.

The 1100s also had a relatively high century mean (44.16 cm) and a relatively low number of extreme years (*n* = 25). 'Good' years (*n* = 14) outnumber 'Bad' (*n* = 9), although 'Very Good' and 'Very Bad' years are equal. The only three-consecutive year strings were both wet (AD 1162–1164 and AD 1195–1197), although the AD 1146–1151 period includes three 'Bad,' two average, and one 'Very Bad' year. The first half of the century was mostly average or 'Good,' the middle average or 'Bad,' and the end was average or 'Good.'

The 1200s had a low century mean (43.40 cm) and 33 extreme years—about evenly split between 'Very Good/Good' (*n* = 17) and 'Bad/Very Bad' (*n* = 16). The only consecutive string of extreme years was wet (AD 1230–1232). The first half of the century was above average with the exception of the AD 1214–1217 period, which had a 'Bad,' average, 'Bad,' and 'Very Bad' string of years. The early AD 1250s were 'Bad,' but most of the rest of the century was average or 'Good.' This reconstruction is notable because the Great Drought (AD 1276–1299) of the Colorado Plateau does not appear to have seriously impacted the Chama area.

The 1300s had the second-highest century mean and third-highest number of extreme years in the reconstruction. The century had the highest number of 'Good' years (n = 23) of any century in the reconstruction, but only one 'Very Good' year. The only string of consecutive extreme years was AD 1356–1359, which included three 'Good' and one 'Very Good' year. Importantly, AD 1353 and AD 1354 were also 'Good' years, and AD 1355 was an average year. In short, the AD 1350s were wet. There were no consecutive strings of 'Bad' years. Overall, the AD 1300s experienced several average and 'Good' periods and no serious downturns in precipitation.

The AD 1400s exhibited the most variability of any century; only 60 years were classified as "normal." The mean is somewhat low, but not extremely so. 'Good' (*n* = 17) and 'Very Good' (*n* = 2) years almost equal the number of 'Bad/Very Bad' years (*n* = 21). The only consecutive string of extreme years is the AD 1495–1497 'Bad' period. The AD 1404–1414 period, however, includes six 'Good,' one 'Very Good,' three normal, and only one 'Bad' year; on the other hand, the AD 1449–1464 period includes seven 'Bad' years, eight normal years, and one 'Good' year. In general, the early part of the century was relatively wet and the last half was much drier.

The AD 1500s had a low century mean and relatively few extreme years. 'Bad' years (*n* = 14) outnumber 'Good' (*n* = 6), but 'Very Good' years (*n* = 3) outnumber 'Very Bad' (*n* = 1) years. The only consecutive string of extreme years is the AD 1513–1515 period when all three years were 'Very Good.' The first 30 years of the century were relatively wet or normal, but the AD 1532–1588 period contains only normal or 'Bad' years. The mega-drought of the late AD 1500s may have affected the area, but probably not as severely as areas farther south.

The AD 1600s had a high century mean and neither 'Very Good' nor 'Very Bad' years; indeed, the century was the second least variable in the reconstruction in terms of extreme years (*n* = 20). The only consecutive string of extreme years was the AD 1610–1613 wet period. In general, extreme years were somewhat evenly distributed throughout the century with neither prolonged wet or dry periods.

The AD 1700s had a century mean near the long-term mean, but had the highest number of 'Very Good' (*n* = 6) years in the reconstruction. The only consecutive strings of extreme years were the AD 1720–1722 and AD 1770–1772 periods; dry periods include the AD 1733–1739 period with four 'Bad' and three normal years, and the AD 1773–1781 period with six 'Bad' and three normal years. The early part of the century was somewhat wet, but after AD 1729, most years were either normal or 'Bad' with a couple of exceptions.

The AD 1800s had the lowest century mean in the reconstruction. They also had the highest number of normal years (*n* = 81); 'Bad' (*n* = 10) and 'Very Bad' (*n* = 2) years outnumber 'Good' (*n* = 7) and 'Very Good' years (*n* = 0). No strings of consecutive extreme years were identified.

The AD 1900s had the highest century mean in the reconstruction (45.17) and a relatively high number of extreme years (*n* = 36). Extremely wet periods include 1919–1921 and 1985–1988 (three 'Very Good' and one 'Good' year); only one string of 'Bad' years was identified (1954–1956). In general, the 1905–1950 period was wet or normal, the 1950s with six 'Bad,' one 'Very Bad,' and three normal years were extremely dry, and the last 40 years of the century were relatively wet or normal.

Little can be said about the 2000s, except that 2002 was an extremely dry year.

Chama Chronology: Extreme Events

The 25 most extreme years (Table 8.7) show an impressive range of precipitation from a low of 14.70 cm in AD 907 to a high of 88.11 cm in AD 1771. In terms of centuries, the AD 1900s and AD 1000s both contain four of the driest and four of the wettest years. The AD 800s also contained a high number of these extreme years. Interestingly, the AD 1100–1600 period of the most intense Puebloan occupation of the area contains only six of the wettest and six of the driest extreme years. In historical terms, the only significant correlation is the very wet year of AD 1793, which may have aided de Vargas' reconquest of New Mexico.

Table 8.7. Twenty-five wettest and driest years in the Chama reconstruction.

Year	Driest	Year	Wettest
907	14.70	1771	88.11
867	15.28	888	78.29
924	15.57	1065	74.53
980	15.57	1986	74.04
1254	15.57	1025	73.66
1315	15.57	843	73.37
2002	15.81	1290	71.93
1005	16.15	1414	71.93
1956	16.82	1428	71.64

Year	Driest	Year	Wettest
1090	17.01	1513	71.64
1996	17.29	1515	70.77
1316	17.59	1747	70.29
1899	17.76	1129	70.19
878	17.88	776	69.90
1217	18.17	917	69.62
1480	18.17	858	68.75
1904	18.23	856	68.46
1847	19.00	1024	68.46
1896	19.02	1710	68.26
1013	19.32	1920	68.24
1902	19.75	1793	67.93
868	19.90	1987	67.52
981	19.90	1721	67.38
1035	19.90	1029	67.30
1495	19.90	1937	67.13

COMPARING THE JEMEZ AND CHAMA RECONSTRUCTIONS: SPATIAL DIFFERENCES IN PAJARITO AREA PRECIPITATION

One of the goals of this project was to explore the possible spatial differences in precipitation in the Pajarito area. Such differences may help archaeologists elucidate differences in settlement and subsistence patterns in different areas at different times and address issues such as mobility and migration. By using the chronologies and correlating them with the Chama and Jemez Springs weather stations, respectively, we are able to provide estimates for past precipitation in both the northern and southern portions of the project area (Figure 8.15).

There are several ways to examine and compare the two reconstructions, including by annual values, smoothed annual values, frequency and severity of extreme events, and Z-scores. Appendices H and I present the annual and smoothed basis for every common year in both chronologies. The reconstruction graphs typically track each other very well—when it is wet/dry in Chama, it is wet/dry in Jemez and vice versa. The Chama area typically received about 10 cm more precipitation than the Jemez area (Figure 8.15) on an annual basis. This difference is certainly real, although the magnitude of the difference may be impacted by our use of the Chama modern data in the calibration. Chama is farther north than our tree collection sites, but the live-tree sites are approximately 1000 ft higher in elevation than the weather station. Both of these factors may inflate the absolute quantities for the northern Pajarito area, but we believe they represent increased precipitation in the north and that the trends are accurate. One interesting aspect of Figure 8.15 is those years when the Jemez area shows higher absolute values than the Chama reconstruction. Given that Puebloan societies developed a three-year storage strategy (Schlanger 1985), such single-year discontinuities probably had little effect on long-term adaptive strategies. It would be interesting, however, to determine whether or not hunting, gathering, trading, or raiding changed during those years.

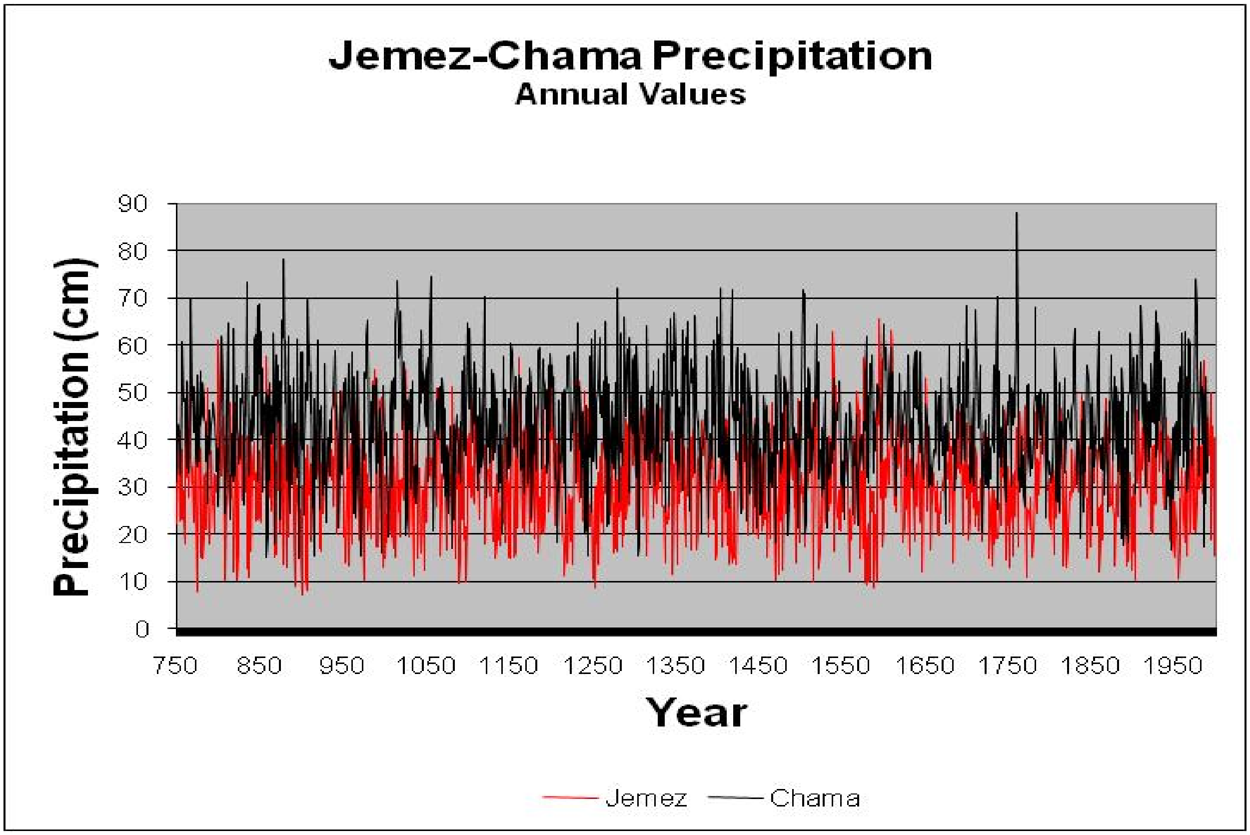

Figure 8.15. Annual precipitation values for both Jemez and Chama chronologies.

Another way to compare the two reconstructions is by plotting the 20-year smoothed absolute values for each year (Figure 8.16). This approach helps remove the individual annual variation in each reconstruction. The Chama reconstruction almost always retrodicts higher precipitation values than the Jemez reconstruction using the 20-year spline. There is one short span in the entire 1241 years of both reconstructions when the Jemez was more well-watered than the Chama area. The AD 1538–1542 period shows the Jemez with absolutely more precipitation than the Chama; in addition, during AD 1543–1544 the two areas are nearly equal. Significantly, this trend is not due to droughts when both areas were dry and the Jemez simply less arid. Included in the 25 wettest years of the Jemez reconstruction are AD 1540, AD 1541, and AD 1543 (see below); none of the years between AD 1530–1550 in the Chama area was unusually wet. As shown in Figure 8.17, even the absolute differences are highest during this time period. From this perspective, Coronado's trip from Hawikuh and sojourn in the Rio Grande Valley could not have come at a better time for the Spaniards.

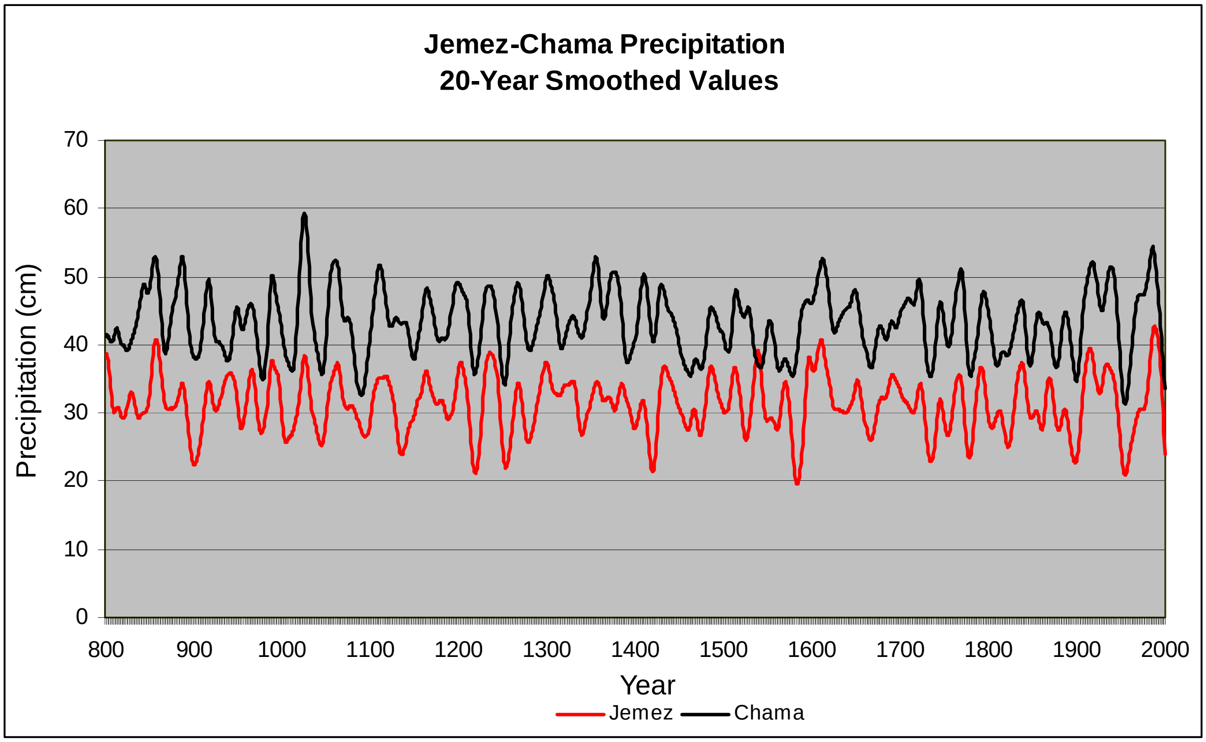

Figure 8.16. Splined precipitation values for both Jemez and Chama chronologies.

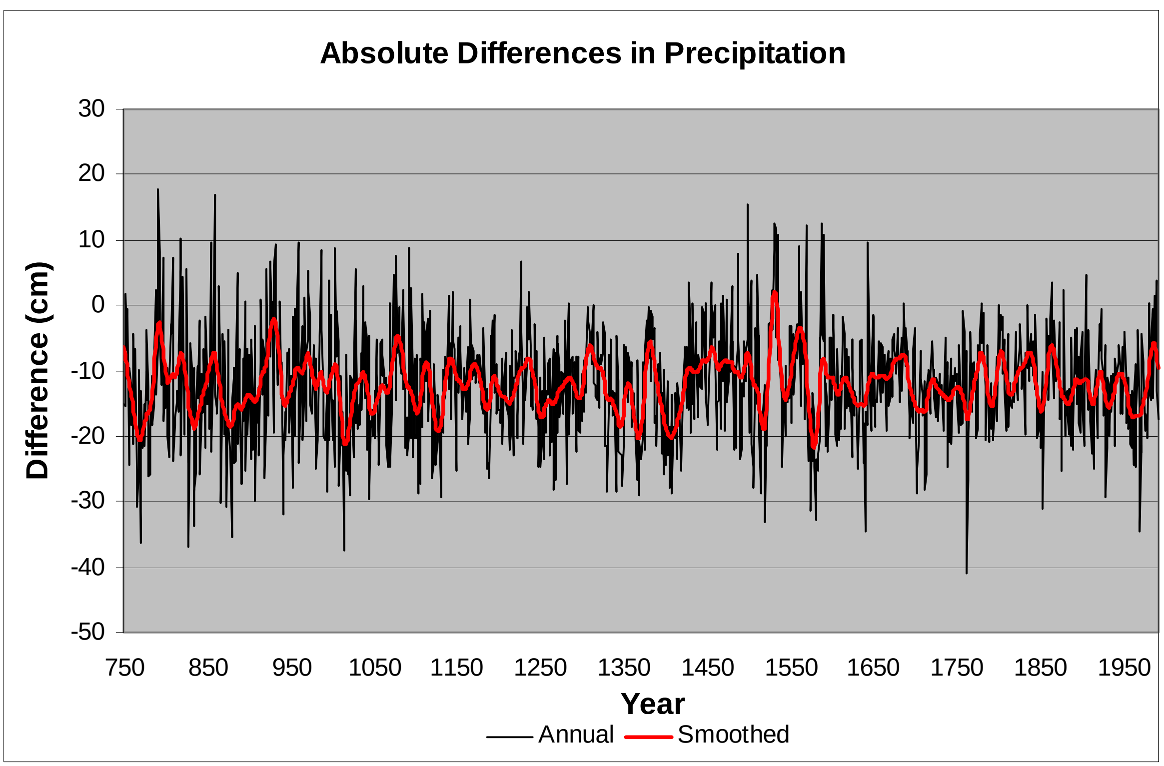

Figure 8.17. Graph of precipitation value absolute differences, both chronologies.

Extreme Events

Another factor that may have been important in land-use strategies of the area is the frequency and magnitude of extreme events. The chronology-specific extreme events have been discussed above, but here we examine the temporal relationships in each area.

Table 8.8 presents the extreme (very good, good, bad, and very bad) years in each reconstruction. These classifications are based on each chronology's mean and standard deviation; thus, a 'Bad' year in Chama may not necessarily be a 'Bad' year in Jemez and vice-versa. Because the Chama retrodiction is shorter, only the 9th to 20th centuries are compared.

Table 8.8. Comparison of extreme years in each reconstruction.

Century	Jemez Very Good	Chama Very Good	Jemez Good	Chama Good	Jemez Average	Chama Average	Jemez Bad	Chama Bad	Jemez Very Bad	Chama Very Bad
800–899	3	4	12	17	69	61	13	15	3	3
900–999	2	1	15	15	62	69	18	12	3	3
1000–1099	1	4	11	11	66	68	20	13	2	4
1100–1199	1	1	10	14	72	75	17	9	0	1
1200–1299	1	1	14	16	67	67	17	14	1	2
1300–1399	0	1	13	23	77	63	10	10	0	3
1400–1499	0	2	11	17	69	60	19	19	1	2
1500–1599	6	3	13	6	59	76	17	14	5	1
1600–1699	3	0	4	12	82	80	11	8	0	0
1700–1799	0	6	8	9	77	68	17	16	0	1
1800–1899	0	0	6	7	81	81	13	10	0	2
1900–1999	1	5	14	15	69	64	16	12	0	4

In general, the frequency of extreme years are similar in the two areas through time. The Jemez area has experienced fewer 'Very Bad,' 'Very Good,' and 'Good' years, but more 'Bad' years. Most centuries were similar in that most had an equivalent number of normal years, but there were exceptions.

In the AD 800s, the Chama area experienced more 'Good' years; in the AD 900s, the Jemez area suffered through more 'Bad' years; in the AD 1300s, the Chama area had more 'Good' years, but also more 'Very Bad' years; in the AD 1400s, the Chama area also had more 'Good' and 'Very Good' years. The AD 1500s were unusual in that the Jemez area had more 'Very Good' and 'Good' years, but also more 'Bad' and 'Very Bad' years—obviously, precipitation was more variable in that area at that time. The AD 1900s were also somewhat unusual in that the Chama area experienced more 'Very Good,' 'Good,' and 'Bad' years, but also more 'Very Bad' years.

These data suggest that differences in extreme years most often, but not always, were the result of wetter years in the north. The impacts of these inferences on past human settlement and land-use practices remain to be explored by area archaeologists.

Z-Scores

Perhaps the most efficient way of comparing the two retrodictions on both short- and long- term time scales is by transforming the data into Z-scores. This transformation allows us to compare the chronologies using the same quantitative and temporal scales regardless of the absolute values. Table 8.9 summarizes these differences for each century in the reconstructions. It should be remembered, however, that the absolute values in the reconstruction are estimates with associated statistical errors and that they should not be interpreted as absolutely measured precipitation amounts.

Table 8.9. Comparison of Z-scores.

Time Period	Jemez	Chama	Comments
770–790	decreasing	increasing	Values moving in opposite directions; possibly related to sample size (?)
795–807	increasing	flat	Jemez wetter, Chama relatively flat just below mean
836–848	flat	increasing	Chama wetter, Jemez flat around mean
875–893	increasing	increasing	Both wet; Chama much wetter
895–910	decreasing	decreasing	Both dry; Jemez much drier
929–945	increasing	decreasing	Values moving in opposite directions; Chama much drier
972–984	decreasing	decreasing	Both dry; Chama drier
1019–1033	increasing	increasing	Both wet; Chama much wetter
1078–1096	decreasing	decreasing	Both dry; Chama drier
1107–1114	increasing	increasing	Both wet; Chama wetter
1128–1152	decreasing	decreasing	Both dry; Jemez drier; Chama offset 1133–1157
1211–1227	decreasing	decreasing	Both dry; Jemez drier
1230–1244	increasing	increasing	Both wet; Jemez wetter
1311–1325	increasing	decreasing	Jemez wet above mean; Chama dry
1349–1361	increasing	increasing	Both wet; Chama wetter
1372–1383	flat	increasing	Chama wet; Jemez at mean
1386–1402	decreasing	decreasing	Both dry; Jemez offset 1393–1406
1411–1426	decreasing	decreasing	Both dry; Jemez much drier; Chama offset 1417–1424
1480–1497	increasing	increasing	Both wet; Jemez wetter
1525–1530	decreasing	increasing	Jemez dry; Chama around mean
1533–1545	increasing	decreasing	Chama dry; Jemez much wetter
1566–1574	increasing	decreasing	Chama dry; Jemez wetter
1579–1592	decreasing	decreasing	Both dry; Jemez much drier
1593–1622	increasing	increasing	Both wet; 1593–1613 Jemez wetter

Time Period	Jemez	Chama	Comments
1676–1698	increasing	decreasing	Jemez wet; Chama dry
1710–1717	decreasing	increasing	Jemez average; Chama wet
1806–1813	decreasing	decreasing	Chama dry; Jemez not as dry
1830–1844	increasing	increasing	Both wet; Jemez wetter
1845–1854	decreasing	decreasing	Both dry; Chama drier
1866–1871	decreasing	decreasing	Both dry; Chama drier

Figure 8.18 shows the smoothed Z-scores for the common years in both chronologies. As can be seen, both chronologies track each other relatively well—again, not surprising. During periods such as the AD 850s, mid-900s to mid-1000s, mid-1100s to early 1300s, and much of the post-1700 era, the chronologies are very similar in terms of trends, if not magnitudes of change. Certainly there were more severe droughts and more precipitation in one area or another, but the changes were, for the most part, synchronous.

The most interesting periods, on the other hand, are those that are asynchronous—drought in one area offset by wetter conditions in the other. Table 8.9 describes the graph in detail and the raw data are presented in Appendix J. Again, the most dramatic difference between the two areas occurs in the AD 1530s and early 1540s when Jemez was wet and Chama dry.

Finally, we have also developed quantitative methods for comparing the periodicity of the two time series (Cook and Peters 1981; Johnson 1994; Salzer 2000a). We use these techniques to characterize each reconstruction and compare the high and low precipitation periods in each area.

The quantitative method involves several steps. First, a 10-year smoothing spline was applied to the reconstructed precipitation values (Cook and Peters 1981); the spline functions as a low-pass filter and preserves the high-frequency variation in the data. Second, the original and splined data were converted to Z-scores, which quantified the deviations from the long-term mean. Third, we used the splined (Z-score) data to identify periods that deviated from long-term mean conditions by at least 1.1 standard deviations, the value proposed by Dean (1988) as significant in influencing past human adaptive behavior. The initial and terminal years of each period were defined using non-smoothed data because the splined data are influenced by preceding and succeeding amounts. The minimum length for any period was defined as five years. Finally, the beginning of a period was defined as the year when the reconstructed value first substantially deviated from mean conditions (<0.5 sad or >0.5 sad), and the end of a period was defined as that point when conditions returned for two consecutive years.

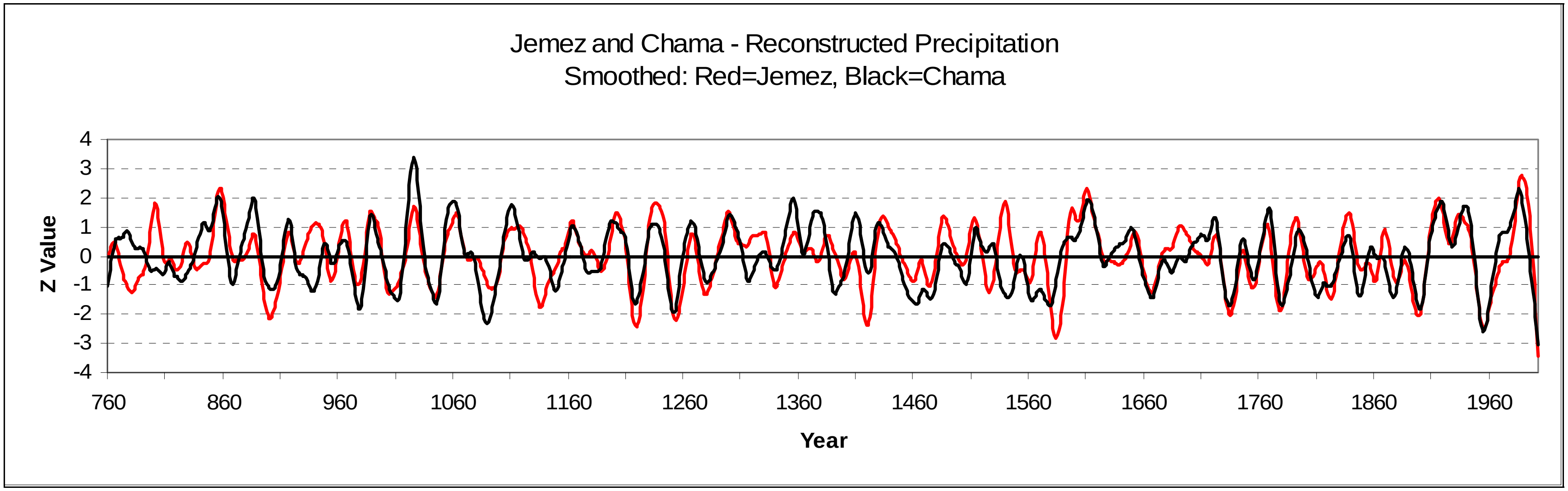

Figure 8.18. Z-scores of both chronologies.

Table 8.10 lists the wet and dry periods for both areas using quantitative criteria. There are several interesting aspects of these data. First, the only absolutely contemporaneous dry periods in both chronologies are near the recent end—the 1899–1904 drought, the 1950s drought, and the current drought. Conversely, four absolutely contemporaneous wet periods all occurred before AD 1302. Six wet periods overlap substantially, but are offset by a year or more; three occurred before AD 1029 and three occurred after AD 1608. There are also seven near-contemporaneous dry periods—three occurred before AD 1000 and three occurred after AD 1664. These short differences in periodicity may be the result of the use of different tree species in various parts of the chronologies and deserves additional research. The distribution of these periods in different centuries may also be important; there were no wet periods in the 1800s in either chronology, no dry periods in the 1300s at Chama, and no wet periods in the 1500s at Chama.

Table 8.10. Quantitative comparison of wet/dry periods in each reconstruction.

Jemez Wet	Chama Wet	Jemez Dry	Chama Dry
612–619	--	639–648	--
628–632	--	658–666	--
649–655	--	672–681	--
800–806	841–844	698–706	939–943
853–860	858–862	778–783	975–984
885–890	**885–890**	807–811	999–1005
915–919	915–921	897–903	1010–1014
985–989	985–990	950–955	1044–1049
994–998	1023–1029	999–1006	1081–1087
1024–1029	1052–1057	1131–1140	1090–1094
1060–1066	1109–1114	1214–1224	1146–1151
1162–1167	**1162–1167**	1248–1258	1214–1227
1200–1204	1207–1213	1276–1288	1426–1256
1228–1232	**1228–1232**	1335–1342	1461–1465
1241–1245	1266–1270	1396–1400	1471–1477
1297–1302	**1297–1302**	1415–1424	1504–1510
1330–1334	1353–1359	1455–1461	1542–1548
1383–1387	1370–1374	1470–1477	1573–1581
1431–1437	1377–1384	1579–1587	1664–1672
1484–1488	1409–1414	1666–1670	1729–1739
1511–1515	1608–1613	1733–1742	1773–1781
1536–1541	1617–1621	1773–1782	1806–1814
1609–1613	1646–1651	1818–1824	1842–1848
1651–1655	1743–1747	1859–1864	1871–1876
1766–1771	1768–1772	**1899–1904**	**1899–1904**
1790–1795	1792–1797	**1950–1959**	**1950–1959**
1912–1921	1941–1945	**2000–?**	**2000–?**
1930–1937	--	--	--
1983–1988	--	--	--

Also of interest may be those near-sequential periods with similar conditions. For example, the Jemez wet period of AD 1200–1204 was followed shortly thereafter by a Chama wet period from AD 1207–1213; other wet sequences include AD 1377–1384 (Chama) and AD 1383–1387 (Jemez), and AD 1646–1651 (Chama) and AD 1651–1655 (Jemez). There are only two near-sequential dry periods in the reconstructions; AD 1455–1461 (Jemez) and AD 1461–1465 (Chama), and AD 1573–1581 (Chama) and AD 1579–1587 (Jemez). Although few in number, these near-sequential periods may have influenced land-use patterns on the Pajarito Plateau and in surrounding areas. All but the latest wet episode in the mid-1600s occurred during the Bandelier archaeological periods and may be amenable to archaeological research using those data.

It is probable that the differences between the Chama and Jemez, particularly on a seasonal basis, are related to the fluctuating, sinuous line that separates two different climatic regimes in the Southwest (Ahlstrom et al. 1995; Dean and Funkhouser 1995). North and west of the line, precipitation has generally been unimodal; that is, winter snow pack has been the major component of annual precipitation. South and east of the line, a bimodal regime of winter rains and summer monsoons has predominated. Over the centuries, this fluctuating pattern has moved back and forth between the New Mexico-Colorado border and approximately the northern Chama Valley area (Dean 1996b; Dean and Funkhouser 1995), except during the chaotic period of ca. AD 1225–1450. Therefore, combined with the archaeological record of the area, the Pajarito area is an ideal locale to investigate the impacts of changing seasonal precipitation patterns on the cultural adaptations of subsistence agriculturalists, hunter-gatherers, and pastoralists.

Evaluation of the Agricultural Risk Model

Orcutt (1999) developed a detailed model of agricultural risk in the Bandelier area in order to explain such archaeological phenomena as mobility, aggregation, and the degree of commitment to agriculture during the AD 1150–1610 period. Orcutt's detailed study used the July PDSI (Palmer 1965) and exhaustive archaeological data (Powers and Orcutt 1999b) to elucidate many aspects of the prehistoric and protohistoric occupation of the area. The PDSI data were derived using the Rose et al. (1981) Arroyo Hondo tree-ring reconstruction of precipitation.

One of the major goals of this study was to evaluate the climatic aspects of the model; we are not reevaluating or using the archaeological data. This evaluation should in no way be construed as a criticism of Orcutt's efforts. We have developed new databases and used previously collected data that were not available at the time of her study.

The basic theoretical underpinnings of the Orcutt model are sound and we use them here. The mean and variability of moisture during each archaeological period are critically important to the success of argriculturalists in the Southwest. We use these same measures, but in different ways, to compare all three data sets: the Jemez reconstruction, the Chama reconstruction, and the Orcutt model.

The Jemez Reconstruction

Table 8.11 presents the precipitation mean and standard deviation for each period in the Bandelier chronology. It also lists the period deviation from the long-term mean and standard deviation (columns 4 and 6); Figure 8.19 summarizes these data using box-and-whisker plots.

Table 8.11. Jemez reconstruction wet/dry periods compared to Bandelier archaeological chronology (non-overlapping).

Period	Years	Mean	Deviation from Long-Term Mean	St Dev	Deviation from Long-Term Value
1	1150–1190	31.91	0.59	11.26	0.77
2	1190–1220	31.24	-0.08	9.85	-0.64
3	1220–1235	31.05	-0.27	11.63	1.14
4	1235–1250	35.40	4.08	10.48	-0.01
5	1250–1290	28.15	-3.17	9.52	-0.97
6	1290–1325	34.43	3.11	9.97	-0.52
7	1325–1375	32.26	0.94	9.15	-1.34
8	1375–1400	30.23	-1.09	8.57	-1.92
9	1400–1440	29.90	-1.42	10.27	-0.22
10	1440–1525	31.44	0.12	10.54	0.05
11	1525–1600	30.46	-0.86	13.07	2.58

Long-term mean = 31.32; standard deviation = 10.49

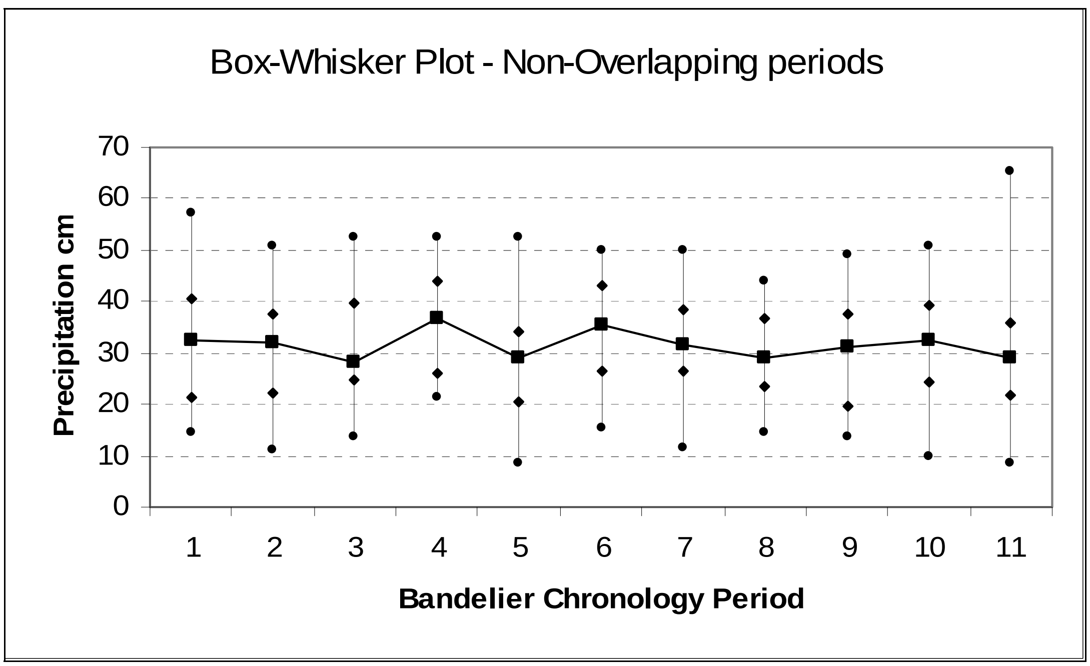

Figure 8.19. Jemez box-and-whisker plot of Bandelier chronology (non-overlapping).

Most of the periods exhibit similar precipitation means and standard deviations. Periods 4, 5, 6, and 9, however, are clearly different. Periods 4 and 6 had much higher mean precipitation than other periods, and Period 5 was much lower. Period 9 was also dry, but not as dry as Period 5. The dramatic differences, or alternations, between Period 4, 5, and 6 may have had important impacts on the area occupants. We leave such interpretations to Pajarito archaeologists.

The standard deviations within each period are also informative. Periods 3, 7, 8, and 11 have the highest standard deviations, although Period 5 could also be considered somewhat high. We believe it important that the "alternating" Periods 4, 5, and 6, which have very different precipitation means, have relatively low standard deviations. It may also be important that the highest standard deviation is in Period 11, which exhibits a relatively low mean precipitation. How this precipitation regime impacted the Puebloan and Spanish populations in the area remains an important question.

Orcutt uses 10-year overlaps for each period because the period boundaries are uncertain and because there is usually a lag between environmental stress and human behavior (Orcutt 1999:231). Table 8.12 presents the 10-year overlapped Jemez data and Figure 8.20 shows these data graphically.

Table 8.12. Jemez reconstruction wet/dry periods compared to Bandelier archaeological chronology (overlapping).

Period	Years	Mean	Deviation from Long-Term Mean	St Dev	Deviation from Long-Term Value
1	1140–1200	31.57	0.25	10.36	-0.13
2	1180–1230	30.59	-0.73	10.32	-0.17
3	1210–1245	31.80	0.48	11.14	0.65
4	1225–1260	31.36	0.04	11.41	0.92
5	1240–1300	30.32	-1.00	10.18	-0.31
6	1280–1335	33.29	1.97	9.56	-0.93
7	1315–1385	31.92	0.60	9.12	-1.37
8	1365–1410	31.71	0.39	8.26	-2.23
9	1390–1450	30.15	-1.17	9.88	-0.61
10	1430–1535	31.64	0.32	10.03	-0.46
11	1515–1610	30.95	-0.37	13.39	2.90

Long-term mean = 31.32; standard deviation = 10.49

Examining the data in this way indicates that only Periods 5, 6, and 9 were different from the long-term mean in any meaningful way. Period 4, which is the most different period in the non-overlapped analysis, is very close to the long-term mean. Period 9 also stands out in both analyses as below the mean. If we examine the overlapped periods in terms of standard deviations, Periods 7, 8, 11, and possibly 6 are clearly different. Period 11 was clearly more variable, as well as relatively dry.

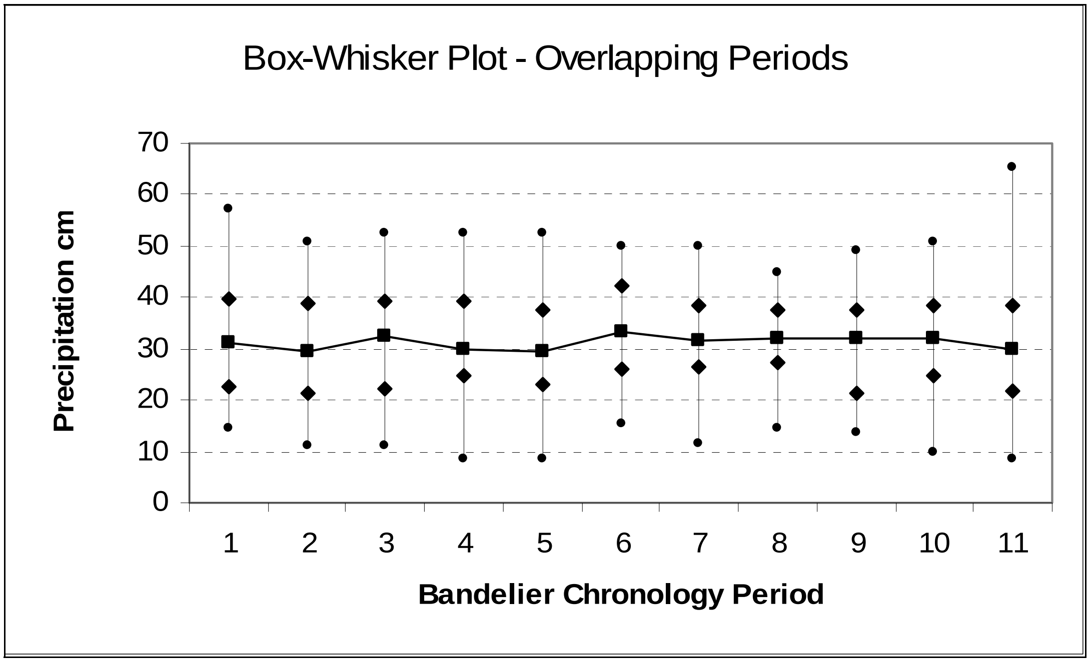

Figure 8.20. Jemez box-and-whisker plot of Bandelier chronology (overlapping).

The Chama Reconstruction

Table 8.13 presents the Chama precipitation mean and standard deviation for each period in the Bandelier chronology. It also lists the period deviation from the long-term mean and standard deviation (columns 4 and 6); Figure 8.21 summarizes these data using box-and-whisker plots.

Table 8.13. Chama reconstruction wet/dry periods compared to Bandelier archaeological chronology (non-overlapping).

Period	Years	Mean	Deviation from Long-term Mean	S.D.	Deviation from Long-term S.D.
1	1150–1190	42.79	-0.55	10.16	-1.26
2	1190–1220	44.68	1.34	10.73	-.69
3	1220–1235	43.57	0.23	10.25	-1.17
4	1235–1250	44.45	1.11	9.81	-1.61
5	1250–1290	42.39	-0.95	13.43	2.01
6	1290–1325	45.22	1.88	13.29	1.87
7	1325–1375	46.58	3.24	11.85	.43
8	1375–1400	42.39	-0.95	11.30	.12
9	1400–1440	45.47	2.13	12.56	1.14
10	1440–1525	41.18	-2.16	12.15	.73
11	1525–1600	40.55	-2.79	9.01	-2.41

Long-term mean = 43.33731; standard deviation = 11.42

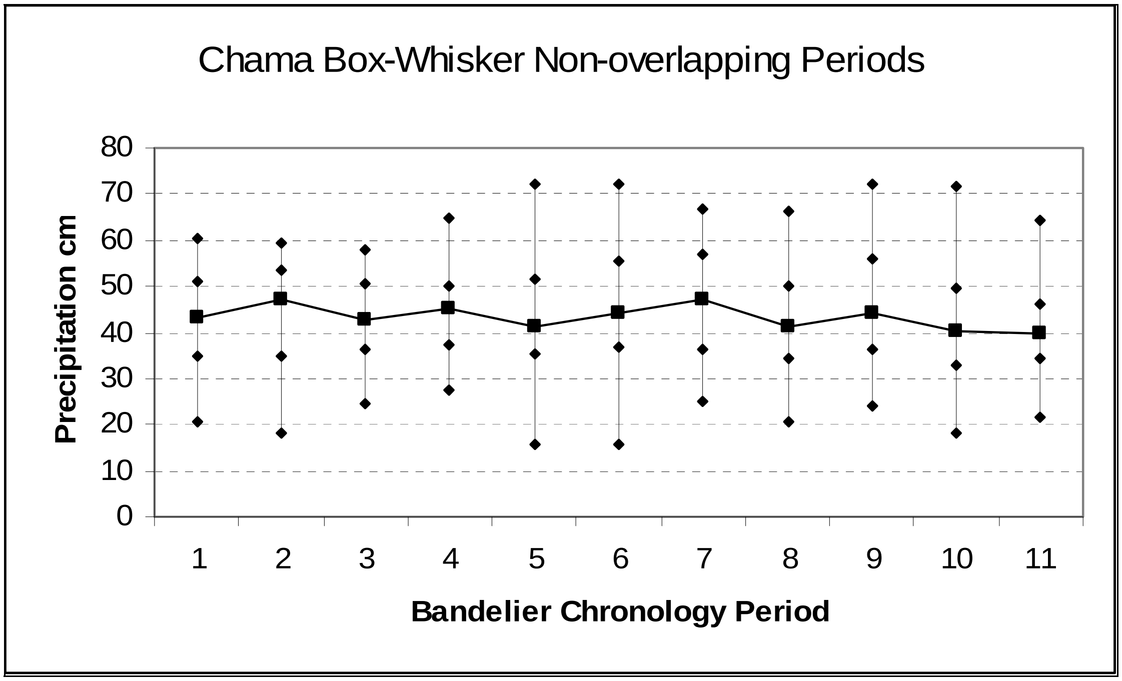

Figure 8.21. Chama box-and-whisker plot of Bandelier chronology (non-overlapping).

The Chama reconstruction period means present an interesting pattern. After below-average precipitation in the AD 1150–1190 period, there was above-average precipitation in Periods 2 to 4, from AD 1190–1250. After low precipitation from AD 1250–1290 (Period 5), above average precipitation prevailed throughout Periods 6 and 7 (AD 1290–1375). Periods 8 and 9 alternated between below and above-average precipitation, but the final two periods (10 and 11) experience the lowest precipitation means in the reconstruction. In short, the archaeological chronology begins dry, is somewhat wet for 60 years, drier for 40 years, wetter for 85 years, drier for 25 years, wetter for 40 years, and finally drier for the last 160 years of the chronology.

The Chama period standard deviations also present an interesting pattern. The first four periods (AD 1150–1250) experienced variability below the long-term average; the next six periods were all above the long-term standard deviation, and the final period (AD 1525–1610) was the least variable in the entire archaeological chronology.

Viewing the Chama chronology using 10-year overlapped periods (Table 8.14; Figure 8.22) changes the interpretation slightly.

Table 8.14. Chama reconstruction wet/dry periods compared to Bandelier archaeological chronology (overlapping).

Period	Years	Mean	Deviation from Long-term Mean	S.D.	Deviation from Long term S.D.
1	1140–1200	43.32	-0.02	9.94	-1.48
2	1180–1230	43.53	0.19	10.58	-.84
3	1210–1245	43.68	0.34	10.94	-.48

Period	Years	Mean	Deviation from Long-term Mean	S.D.	Deviation from Long term S.D.
4	1225–1260	42.83	-0.51	12.59	1.17
5	1240–1300	42.92	-0.42	12.89	1.47
6	1280–1335	43.70	0.36	12.00	.58
7	1315–1385	45.49	2.15	12.20	.78
8	1365–1410	45.53	2.19	11.90	.48
9	1390–1450	43.76	0.42	12.47	1.05
10	1430–1535	41.83	-1.51	11.92	.5
11	1515–1610	41.57	-1.77	9.94	-1.48

Long-term mean = 43.33731; Standard deviation = 11.42

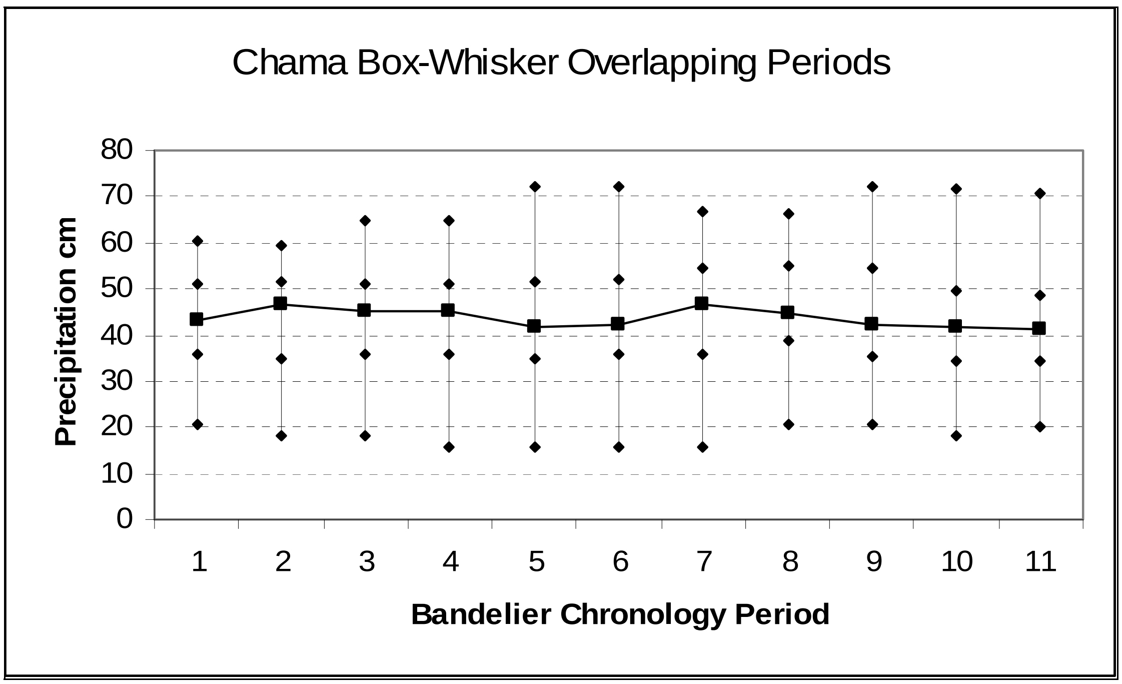

Figure 8.22. Chama box-and-whisker plot of Bandelier chronology (overlapping).

In terms of mean precipitation, Period 4 (AD 1225–1260) is below average and Period 8 (AD 1365–1410) is now above average; the other periods change in terms of absolute values, but not whether or not they are above or below the long-term mean. In terms of standard deviations, only Period 4 changes from less variable to above the long-term standard deviation.

The Jemez and Chama reconstructions and the Orcutt model provide three different views of past moisture availability in the Pajarito Plateau area between AD 1150–1610. There are, of course, differences. This project retrodicted precipitation using tree-ring data and Orcutt retrodicted soil moisture based on different tree-ring data. There are also spatial differences in these approaches—our Jemez retrodiction is calibrated on the Jemez Springs HCN data, our Chama retrodiction is based on the Chama station data, and the Orcutt model is ultimately based on the

Arroyo Hondo tree-ring series. Nevertheless, we believe the different reconstructions are broadly comparable.

Orcutt developed a matrix that partitioned her period data into four possible moisture and variability combinations: high mean/high variation, high mean/low variation, low mean/high variation, and low mean/low variation. She then plotted each archaeological period in the matrix (Figure 8.23) and posited behavioral responses to these variables that should be visible in the archaeological record.

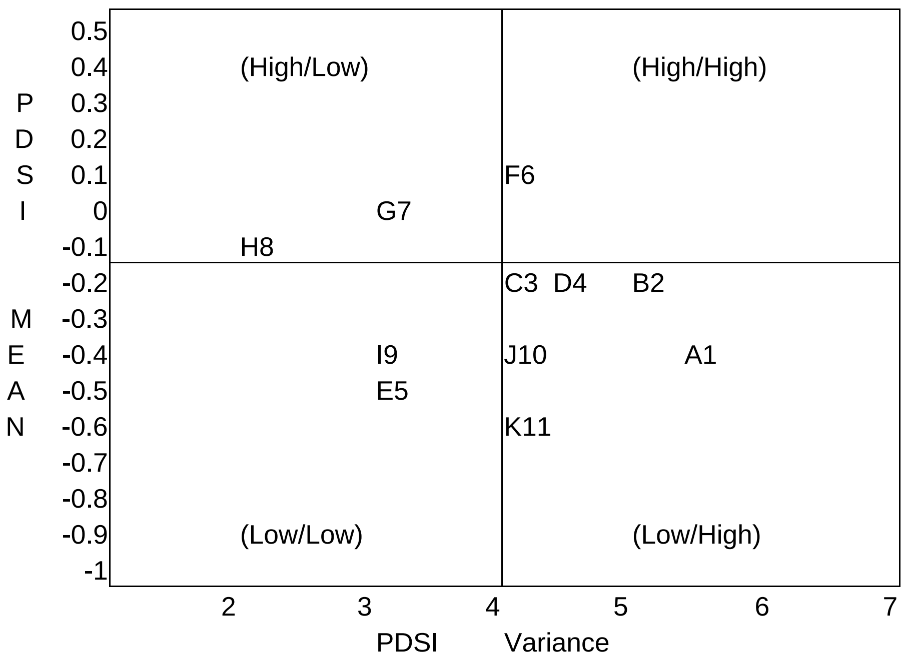

Figure 8.23. Orcutt's quadrats of precipitation variability.

As a comparative exercise, we have partitioned the Jemez and Chama data into similar combinations and plotted them (Figures 8.24 and 8.25). When we compare all three models (Table 8.15), there are important similarities and differences.

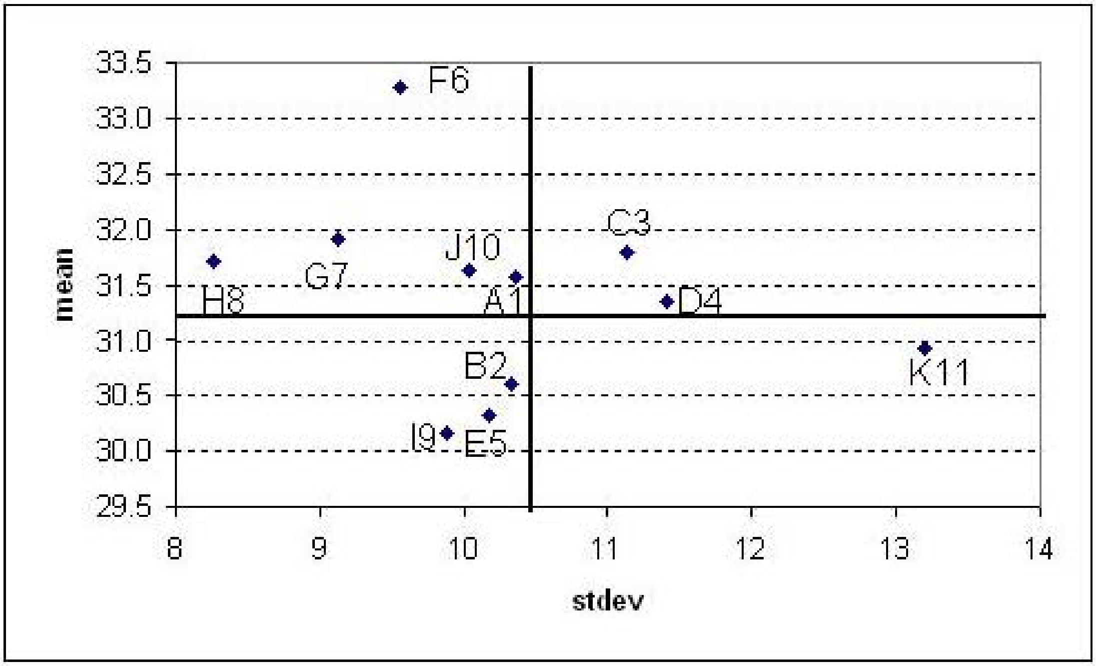

Figure 8.24. Jemez chronology quadrats of precipitation variability.

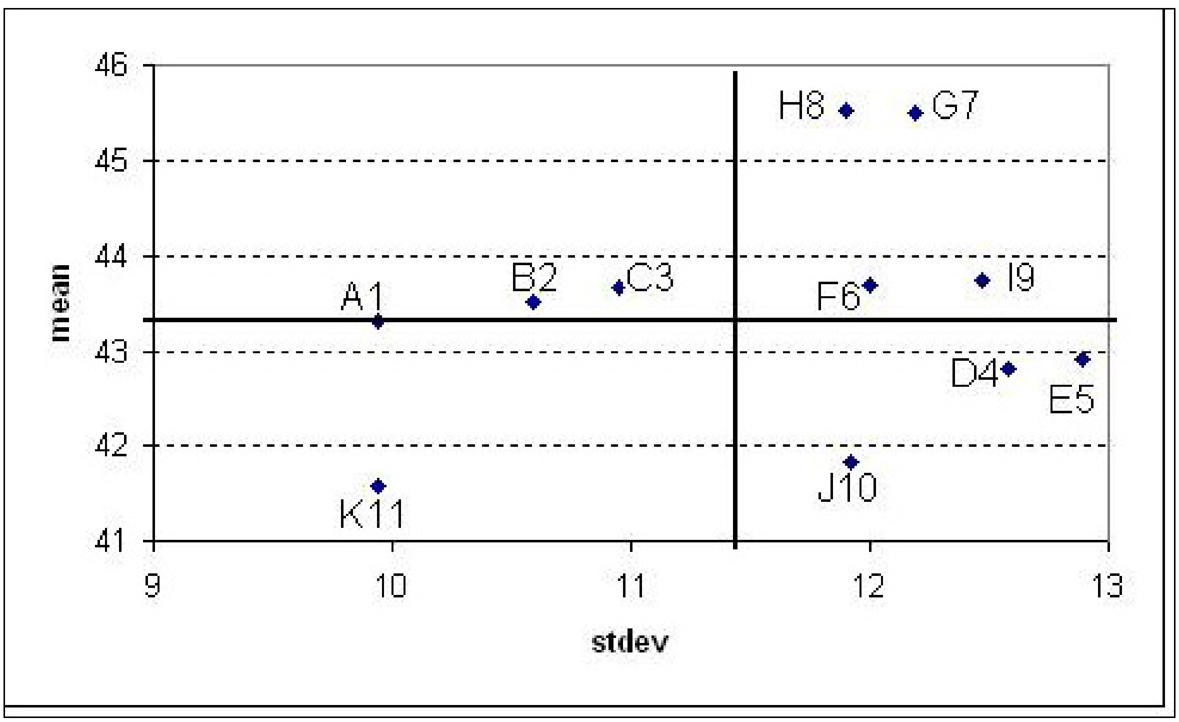

Figure 8.25. Chama chronology quadrats of precipitation variability.

Table 8.15. Comparison of three models' mean and variance.

Period	Orcutt Model		Jemez		Chama	
	Mean	Variance	Mean	S.D.	Mean	S.D.
1	L	H	H	L	H	L
2	L	H	L	L	H	L
3	L	H	H	H	H	L
4	L	H	H	H	L	H
5	L	L	L	L	L	H
6	H	H	H	L	H	H
7	H	L	H	L	H	H
8	H	L	H	L	H	H
9	L	L	L	L	H	H
10	L	H	H	L	L	H
11	L	H	L	H	L	L

Interestingly, there are no periods in which all three models agree on both variables. Sometimes they all agree on one variable, and some times two reconstructions agree on both, but disagree with the other model. The possible reasons for these similarities and differences are explored below.

In Period 1 (AD 1150–1190), the Jemez and Chama datasets agree (High mean/Low standard deviation) and are opposite of the Orcutt model (Low/High). These differences may be more perceived than real. The Jemez and Chama High means are only slightly above their long-term values, and the Jemez standard deviation is only slightly below its long-term value. Clearly, however, the Chama and Orcutt variability value are much different.

During Period 2 (AD 1190–1220), all three reconstructions are different: Orcutt is Low/High, Jemez is Low/Low, and Chama is High/Low. Again, the absolute values may be important—the Chama mean is only slightly above the long-term average, the Orcutt mean is slightly below, and the Jemez standard deviation is slightly below. Thus, the major differences between the Orcutt model variance and Chama standard deviation.

All three reconstructions show different results in Period 3. The Jemez (High/High) and Chama (High/Low) agree about above-average precipitation, and the Orcutt model (Low/High) and Jemez agree about above-average variability. A closer look at the plots, however, shows that all three reconstructions place the period near both central axes of the quadrants; thus, the differences are simply not great.

Period 4 (AD 1235–1250) shows significant agreement in that all three models indicate high variability; the Orcutt model and Chama also indicate low mean moisture availability. Like the previous periods, however, the mean values are all very near the long-term value and the differences are probably not behaviorally important. The period obviously experienced highly variable conditions as indicated by all three datasets.

With only one exception, Period 5 (AD 1250–1290) is characterized as Low mean/Low variability; the Chama reconstructions recorded very high variability. The period was clearly dry throughout the northern Rio Grande, but the Chama area was less arid and experienced more wet years. The implications of this difference deserve more scrutiny by area archaeologists.

Conditions changed significantly during Period 6 (AD 1290–1325). All three models indicate high mean moisture, and the Orcutt and Chama data indicate high variability as well. The Orcutt and Jemez data suggest that this period had the highest mean precipitation during the archaeological chronology. Apparently, the Jemez/Bandelier area was wet and somewhat variable; the Chama area was only slightly above average and somewhat more variable. All in all, Period 6 should have been very productive throughout the northern Rio Grande area.

The good times continued during Period 7 (AD 1325–1375) with high means and low variability, except in the Chama area which also experienced high variability. The high variability in the Chama area was probably offset by one of the highest means in the entire reconstruction.

Period 8 (AD 1375–1400) is identical to Period 7 in terms of the category classifications; Orcutt and Jemez (High/Low) and Chama (High/High). The high means in all three reconstructions are very similar and the variability is lower in all three models than in Period 7. Indeed, Period 8 may have been the most optimal period in the entire archaeological chronology.

Things changed dramatically in Period 9 (AD 1400–1440). Mean moisture availability was low in both the Orcutt and Jemez models, but slightly above average in the Chama dataset. Variability was low in the Jemez/Bandelier area, but still high in the Chama area. These spatial differences may have had important implications for settlement and subsistence throughout the area and should be explored by area archaeologists.

The Orcutt and Chama reconstructions agree that Period 10 (AD 1440–1525) experienced low mean/high variability; the Jemez, on the other hand, indicates high mean/low variability. Examination of the raw data, however, indicates that the Jemez High/Low configuration is a result of classification; the mean is only slightly above the long-term value and the standard deviation is only slightly below the long-term value. Thus, all three models are telling similar stories—times were not great.

The final archaeological period (AD 1525–1610) continued to be relatively poor. The Orcutt and Jemez models indicate Low mean and High variability, and the Chama data indicate Low mean and Low variability.

Finally, we also used quantitative methods to evaluate precipitation periodicity during the years of the Bandelier archaeological chronology. Our methods are similar to those used above to identify wet/dry periods in each reconstruction. In this evaluation, however, every year's value was forced into a wet/dry category based on its relationship to the long-term mean and splined values around it. In this way, the method is similar to those of a PDSI analysis.

Table 8.16 presents our wet/dry years, the Bandelier periods, and comments regarding the precipitation during those periods. Only two periods, Period 1 (AD 1150–1190) and Period 6

(AD 1290–1325), did not experience changes in the precipitation regime. Interestingly, both Periods 1 and 6 experienced above-average precipitation. All the other archaeological periods experienced at least one, and some times more, shifts from wet or dry conditions to the opposite.

Table 8.16. Quantitative evaluation of precipitation periodicity compared to Bandelier archaeological periods.

Years	Condition	Bandelier Period	Bandelier Years	Comments on Period Precipitation
1131–1151	DRY	--	--	n/a
1152–1213	WET	1	1150–1190	wet all period
1214–1227	DRY	2	1190–1220	wet early, dry late period
1228–1245	WET	3	1220–1235	dry early, wet late period
1246–1264	DRY	4	1235–1250	wet early, dry (very) late period
1265–1275	WET	5	1250–1290	dry early, wet middle, dry late period
1276–1289	DRY	5	1250–1290	dry early, wet middle, dry late period
1290–1334	WET	6	1290–1325	wet all period
1335–1350	DRY	7	1325–1375	wet early, dry middle, wet late period
1351–1388	WET	7	1325–1375	wet early, dry middle, wet late period
1389–1403	DRY	8	1375–1400	wet early, dry late period
1404–1414	WET	9	1400–1440	dry (very) early, wet early, dry middle, wet late period
1415–1425	DRY	9	1400–1440	dry (very) early, wet early, dry middle, wet late period
1426–1448	WET	9	1400–1440	dry (very) early, wet early, dry middle, wet late period
1449–1483	DRY	10	1440–1525	wet (very) early, dry early middle, wet late middle, dry early late, wet late period
1484–1494	WET	10	1440–1525	wet (very) early, dry early middle, wet late middle, dry early late, wet late period
1495–1510	DRY	10	1440–1525	wet (very) early, dry early middle, wet late middle, dry early late, wet late period
1511–1541	WET	11	1525–1610	wet early, dry middle, wet late period
1542–1593	DRY	11	1525–1610	wet early, dry middle, wet late period
1594–1655	WET	11	1525–1610	wet early, dry middle, wet late period

DISCUSSION

The three models all provide important data regarding precipitation and the availability of moisture during the AD 1150–1610 period. One of the major problems with using the quadrant classification system, however, is that it ignores the range of data. Several periods in all three models cluster near the quadrant axes, and slight changes in one variable would change their classification. For example, the long-term standard deviation of the Jemez reconstruction is 10.49; the standard deviation for the smoothed Period A1 data is 10.36—a difference of only 0.13. Likewise, the Period A1 mean is 31.57 and the long-term mean is 31.32. Thus, the Jemez period A1 is classified as High/Low, but with minor adjustments—either in the real precipitation or in analysis techniques, could just as easily be classified as High/High, Low/High, or even Low/Low.

In the Jemez reconstruction, five, and maybe more, of the periods could be subject to change due to minor variations (A1, B2, C3, D4, and J10); only Periods E5, F6, K11, and G7 appear to be truly different than the others. In the Chama reconstruction, Periods G7, H8, J10, and K11 appear different, although others could be included as well. In the Orcutt model, all the periods cluster more tightly near the central axes, but Periods F6, H8, G7, K11 and possibly some others appear different.

The quantitative evaluation of precipitation during the Bandelier archaeological periods suggests little correlation between precipitation amounts and variability and cultural sites. This is not to imply that precipitation had no impact on cultural trajectories on the Pajarito Plateau; it most certainly did on both long and short time scales. What we infer is that precipitation was but one factor in the decisions of people to settle, use, and depopulate the plateau over the centuries.

We are not suggesting that there has been no variability between the archaeological periods; clearly other data in this chapter indicate that precipitation has varied over time and across space during the prehistoric and protohistoric occupation of the northern Rio Grande. We do question whether this variability coincides with the Bandelier archaeological periods and if the human responses to the variability are reflected in the archaeological record at such fine temporal scales. In general, we believe the archaeological periods, particularly if overlapped, are too short to capture either the climatic or cultural variation.

CHAPTER 9
A CONTEXT FOR THE INTERPRETATION OF ARCHAEOMAGNETIC DATING RESULTS FROM THE PAJARITO PLATEAU

Eric Blinman and Jeffrey Royce Cox

INTRODUCTION

Archaeomagnetic dating is one of several dating techniques that can be applied to the development of detailed archaeological chronologies. In the context of archaeological investigations on the Pajarito Plateau, the alternate tools include tree-ring dating, radiocarbon dating, ceramic dating, and a variety of luminescence techniques. This summary of archaeomagnetic dating was requested in order to accomplish three goals. The first was to provide an explanatory guide to the theoretical and practical foundations of archaeomagnetic dating. The second was to evaluate existing archaeomagnetic curves that are relevant to the dating interpretation of Pajarito Plateau samples, specifically looking at the strengths and weaknesses of the curves as revealed using sample results from Dr. Robert DuBois, University of Oklahoma. The third was to catalog the archaeomagnetic results from the northern Rio Grande region that can be used for comparison with results from the Pajarito Plateau.

The basic elements of archaeomagnetic dating were developed in the 1930s by Emile Thellier and his students (Wolfman 1990). Despite this early start, research and development have proceeded sporadically compared with other dating techniques in the face of theoretical and practical limitations (Eighmy 1991). Progress has been greater in the Southwestern United States than elsewhere in North America, but archaeomagnetic dating remains of secondary importance to archaeologists compared with other natural science techniques such as dendrochronology and radiocarbon assays. Luminescence dating techniques (Feathers 2000) are showing promise as well, although confidence in its strengths and weaknesses will be dependent on additional case studies (e.g., Dykeman et al. 2002).

The ambiguous position of archaeomagnetic dating is due to a mixture of advantages and disadvantages. Archaeomagnetic dating records the time of the last exposure of archaeological features to a source of heat. Archaeomagnetic dating is most effective when the feature is heated above 580 to 680° C (the Curie points for the most common magnetic materials in soils), but lower temperatures can also produce datable samples (Smith 1990). For features such as hearths or burned structures, archaeomagnetic dating is one of only two techniques that can provide last-use or abandonment dates as opposed to construction dates (luminescence dating can also provide last-use dates in some contexts). Another advantage is that since archaeomagnetic dating is based on geophysical properties (Sternberg 1990) rather than cultural behavior, dating results can be more reliable in some contexts. This is particularly true when dead wood is harvested for fuel or building material, skewing radiocarbon or tree-ring samples toward dates that are too old (Smiley 1985). Finally, when high-quality samples are available, and for some time periods when dating curves are robust, archaeomagnetic dating accuracy and precision can be excellent, falling within the range of 20 to 40 years.

Disadvantages of archaeomagnetic dating are both methodological and contextual. The underlying basis for the technique is the year-to-year variation in the geographic position and strength of the earth's geomagnetic field. There is no theoretical model that can accurately describe geomagnetic field variation, and calibrated virtual geomagnetic polar curves for dating purposes must be developed from paleo- and archaeological samples (or from historic records). The pole positions of these samples and often their calibrating dates are measured with error, and the uncertainties result in archaeomagnetic dating curves that are tentative approximations of the true curve. Also, curves follow an overlapping path, resulting in the possibility of multiple date interpretations for a single sample result. In this respect, final date interpretations are often dependent on the expectations of the archaeologist, reducing the independence of archaeomagnetic dating's contribution to the resulting cultural chronologies. Finally, sample quality can be affected by both systematic and idiosyncratic factors of sampling technique and local magnetic anomalies, resulting in either imprecision or inaccuracy in individual cases.

PRINCIPLES OF ARCHAEOMAGNETIC DATING

The underlying basis for archaeomagnetic dating is the year-to-year variation in the geographic position and strength of the earth's geomagnetic field (Sternberg 1990). This field consists of a dipole component that is usually oriented near the rotational axis of the earth and non-dipole components that are regional and local in nature. At any given point on the earth's surface, these components combine to create an apparent or virtual geomagnetic pole (VGP) location. As the strength and orientation of the dipole and non-dipole fields vary through time, the VGP location changes, describing a VGP curve. Because of the influence of non-dipole fields, VGP curves will not be the same from region to region, although there are greater similarities between regions that are adjacent east-west than north-south (Sternberg 1990:9–10).

Magnetic material in soil (primarily magnetite and hematite) is affected by the prevailing geomagnetic field. When this magnetic material is heated to and above its Curie point (580° C for magnetite and 680° C for hematite), it acquires a field direction that is influenced by the orientation of the earth's field as the material cools. This is known as the thermal remnant magnetism, or TRM. Although subsequent events can weaken or alter this TRM, such as a nearby lightning strike, in most cases the TRM orientation persists until the soil is subjected to another heating episode that exceeds the previous temperature or the Curie point.

An archaeomagnetic sample usually consists of a set of up to 12 specimens collected from the soil lining a hearth, kiln, oven, or other type of burned feature. Fired rocks, such as sandstone, can also be sampled if care is taken during collection. The orientation of each specimen is carefully measured, and magnetic properties of each specimen are subsequently measured in the laboratory. Measurement usually includes progressive alternating field (AF) demagnetization to reduce the influence of any secondary magnetic components that might have been acquired since the feature was last fired. Results of the individual specimen measurements are compared, and data from the best specimens are combined to characterize the earth's magnetic field at the time the feature was burned. The mean orientation of the specimens is the estimate of the VGP location, and the dispersion of the specimen orientations provides an error term that is expressed as an ellipse or oval of confidence (two standard deviations) around the VGP center point.

Inconsistent specimen orientations result in samples with large ellipses, reflecting greater uncertainty about the true VGP location.

Date interpretations are made by comparing each sample plot with a regional VGP curve (also called a secular variation curve). Points of intersection of the ellipse with the curve determine the beginning and end points of the date range. Since the calibration curve is only an approximation of the real curve, when a sample centerpoint falls off of the curve, a common convention is to move the centerpoint to the nearest point on the curve for the calculation of the date range. Where the ellipse intersects more than one segment of the calibration curve, the centerpoint is moved in turn to the closest point of each segment, resulting in as many date range estimates as the number of curve segments that fall within the original ellipse.

Because of the influence of non-dipole components on the geomagnetic field, calibration curves must be established for each region of the earth's surface. The U.S. Southwest curves have been developed for a relatively large region of 500 to 1000 miles in diameter. For this reason, the calibration curves are best thought of as bands within which the true curve lies, varying slightly depending upon the location of the project area within the region. As an arbitrary compensation for this additional uncertainty, date range estimates are usually rounded five years beyond either end of the points where the ellipse intersects the curve.

For regions or time periods where a calibration curve does not exist, sample results can be used to construct a curve. In the absence of independent dates for samples, seriation principles can be used to develop a first approximation of the true curve. Where independent dates are available, they can serve both to validate the direction of the curve and to calibrate the curve to the modern time scale. For regions and time periods where calibration curves have been established, sample results are used not only to produce date estimates but also to validate and refine the existing approximation of the true curve.

SAMPLING AND MEASUREMENT PRACTICE

Burned sediments are collected as carefully oriented specimens approximating the volume of a sugar cube. Ideally, specimens are cut from portions of the feature that are well burned, show no erosion, and show no evidence of cracking or slumpage. Ideal sampling material is rare due to the actions of roots, insects, small mammals, mass slumpage, and repeated exposure to wetting and drying. To the extent that disruptive agents cause small random reorientations of the material, the ultimate sample result will be less precise but still accurate. To the extent that slumpage causes the systematic reorientation of large blocks of the material to be sampled, results may be precise but may be inaccurate. Most of these sources of error can be detected and avoided or minimized during specimen collection. Where cracked and potentially displaced material must be sampled (as in many Pajarito Plateau fire hearths where hearth lining material has cracked), field judgments must identify the most stable material. Where there is ambiguity in the integrity of any particular block of burned sediment, multiple specimens from multiple blocks are necessary to evaluate the potential effects of slumpage on the orientations. A sample or set usually consists of eight to 12 specimens. Fewer than eight weakens the statistical confidence measure of the result. More than eight specimens do not materially improve the statistical precision, but more than eight may be required to cope with sample quality issues that are noted during the collection process.

When columns of burned material have been isolated, they are enclosed within high-precision brass or aluminum molds. The molds are set on bases of modeling clay, which both seal the bottom of the mold to the burned feature and allow the mold to be precisely leveled. After leveling, the mold is filled with a fast-setting plaster, and the contemporary magnetic orientation of the mold is measured with a vetted Brunton compass. Vetting is necessary because of inherent imprecision in the compass manufacturing process; up to seven of every 12 compasses are rejected for inaccuracies that are greater than is acceptable for archaeomagnetic sampling. When the plaster has set, the mold and contents are detached from the feature, the ends of the specimen are trimmed, the base is capped with plaster, and the specimen is labeled so that the mold orientation can be associated with the specimen during measurement.

After collection, samples are transported to the measurement laboratory. At the Archaeomagnetic Dating Laboratory (ADL) at the Museum of New Mexico in Santa Fe, samples are stored under shielded conditions and are measured within Helmholtz coils that are adjusted to create a zero magnetic field around the spinner magnetometer. Storage within a zero field allows weak viscous contaminating magnetic components to dissipate before measurement. Under conditions of a zero magnetic field, measurement accuracy and precision are increased, especially for weak samples. Samples are assigned sequential laboratory numbers. Declinations are assigned to each sample based on the date of collection and the latitude and longitude of the site using either maps of geomagnetic declination or the MagCalc program (1993). The declination allows the magnetic specimen orientation taken during sampling to be translated into an azimuth relative to true north.

Magnetic orientation and strength are first measured for samples (sets of specimens) at their natural remnant magnetism (NRM). The NRM is a combination of the TRM vector of interest and any other vectors that may be present. “Contaminating” vectors can include magnetized pebbles whose size precluded reorientation on heating and viscous magnetic fields that are slowly subject to reorientation by the prevailing earth’s magnetic field. In an effort to remove these contaminating vectors, the specimens are remeasured after progressive AF demagnetization steps. Standard demagnetization and remeasurement are carried out at the following intervals: 50, 100, 150, 200, and 300 Oe (Oersteds). Demagnetization effectively eliminates weakly held magnetic components, from both the TRM and other sources. These secondary components are generally not random and therefore affect both the apparent direction of magnetization and the dispersion of the specimen directions, influencing both the accuracy and precision of pole locations and date estimates. Under ideal conditions, the TRM of interest is the strongest contributor to NRM, and demagnetization eliminates the unwanted components, leaving a residual component that accurately reflects the orientation of the earth's magnetic field at the time of cooling. Under poor conditions (usually extremely weak samples), demagnetization can eliminate the TRM as well as any secondary components before a defensibly “best” orientation is identified.

Since the magnetic history of a sample is unknown and since the strength of spurious magnetic components can vary widely, selection of the "best" demagnetization level for an individual sample can't be predicted in advance. The best demagnetization level for a sample is identified by the analyst when the direction and dispersion measurements of a specimen suite stabilize, and when the analyst is confident that the direction is appropriate for a TRM result. The latter criterion inserts an undesirable but unavoidable subjectivity into the archaeomagnetic dating process. Since the TRM vector of interest must by definition be a point on the VGP curve, demagnetization results that move the centerpoint toward the curve are judged more likely to accurately reflect the TRM than are results that move the centerpoint away from the curve. The field archaeologist's expectations of sample age influence the archaeomagnetic technician's decisions, as do the currently accepted version of the VGP curve. In the absence of any theoretical model that can distinguish the non-TRM vector contributions to the overall result, the judgment, experience, and biases of the technician are a necessary part of the measurement and dating process.

In some instances, individual specimen measurements deviate markedly from the other specimens of the sample. These outliers are usually defined as specimens that fall beyond two standard deviations of the sample mean. Outliers can be caused simply by sampling error, by unwanted heterogeneity in the specimens (such as magnetized pebbles), or by mistakes in field collection and documentation. The usual procedure is to use Fisher statistics to identify outliers and to progressively eliminate outliers from the set result until the results of the remaining specimens fall within two standard deviations of the new sample mean. If only sampling error were contributing to the dispersion of specimen vectors, 1 out of 20 samples would have a result where a single specimen was eliminated. In practice, more samples than expected have one or more specimens dropped from the final result, reflecting the presence of more potential sources of error than simply the measurement process.

Mean vector direction (recorded as the inclination and declination of the sample) and the dispersion (recorded as an angular expression of alpha 95 or α_{95}) are used to calculate a VGP for the selected sample result and an oval of confidence around the VGP centerpoint. Where the α_{95} dispersion value exceeds 4.0°, the confidence oval is so large that its overlap with dating curve segments generally yields large date ranges that are not useful for the archaeologist. Also, as the α_{95} exceeds 4.0°, there is less and less confidence that the result is exclusively representative of the TRM as opposed to other sources of a magnetic orientation. Although results with α_{95} values of more than 4.0° can be interpreted, the ADL does not routinely assign date ranges to those results. As α_{95} values decrease, precision of the VGP location increases. A "good" result generally has an α_{95} of less than 2.0° and an excellent result has an α_{95} of 1.0° or less. However, measurement precision applies to the estimate of the sample VGP location only, and its extension to a subsequent dating interpretation is dependent on all of the assumptions of the dating technique being correct.

Calibration Curves

Archaeomagnetic dates are estimated by comparing sample results with a calibration or VGP or dating curve. However, as discussed above, VGP curves are approximations since there is no theoretical model for polar movement. We can assume that the true curve is continuous, it can change in its rate of movement, it can turn abruptly or slowly, and it can loop back upon itself in either short or long time periods. Any attempt to derive a true curve with these qualities from ancient records faces three problems. First is the degree to which the material being sampled is continuously recording the changing VGP and that the material will support a sampling interval that is fine enough that all significant inflection points of the curve are represented in the dataset. Second, since VGPs are measured with error, sample density at each time point must be high enough that a mean VGP location is a valid representation of the curve position. Third, the independent chronology of the samples must be sufficiently robust that samples are not mis-sequenced or mis-dated.

Lake or ocean sediment cores can provide a relatively continuous record of polar movement through detrital remnant magnetism, in which minute magnetized particles are influenced by the prevailing earth's magnetic field as the particles fall through water (Sternberg 1990:18). The particle orientations are set as the sediment gels and compacts, and the sediment sequence becomes a continuous record of secular field variation. Such records would be ideal for VGP curve development, but the theoretical potential runs into practical limitations. Even small variations in sedimentation rates stretch and shrink the record, limiting the simple use of depth as a proxy for an interval or ratio time scale. The physical process of core collection is challenging, and it is difficult to maintain core orientation precisely. Relative declination variation within a core is generally reliable, but the absolute orientation of a core to the modern geomagnetic field is only an approximation. Rapid sedimentation rates are ideal, but core lengths are limited (generally 2 to 3 m), so that long records must be collected by multiple overlapping cores, introducing the problem of core matching, both in a stratigraphic sense and in the sense of consistent specimen orientation. Dating calibration is limited to radiocarbon assays of the organic constituents of the sediments, with the inherent ambiguities of the calibration process (Stuiver and Reimer 1983) and the expense of having to submit multiple and close interval samples to calibrate changes in deposition rates as well as to establish age. Also, detrital magnetism studies have been limited in number, and their geographic positions have been peripheral to the Southwest (e.g., Verosub et al. 1986). Similarities with the Southwestern archaeological VGP curves have been used to validate the detrital curves, rather than the opposite.

At the present time, approximations of the Southwestern VGP curve must be built from large numbers of results from archaeological contexts, using independent sources of dating both to establish the relative sequence of pole positions and the calibration of the resulting curve to the modern time scale. This task is not simple, either in theory or in practice. Archaeological samples are dependent on cultural burning events and on the archaeologists' decisions of what sites will be excavated. There is no guarantee that the cultural burning events are sampling the entire sequence of VGP variation with the same richness, and of the universe of culturally burned sediments, only a small portion has been excavated let alone sampled for archaeomagnetic information. Independent chronological control can be highly variable, from the precision of tree-ring dates to the ambiguity of radiocarbon assays to the generality of phase or ceramic period assignments. Given these limitations, it is remarkable and gratifying that the calibration curves that have been proposed through the years by Robert DuBois, Jeffrey Eighmy, Robert Sternberg, and Daniel Wolfman have been so robust and effective, despite their status as approximations and despite their differences.

Two contrasting approaches have been used for constructing VGP curves in the Southwest (Sternberg and McGuire 1990a, b; Eighmy 1991). One is a moving-window averaging technique. In this method, sample results are arranged by estimated archaeological age (based on independent judgments of the excavators). A weighted average is calculated of the sample results that fall or could fall within a given range of years, and that average is used to define the calibration point for the midpoint of the range. The "window" is advanced by an interval (such as one-half the length of the time window), and another average is calculated and plotted. The calibration curve is then constructed by joining these points.

The second method is a visual or freehand approach. In this method, sample centerpoints are placed on a polar plot, including both independently dated and undated samples. A freehand approach is then used to sketch in a curve, assuming that all samples, whether independently dated or not, should be on or near the curve. Independently dated samples are used to confirm the direction of the curve, to differentiate crossover points and loops, and to calibrate the curve to the modern time scale. Knowledge of the behavior of calibration curves in adjacent regions can also be applied to develop the curve in time periods where sample points are thin or trends are ambiguous.

Both techniques have strengths and limitations. The moving-window approach is replicable and explicit, and it is amenable to computer manipulation so that revised curves are easily constructed as additional calibration data become available. Weaknesses are a reduced sample size, susceptibility to error in archaeological date assignment, and artificial smoothing of variation. Smoothing poses two related problems. Window lengths are set arbitrarily, usually in the range of 40 to 100 years, or can be variable based on data density (Sternberg and McGuire 1990; Eighmy and Klein 1990). VGP variation that occurs at time scales below the window size and interval is effectively lost. In most instances this is inconsequential due to the size of most error ellipses, but it also partially explains the disconcerting consequence that an unusually large number of excellent results $\acute{\alpha}_{95}$s of 1.0° or less) fall off of the resulting curve. The second and more important problem is that changes in the direction of VGP movement are artificially foreshortened, with the magnitude of the effect proportional to the abruptness of the direction change. Foreshortening is a mathematical consequence of the averaging technique, and the degree and significance was first demonstrated by Cox and Blinman (1999) and then confirmed by Lengyel (1999). The moving window average technique is also susceptible to distortion if archaeologists have misinterpreted the chronology of the calibration samples or if inaccurate VGPs are included in the calibration dataset.

Subjectivity is the principal weakness of the freehand approach to calibration. Because paleomagnetic curves commonly contain loops and intersections, sample results that are not independently dated can be interpreted based on preconceptions of curve direction. Also, familiarity with individual samples or suites of samples can lead to over-interpretation of small (<2°) curve features such as loops and kinks. As a result, two researchers given the same data are unlikely to produce precisely the same curve. Strengths of the technique are that it makes use of a large amount of data and that it need not systematically dampen variation. The large number of data points has the potential to increase the resolution of the curve, especially if there are cultural factors that reduce the number of independently dated samples for specific time periods. Perhaps more important is that there is no systematic foreshortening bias built into the technique, so that there is an opportunity for more accurate representation of loops and short term deflections of the curve. However, due to the subjectivity of curve construction, there is no internal standard against which the accuracy of the curve can be measured.

Three calibration curves are currently available for the interpretation of dates from Southwestern sample results (Figure 9.1). Robert DuBois' Southwest curve (1989) is a freehand compilation based on four decades of research on Southwestern archaeomagnetic dating. His curve is unique in including a pre-AD 600 component, but its calibration is more general than the other curves, and it is rarely used by other researchers for date interpretation except in the pre-AD 600 period. Stacey Lengyel and Jeffrey Eighmy's SWCV2000 curve is the latest revision of a long series of moving average-based curves produced by Eighmy's Archaeometric Laboratory at Colorado State University (Eighmy 1991; Eighmy and Klein 1990; LaBelle and Eighmy 1995). The Eighmy curves have generally superceded the curves developed by Robert Sternberg (1990) using the same averaging technique. The SWCV2000 curve is a methodological departure in that it incorporates modifications to the moving average results. Simulations were used to estimate and correct for the magnitude and direction of foreshortening at inflection points, and non-calibration data were used to modify the location of the curve in the AD 900 to 1025 segment. Daniel Wolfman's curve is a freehand compilation based on his interpretation of his own data. He lacked data to improve on the various Eighmy curves or on the DuBois curve for the AD 400 to 1000 and post-AD 1450 time periods. Wolfman's curve has been in use for some time (Windes 1991:297–304), but formal publication of the curve was posthumous (Cox and Blinman 1999). The data Wolfman used to construct the curve have never been completely reconstructed.

Differences between the three curves are both minor and dramatic, depending on the time period. This reflects the tentative nature of our understanding of the Southwest VGP curve as well as the different methodological approaches to curve construction. Small discrepancies in both path and calibration characterize the AD 400–1150 period segments of the three curves, but the discrepancies by and large have little effect on date interpretations. In contrast, there are large and significant differences in the AD 1150–1800 period, and in particular the AD 1150–1400 period. The DuBois and Wolfman freehand curves are similar, but the more explicitly developed SWCV2000 differs markedly. These differences are incompatible with the magnitude of many sample error terms, resulting in an inordinately large number of precise results (α_{95}s of 2.0° or less) that fall significantly off of one or more of the curves. These differences have also been evident in a number of incorrect date interpretations, where demonstrably post-AD 1150 samples were being given pre-AD 1150 date assignments, and vice versa. Since only one true curve exists, portions or all of each of the three extant curve models are probably incorrect for the AD 1150–1400 time period.

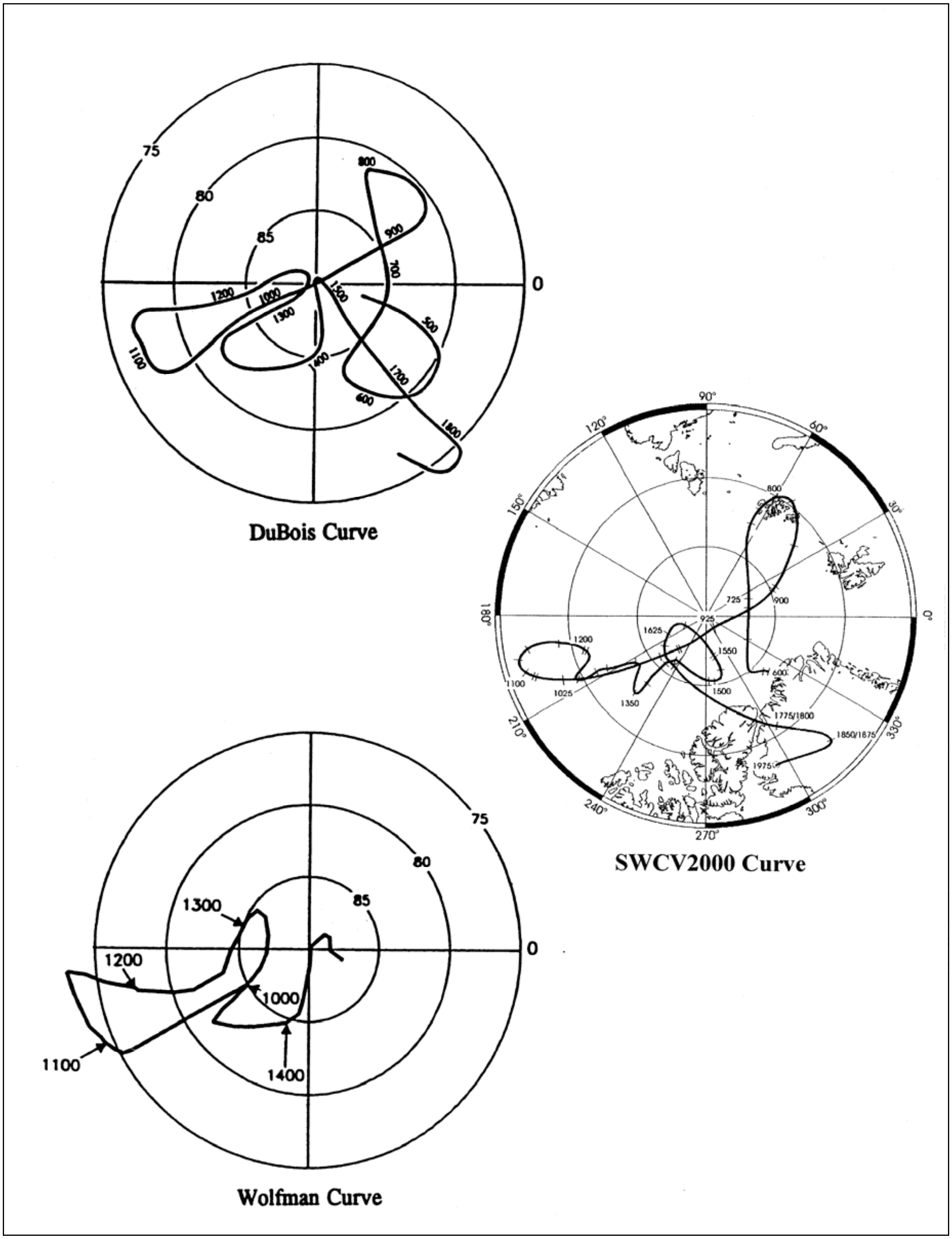

Figure 9.1. Current archaeomagnetic dating curves for the Southwestern United States. The DuBois curve is adapted from DuBois (1989), the SWCV2000 curve is from Lengyel and Eighmy (2002), and the Wolfman Curve is from Cox and Blinman (1999).

This significant weakness in the calibration curves for archaeomagnetic dating coincides, unfortunately, with the period of interest in Pajarito Plateau chronology (Vierra et al. 2002a). The initiation of the Coalition period is placed around AD 1150 (Vierra et al. 2002a) or AD 1200 (Powers and Van Zandt 1999). Trajectories of population growth and aggregation are demonstrable through the Coalition period, but the dynamics of those trajectories are still poorly understood for lack of a robust chronology through the 13th and 14th centuries. Significant regional changes in population aggregation (nucleation) define the onset of the Classic period at AD 1325, and large pueblo-based or village-based settlement patterns persist until the onset of the Spanish Colonial period at AD 1600.

CURVE PERFORMANCE EVALUATION

Ambiguities surrounding the AD 1150–1400 VGP curve segments can be explored with a performance evaluation of the proposed curves. The template for this approach was developed in an evaluation of the AD 650–950 portion of the SWCV590 curve (Cox and Blinman 1999). The underlying assumption is that archaeomagnetic results are all valid "samples" of the true curve position. Each will reflect a location of the earth's geomagnetic pole at the time of cooling, with an error that stems principally (although not entirely) from measurement uncertainties. Additional sources of error may be present, and those must be considered during data interpretation. The method of curve evaluation is most easily characterized as a study of residuals. Samples are reviewed for relevance to a particular curve segment. Sample centerpoints are plotted in relation to the curve, residual distances are calculated between the centerpoints and the curve, and the magnitude and sign of the residuals are evaluated for the presence of any systematic patterns. If the curve is a valid approximation of the true curve, residuals should be randomly distributed around the curve, and most sample error terms (α_{95}s) should overlap with the curve. In the AD 650–950 curve evaluation, we were able to demonstrate that the moving average technique used to develop the SWCV590 curve systematically biased the curve at its inflection points (Cox and Blinman 1999), resulting in confirmation of our conclusions with a simulation approach (Lengyel 1999), and revision of the Eighmy curve to begin to correct the problem (Lengyel and Eighmy 2002).

The original residual study was conducted by hand using graphic techniques (Cox and Blinman 1999). The steps have now been automated using the capabilities of Surfer and custom programs written in C++. The steps in the analysis consist of 1) rendering the curve to be evaluated as a "string of pearls," 2) development of a dataset of relevant (or possibly relevant) archaeomagnetic results, 3) residual calculation, and 4) data analysis and interpretation.

Curve rendering was accomplished by digitizing a proposed curve and replacing the table of digitized points with points that are evenly distributed along the path of the curve (a "string of pearls"). The calibration points (dates) proposed by the curve authors were added to the table at the appropriate points along the curve, and intervening dates were interpolated for each point. As the most widely used curve in the interpretation of contemporary archaeomagnetic results, the SWCV2000 curve was used for segment definition. Arbitrary break points were defined along the curve, each representing both a discrete period of time and a distinctive feature of the curve. The segment definitions are provided in Table 9.1.

Table 9.1. Segment definitions for curve performance evaluation.

Segment number	Beginning date (AD)	Ending date (AD)
1	NA	400
2	400	600
3	600	800
4	800	950
5	950	1125
6	1125	1225
7	1225	1300
8	1300	1400
9	1400	1500
10	1500	1600
11	1600	1900

The datasets chosen for comparison with the curve segments in this study come from data provided by Robert DuBois. These archaeomagnetic results were not used in producing either the SWCV2000 or the Wolfman Curve, and therefore they can be viewed as independent comparative information. Only results with $ά_{95}$ values of 3.0° or less were selected for use in the comparison. Independent chronological information for many of the results is sketchy, but most samples could be assigned to one or more segments after researching site notes and interviewing archaeologists. We expect that additional research will improve the precision in the assignments of individual samples to the segments. Segments 5 through 9 are most relevant to the culture history of the Pajarito Plateau, and only those segments are treated in the following discussion.

AD 950–1125 (Segment 5)

Segment 5 of both the SWCV2000 and Wolfman Curves are generally similar in path location and pace (Figure 9.2). The Wolfman Curve begins at AD 1000 rather than 950, explaining part of the apparent discrepancy at the early end of the curves. The most significant difference is the extension of the Wolfman Curve to below 74° N latitude at its most extreme, while SWCV2000 loops back at about 76° N latitude. The Wolfman Curve also remains at higher longitudes in the decades before AD 1100 than SWCV2000.

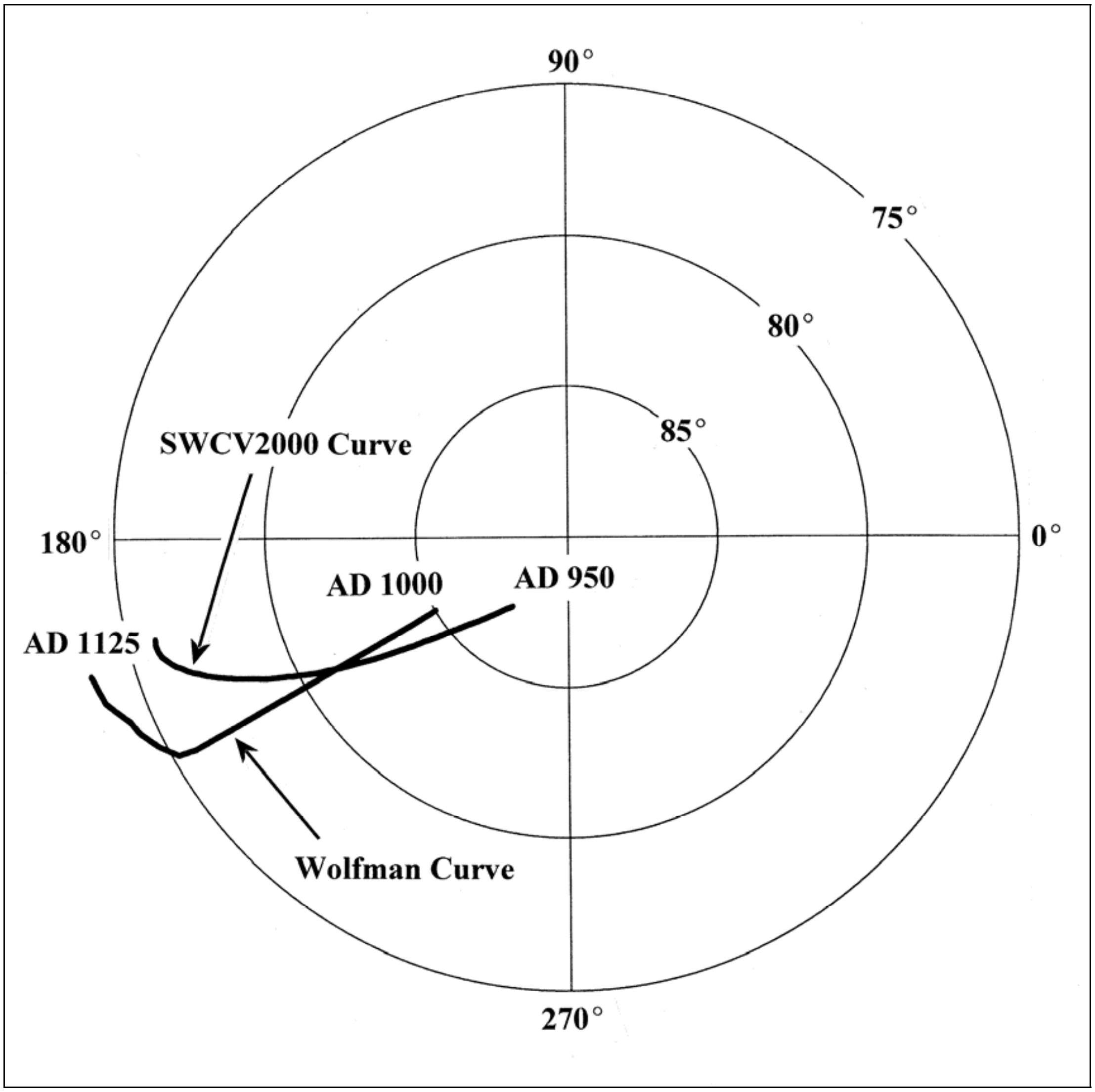

Figure 9.2. AD 950 to 1125 and AD 1000 to 1125 segments of the SWCV2000 and Wolfman VGP curves.

SWCV2000 is compared with results from the DuBois database that might date to the AD 950–1125 period in Figure 9.3. Samples that might date within the AD 950–1125 segment or earlier are indicated with circles. Open circles are results that could date as much as two segments earlier, while solid circles are probably either associated with this segment or one segment earlier. Results marked with "+" signs are assigned exclusively to this segment with relatively strong confidence. Results identified with square symbols either date to this segment or to a later segment. Solid squares could date in the next segment, while open squares could be relevant to either of the next two segments as well as perhaps being associated with Segment 5. Three results (all circles) are located between 0 and 90 longitude and clearly are related to pre-AD 950 segments of the curve. Two other possibly early results are located along this segment of VGP curve and probably date to this period. All of the sample results that were confidently expected to be along this segment are generally in the curve vicinity, validating their temporal placement. The results that might be either contemporary with or slightly later than this segment include a number of centerpoints that extend to both lower longitudes and latitudes than the AD 1125 end of the curve. Otherwise they cluster relatively evenly around the VGP path. The most temporally ambiguous of the later samples (the open squares) tend to cluster within the limits of the curve but are relatively consistently above the curve.

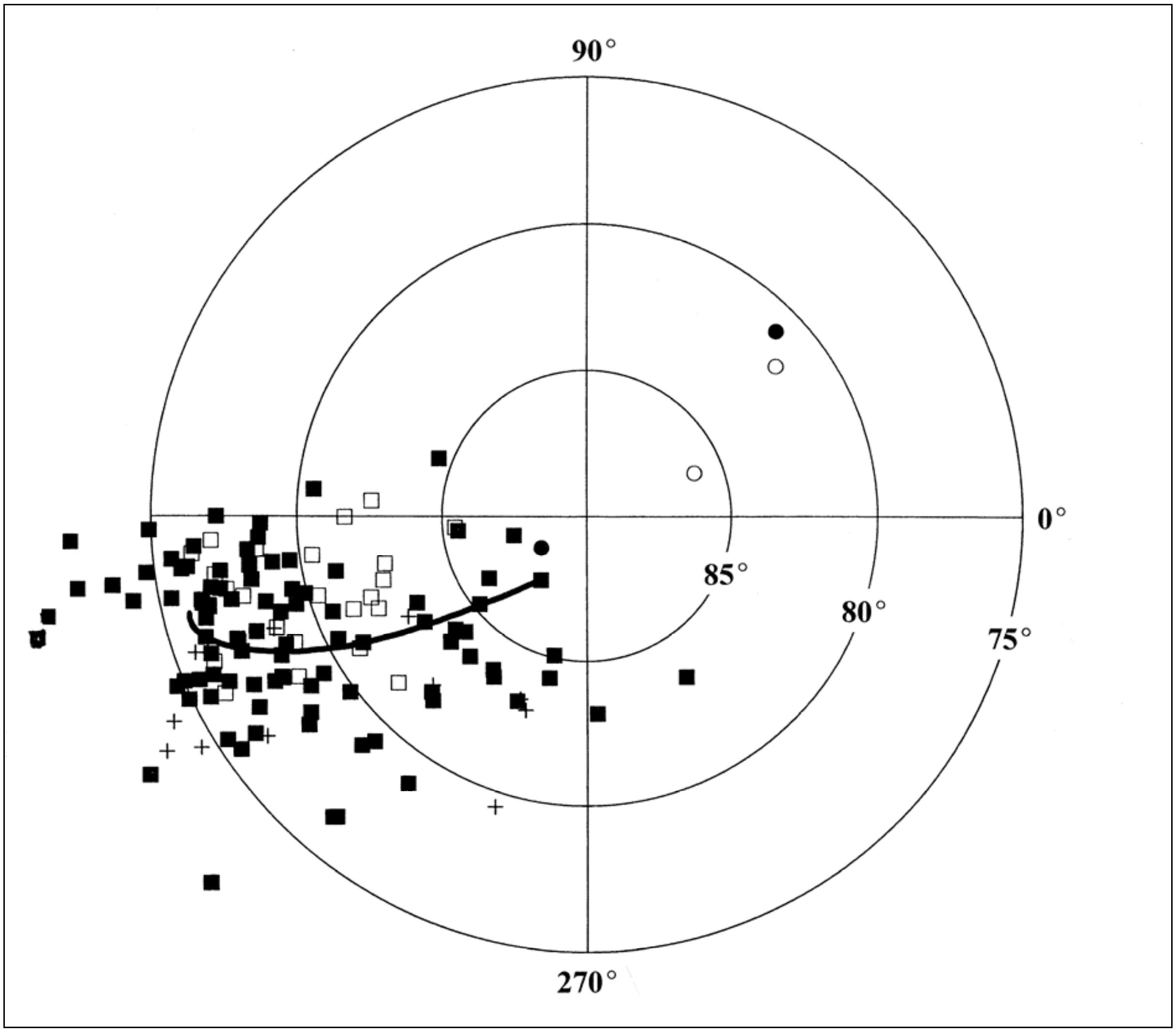

Figure 9.3. Archaeomagnetic result centerpoints from the DuBois database that could date to the AD 950 to 1125 period. Open circles denote samples that are believed to date within the AD 600 to 1125 period. Solid circles denote samples that are believed to date with the AD 800 to 1125 period. Samples denoted by a "+" are exclusively dated to the AD 950 to 1125 period. Solid squares denote samples that are believed to date within the AD 950 to 1225 period. Open squares denote samples that are believed to date within the AD 950 to 1300 period. All centerpoints are associated with α_{95} values of 3.0° or less.

Only those results that are exclusively and confidently associated with the AD 950–1125 period are presented in Figure 9.4.

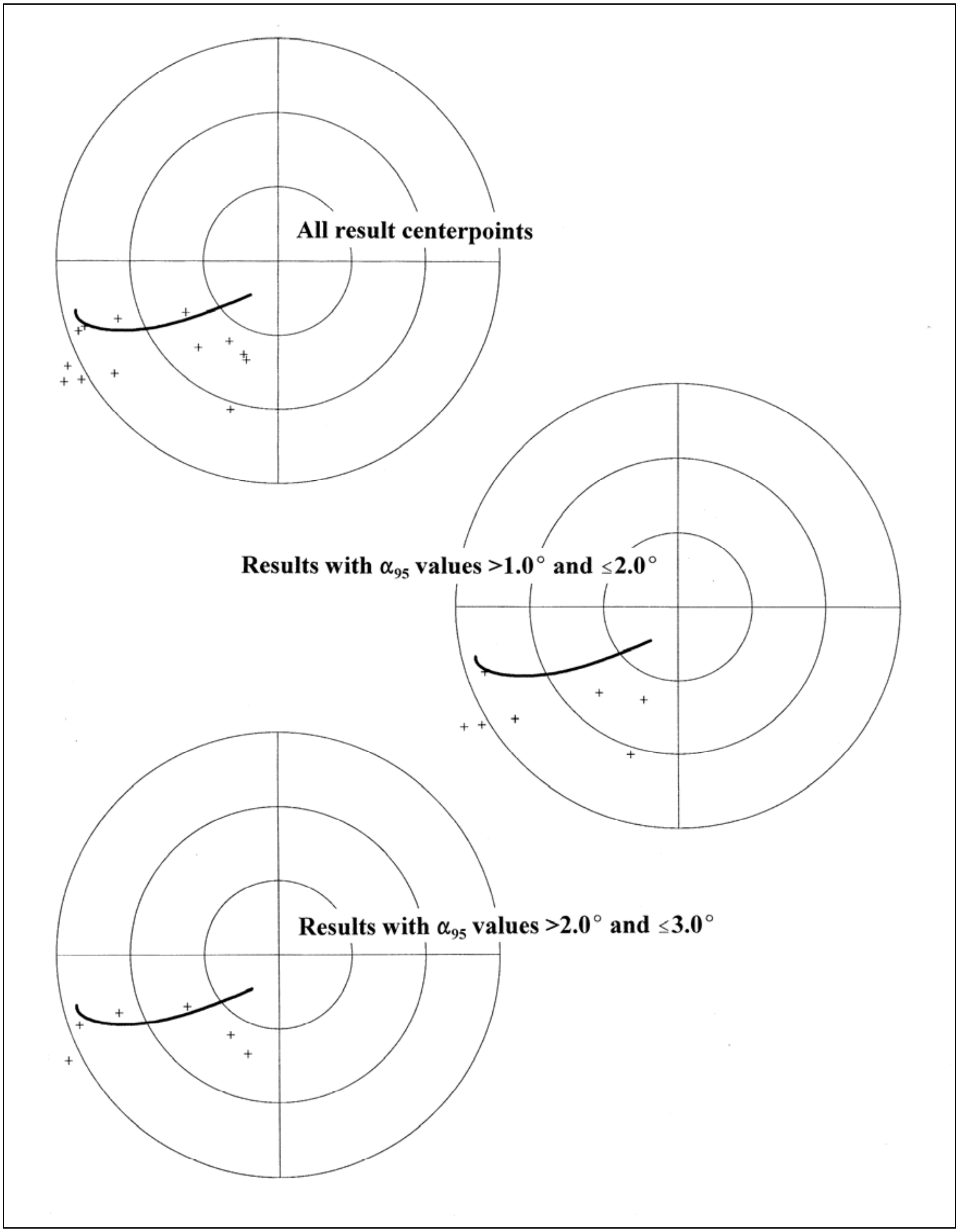

Figure 9.4. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 950 to 1125 period, contrasted with the SWCV2000 VGP curve. The upper figure includes all results, regardless of precision. The lower plots include only moderate and low precision results, respectively.

All results are plotted together, and additional plots are provided that present the same results by precision categories. These overall results strongly suggest that the SWCV2000 segment is placed too low in longitude, and this is confirmed by looking only at the moderate precision results ($\alpha_{95} \leq 2.0°$). Residuals calculated for these samples are overwhelmingly negative for the entire length of the curve segment, as graphed against time (date of the closest point on the SWCV2000 curve) in Figure 9.5. This discrepancy in curve path is consistent with the observation by Lengyel and Eighmy (2002) that there is anecdotal evidence for a lower latitude path than was produced by the moving average technique using the independently dated samples alone.

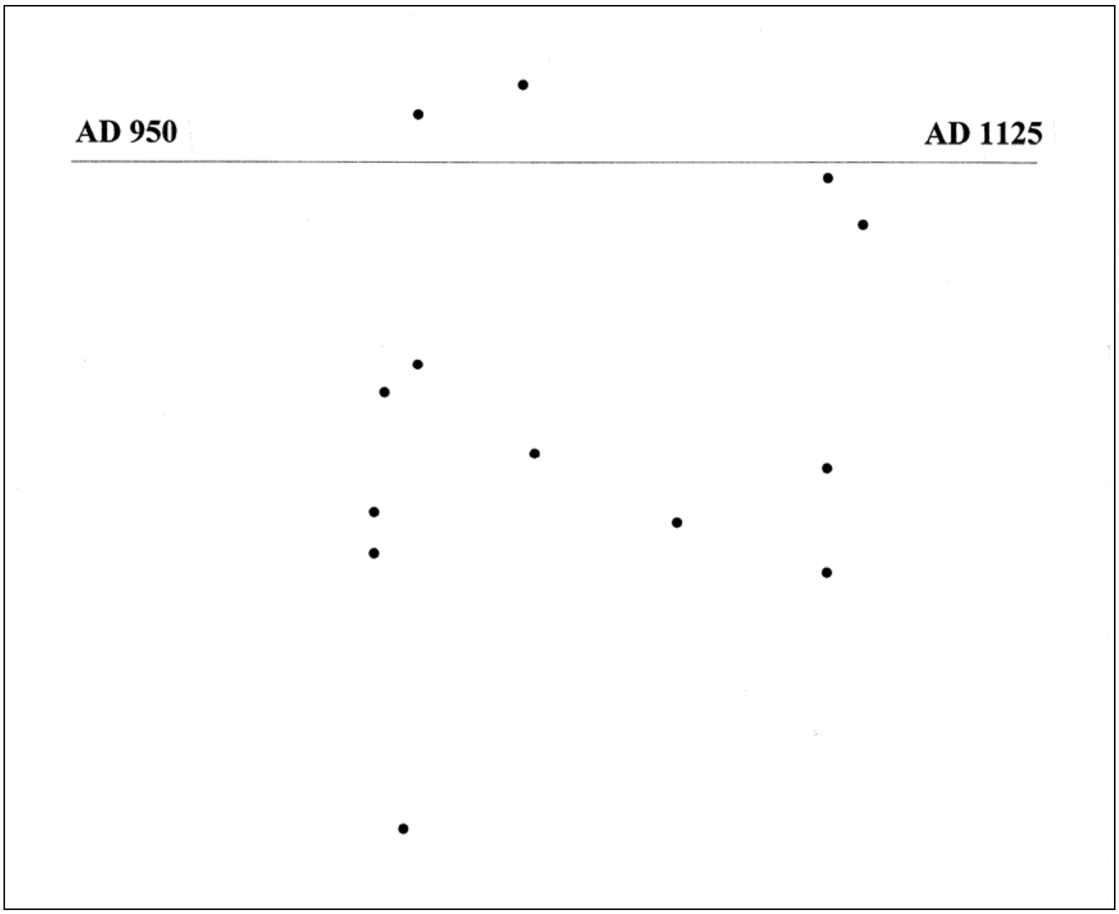

Figure 9.5. Plot of residual distances from confidently attributed AD 950 to 1125 sample centerpoints and nearest points along the AD 950 to 1125 segment of SWCV2000.

The same DuBois AD 950–1125 result dataset is contrasted with the Wolfman Curve in Figure 9.6. Although the Wolfman Curve begins at AD 1000 rather than 950, as with the SWCV2000 curve, four of the potentially early samples (solid and open circles) fall off the curve at the younger end. The potentially contemporary or slightly later samples (solid squares) are clustered both around the curve and off of the later end of the curve, while the potentially contemporary and much later samples (open squares) tend to fall above the curve (lower longitudes).

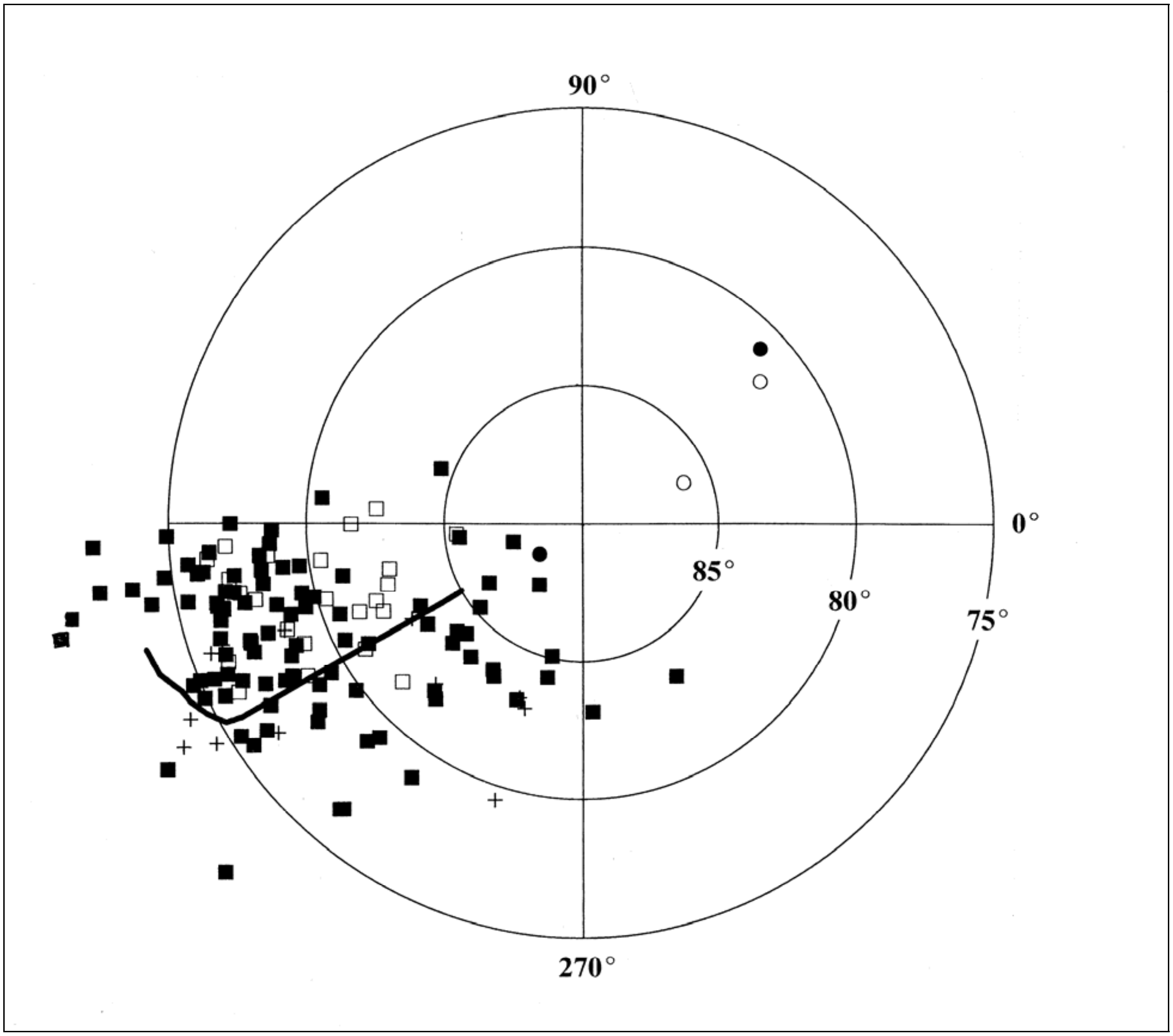

Figure 9.6. The AD 1000 to 1125 segment of the Wolfman Curve and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 950 to 1125 period. Open circles denote samples that are believed to date within the AD 600 to 1125 period. Solid circles denote samples that are believed to date within the AD 800 to 1125 period. Samples denoted by a "+" are exclusively dated to the AD 950 to 1125 period. Solid squares denote samples that are believed to date within the AD 950 to 1225 period. Open squares denote samples that are believed to date within the AD 950 to 1300 period. All centerpoints are associated with α_{95} values of 3.0° or less.

The 13 results that are confidently associated with the AD 910–1125 time period (+) are presented without the more ambiguous data points in Figure 9.7. The scatter suggests that the Wolfman Curve is more consistent than the SWCV2000 curve in representing the results, but only slightly more consistent and only in the last half of the curve segment. The first half of the curve segment appears to be at a lower latitude than is suggested by the locations of the DuBois centerpoints, a suggestion supported by both the moderate and low precision results. This conclusion is clearly evident in the residual plot for the pre-AD 1050 period (Figure 9.8).

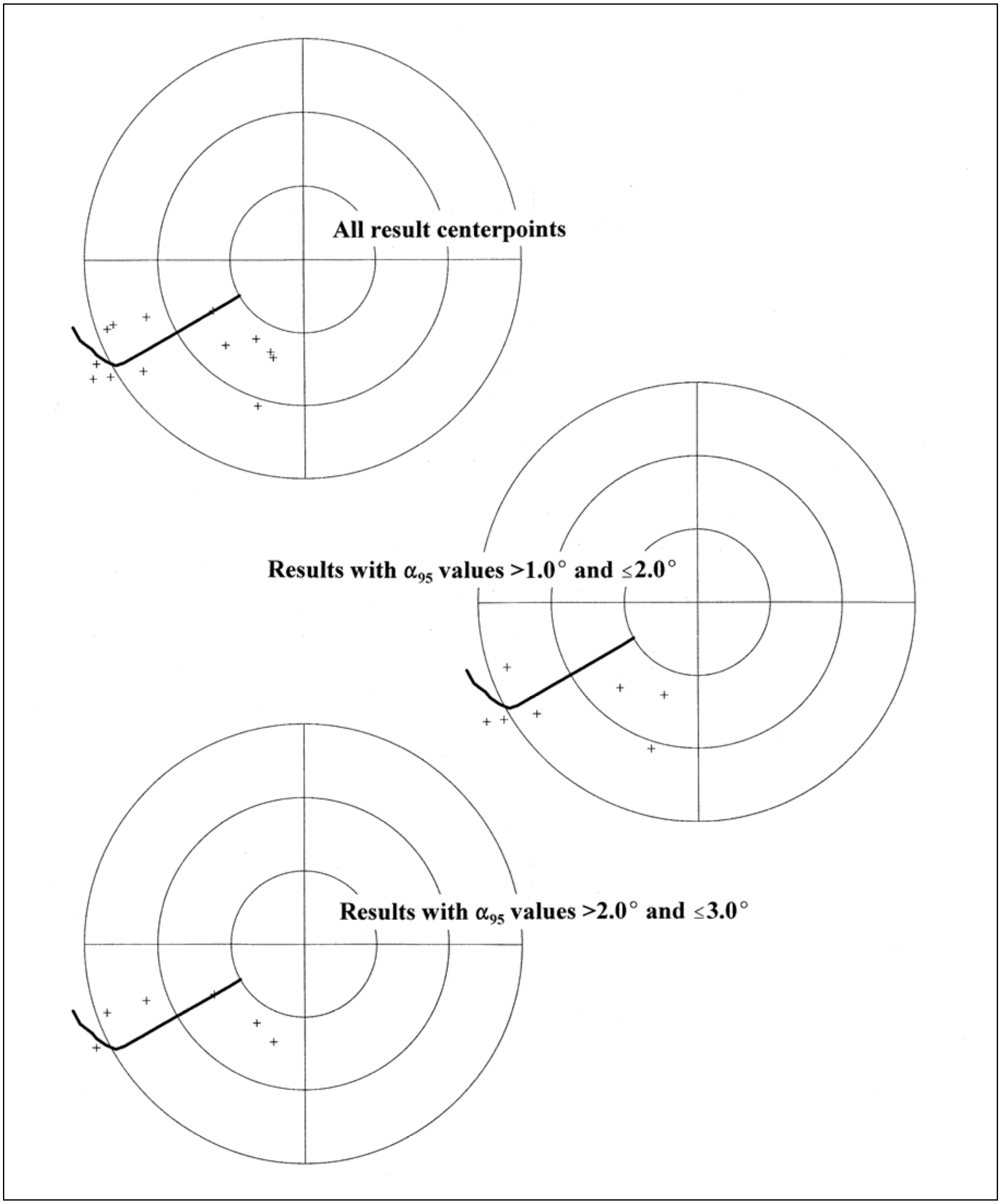

Figure 9.7. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 950 to 1125 period, contrasted with the Wolfman VGP curve from the AD 1000 to 1125 period. The upper figure includes all results regardless of precision. The lower plots include only moderate and low precision results, respectively.

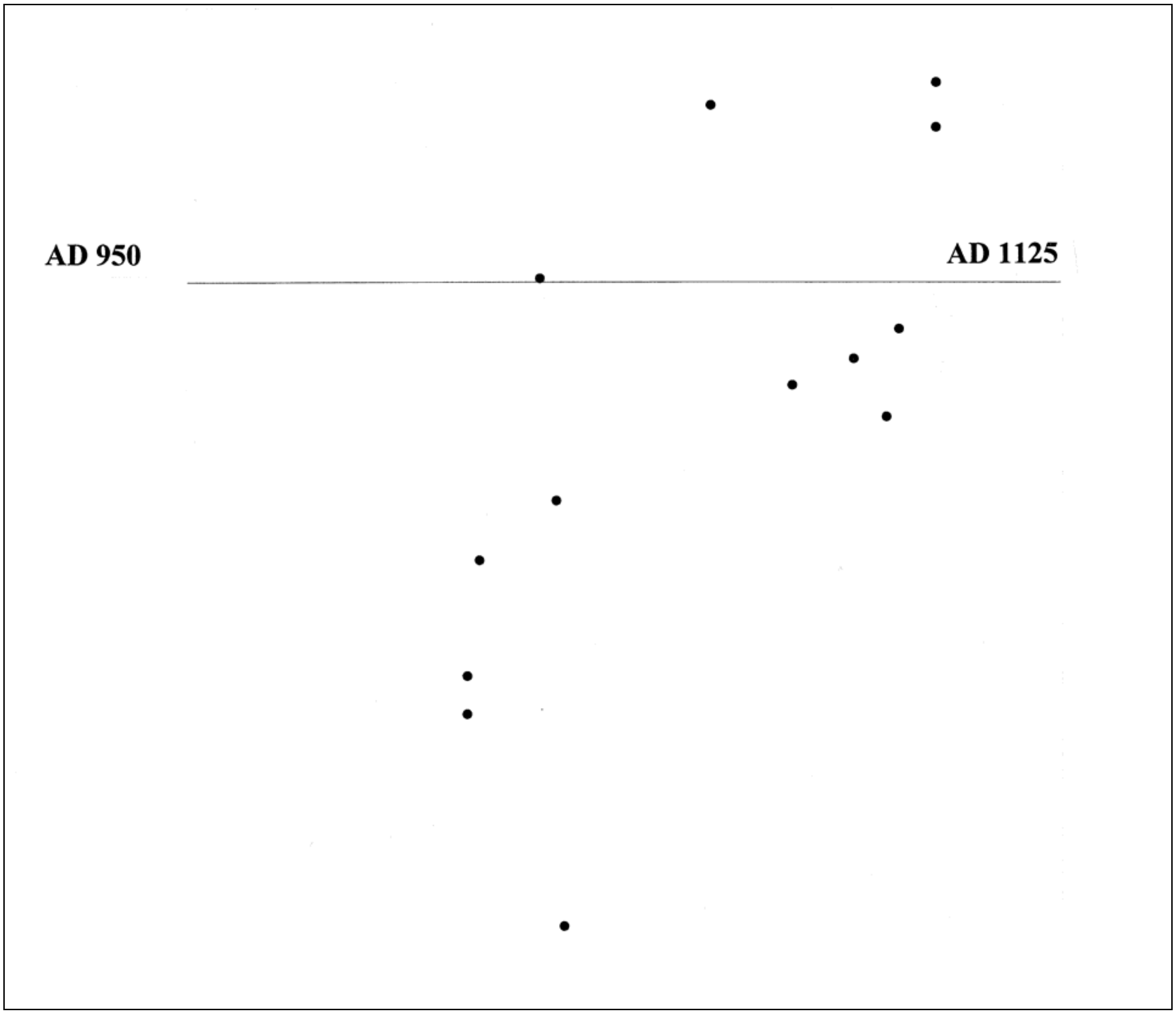

Figure 9.8. Plots of residual distances from confidently attributed AD 950 to 1125 sample centerpoints and nearest points along the AD 1000 to 1125 segment of the Wolfman Curve.

The post-AD 1050 segment has a more normally distributed pattern of residuals, but the termination of this curve segment may be slightly too extreme (too low in both latitude and longitude). The latter observation is weak simply because there are too few points in the DuBois dataset to be confident, and there are a number of potentially contemporary or later results (solid squares) that are at lower latitudes and longitudes.

This tentative evaluation of Segment 5 suggests that neither the SWCV2000 nor Wolfman Curves adequately represent a VGP path that would best account for the samples in the DuBois dataset. The post-AD 1050 segment of the Wolfman Curve may be more accurate, while the paths of both curves appear to need adjustment toward higher longitudes in the pre-AD 1050 period.

AD 1125–1225 (Segment 6)

The VGP path reverses itself in a loop at some time near or after AD 1125. The SWCV2000 and Wolfman approximations of the AD 1125–1255 VGP path are presented in Figure 9.9. The VGP curves are in relatively close agreement of the pole position at about AD 1225, but they disagree at AD 1125 and for the subsequent 50 to 60 years. The Wolfman Curve begins at a lower latitude and remains below 76° latitude until shortly after AD 1180. Where SWCV2000 presents the inflection point of the reversal at AD 1125, the Wolfman Curve proposes that the inflection is delayed until approximately AD 1150.

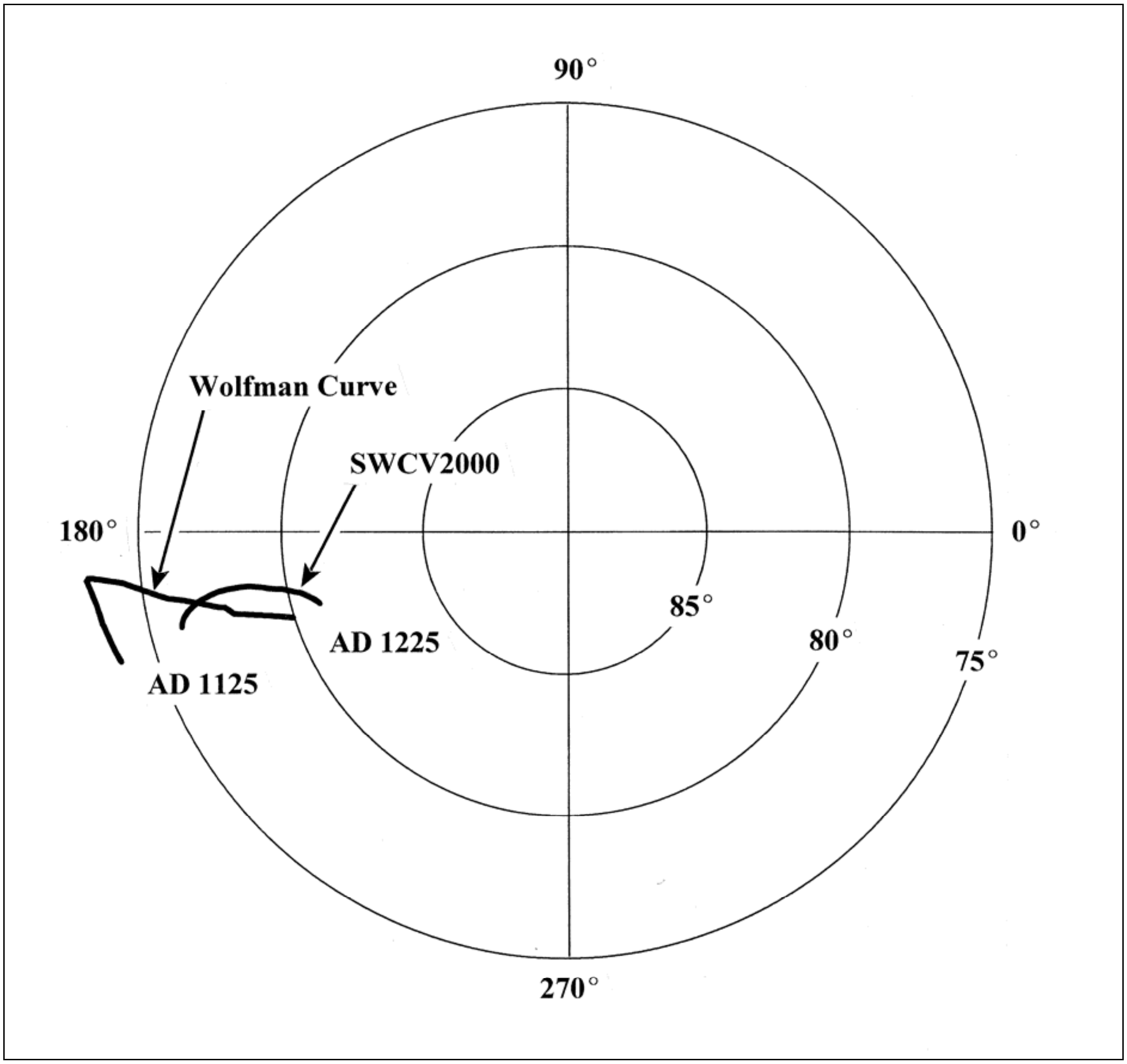

Figure 9.9. AD 1125 to 1225 segments of the SWCV2000 and Wolfman VGP curves.

Sample results from the DuBois database that could be contemporary with the AD 1125–1225 period are plotted with the AD 1125–1225 segment of SWCV2000 in Figure 9.10. Those results whose independent dating suggests that they are contemporary with or earlier than the segment (solid circles) are scattered around the segment, with the majority below (at higher longitudes) where earlier samples might be expected to fall. A small number are located off the early end of the curve, at lower latitudes. Results whose independent dating could be contemporary with or either slightly later (solid squares) or significantly later (open squares) tend to be located around the curve, below the curve (lower longitudes), or to the right (higher latitudes).

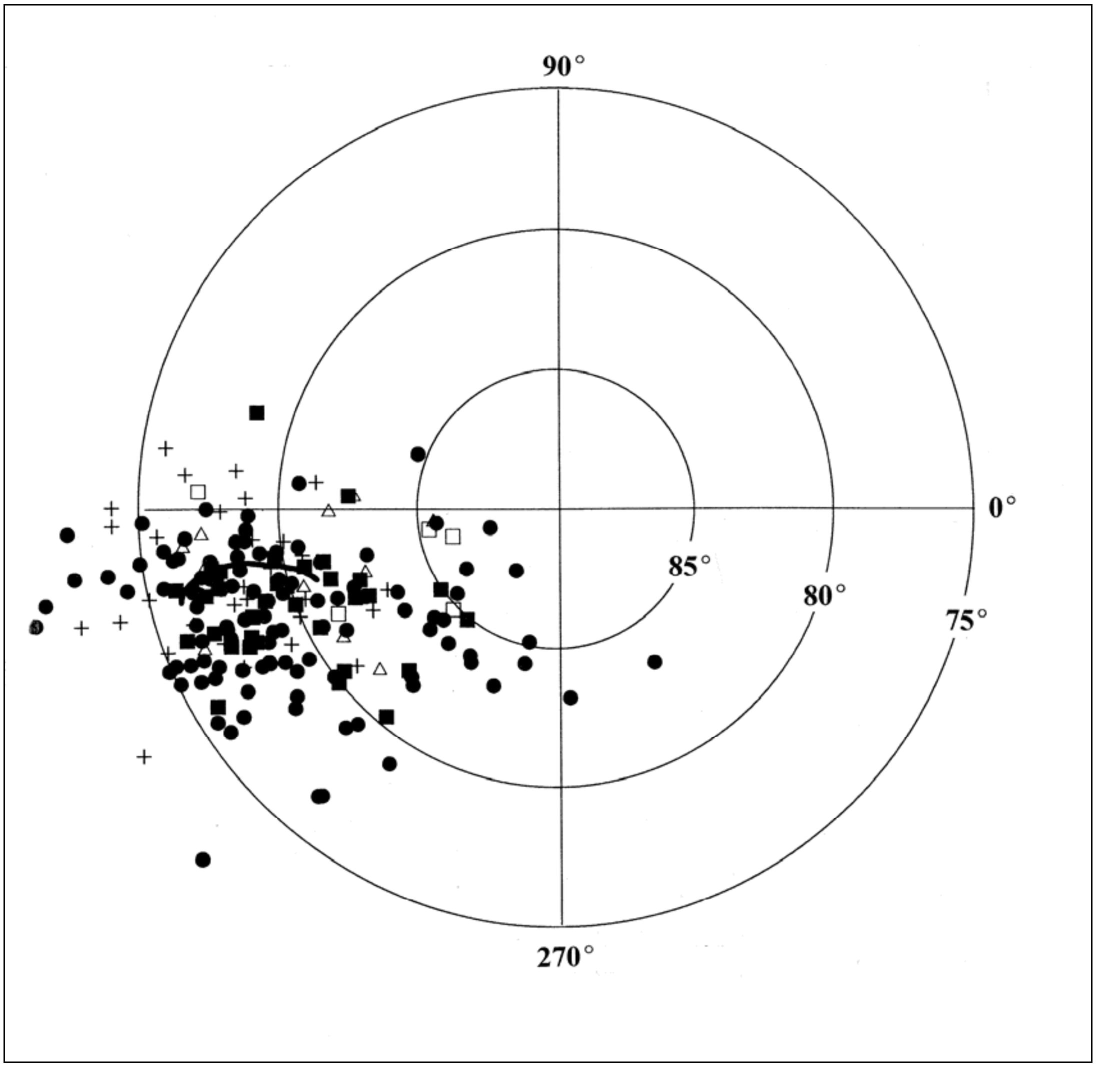

Figure 9.10. SWCV2000 and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1125 to 1225 period. Open circles denote samples that are believed to date within the AD 800 to 1225 period. Solid circles denote samples that are believed to date within the AD 950 to 1225 period. Samples denoted by a "+" are exclusively dated to the AD 1125 to 1225 period, while samples marked with an open triangle are dated to the broader AD 950 to 1300 period. Solid squares denote samples that are believed to date within the AD 1125 to 1300 period. Open squares denote samples that are believed to date within the AD 1125 to 1400 period. All centerpoints are associated with α_{95} values of 3.0° or less.

Those samples that are confidently and exclusively associated with AD 1125–1225 period based on independent evidence are illustrated without the less precisely dated results in Figure 9.11.

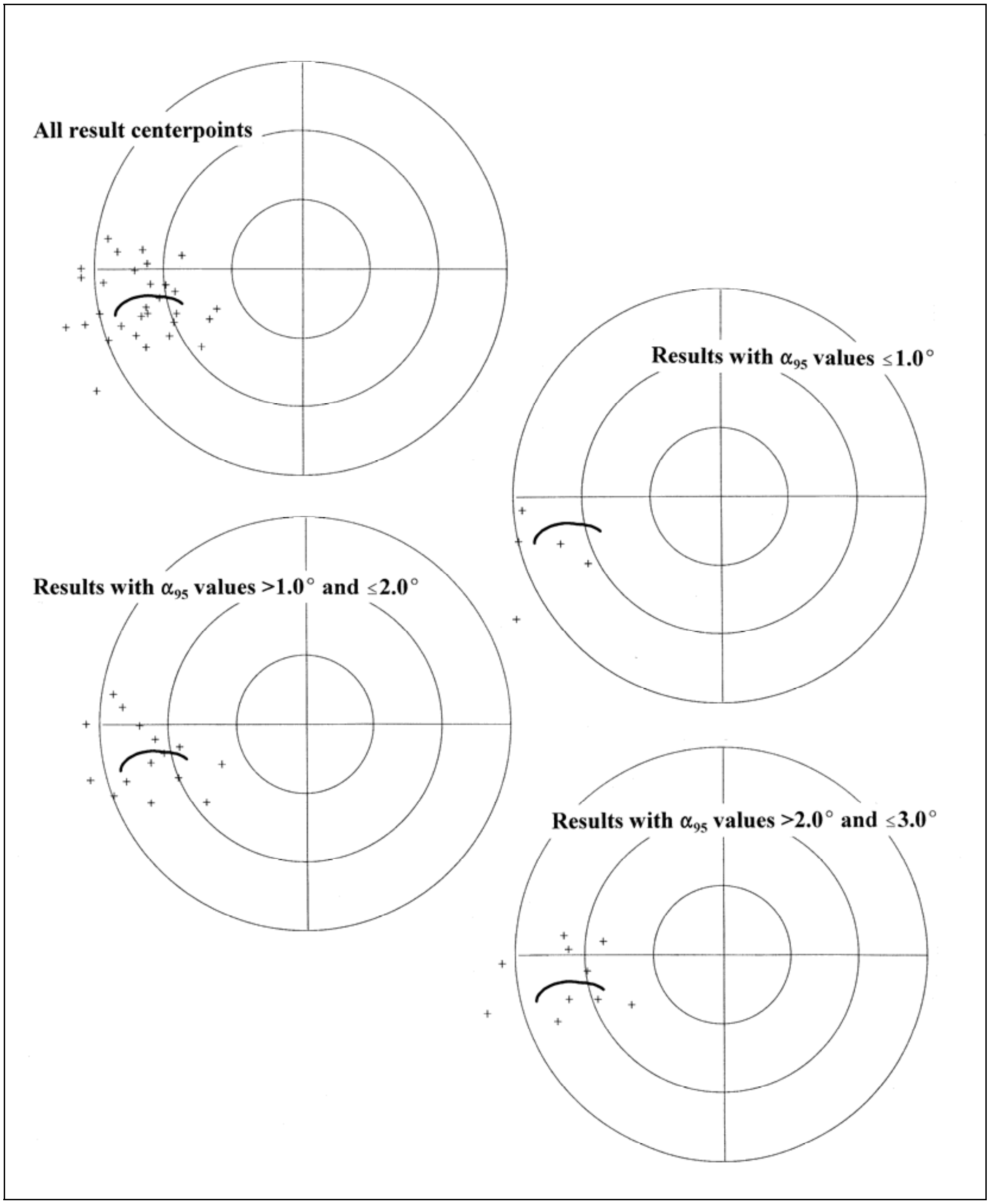

Figure 9.11. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1125 to 1225 period, contrasted with the SWCV2000 VGP curve. The upper plot includes all results, regardless of precision. The other plots distinguish high, moderate, and low precision results.

One extremely precise result (α_{95}<1.0°) falls at a considerable distance from the curve at higher longitudes and latitudes. Moderately precise results (1.0°<α_{95}<2.0°) include several that fall at lower longitudes and lower latitudes. The low precision results are all closely within their errors of the SWCV2000 segment. A plot of the residual distances of these high precision results from their closest points on the curve is presented in Figure 9.12.

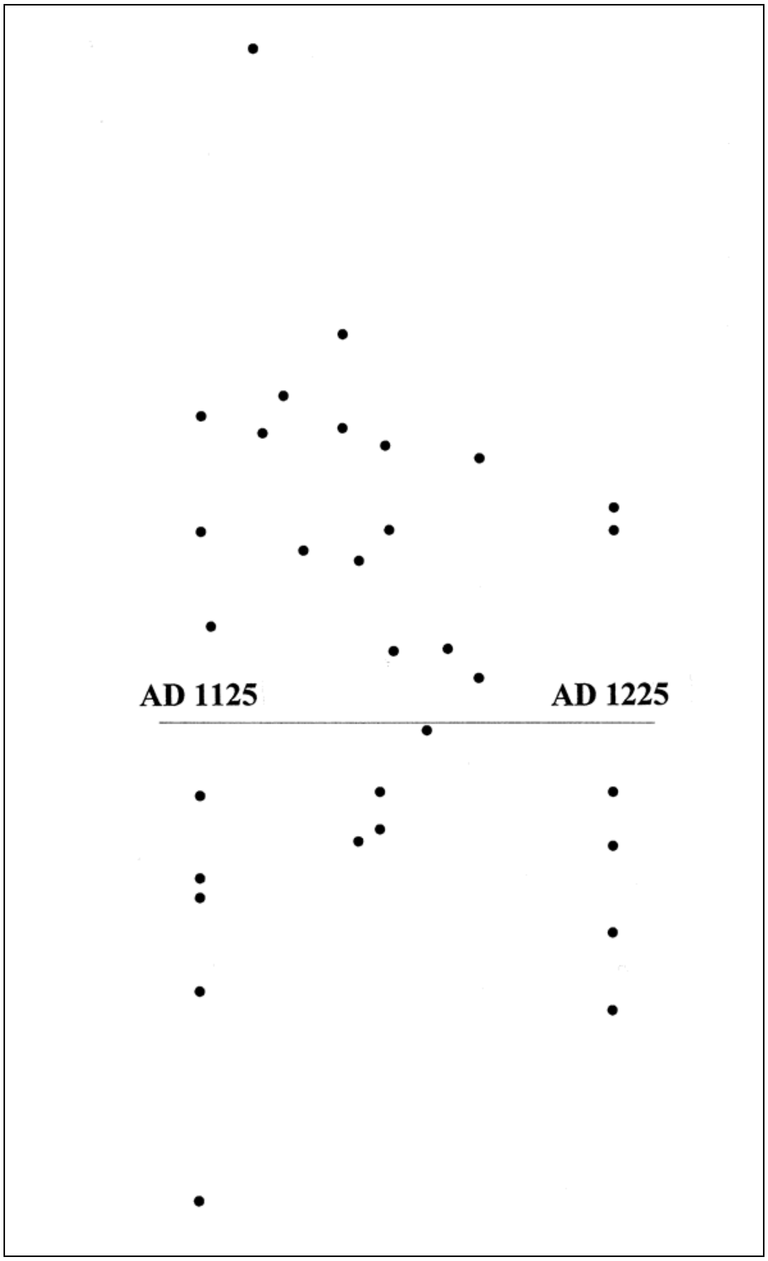

Figure 9.12. Plot of residual distances from confidently attributed AD 1125 to 1225 sample centerpoints and nearest points along the AD 1125 to 1225 segment of SWCV2000.

Unlike the previous segment, residuals are not patterned on either side of the curve, but there are concentrations of large residuals at the ends of the segment. The three results that are substantially distant from the AD 1225 end of the segment are associated with moderate and low precision VGP estimates. A larger number of results, including high precision estimates, are at a distance from the AD 1125 end of the segment.

The same DuBois results are contrasted with the Wolfman Curve for the AD 1125–1225 period in Figure 9.13.

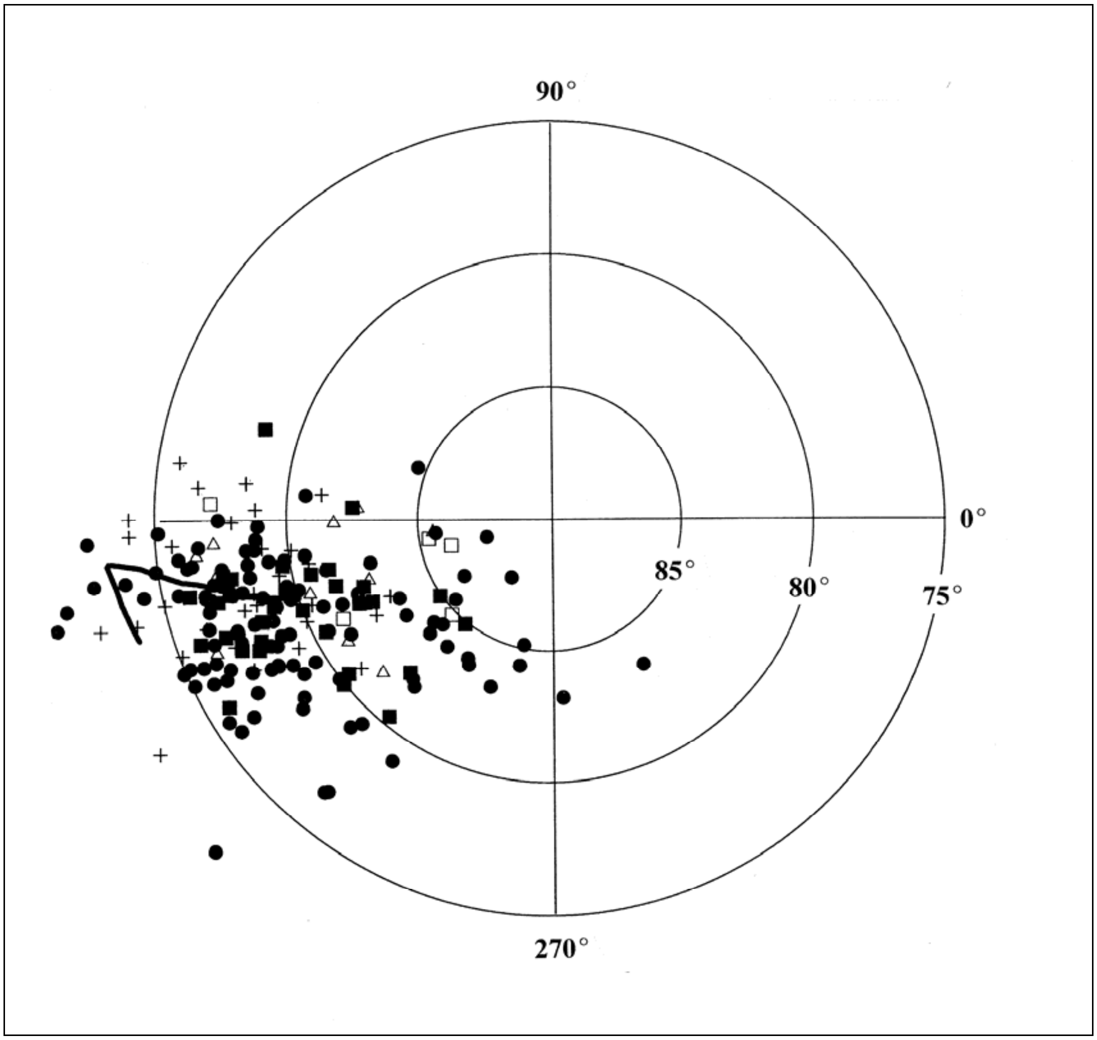

Figure 9.13. The AD 1125 to 1225 segment of the Wolfman Curve and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1125 to 1225 period. Open circles denote samples that are believed to date within the AD 800 to 1225 period. Solid circles denote samples that are believed to date within the AD 950 to 1225 period. Samples denoted by a "+" are exclusively dated to the AD 1125 to 1225 period. Solid squares denote sample that are believed to date within the AD 1125 to 1300 period. Open squares denote samples that are believed to date within the AD 1125 to 1400 period. All centerpoints are associated with α_{95} values of 3.0° or less.

In general, the same comparisons hold for the samples that could be earlier and the samples that could be later. There is, however, a slightly better fit between the Wolfman Curve segment and the results that can be confidently and exclusively attributed to this period (Figure 9.14). A single high precision result is significantly off the AD 1125 end of the curve, but the discrepancy is less than that associated with the SWCV2000 curve. The late end of the segment seems to be at an appropriate longitude, although there is a slight suggestion in the moderate precision results that the AD 1225 point should be extended to a slightly higher latitude. There is less support for the low latitude path of the portion of the curve between AD 1125 and 1150, and there is even some suggestion that the inflection point should be closer to 76° latitude and 180° longitude.

Because of the inflection of this segment of the Wolfman Curve, the residual plot is somewhat less useful than it might be, especially for the pre-AD 1175 portion of the curve (Figure 9.15). However, a slight dominance of positive residuals along the last half of this segment supports the suggestion that a slightly lower latitude path from the inflection point may be appropriate. Also, the cluster of residuals that fall off the AD 1225 end of the curve segment support the need to extend this portion of the curve to higher latitudes.

In comparing the performance of the two curves for the AD 1125–1225 period (see Figures 9.9, 9.11, and 9.14), a compromise between the two paths would seem to be called for. The DuBois dataset does not support the excursion of the early portion of the Wolfman Curve along such a low latitude path, but it does suggest that the path needs to extend to lower latitudes than is represented by SWCV2000. A very slightly wedge-shaped distribution of points along the low latitude end of the scatter provides weak support for an inflection point in the early portion of this time period (as represented in the Wolfman Curve), but that point would need to be closer to 76° latitude and 180° longitude than where the inflection point is currently drawn. The slightly lower (higher longitude) termination path of the Wolfman Curve for the period is supported by the high and moderate precision results of the confidently and exclusively attributed samples, but that support fades when the low precision results are added to the evaluation. Regardless, the comparison suggests that the AD 1225 extension of the SWCV2000 curve is probably more accurate and that the AD 1225 point may even need to be pushed to a slightly higher latitude.

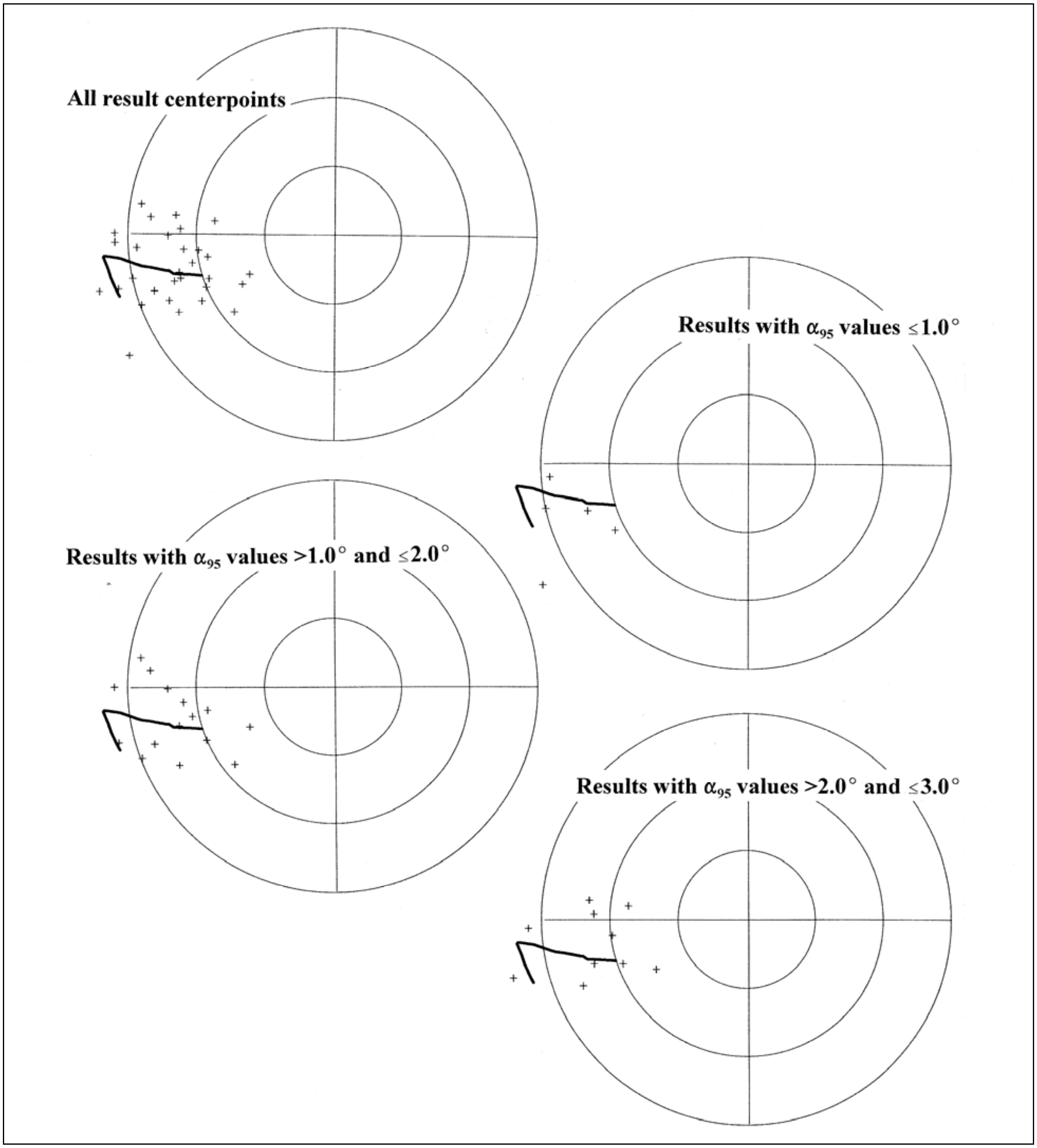

Figure 9.14. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1125 to 1225 period, contrasted with the Wolfman VGP curve for the AD 1125 to 1225 period. The upper figure includes all results, regardless of precision. The lower plots include only moderate and low precision results, respectively.

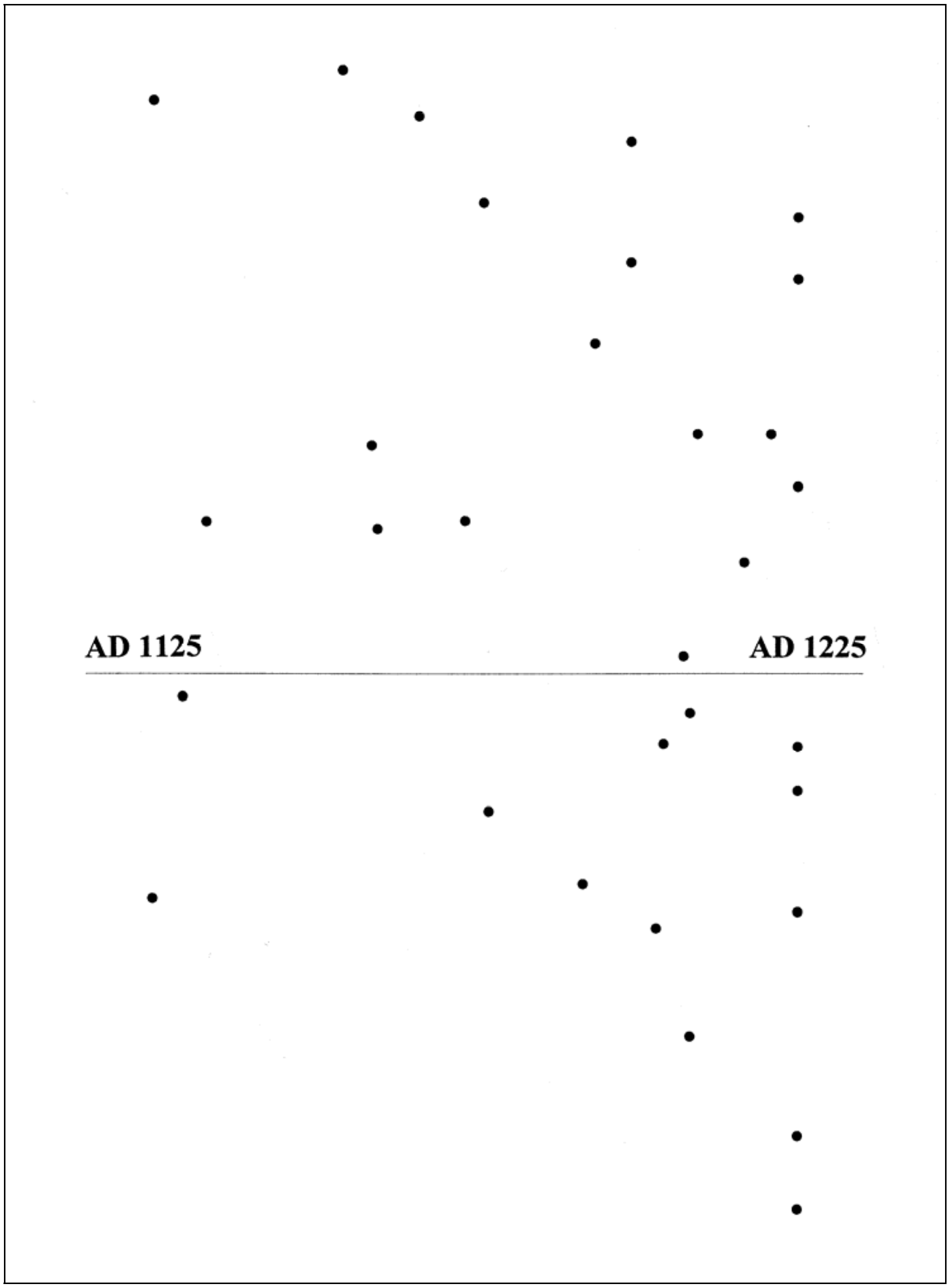

Figure 9.15. Plot of residual distances from confidently attributed AD 1125 to 1225 sample centerpoints and nearest points along the AD 1125 to 1225 segment of the Wolfman Curve.

AD 1225–1300 (Segment 7)

The greatest discrepancies between current Southwest VGP curves begin at AD 1225. The SWCV2000 and Wolfman Curve segments for the AD 1225–1300 period are presented in Figure 9.16. Both begin at approximately the same position, but the end points differ radically. SWCV2000 portrays the VGP movement as extremely slow and in the form of a relatively tight loop. The progression of the curve is so slow that only samples with remarkably precise results ($\alpha_{95} \lesssim 0.5°$) could distinguish features that dated to the extreme ends of the period. The Wolfman Curve is radically different, suggesting polar movement at approximately the same rate as the preceding period, and with a termination point significantly distant from the starting point.

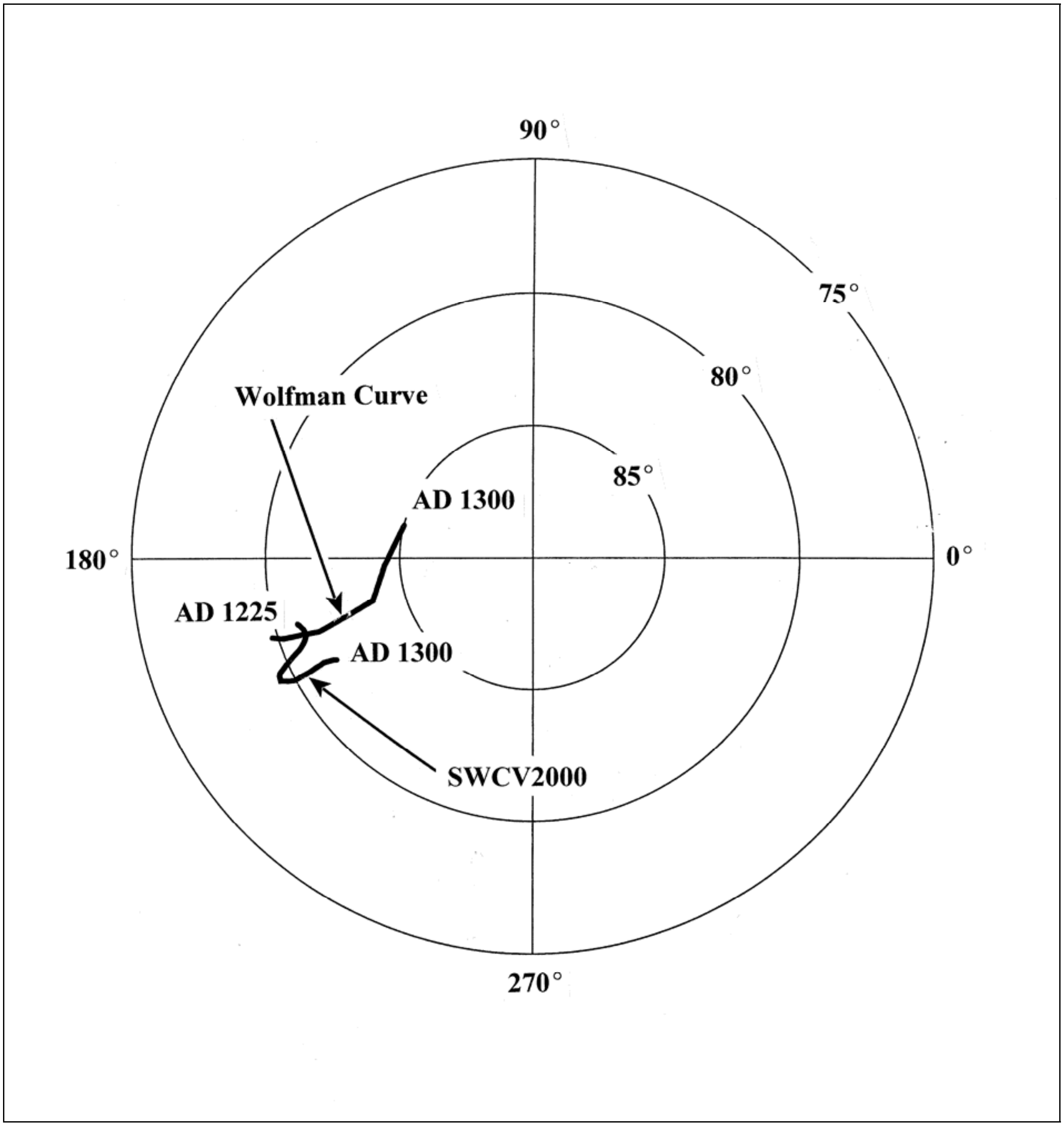

Figure 9.16. AD 1225 to 1300 segments of the SWCV2000 and Wolfman VGP curves.

The DuBois dataset is contrasted with the SWCV2000 curve in Figure 9.17. Contemporary or potentially earlier results (solid and open circles) tend to be scattered both around the curve segment and toward lower latitudes (in the area of the AD 1125–1225 segment). Contemporary or potentially later results (solid and open squares) are much more dispersed, with clusters both around the segment and at higher latitudes and slightly higher longitudes.

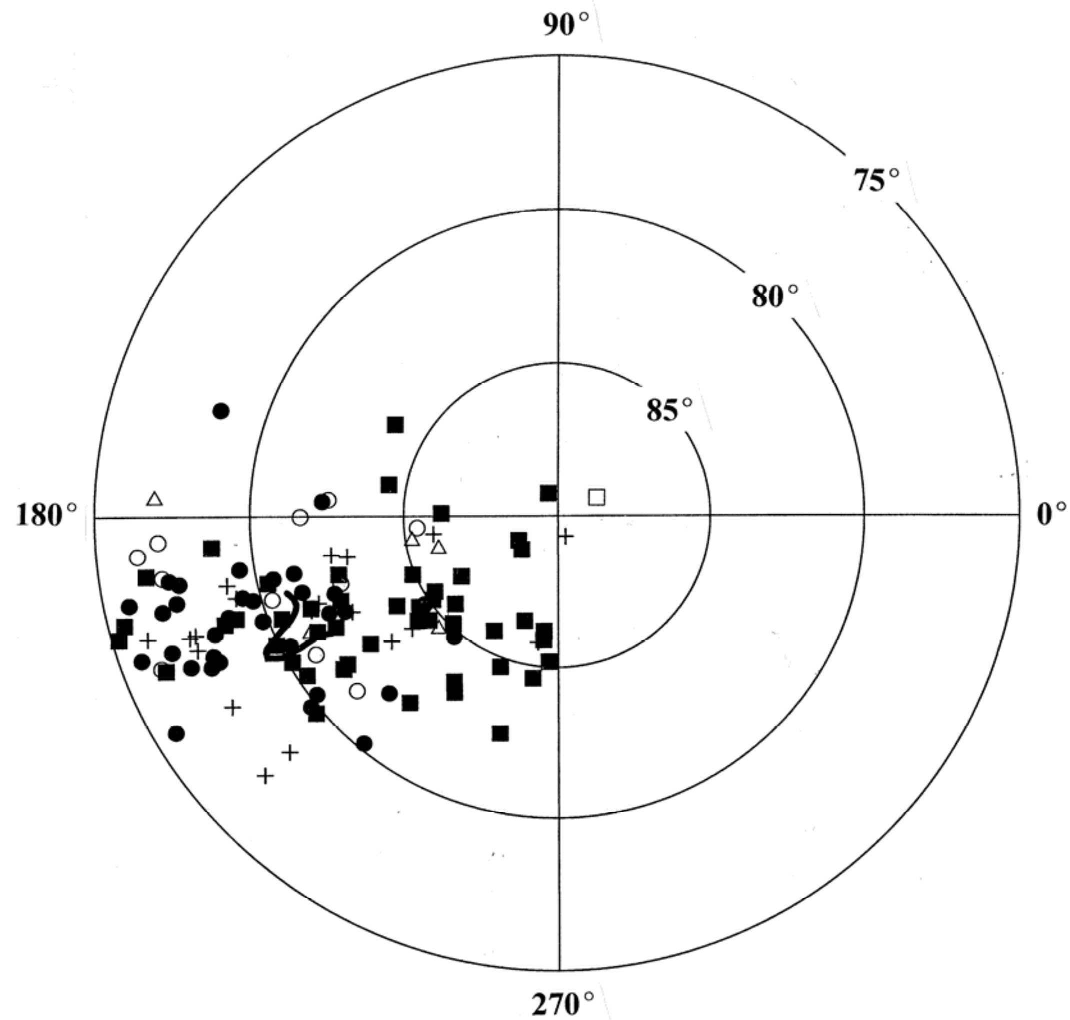

Figure 9.17. SWCV2000 and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1225 to 1300 period. Open circles denote samples that are believed to date within the AD 950 to 1300 period. Solid circles denote samples that are believed to date within the AD 1125 to 1300 period. Samples denoted by a "+" are exclusively dated to the AD 1225 to 1300 period, while samples marked with an open triangle are dated to the broader AD 1125 to 1400 period. Solid squares denote samples that are believed to date within the AD 1225 to 1400 period. Open squares denote samples that are believed to date within the AD 1225 to 1500 period. All centerpoints are associated with a α_{95} values of 3.0° or less.

Results that are confidently and exclusively attributed to the AD 1225–1300 period are isolated from the less-well-dated results in Figure 9.18.

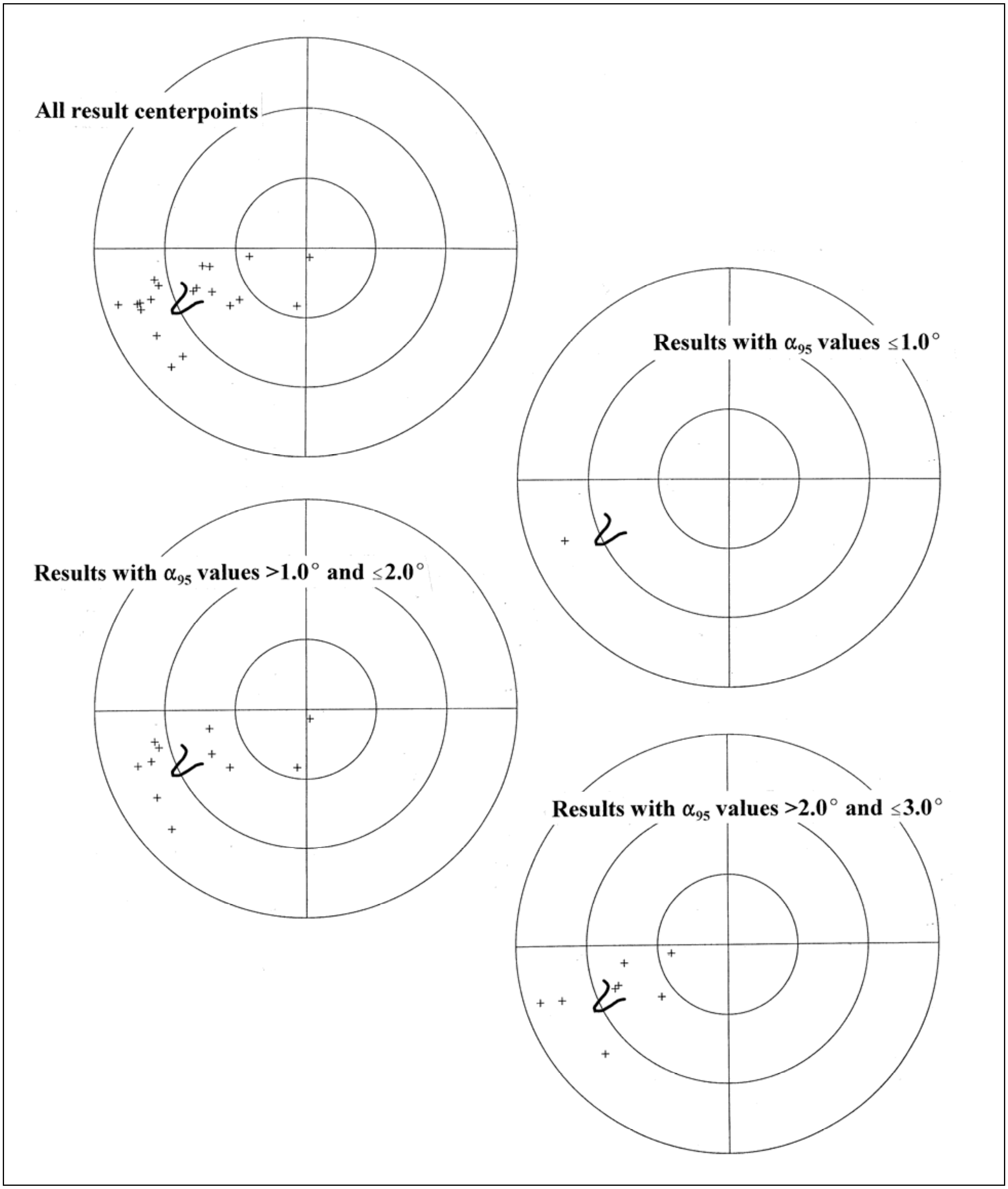

Figure 9.18. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1225 to 1300 period, contrasted with the SWCV2000 VGP curve. The upper plot includes all results, regardless of precision. The other plots distinguish high, moderate, and low precision results.

Only one of the results is extremely precise, and it lies off of the curve at a lower latitude. Moderately precise results both cluster around the curve and tend to spread linearly, toward and away from the North Pole. The centerpoints associated with low precision results are similar in dispersion to the moderate precision results. Residual distances between the centerpoints and the curve are less useful as an analytic tool for this segment due to the short and reflexive nature of the curve segment. The distances were divided into those for centerpoints that are closer to the North Pole (positive) and those centerpoint distances that are further away (negative), and the distances are plotted in Figure 9.19. Positive residuals tend to be greater in magnitude, reflecting an apparent longitudinal linearity that is not captured by the SWCV2000 curve.

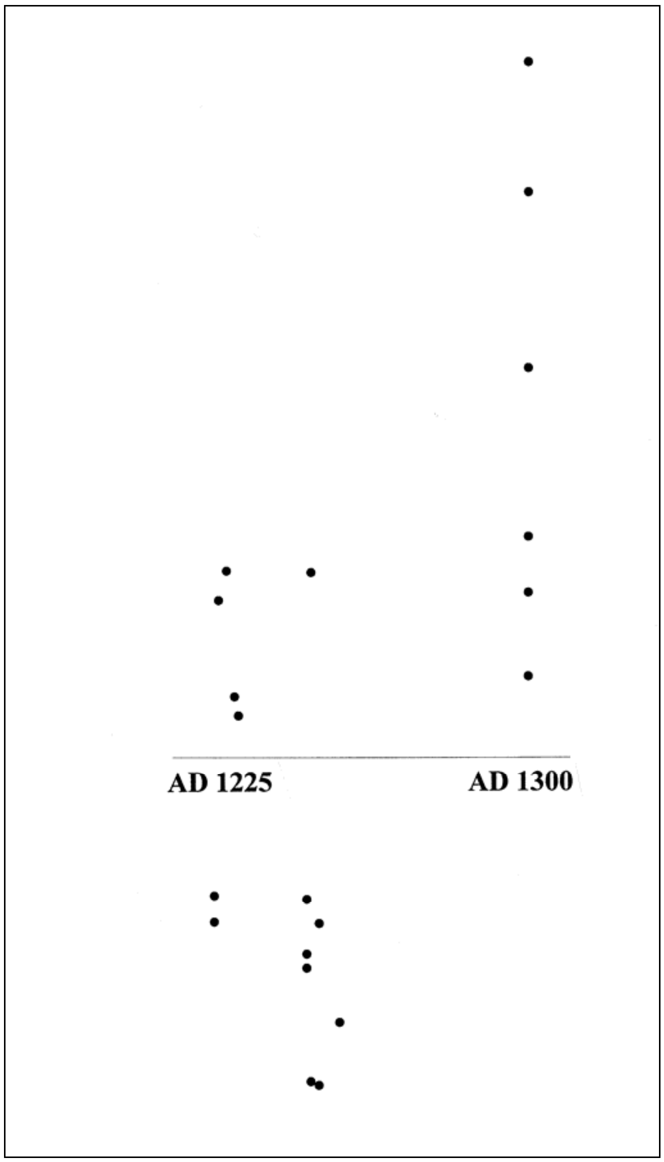

Figure 9.19. Plot of residual distances from confidently attributed AD 1225 to 1300 sample centerpoints and nearest points along the AD 1225 to 1300 segment of SWCV2000.

The same Dubois AD 1225–1300 dataset is contrasted with the Wolfman Curve in Figure 9.20.

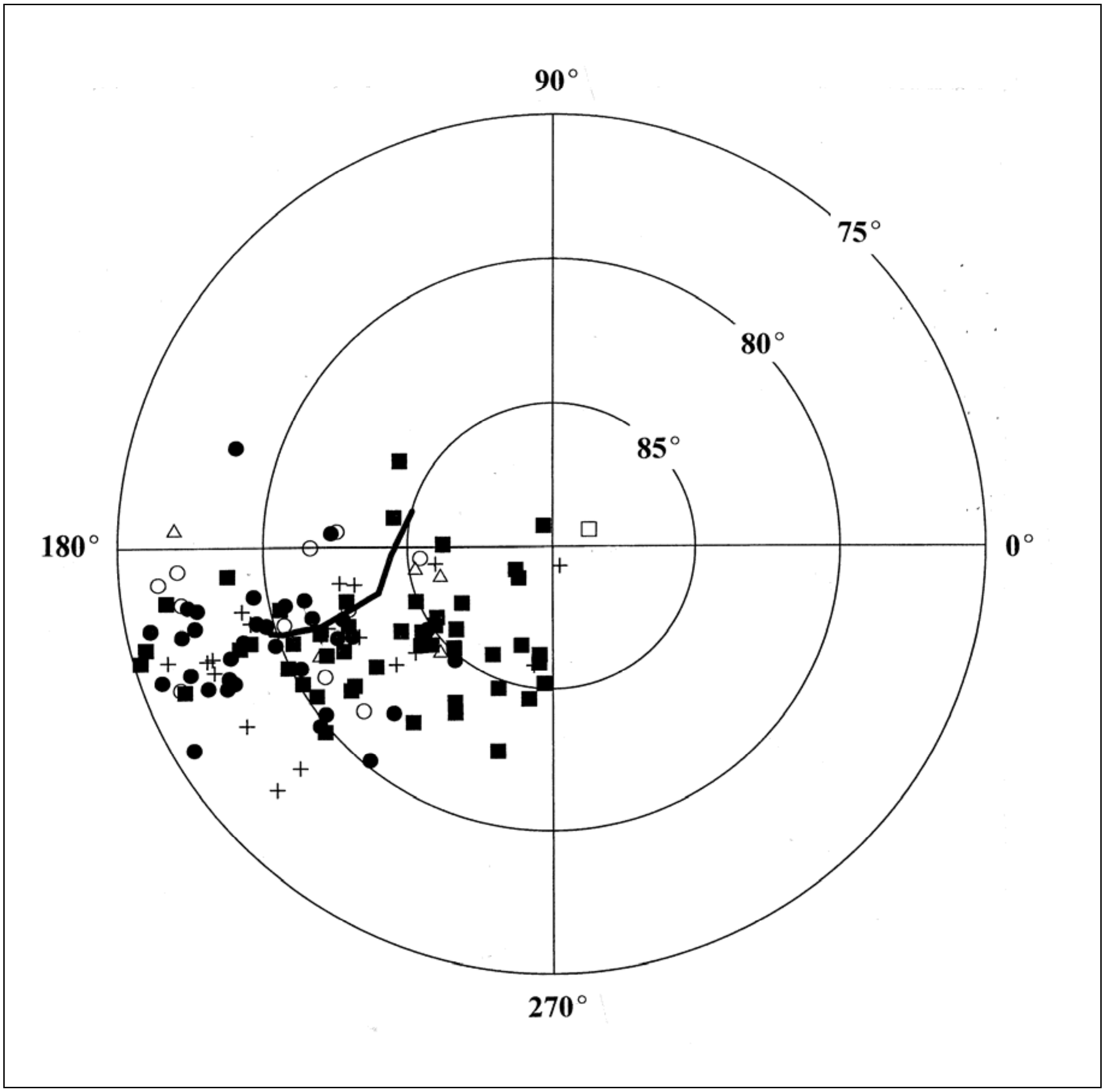

Figure 9.20. The AD 1225 to 1300 segment of the Wolfman Curve and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1225 to 1300 period. Open circles denote samples that are believed to date within the AD 950 to 1300 period. Solid circles denote samples that are believed to date within the AD 1125 to 1300 period. Samples denoted by a "+" are exclusively dated to the AD 1225 to 1300 period, while samples marked with an open triangle are dated to the broader AD 1125 to 1400 period. Solid squares denote samples that are believed to date within the AD 1225 to 1400 period. Open squares denote samples that are believed to date within the AD 1225 to 1500 period. All centerpoints are associated with α_{95} values of 3.0° or less.

Contemporary or potentially earlier results (solid and open circles) tend to cluster around the earlier one-third of the Wolfman Curve segment and extend to lower latitudes in the approximate area of the AD 1125–1225 segment. Samples that are contemporary or potentially later (solid and open squares) are more broadly distributed, again clustering around the earlier half of the Wolfman Curve segment as well as filling an area toward higher latitudes and slightly higher longitudes. A few of the contemporary or potentially later sample results are near the AD 1330 end of the curve segment, but much fewer than are in the other areas of the scatter.

Only the results that are confidently and exclusively attributed to the AD 1225–1300 period are included in the plots of Figure 9.21. The single high precision result is just outside the early end of the curve. The moderate precision results are scattered mainly below the curve (higher longitudes), and a cluster of results extends beyond the early end of the segment. No samples cluster around the later one-third of the segment, while two centerpoints are much closer to the north pole. Low precision results mirror the moderate precision scatter, and the total distribution suggests that a slightly longer path at higher longitudes would better match the DuBois data. The residual distance between the centerpoints and the nearest points on the curve segment support this conclusion (Figure 9.22), with an inordinately high proportion of negative residuals and a large numbers of and magnitudes for residuals associated with the end points of the segment.

If the samples in the DuBois dataset are representative of the AD 1225–1300 time period, neither curve adequately reflects the true VGP path. There appears to be greater linearity to the path than is represented by the reflexive and short SWCV2000 segment. The Wolfman segment is too low in longitude, and there is little support for the even lower longitude termination of the segment. In both cases, a path toward the north pole would more completely account for the available data.

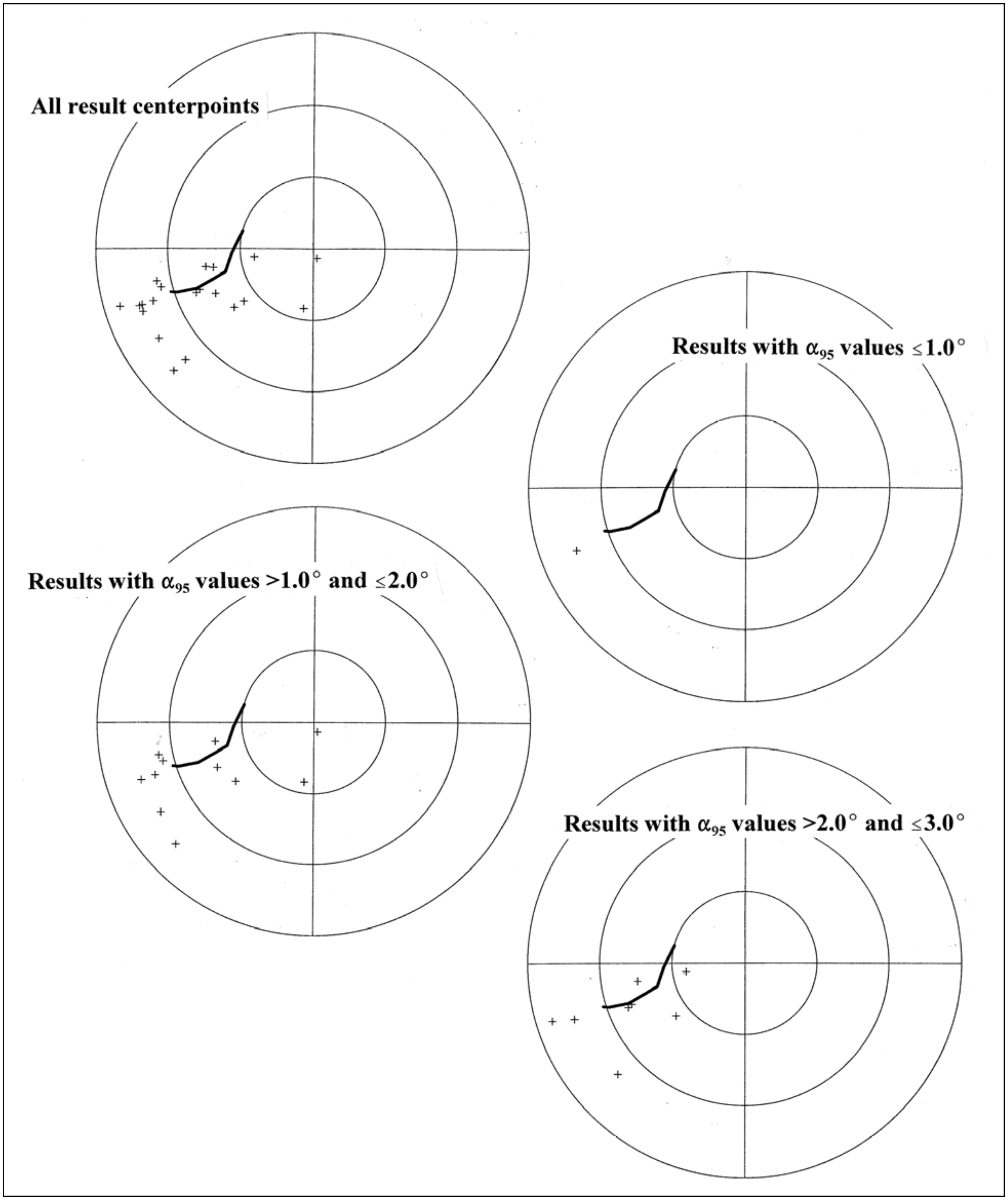

Figure 9.21. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1225 to 1300 period, contrasted with the Wolfman VGP curve for the AD 1225 to 1300 period. The upper figure includes all results, regardless of precision. The lower plots include only moderate and low precision results, respectively.

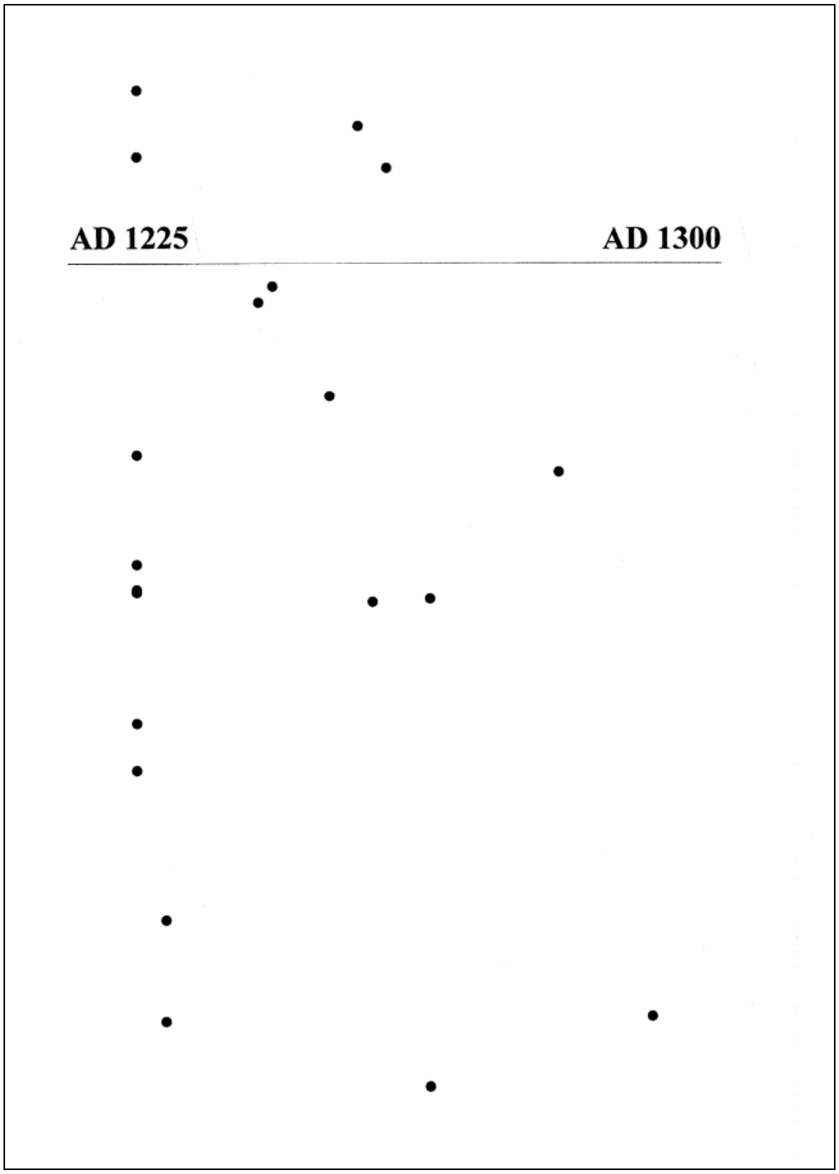

Figure 9.22. Plot of residual distances from confidently attributed AD 1225 to 1300 sample centerpoints and nearest points along the AD 1225 to 1300 segment of the Wolfman Curve.

AD 1300–1400 (Segment 8)

Differences between the SWCV2000 and Wolfman approximations of the AD 1300–1400 curve segment are extreme, although both segments terminate at approximately the same location (Figure 9.23). The SWCV2000 VGP path is relatively short and has a kink or inflection in the middle of the period. High precision results could conceivably discriminate events at either end of the period, but moderate precision results could encompass the entire segment. The Wolfman Curve represents a path more than twice as long, beginning with an excursion to longitudes of less than 170E, significantly distant from the nearest point on the SWCV2000 curve. For nearly the first half of the period, the Wolfman segment remains at latitudes greater than 85E, returning to the vicinity of the SWCV2000 curve for the post-AD 1350 portion of the segment. The Wolfman Curve segment terminates at a higher longitude than SWCV2000, but they are similar in latitude.

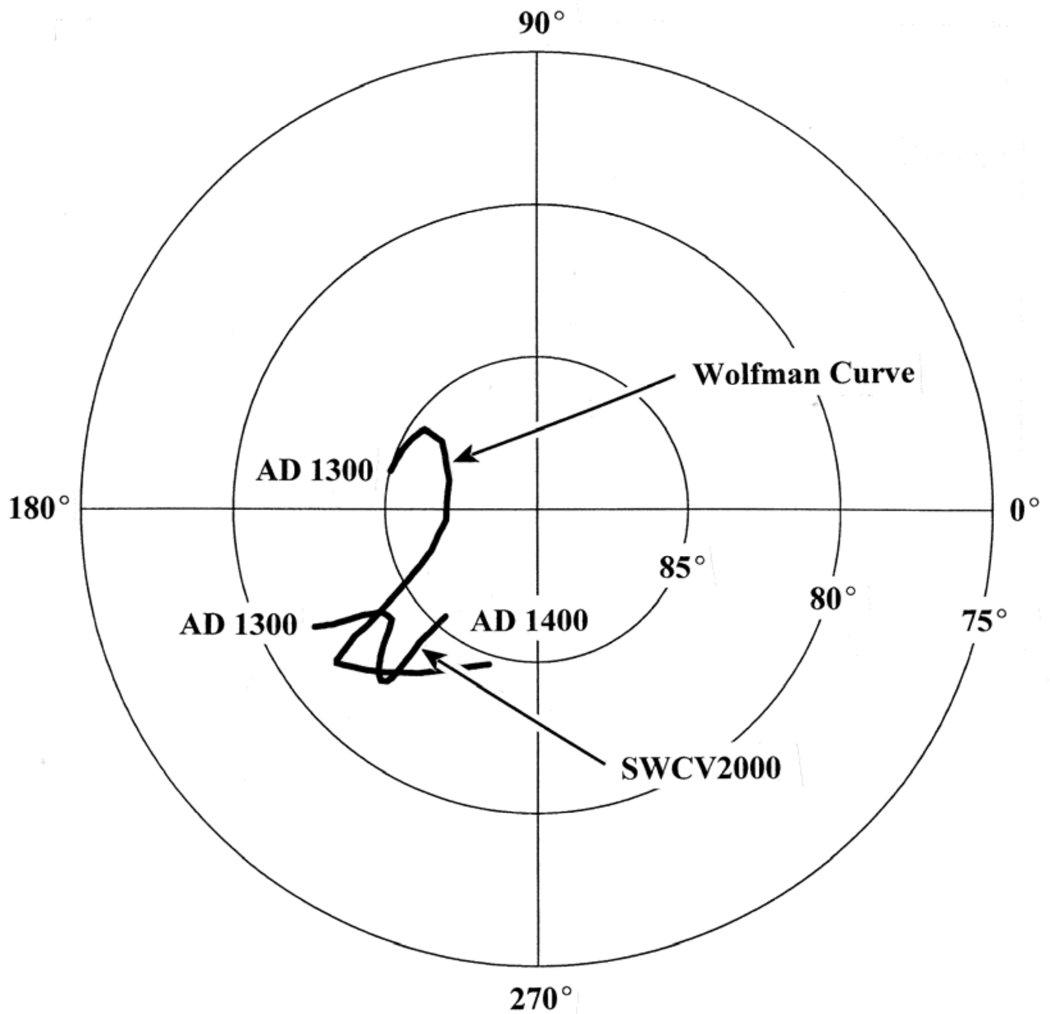

Figure 9.23. AD 1300 to 1400 segments of the SWCV2000 and Wolfman VGP curves.

The DuBois dataset is contrasted with the SWCV2000 curve in Figure 9.24. Contemporary or potentially earlier results (solid and open circles) tend to be scattered both around the curve segment, above it (toward lower longitudes), and toward lower latitudes. Contemporary or potentially later results (solid and open squares) are more tightly clustered, both around the later half of the segment and at higher longitudes.

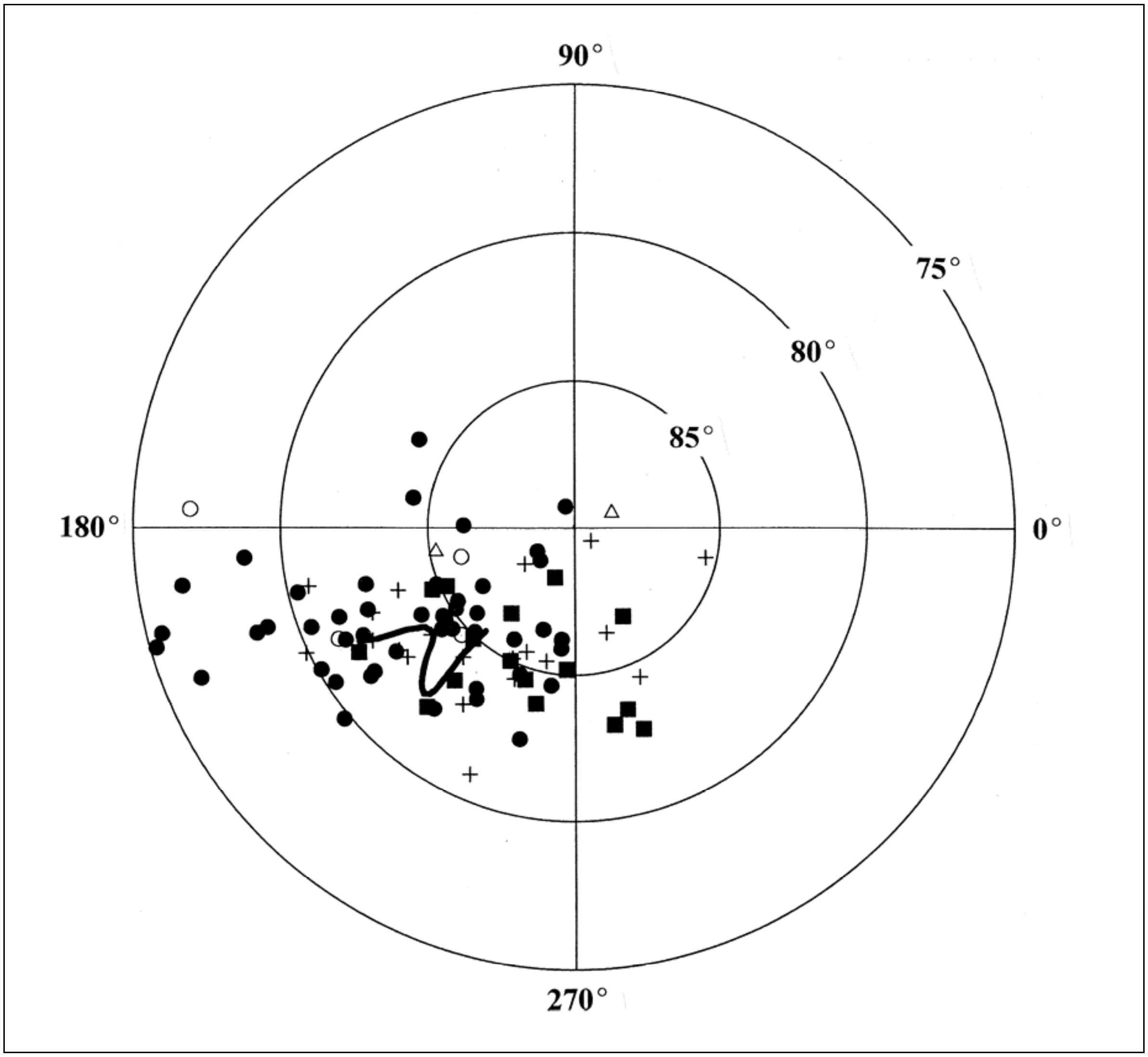

Figure 9.24. SWCV2000 and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1300 to 1400 period. Open circles denote samples that are believed to date within the AD 1125 to 1400 period. Solid circles denote samples that are believed to date within the AD 1225 to 1400 period. Samples denoted by a "+" are exclusively dated to the AD 1300 to 1400 period, while samples marked with an open triangle are dated to the broader AD 1225 to 1500 period. Solid squares denote samples that are believed to date within the AD 1300 to 1500 period. All centerpoints are associated with α_{95} values of 3.0° or less.

Results that are confidently and exclusively attributed to the AD 1300–1400 period are isolated from the less precisely dated results in Figure 9.25. The scatter of all results clusters around the curve and also extends to higher longitudes. These higher longitude points extend the late end of the segment, and they include results of high, moderate, and low precision.

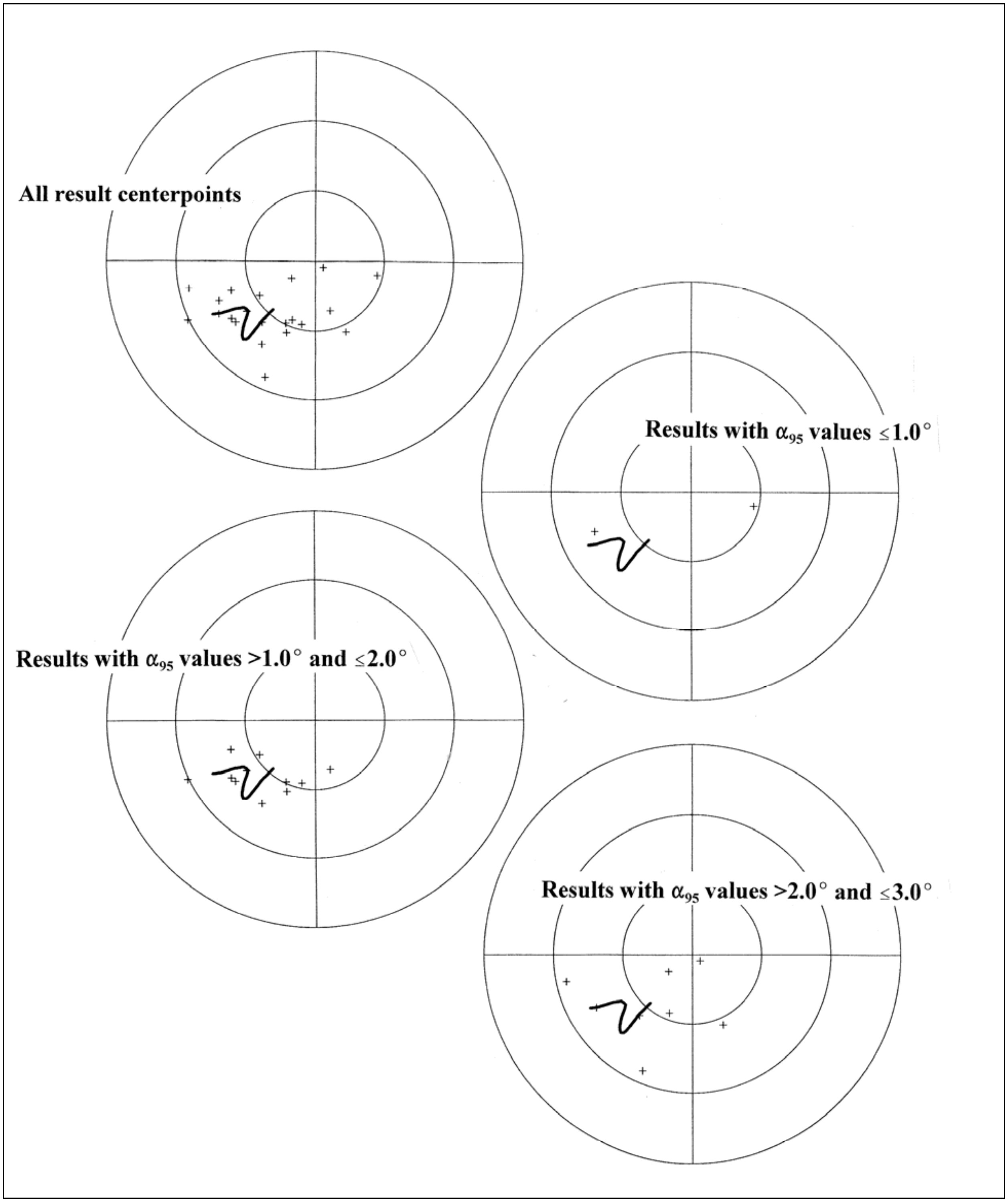

Figure 9.25. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1300 to 1400 period, contrasted with the SWCV2000 VGP curve. The upper plot includes all results, regardless of precision. The other plots distinguish high, moderate, and low precision results.

Residual distances between the result centerpoints and the nearest points along the curve segment (Figure 9.26) are less meaningful due to the relatively nonlinear nature of the curve segment. The distances were divided into those for centerpoints that are graphically above the curve as extended (positive) and those centerpoints that are below the curve segment (negative). Negative residuals are more common than positive residuals, and there is an unusually large number of large residuals at the end of the segment (AD 1400).

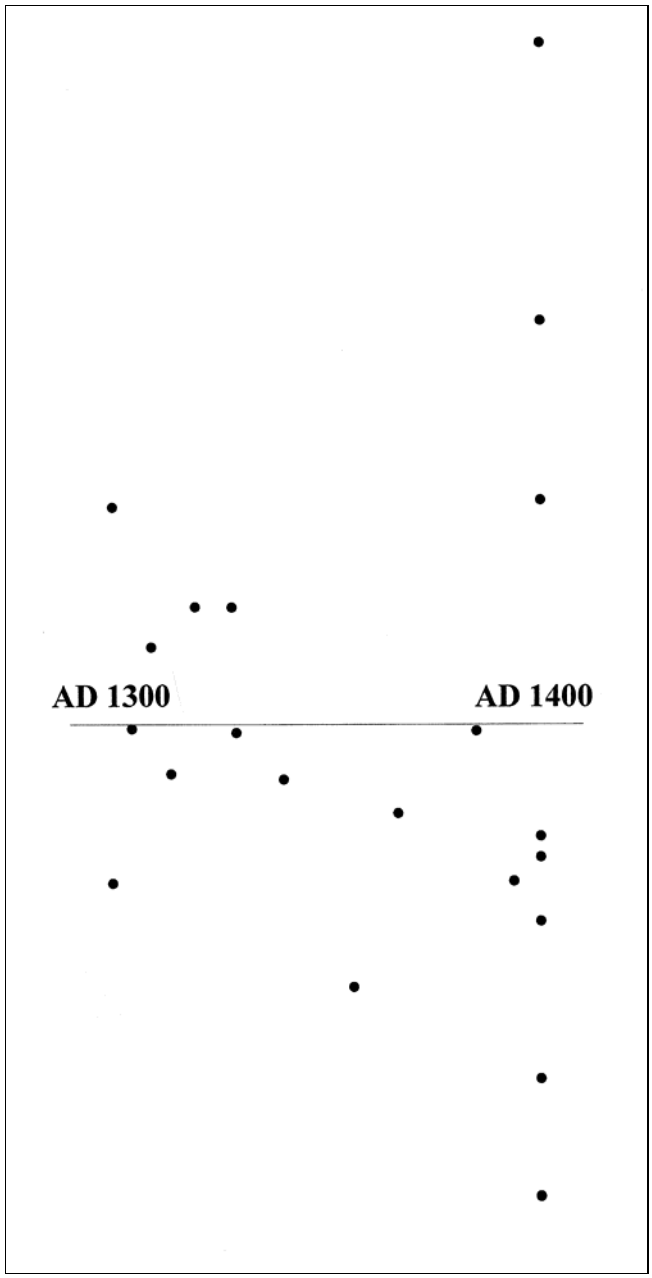

Figure 9.26. Plot of residual distances from confidently attributed AD 1300 to 1400 sample centerpoints and nearest points along the AD 1300 to 1400 segment of SWCV2000.

The same DuBois dataset is contrasted with the AD 1300–1400 segment of the Wolfman Curve in Figure 9.27.

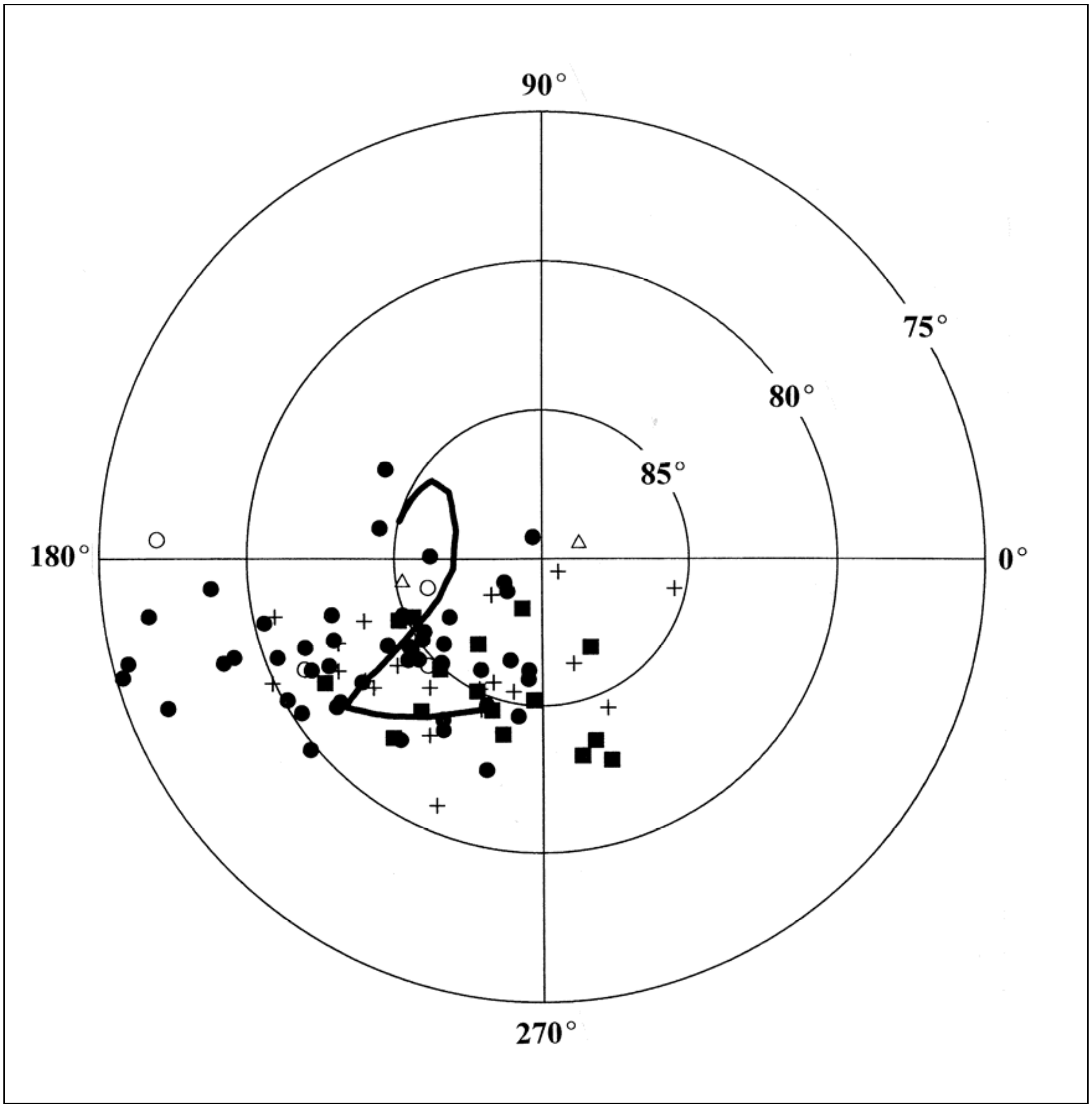

Figure 9.27. The AD 1300 to 1400 segment of the Wolfman Curve and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1300 to 1400 period. Open circles denote samples that are believed to date within the AD 950 to 1300 period. Solid circles denote samples that are believed to date within the AD 1125 to 1300 period. Samples denoted by a "+" are exclusively dated to the AD 1225 to 1300 period, while samples marked with an open triangle are dated to the broader AD 1125 to 1400 period. Solid squares denote samples that are believed to date within the AD 1225 to 1400 period. All centerpoints are associated with α_{95} values of 3.0° or less.

Results that are either contemporary with or earlier than the segment (solid and open circles) cluster either around the curve or at lower latitudes. Several of these results are proximate to the early third of the curve segment (180° longitude or less). Sample results that are either contemporary with, or later than, the segment (solid and open squares) cluster around the segment or lie at higher longitudes off of the late end of the segment.

The results that are confidently and exclusively attributed to the AD 1300–1400 period are plotted with the Wolfman Curve segment in Figure 9.28. One high precision result is near the curve while the other is significantly removed off of the late end of the segment. Moderate precision results are all clustered in the area of the later two-thirds of the curve, as are the low precision results albeit with a slightly more diffuse scatter. None of the precisely attributable results falls proximate to the early one-third of this segment. The residual distances are defined as positive if the centerpoint lies to right of the curve segment, while negative distances denote centerpoints to the left of the curve (Figure 9.29). One large positive residual is the single high precision result, but the most significant observation is the scarcity of results that are linked to the first quarter of the curve path.

The DuBois dataset suggests that some revision of these segments is warranted. The resolution (precision) of the DuBois results is insufficient to evaluate the validity of the recurved path represented in SWCV2000, but the scatter does suggest that the segment may need to be extended toward lower latitudes. The Wolfman Curve is more ambiguous. There are no results in the well-dated DuBois samples that can validate the extension of the early one-third of the curve segment to the lower longitudes. Either this extension is invalid or the early 14th century is not represented by the results in the database.

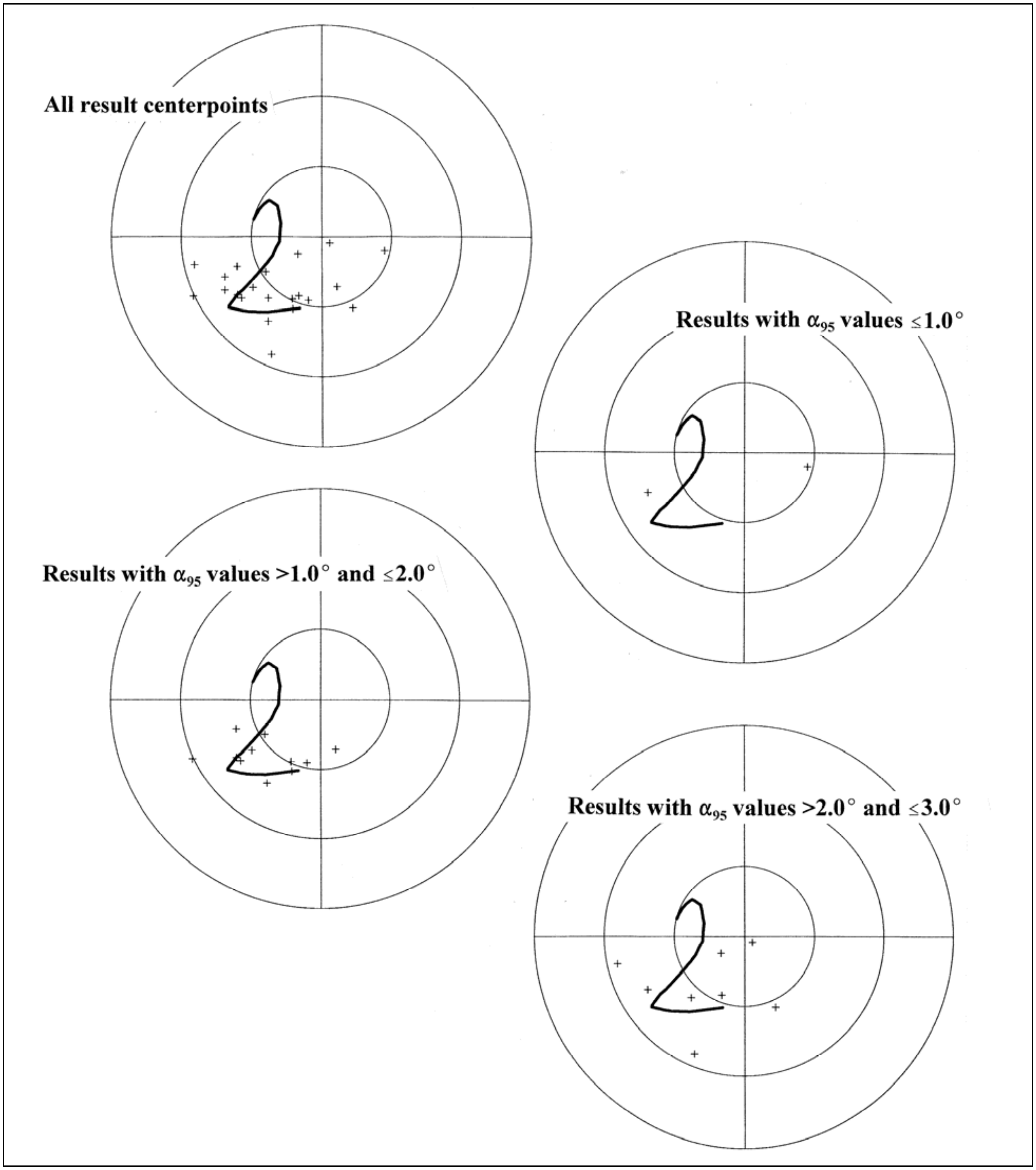

Figure 9.28. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1300 to 1400 period, contrasted with the Wolfman VGP curve for the AD 1300 to 1400 period. The upper figure includes all results, regardless of precision. The lower plots differentiate high, moderate, and low precision results, respectively.

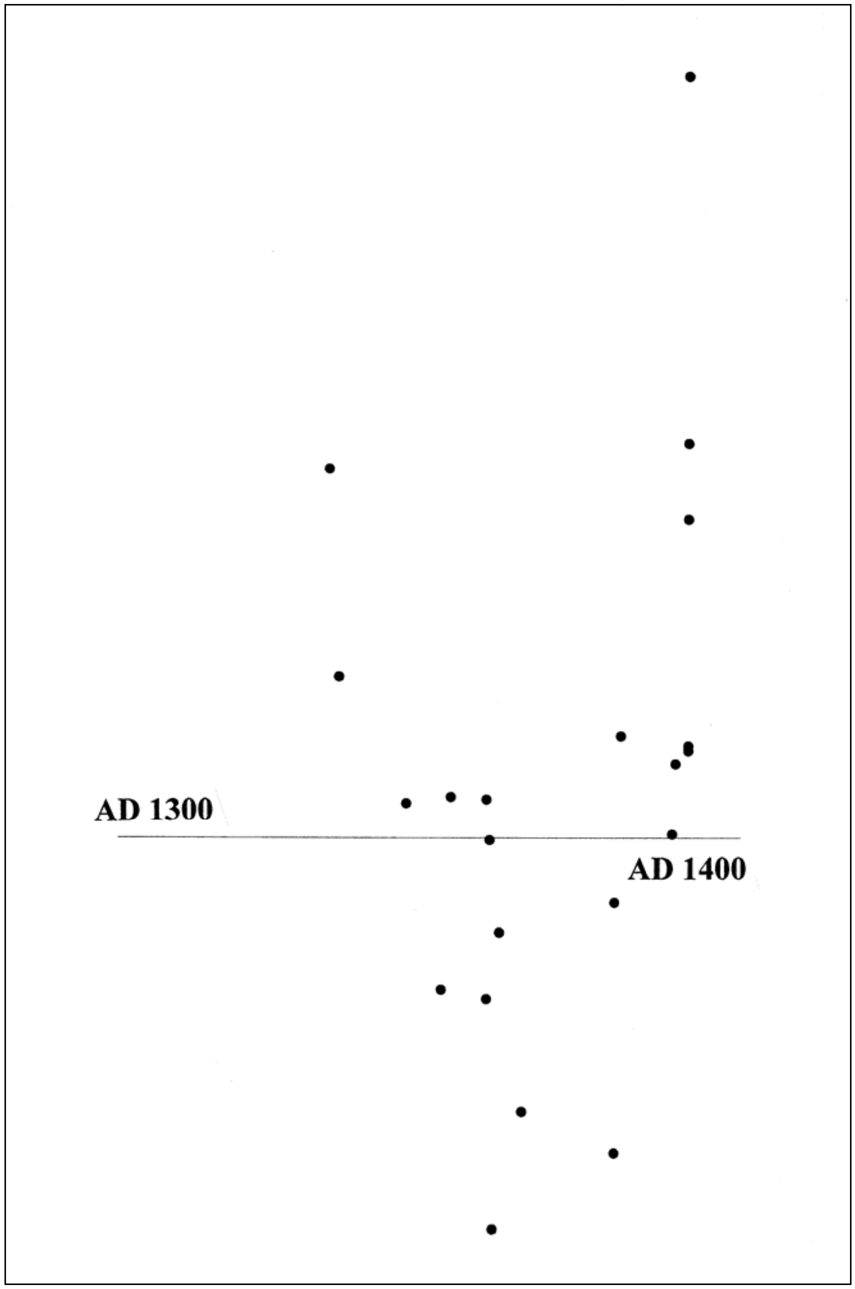

Figure 9.29. Plot of residual distances from confidently attributed AD 1300 to 1400 sample centerpoints and nearest points along the AD 1300 to 1400 segment of the Wolfman Curve.

AD 1400–1500 (Segment 9)

The final segment of this study covers the AD 1400–1500 period. The SWCV2000 and Wolfman Curves for the period are presented in Figure 9.30. The two curve segments have approximately the same starting point, but they again diverge radically, and high precision results would easily distinguish the two proposed AD 1500 positions. The difference between the proposed VGP segments lies in the abrupt excursion of the Wolfman Curve toward the pole, followed by movement to lower latitudes in the area between 10° and 350° longitude. The Wolfman Curve implies polar movement at nearly twice the rate implied by the SWCV2000 path.

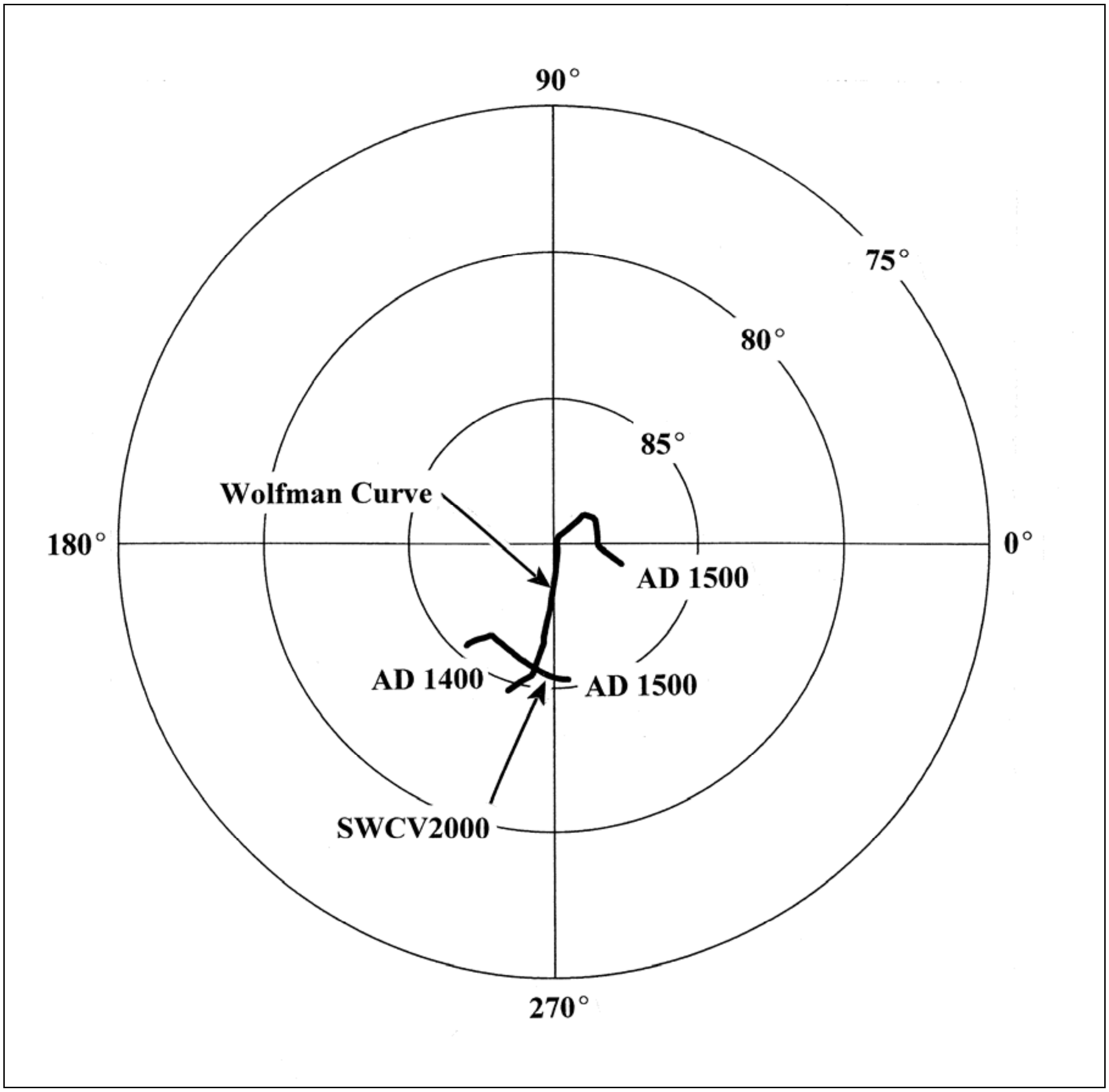

Figure 9.30. AD 1400 to 1500 segments of the SWCV2000 and Wolfman VGP curves.

Potentially relevant results from the DuBois dataset are contrasted with the SWCV2000 curve in Figure 9.31. Contemporary or potentially earlier results (solid and open circles) tend to be clustered around the curve segment, with slightly more results at lower latitudes. Contemporary or potentially later results (solid squares) are restricted to higher longitudes.

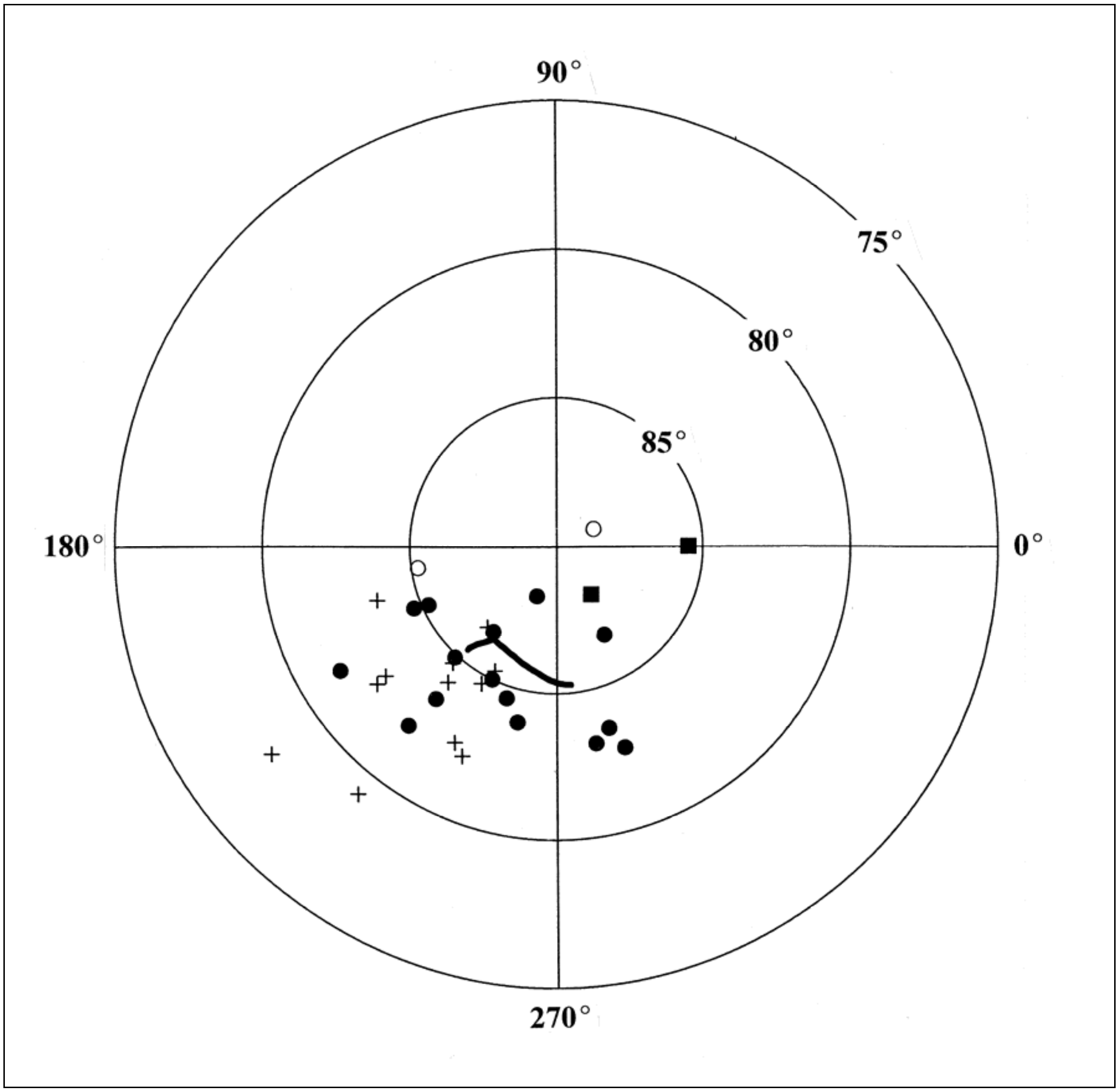

Figure 9.31. SWCV2000 and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1400 to 1500 period. Open circles denote samples that are believed to date within the AD 1225 to 1500 period. Solid circles denote samples that are believed to date within the AD 1300 to 1500 period. Samples denoted by a "+" are exclusively dated to the AD 1400 to 1500 period. Solid squares denote samples that are believed to date within the AD 1400 to 1600 period. All centerpoints are associated with α_{95} values of 3.0° or less.

Results that are confidently and exclusively attributed to the AD 1400–1500 period are isolated from the less precisely dated results in Figure 9.32. Where potentially earlier results were scattered around the curve segment, the AD 1400–1500 result centerpoints barely overlap the curve path. All but one are located at lower latitudes and at equivalent or lower longitudes. This is true of both moderate and low precision results, although the scatter of low precision result centerpoints is greater. The systematic offset of these results from the curve segment prompted a cursory examination of the source of these samples.

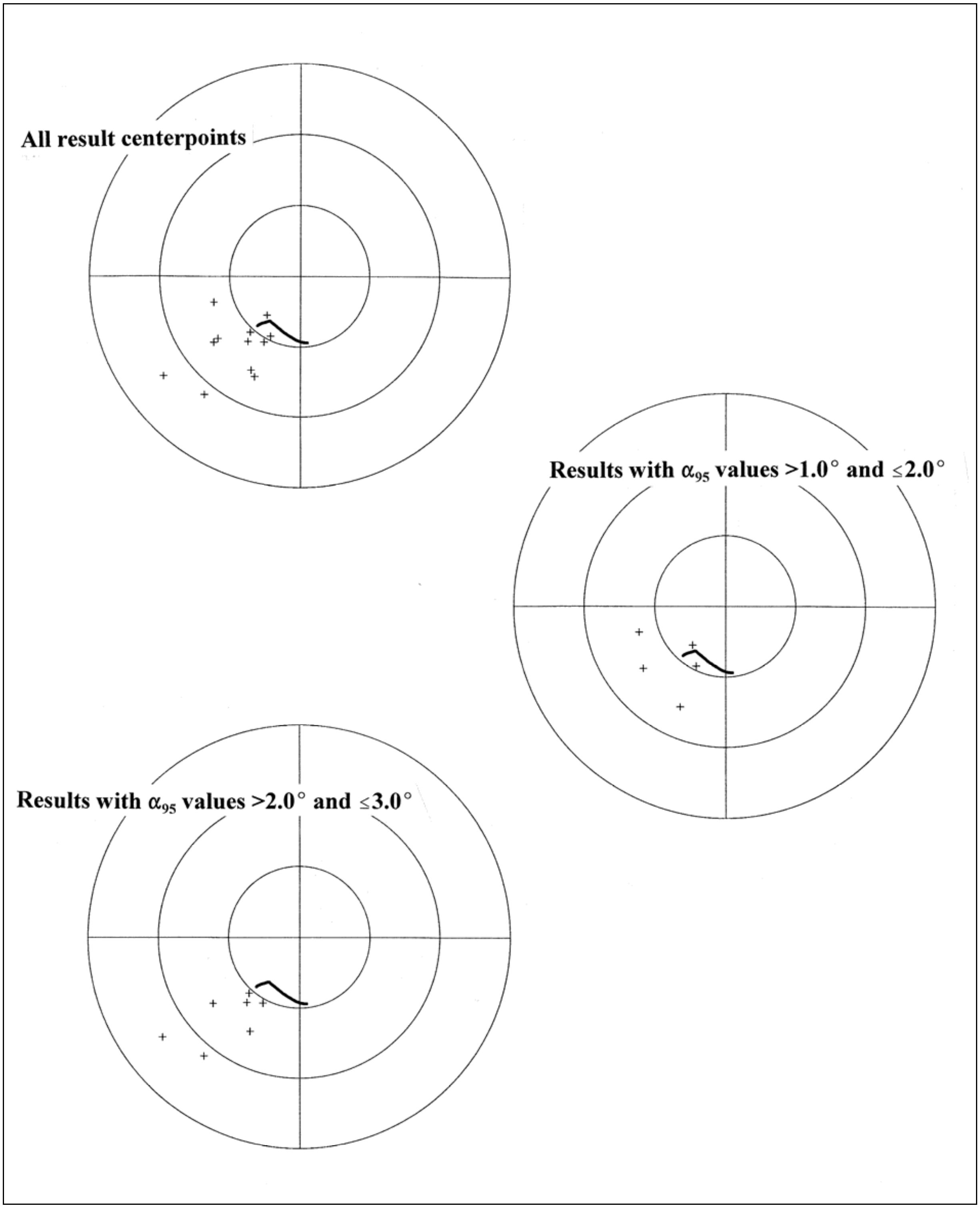

Figure 9.32. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1400 to 1500 period, contrasted with the SWCV2000 VGP curve. The upper plot includes all results, regardless of precision. The other plots distinguish moderate and low precision results.

All but two of the exclusively attributed results are from Component II at Arroyo Hondo (LA 12). This component is given an initiation date of AD 1388 and an abandonment date of shortly after AD 1410. An additional sample is dated by the 15th century by non-cutting tree-ring dates of 1401 and 1412, while the final sample is dated by the presence of Glaze C to the early 15th century. All of these results could conceivably fall within the first 25 years of the AD 1400–1500 period, explaining their placement near the early end of the SWCV2000 curve segment, but they are sill falling off of the curve. Residual distances between the result centerpoints and the nearest points along the curve segment (Figure 9.33) reflect this relationship in both their magnitude and their date associations.

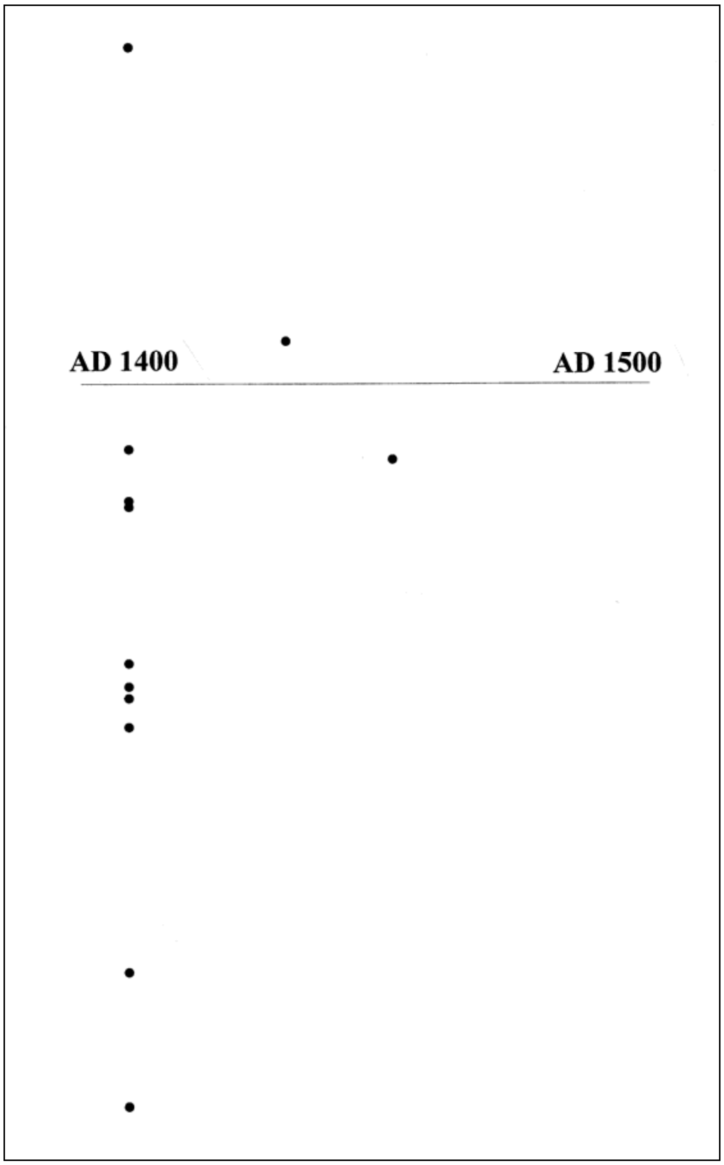

Figure 9.33. Plot of residual distances from confidently attributed AD 1400 to 1500 sample centerpoints and nearest points along the AD 1400 to 1500 segment of SWCV2000.

The same DuBois data are contrasted with the Wolfman Curve segment for the 1400–1500 period in Figure 9.34. Contemporary or potentially earlier results (solid and open circles) tend to be clustered around the early one-half of the curve segment, with slightly more results at lower latitudes. Contemporary or potentially later results (solid squares) are both located near the termination of the curve segment.

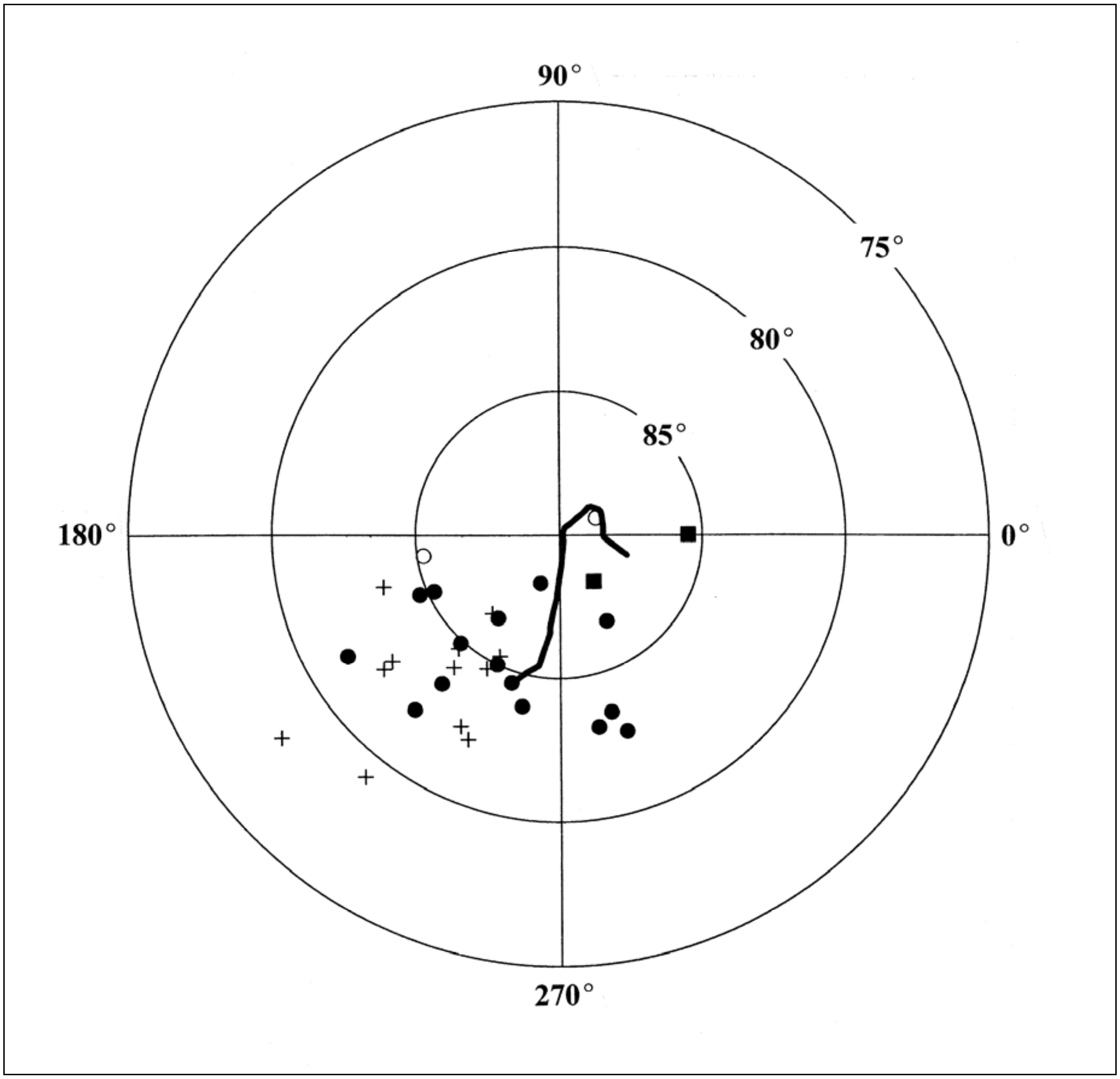

Figure 9.34. The AD 1400 to 1500 segment of the Wolfman Curve and archaeomagnetic result centerpoints from the DuBois database that could date to the AD 1300 to 1400 period. Open circles denote samples that are believed to date within the AD 1225 to 1500 period. Solid circles denote samples that are believed to date within the AD 1300 to 1500 period. Samples denoted by a "+" are exclusively dated to the AD 1400 to 1500 period. Solid squares denote samples that are believed to date within the AD 1400 to 1600 period. All centerpoints are associated with α_{95} values of 3.0° or less.

The results that are exclusively dated to the AD 1400–1500 period are contrasted with the curve segment in Figure 9.35.

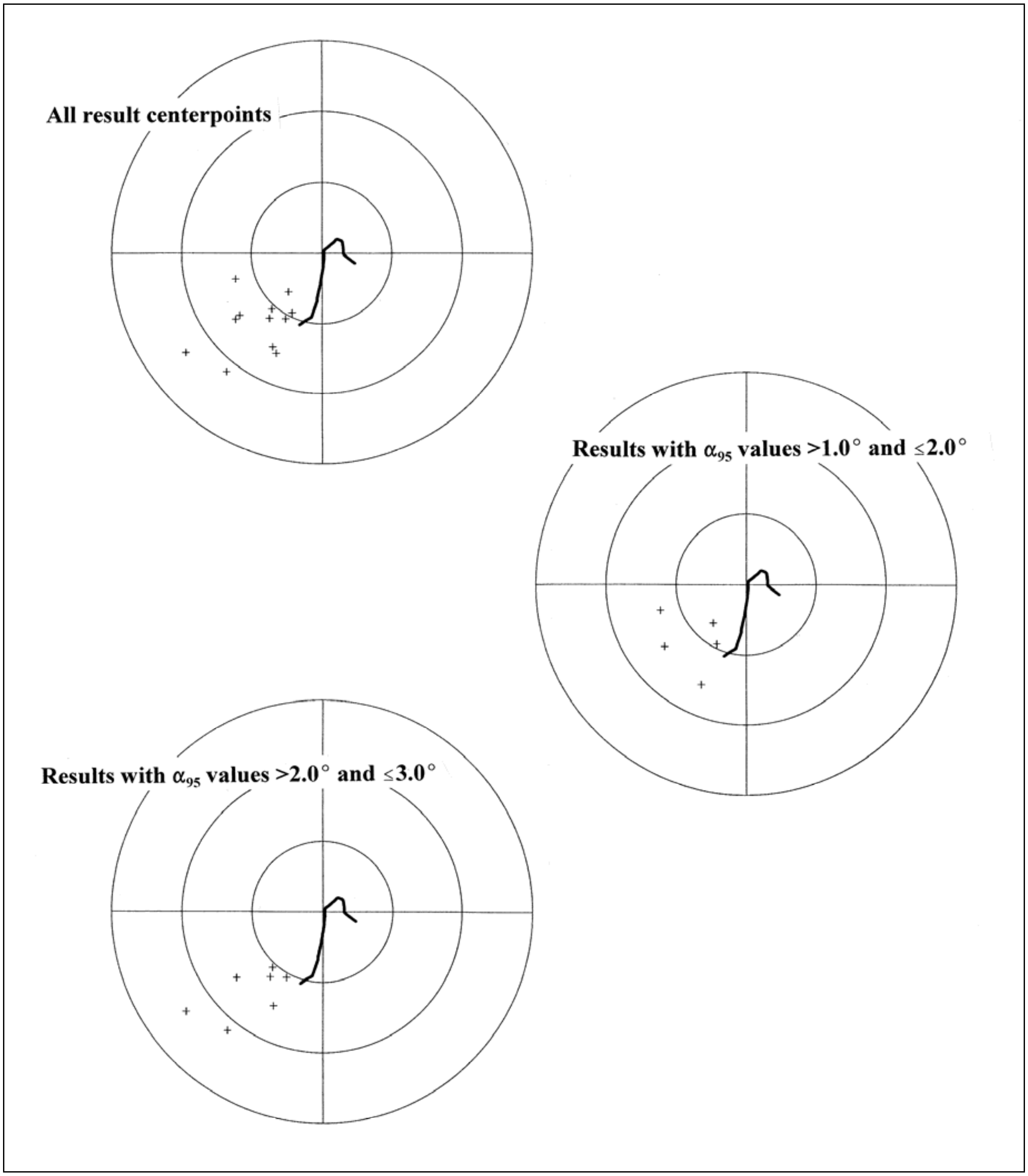

Figure 9.35. DuBois archaeomagnetic results that are confidently and exclusively associated with the AD 1400 to 1500 period, contrasted with the Wolfman VP curve for the AD 1400 to 1500 period. The upper figure includes all results, regardless of precision. The lower plots differentiated moderate and low precision results, respectively.

There is slight overlap between the moderate precision results and the early portion of the curve segment, but the majority of the results are located at lower latitudes and slightly lower longitudes than the AD 1400 end of the curve. Since these results are biased toward the AD 1400–1425 period, overlap with the early end of the curve only would be expected, but they clearly tend to fall off of the early end of the curve. This is reflected in the residual pattern (Figure 9.36), which is similar to that for the SWCV2000 curve.

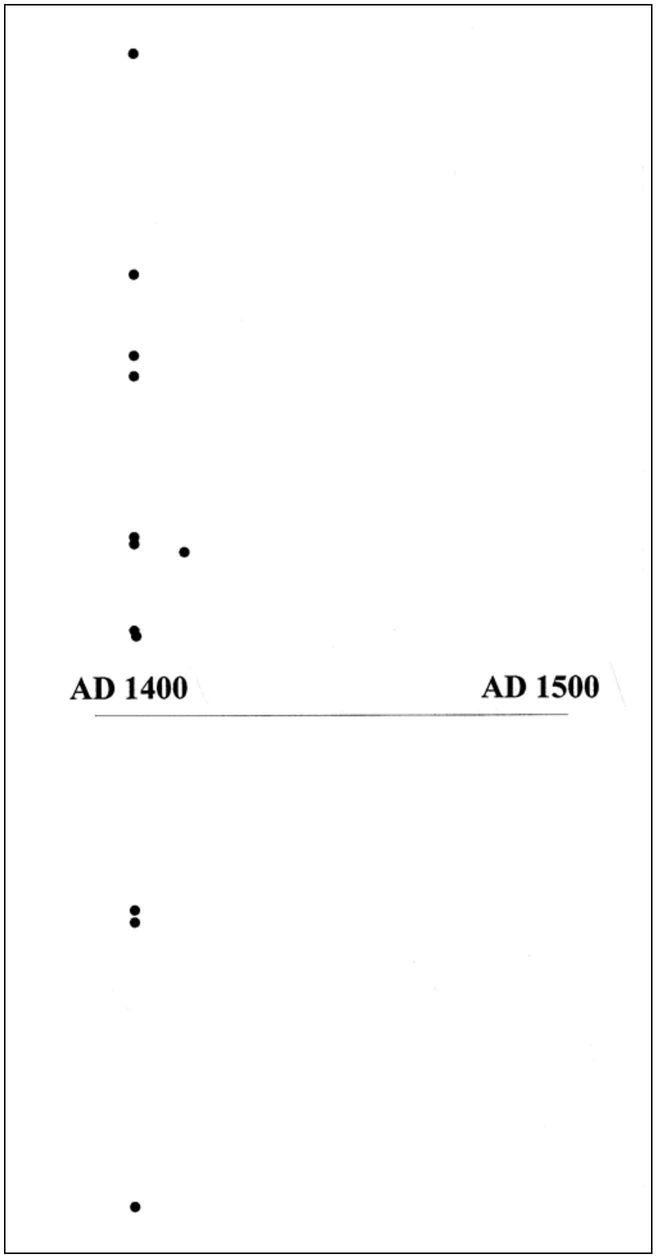

Figure 9.36. Plot of residual distances from confidently attributed AD 1300 to 1400 sample centerpoints and nearest points along the AD 1300 to 1400 segment of the Wolfman Curve.

Neither the SWCV2000 nor Wolfman VGP paths appear to be accurate for the AD 1400–1500 period, but the DuBois dataset for this period is an incomplete basis for evaluation. Both curves appear to be too high in latitude for their representations of the first few decades of the 15th century, but after about AD 1425, we have no DuBois data to compare with the remaining 75 years of polar movement. Two "contemporary or later than" sample results (solid squares in Figure 9.34) are the only suggestions that the Wolfman Curve may be correct in proposing an excursion toward the pole in the later half of the 15th century. Otherwise, the differences between the two proposed paths cannot be resolved at this time.

Summary

The DuBois dataset has provided a relatively unique opportunity to evaluate the SWCV2000 and Wolfman VGP dating curve performances with an independent body of archaeomagnetic results. Neither of the curves appears to be validated for their entire path, some segments appear to be more valid than others, and a hybrid curve will probably prove to be a stronger approximation of the true curve. The weakest areas of the curve are, unfortunately, in the very segments of interest for the interpretation of Pajarito Plateau archaeomagnetic dating results (AD 1125–1500). In most cases, even the more extreme differences in the curves will not result in serious chronological errors, as long as the full date ranges of archaeomagnetic date ranges are used in archaeological interpretations. However, there is one ironic consequence of the differences between the curves and the weaknesses in both that have been suggested by the DuBois dataset. For some time periods, the discrepancies are large enough that precise samples (small α_{95} values) will fall off the dating curves and are in greater jeopardy of misinterpretation than are less precise results.

The extent to which the DuBois dataset is representative of the full time periods used in the segment analysis has yet to be studied, but in one case (AD 1400–1500) it is clear that cluster effects (many samples from one site or one component) must be investigated before the trends noted in this evaluation can be acted on. The next steps in this study of curve performance will be the integration of the individual Colorado State University results that were used to develop SWCV2000, a more detailed evaluation of within-segment chronology, and an evaluation of the calibration of the curves. These efforts can be compared with the summaries of Deaver (1997) for the Hohokam region, ultimately resulting in the proposal of a hybrid curve that can be applied as the next approximation for dating purposes.

ARCHAEOMAGNETIC RESULTS FROM THE NORTHERN RIO GRANDE REGION

In addition to chronological interpretation based on regional VGP curves and date ranges, archaeomagnetic results can be used directly in both intra-site and inter-site comparisons. Toward this end, we have compiled the DuBois dataset archaeomagnetic results from sites within the broadly defined northern Rio Grande region. The region has been defined as the area within 35.0 to 36.5° north latitude and 105 to 107° west longitude (253 to 255° longitude). These results have been previously distributed as date ranges based on various generations of the DuBois curve, but the VGP positions and error ellipses have not been published. The individual and grouped results are presented in Table 9.2, plotted with either the Wolfman Curve or with the pre-AD 950 portion of the SWCV2000 curve for comparison. The samples are listed with available contextual information in Table 9.2.

Table 9.2. Robert DuBois dataset for the northern Rio Grande region.

Curve segment	Sample number	Multiple segments?	Independent dating implications	Comments
AD 400–600	? 11	AD 600–800	Field = BM III	1963 UNM Anthro Club excavations
AD 600–800	? 11	AD 400–600	Field = BM III	1963 UNM Anthro Club excavations
AD 800–950	? 30	AD 950–1125	Field = 1000	LA 70, Room 126; Snow 1976
	1854		Pottery late 9th thru early 10th century	LA 25852, Pithouse, fire pit; Hammack et al. 1983
	1857		Pottery mid 9th thru early 10th century	LA 25860, Pithouse 2, hearth; Hammack et al. 1983
	1858		Pottery mid 9th thru early 10th century	LA 25860, Pithouse 1, hearth; Hammack et al. 1983
	1859		Pottery late 9th thru early 10th century	LA 25860, Pithouse 3, hearth; Hammack et al. 1983
AD 950–1125	30	AD 800–950 ?	Field = 1000	LA 70, Room 126; Snow 1976
	? 167	AD 1125–1225	Valdez Phase	LA 9206?; Loose 1974; Boyer 1997
	905	AD 1125–1225 ?	Field = 850–1125	Nambe Falls, 29SF18, Pithouse, Feature 151, hearth; Skinner et al. 1980
	? 1075	AD 1125–1225 ? AD 1225–1300 ?	Field 1000–1300	LA 12054 (LG77-P), Gallina pithouse, circular hearth; Mackey and Holbrook 1978
	? 1076	AD 1125–1225 ? AD 1225–1300 ?	Field 1000–1300	LA 12056 (LG42), Gallina unit house, slab-lined hearth; Mackey and Holbrook 1978
	? 1904	AD 1125–1225 ?	Valdez Phase	Cerrita Ridge Site, Pithouse, Floor 2, Hearth; Woosley 1986; Boyer 1997
AD 1125–1225	167	AD 950–1125?	Valdez Phase	LA 9206?; Loose 1974; Boyer 1997
	? 905	AD 950–1125	Field = 850–1125	Nambe Falls, 29SF18, Pithouse, Feature 151, hearth; Skinner et al. 1980

Curve segment	Sample number	Multiple segments?	Independent dating implications	Comments
	? 1075	AD 950–1125 ? AD 1225–1300 ?	Field 1000–1300	LA 12054 (LG77-P), Gallina pithouse, circular hearth; Mackey and Holbrook 1978
	? 1076	AD 950–1125 ? AD 1225–1300 ?	Field 1000–1300	LA 12056 (LG42), Gallina unit house, slab-lined hearth; Mackey and Holbrook 1978
	? 1113	AD 1225–1300 ?	Field, Pueblo III	Cochiti, LA 12522, Pithouse 1, central fire pit; Laumbach et al. 1977
	1183		TR 1148 in fill below; roomblock const thru 1177	Bandelier, LA 12121, Room 7, Hearth 1; Hubbell and Traylor 1982
	? 1185	AD 1225–1300 ?	Const in late 1100s to 1200	Bandelier, LA 12119, Kiva 2, Hearth 1; Hubbell and Traylor 1982
	? 1282	AD 1225–1300 ?	Const in late 1100s to 1200	Bandelier, LA 12119, Room 10, Hearth 1; Hubbell and Traylor 1982
	? 1287	AD 1225–1300 ?	Const in late 1100s to 1200	Bandelier, LA 12119, Room 14, Hearth 4 (subfloor); Hubbell and Traylor 1982
	? 1398	AD 1225–1300 ?	Field 1100–1300	Gallina site 1, LA 14323, Room 4, Floor; Mackey ?
	? 1399	AD 1225–1300 ?	Field 1100–1300	Gallina, LA 12760, Pithouse hearth; Mackey ?
	? 1400	AD 1225–1300 ?	Field 1100–1300	Gallina, LA 14324, Pithouse hearth; Mackey ?
	? 1904	AD 950–1125 ?	Valdez Phase	Cerrita Ridge Site, Pithouse, Floor 2, Hearth; Woosley 1986; Boyer 1997
AD 1225–1300	? 24	AD 1300–1400	TR 1280 construction	LA 6462, Unit VI Kiva, F 45; Bussey 1968b
	? 25	AD 1300–1400	TR 1280 construction	LA 6462, Unit VI Kiva, F 45; Bussey 1968b
	536	AD 1300–1400 ?	1263r-1284vv; Santa Fe B/w	Pueblo Alamo, Room 3, hearth; Allen 1973; Robinson et al. 1973
	537	AD 1300–1400 ?	1263r-1284vv; Santa Fe B/w	Pueblo Alamo, Room 100, wall; Allen 1973; Robinson et al. 1973
	? 614	AD 1300–1400 ?	1215vv, 1241vv; Santa Fe B/w	Bandelier, LA 4997, Saltbush Pueblo, Kiva hearth (south,

Curve segment	Sample number	Multiple segments?	Independent dating implications	Comments
				younger)
	? 615	AD 1300–1400 ?	1215vv, 1241vv; Santa Fe B/w	Bandelier, LA 4997, Saltbush Pueblo, Kiva hearth (east, older)
	903		Field = 1200–1400; 1268vv in room fill	Nambe Falls, 29SF10, Room 2, Feature 123, hearth; Skinner et al. 1980
	904		Field = 1200–1400	Nambe Falls, 29SF10, Room 9, Feature 170, hearth; Skinner et al. 1980
	906		Field = 1200–1400	Nambe Falls, 29SF10, Room 8, burned west wall; Skinner et al. 1980
	944		Field = 1250–1350; 1269r from adjacent room	Nambe Falls, 29SF10, Room 32, Feature 191, hearth; Skinner et al. 1980
	1069		TR 1230–1240	LA 12063 (LG 231), Gallina unit house (LL-1), central hearth; Mackey and Holbrook 1978
	1070		TR 1244–1256	LA 12059 (LG 84), Gallina; Mackey and Holbrook 1978
	1072		TR 1238–1252	LA 12066 (LG 124N), Gallina unit house, central hearth; Mackey and Holbrook 1978
	1074		TR 1240–1247	LA 12054 (LG-77-U), Gallina unit house, circular hearth; Mackey and Holbrook 1978
	? 1075	AD 950–1125 ? AD 1125–1225 ?	Field 1000–1300	LA 12054 (LG77-P), Gallina pithouse, circular hearth; Mackey and Holbrook 1978
	? 1076	AD 950–1125 ? AD 1125–1225 ?	Field 1000–1300	LA 12056 (LG42), Gallina unit house, slab-lined hearth; Mackey and Holbrook 1978
	1077		TR1228–1260	LA 12062 (FS 28), Gallina unit house, hearth; Mackey and Holbrook 1978
	? 1113	AD 1125–1225 ?	Field = Pueblo III	Cochiti, LA 12522, Pithouse 1, central fire pit; Laumbach

Curve segment	Sample number	Multiple segments?	Independent dating implications	Comments
				et al. 1977
	? 1185	AD 1125–1225 ?	Const in late 1100s to 1200	Bandelier, LA 12119, Kiva 2, Hearth 1; Hubbell and Traylor 1982
	? 1282	AD 1125–1225 ?	Const in late 1100s to 1200	Bandelier, LA 12119, Room 10, Hearth 1; Hubbell and Traylor 1982
	? 1287	AD 1125–1225 ?	Const in late 1100s to 1200	Bandelier, LA 12119, Room 14, Hearth 4 (subfloor); Hubbell and Traylor 1982
	? 1398	AD 1125–1225 ?	Field 1100–1300	Gallina site 1, LA 14323, Room 4, Floor; Mackey ?
	? 1399	AD 1125–1225 ?	Field 1100–1300	Gallina, LA 12760, Pithouse hearth; Mackey ?
	? 1400	AD 1125–1225 ?	Field 1100–1300	Gallina, LA 14324, Pithouse hearth; Mackey ?
	1444	AD 1300–1400 ?	Field Pueblo III	Bandelier, LA 13086, Room 5, hearth R5C; Hunter-Anderson et al. 1979
	1584		1250–1300; may be slightly later	San Ysidro, LA 13197 (AS-8), Room W-1, Floor fire pit; Bice et al. 1998
	1585		1250–1300; may be slightly later	San Ysidro, LA 13197 (AS-8), Room W-1, Floor fire pit; Bice et al. 1998
	?1829	AD 1300–1400	Coalition aggregation period or later	Rowe Pueblo, LA 108, Room 11, Level 4A, Floor 1, F3H1, first story; Cordell ?
AD 1300-1400	24	AD 1225–1300 ?	TR 1280 construction	LA 6462, Unit VI Kiva, F 45; Bussey 1968b
	25	AD 1225–1300 ?	TR 1280 construction	LA 6462, Unit VI Kiva, F 45; Bussey 1968b
	? 26	AD 1400–1500 ?	Field = 1400	LA 6455, Kiva 54 or Room 52; Lange 1968b
	74		Field = 1300–1400; TR 1364	LA 70, Room 166, Level 4, firepit; Snow 1976
	75		Field = 1300–1400; TR 1364	LA 70, Room 166, Level 4, firepit; Snow 1976
	91		1239vv-1309+B	Pot Creek Pueblo, Unit 3, Room 2 (302); Crown 1991
	283	AD 1400–1500		
	? 536	AD 1225–	1263r–1284vv; Santa Fe	Pueblo Alamo, Room 3,

Curve segment	Sample number	Multiple segments?	Independent dating implications	Comments
		1300	B/w	hearth; J. Allen 1973; Robinson et al. 1973
	? 537	AD 1225–1300	1263r–1284vv; Santa Fe B/w	Pueblo Alamo, Room 100, wall; J. Allen 1973; Robinson et al. 1973
	545	AD 1400–1500 ?	Field = 14th century	LA 4955, Coronado State Monument, Site B, Kiva, Feature 21
	? 614	AD 1225–1300 ?	1215vv, 1241vv; Santa Fe B/w	Bandelier, LA 4997, Saltbush Pueblo, Kiva hearth (south, younger)
	? 615	AD 1225–1300 ?	1215vv, 1241vv; Santa Fe B/w	Bandelier, LA 4997, Saltbush Pueblo, Kiva hearth (east, older)
	705		Component 1, 1320s construction, as late as 1350s?	Arroyo Hondo, LA 12, 18-7, room wall; Creamer 1993
	936		Component I, 1310–1340	Arroyo Hondo, LA 12, K-15, hearth; Creamer 1993
	? 943	AD 1400–1500 ?	Provenience not cited in report; Component I or II	Arroyo Hondo, LA 12, N-3 hearth; Creamer 1993
	? 1444	AD 1225–1300	Field Pueblo III	Bandelier, LA 13086, Room 5, hearth R5C; Hunter-Anderson et al. 1979
	? 1740	AD 1400–1500 ?	Field = 1350–1450	Los Ranchos del Albuquerque, Chamisal 1, hearth
	1812	AD 1400–1500 ?	Glaze B occupation; probably just before 1400, but ...	LA 677, Pitroom 3, east hearth; Marshall 1982
	1813	AD 1400–1500 ?	Glaze B occupation; probably just before 1400, but ...	LA 677, Pitroom 3, south hearth; Marshall 1982
	1855	AD 1400–1500 ?	Glaze A and B, with little Glaze C	LA 25852, Pit room 2, fire pit; Hammack et al. 1983
AD 1400–1500	? 26	AD 1300–1400 ?	Field = 1400	LA 6455, Kiva 54 or Room 52; Lange 1968b
	283	AD 1300–1400 ?		
	? 545	AD 1300–1400	Field = 14th century	LA 4955, Coronado State Monument, Site B, Kiva, Feature 21

Curve segment	Sample number	Multiple segments?	Independent dating implications	Comments
	693		1381–1388 cutting dates; 1410+ general abandonment	Arroyo Hondo, LA 12, 15-6, wall and floor; Creamer 1993
	694		1381–1388 cutting dates; 1410+ general abandonment	Arroyo Hondo, LA 12, 15-6, hearth; Creamer 1993
	696		1381–1388 cutting dates; 1410+ general abandonment	Arroyo Hondo, LA 12, 16-36-5, hearth; Creamer 1993
	700		1381–1388 cutting dates; 1410+ general abandonment	Arroyo Hondo, LA 12, 16-34-4, hearth; Creamer 1993
	702		1381–1388 cutting dates; 1410+ general abandonment	Arroyo Hondo, LA 12, 11-5-5-1, hearth; Creamer 1993
	703		1381–1388 cutting dates; 1410+ general abandonment	Arroyo Hondo, LA 12, 11-8-3-4, hearth; Creamer 1993
	706		1381–1388 cutting dates; 1410+ general abandonment	Arroyo Hondo, LA 12, 11-9-6, wall; Creamer 1993
	? 943	AD 1300–1400 ?	Provenience not cited in report; Component I or II	Arroyo Hondo, LA 12, N-3 hearth; Creamer 1993
	1562		TR 1401+vv, 1412+vv	Bandelier, LA 16097, Room 1, Hearth 1; Traylor et al. 1990
	? 1740	AD 1300–1400 ?	Field = 1350-1450	Los Ranchos del Albuquerque, Chamisal 1, hearth
	? 1812	AD 1300–1400	Glaze B occupation; probably just before 1400, but ...	LA 677, Pitroom 3, east hearth; Marshall 1982
	? 1813	AD 1300–1400	Glaze B occupation; probably just before 1400, but ...	LA 677, Pitroom 3, south hearth; Marshall 1982
	1814		Glaze C occupation; just after 1400	LA 677, Kiva 2, Pit 6
	? 1855	AD 1300–1400	Glaze A and B, with little Glaze C	LA 25852, Pit room 2, fire pit; Hammack et al. 1983
AD 1500–1600				

Curve segment	Sample number	Multiple segments?	Independent dating implications	Comments
AD 1600–1900	92		ca. 1860	Ft. Burgwin, Hospital, Room 1; Woosley 1980
	93		ca. 1860	Ft. Burgwin, Hospital, Room 7; Woosley 1980
	123		Field = 1700–1750	LA 591, Las Majadas, Unit 1, Room 5, corner fireplace (Feature 6); Snow and Warren 1973
	124		Field = 1700–1750	LA 591, Las Majadas, Unit 1, Room 2, raised firebox (Feature 9); Snow and Warren 1973
	144		Field = 1620–1790	Pecos
	145		Field = 1620–1790	Pecos
	146		Field = 1620–1790	Pecos
	958		Field = 1620–	Pecos, Room 48, wall in SW corner
	960		Field = 1620–	Pecos, Room 28, NE corner, hearth
	961		Field = 1620–	Pecos, Room C-3, rectangular hearth

AD 400–600 and AD 600–800

Only a single result falls within each of these periods. Field assessment of the context was that the burn should date to the Basketmaker III period. The location of the result (11) agrees with that placement, probably shortly before AD 650.

AD 800–950

Five samples are potentially attributable to this period. Four (1854, 1857, 1858, and 1859) are from Early Developmental structures in the Jemez River Valley, and all four results are consistent with age assignments in the AD 825–875 period. The fifth sample (30) was collected from the Cochiti Reservoir area. Field expectation was for an age around AD 1000, and the result is consistent with that expectation.

AD 950–1125

Six samples are potentially attributable to this period. One (30), discussed above, falls at the early end of the period. Two samples from Valdez Phase structures (167, 1904) have relatively imprecise results ($\acute{\alpha}_{95}$>2.0°) but may belong to this segment within the AD 1025–1125 portion of the curve. Sample 905 was collected from a Late Developmental structure at Nambe Falls and was expected to date within the AD 850–1125 period. The location of the result is consistent with the very end of that span. The remaining two results are samples from Gallina phase structures. Sample 1075 is unlikely to be from a context that dates before AD 1125. Sample 1076 has an imprecise result that could accommodate either a pre- or post-AD 1125 interpretation. However, a post-AD 1125 age is more likely.

AD 1125–1225

Thirteen samples are potentially attributable to this period. One (1183) from excavations at LA 12121 in Bandelier National Monument is exclusively and confidently dated to the last quarter of the 12th century. Three others from LA 12119 in Bandelier National Monument (1185, 1282, and 1287) are from a component with construction at the end of the 12th century and should date to the end of this period or the early decades of the next period. Two Valdez phase samples (167 and 1904) are ambiguously dated (see above). A sample from a fieldhouse within the Cochiti Reservoir pool (1113) is remarkably precise (α_{95}<1.0°), but its independent dating is weak within this period or perhaps the subsequent period. The result from Nambe Falls (905) either dates to the previous period or perhaps falls within the first decade or two of this period. Five samples are from Gallina structures, two of which may either date earlier or later than this period (1075 and 1076) and three of which may date to this period or to the AD 1225–1300 period (1398, 1399, and 1400).

AD 1225–1300

Twenty-eight of the DuBois samples are potentially attributable to this period. Two samples (24 and 25) from LA 6462 are associated with construction in the 1280s, and the results fall either at the very end of this period or the beginning of the next period. Pueblo Alamo is associated with construction dates spanning 1263–1284, and two hearths (536 and 537) have results that also fall either at the very end of this period or the early decades of the next. Saltbush Pueblo within Bandelier National Monument is ambiguously dated with non-cutting dates in the mid to early 13th century. The samples were taken from kiva hearths, one earlier (615) than the other (614). Four samples were measured from rooms in 29SF10 in the Nambe Falls area. Construction at the site as a whole appears to have been in the mid to late 13th century, but the abandonment date for the structures may fall within the early decades of the 14th century. Cochiti Reservoir excavations yielded sample 1113, which may date to this period or to the earlier period, while another sample (1444) could date to this period or the subsequent period. Samples from LA 12119 in Bandelier National Monument (1185, 1282, and 1287) either date to the early decades of this period or the final decades of the previous period. Two samples (1584 and 1585) from a room hearth at LA 13197 (AS-8) near San Ysidro are believed to date to the very late 13th century or perhaps into the first decade of the 14th century. A single sample from Rowe Pueblo (1829) may date to this period but probably dates to the 14th century. The remaining 10 samples are from Gallina sites. Five of these (1075, 1076, 1398, 1399, and 1400) are not associated with precise sources of independent dating and could date within this period or earlier periods. All of the remaining results (samples 1069, 1070, 1072, 1074, and 1077) are from sites and components with tree-ring dates in the mid-13th century.

AD 1300–1400

Twenty results could potentially fall within this period. Two samples (24 and 25) from LA 6462, discussed above, are associated with construction in the 1280s and may date as late as the first decade of the 14th century. Another sample from the original Cochiti Reservoir excavations (26) was estimated to date to AD 1400 based on field observations, and it may date to this period or the subsequent period. Two samples from a fire pit in Room 166 at LA 70 (74 and 75) are associated with tree-ring dates in the 1360s and the results probably date to the late 14th century. One sample from Pot Creek Pueblo (91) should date late within the first quarter of the 14th century. A sample from an as yet unidentified site (283) was estimated to date to around 1400 based on field observations. Two samples from Pueblo Alamo (536 and 537) date the abandonment of rooms that were constructed in or after the 1280s, and they date to either the very end of the previous period or within the first decades of this period. Four samples were recovered from three sites in the Bernalillo area. A kiva sample from Coronado State Monument (545) was estimated in the field to have a 14th century age and could be relevant to either this period or the subsequent period. The other three samples are all associated with Glaze B occupations (1740, 1812, and 1813) either at the end of this period or within the first decades after AD 1400. Two samples from Saltbush Pueblo within Bandelier National Monument are associated with non-cutting dates as late as the mid-13th century (614 and 615). The results probably date to the preceding period, but they may extend into the early decades of this period. Two samples represent Component I at Arroyo Hondo (705 and 936) and therefore are well-dated to the mid-14th century, while a third sample from the site (943) was not assigned to either Component 1 or Component II and could date either to the mid-14th century or the early 15th century. LA 13086 within the Cochiti Reservoir pool was characterized as a Pueblo III component and could date to the 13th or early 14th century. Finally, a sample from a pit room at LA 25852 (1855) is associated with Glaze A, B, and small amounts of Glaze C pottery. It should be slightly later than samples 1812 and 1813, so it may fall within the last decades of this period or the first decades of the subsequent period.

AD 1400–1500

Seventeen results could be potentially relevant to this period. Samples 26, 283, 545, 943, 1740, 1812, 1813, and 1855 all have independent dating that either straddles the AD 1400 threshold or is ambiguous between this period and the previous period. Seven samples (693, 694, 696, 700, 702, 703, and 706) were collected from features and burned walls associated with Component II at Arroyo Hondo. Component II is well dated with initial construction in the 1380s and remodeling and additional construction as late as AD 1410. Abandonment and the burning documented by the samples should have occurred within the AD 1410s. LA 16097 is associated with non-cutting tree-ring dates in the first two decades of the 15th century, and sample 1562 should be dated at some point in the second decade of the 15th century or later. The final sample attributed to this period is from LA 25852 (1814) and is associated with a Glaze C occupation that suggests a date within the middle third of the 15th century.

AD 1500–1600

No results within the DuBois database can be attributed to this time period at this time.

AD 1600–1900

Historic period sample results include a suite from Pecos Pueblo that are broadly assigned to the AD 1620–1790 period (144, 145, and 146). Another trio of samples from Pecos Pueblo is potentially contemporary, but the samples were not given an upper limiting age. Samples 123 and 124 are more narrowly dated to the AD 1700–1750 period based on their association with the site of Las Majadas, Unit 1. These compare with the much later (circa AD 1860) samples from Fort Burgwin (92 and 93).

Summary

There is a surprisingly rich body of comparative data for the northern Rio Grande region, especially when results from the DuBois dataset are combined with those of the Museum of New Mexico's ADL and the laboratory at Colorado State University. Although few data points originate from sites on the Pajarito Plateau itself, the complex culture history of the Coalition and Classic periods are well represented.

CONCLUSIONS

This review of archaeomagnetic dating is a work in progress. Unlike some other dating techniques, archaeomagnetic dating is accretional. The calibration curves must be compiled from the growing body of results from sample measurements. Although individual results are discrete and stable, the date range interpretations from those results are ephemeral, changing as the quality of the approximation of the true VGP curve changes. Despite a considerable amount of work by the three major practitioners of the technique over the past half-century, there is room for improvement in the performance of the current approximations of the VGP curve for the Southwest. Access to the Robert DuBois dataset is the single greatest step forward in this process, since the data have been only indirectly applied to the development of the two most commonly used dating curves in the Southwest. Improvements, both technical and theoretical, are expected over the next decade that will improve the reliability of this dating technique, but those improvements will require a thorough understanding of the strengths and limitations of the technique on the part of regional archaeologists.

CHAPTER 10
ARCHAEOLOGICAL OBSIDIAN AND SECONDARY DEPOSITIONAL EFFECTS IN THE JEMEZ MOUNTAINS AND THE SIERRA DE LOS VALLES, NORTHERN NEW MEXICO

M. Steven Shackley

INTRODUCTION

Distributed in archaeological contexts over as great a distance as Government Mountain in the San Francisco Volcanic Field in northern Arizona, the Quaternary sources in the Jemez Mountains, most associated with the collapse of the Valles Caldera, are distributed at least as far south as Chihuahua through secondary deposition in the Rio Grande, and east to the Oklahoma and Texas Panhandles through exchange. And like the sources in northern Arizona, the nodule sizes are up to 10 to 20 cm in diameter; El Rechuelos, Cerro Toledo Rhyolite, and Valle Grande (Valles Rhyolite derived from the Cerro del Medio dome complex) glass sources are as good a media for tool production as anywhere. While there has been an effort to collect and record primary source obsidian, the focus here has been to understand the secondary distribution of the Jemez Mountains sources. Until the recent land exchange of the Baca Ranch properties, the Valle Grande primary domes (i.e., Cerro del Medio) have been off limits to most research. The discussion of this source group here is based on collections by Dan Wolfman and others, facilitated by Los Alamos National Laboratory (LANL), the Museum of New Mexico, and recent sampling courtesy of the Valles Caldera National Preserve (VCNP; see Broxton et al. 1995; Shackley 2005a; Wolfman 1994).

Due to its proximity and relationship to the Rio Grande Rift System, potential uranium ore, geothermal possibilities, an active magma chamber, and a number of other geological issues, the Jemez Mountains and the Toledo and Valles Caldera particularly have been the subject of intensive structural and petrological study, particularly since the 1970s (Bailey et al. 1969; Gardner et al. 1986; Heiken et al. 1986; Ross and Smith 1955; Self et al. 1986; Smith et al. 1970; Figure 10.1 and 10.2). Half of the 1986 *Journal of Geophysical Research*, volume 91, was devoted to the then current research on the Jemez Mountains. More accessible for archaeologists, the geology of which is mainly derived from the above, is Baugh and Nelson's (1987) article on the relationship between northern New Mexico archaeological obsidian sources and procurement on the southern Plains, and Glascock et al.'s (1999) more intensive analysis of these sources, including the No Agua Peak source in the Taos Plateau Volcanic Field at the Colorado/New Mexico border.

This study is focused on the analysis of obsidian and rock samples submitted by LANL, and the report of the long-term secondary depositional study by this laboratory, in part funded by LANL. The secondary depositional study is geared toward an understanding of the probable patterns of prehistoric procurement of artifact-quality obsidian from sources in the Jemez Mountains.

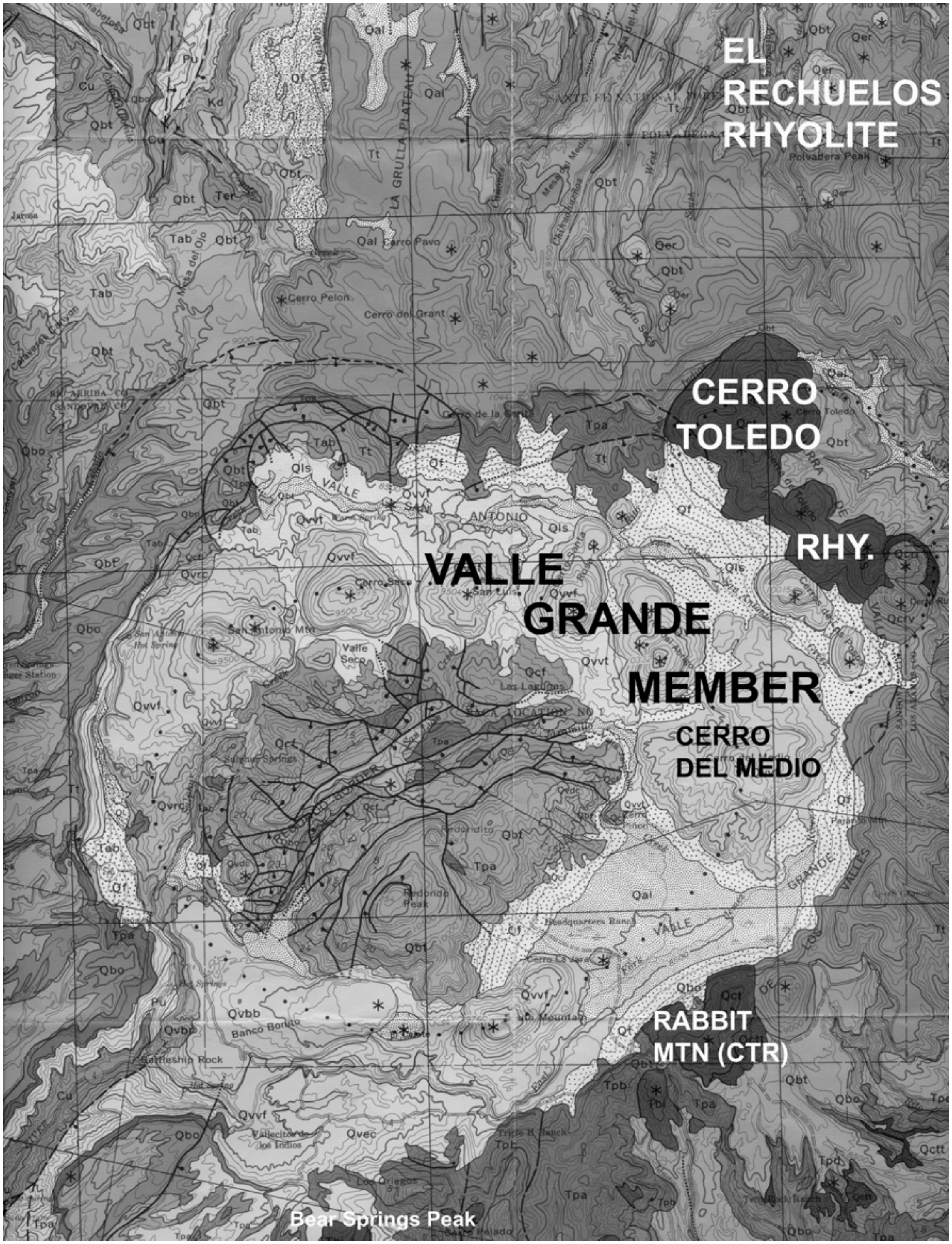

Figure 10.1. Topographical rendering of a portion of the Jemez Mountains, Valles Caldera, and relevant features (from Smith et al. 1970; formation explanations in Smith et al. 1970).

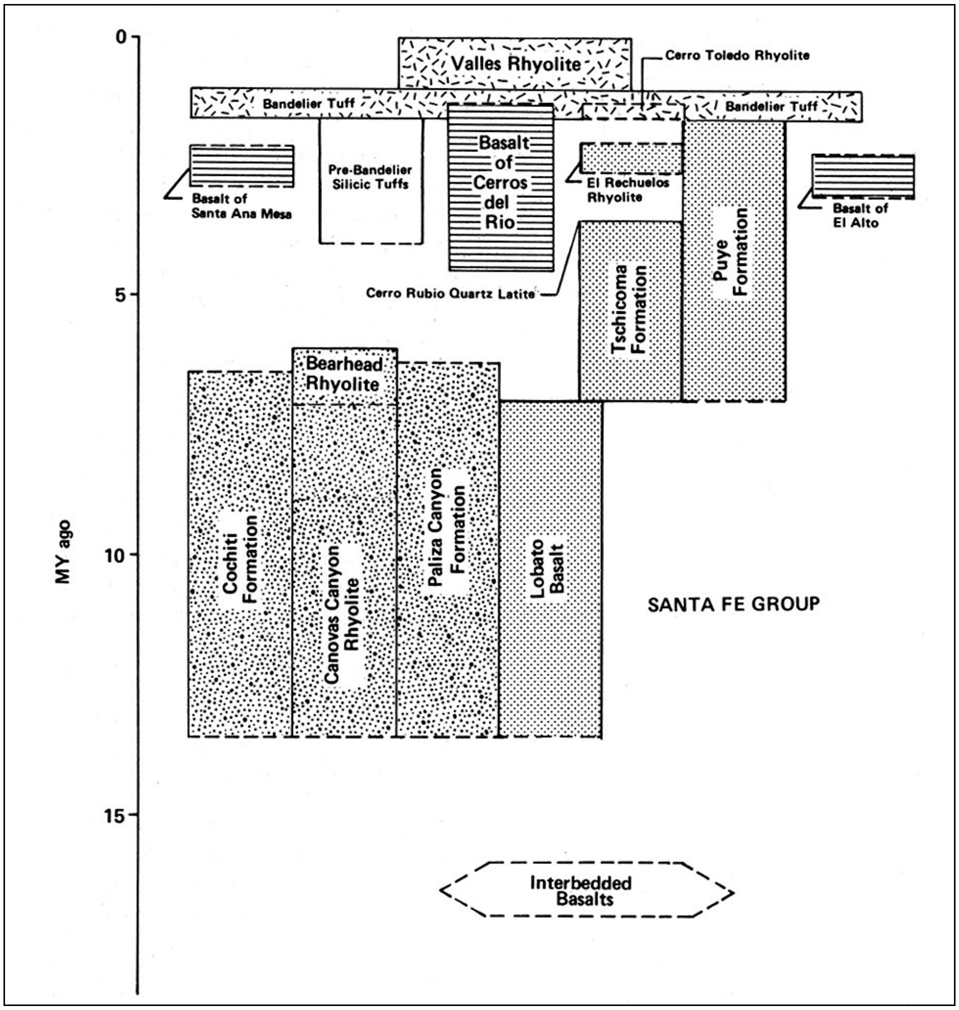

Figure 10.2. Generalized stratigraphic relations of the major volcanic and alluvial units in the Jemez Mountains (from Gardner et al. 1986). Note the near overlapping events at this scale for the Cerro Toledo and Valles Rhyolite members, and the position of Cerro Toledo Rhyolite at the upper termination of the Puye Formation.

BEDROCK AND ALLUVIAL DEPOSITION OF THE SIERRA DE LOS VALLES

Due to continuing tectonic stress along the Rio Grande, a lineament down into the mantle has produced a great amount of mafic volcanism during the last 13 million years (Self et al. 1986). Similar to the Mount Taylor field to the west, earlier eruptive events during the Tertiary more likely related to the complex interaction of the Basin and Range and Colorado Plateau provinces produced bimodal andesite-rhyolite fields, of which the Paliza Canyon (Keres Group), Canovas Canyon Rhyolite (Bear Springs Peak obsidian) and probably the Polvadera Group (El Rechuelos obsidian) is a part (Broxton et al. 1995; Shackley 1998a, 2005a; Smith et al. 1970). While both these appear to have produced artifact quality obsidian, the nodule sizes are relatively small due to hydration and devitrification over time (see Hughes and Smith 1993; Shackley 1995, 2005a). Later, during rifting along the lineament and other processes not well understood, first the

Toledo Caldera (ca. 1.45 Ma) and then the Valles Caldera (1.12 Ma) collapsed causing the eruptive events that were dominated by crustally derived silicic volcanism and dome formation (Self et al. 1986). The later eruptive sequence of the Valle Grande Member is significant for the prehistoric procurement of the obsidian as discussed below. The Cerro Toledo Rhyolite and Valle Grande Member obsidians are grouped within the Tewa Group due to their similar magmatic origins. The slight difference in trace element chemistry is probably due to evolution of the magma through time from the Cerro Toledo event to the Valle Grande events (see Hildreth 1981; Mahood and Stimac 1990; Shackley 1998a, 1998b). Given the relatively recent events in the Tewa Group, nodule size is large and hydration and devitrification minimal, yielding the best natural glass media for tool production in the Jemez Mountains.

Some of the potentially minor sources of archaeological obsidian from the Jemez Mountains area such as the glass from the Bland Canyon area appear to be better artifact-quality obsidian than previously reported. The exact sampling location for the Glascock et al. (1999) samples is apparently unknown (see also Wolfman 1994). The Bland Canyon data reported appear to be rare nodules from the Canovas Canyon Rhyolite, Bear Springs Peak eruptive events (ca. 8 to 9 mya), since obliterated by subsequent volcanism and thus making the nodules rare. In 2004, the Bear Springs Peak dome complex, part of the Canovas Canyon Rhyolite, was "discovered" and the elemental chemistry is identical to the "Bland Canyon Apache Tears" as reported by Glascock et al. (1999; see discussion below). This certainly suggests by this research that the eruptive history and trace element chemistry of artifact quality obsidian from the Jemez Mountains is somewhat more complex than originally described and warrants more intensive geoprospection, a major stimulus for the LANL project here.

SECONDARY DEPOSITION AND PREHISTORIC PROCUREMENT IN NORTHERN NEW MEXICO

Recent research investigating the secondary depositional regime from the Jemez Mountains (Sierra de los Valles), indicates that: 1) Valle Grande Member rhyolite and obsidian in the Jemez Mountains, the result of the most recent eruptive event that produced glass in the caldera, does not erode out of the caldera in nodules of any workable size; 2) During the Pleistocene, Cerro Toledo Rhyolite and glass, mainly the result of the Rabbit Mountain ash flow eruption deposited vast quantities of ash and quenched rhyolite through erosion in the Rio Grande basin as discussed above (Shackley 1998a, 2005a). While Cerro Toledo Rhyolite obsidian is found in secondary contexts in the Puye Formation along the northeastern margin of the caldera (Figures 10.3 and 10.4), the greatest quantity of obsidian found today in the Rio Grande alluvium most likely came from the Rabbit Mountain ash flow event (Gary Smith, personal communication 2005).

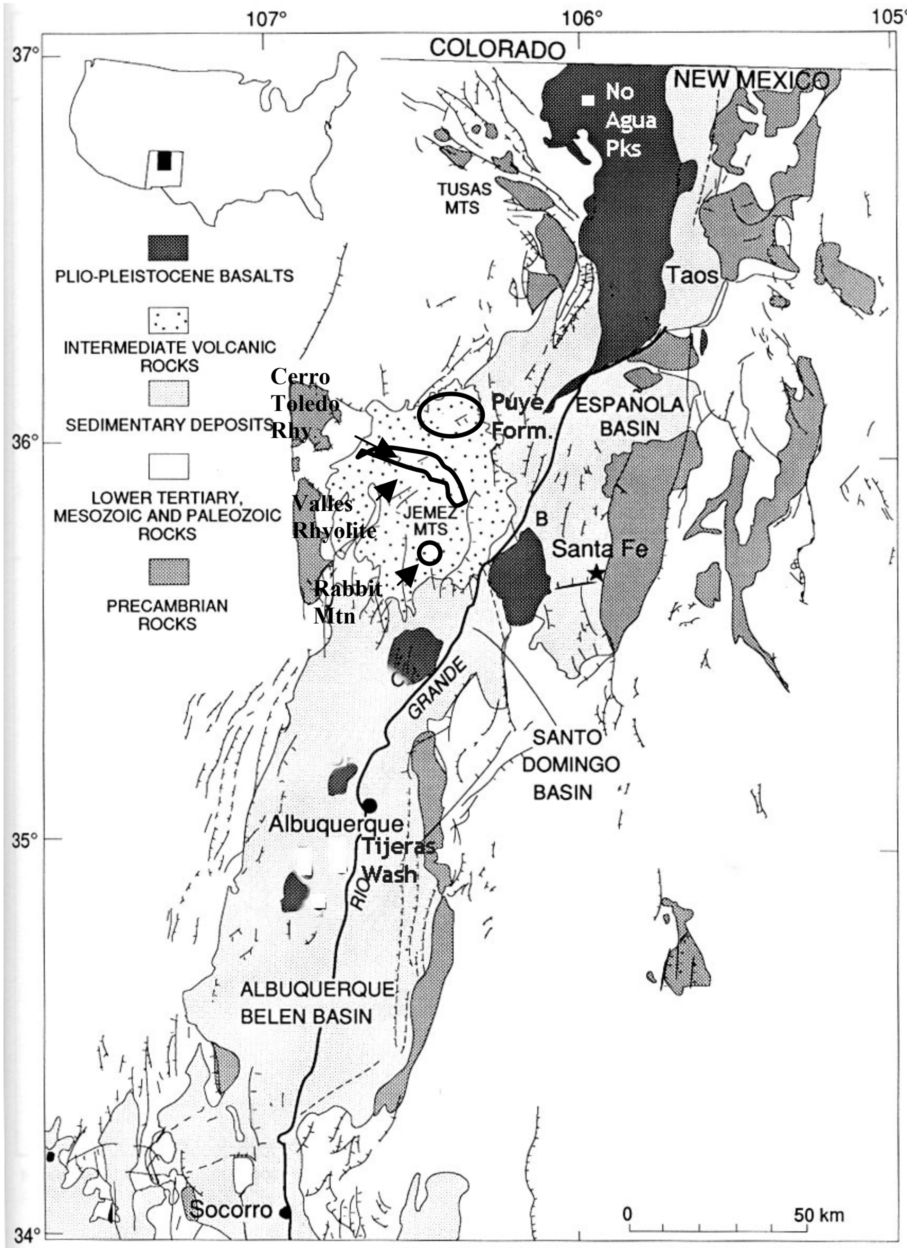

Figure 10.3. Generalized large-scale view of major obsidian source areas and relevant secondary depositional features in north-central New Mexico (adapted from Heiken et al. 1986).

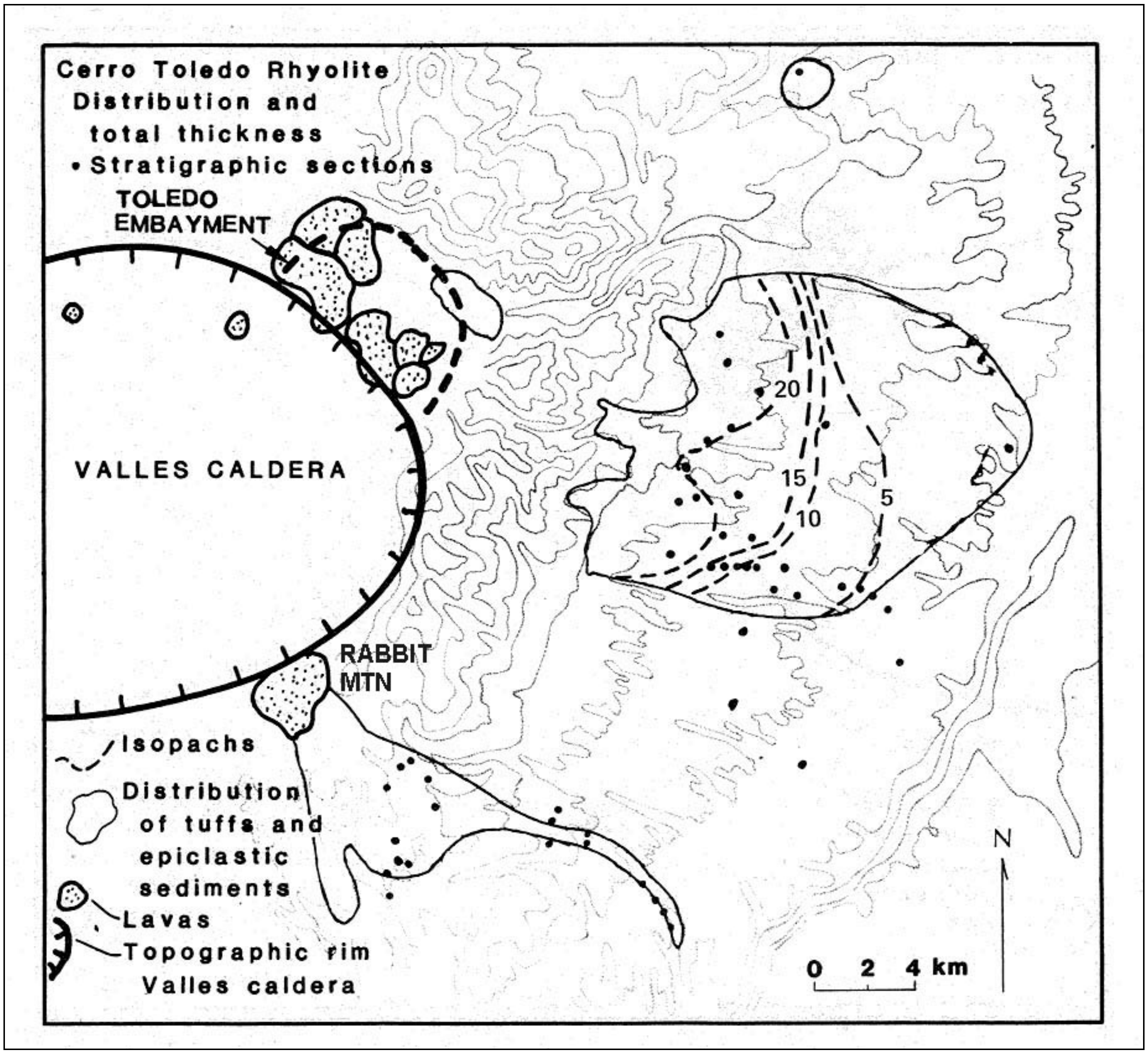

Figure 10.4. Distribution of tuffs and epiclastic sediments derived from Toledo Embayment and Rabbit Mountain eruptions (from Heiken et al. 1986).

There were six pyroclastic eruptive events associated with the Cerro Toledo Rhyolite:

> All tuff sequences from Toledo intracaldera activity are separated by epiclastic sedimentary rocks that represent periods of erosion and deposition in channels. All consist of rhyolitic tephra and most contain Plinian pumice falls and thin beds of very-fine-grained ash of phreatomagmatic origin. Most Toledo deposits are thickest in paleocanyons cut into lower Bandelier Tuff and older rocks [as with the Rabbit Mountain ash flow]. Some of the phreatomagmatic tephra flowed down canyons from the caldera as base surges (Heiken et al. 1986:1802).

Two major ash flows or ignimbrites are relevant here. One derived from the Toledo embayment on the northeast side of the caldera is a 20-km-wide band that trends to the northeast and is now highly eroded and interbedded in places with the earlier Puye Formation from around Guaje Mountain north to Santa Fe Forest Road 144. This area has eroded rapidly and obsidian from this tuff is now an integral part of the Rio Grande alluvium north of Santa Fe. The other major ash flow is derived from the Rabbit Mountain eruption and is comprised of a southeast-trending 4-km-wide and 7-km-long "tuff blanket" interbedded with a rhyolite breccia 3 to 6 m thick that contains abundant obsidian (Heiken et al. 1986; see also Broxton et al. 1995). All of this is still eroding into the southeast trending canyons toward the Rio Grande. The surge deposits immediately south of Rabbit Mountain contain abundant obsidian chemically identical to the samples from the ridges farther south and in the Rio Grande alluvium. Heiken et al.'s ((1986:1810) neutron activation analysis of Rabbit Mountain lavas is very similar to those from this study (Table 10.1 here).

Table 10.1. Selected wavelength X-ray fluorescence spectroscopy (WXRF) oxide values (wt. %) for the three major archaeological obsidian source standards from the Jemez Mountains. Sample prefix "CDM" is from the Wolman (1994) sample collected from Cerro del Medio and designated as Valle Grande Rhyolite here. Samples analyzed whole after polishing to present a flat surface to beam as in Shackley (1998a, 2005a).

Sample Locality	Source Name	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_3
081199-1-7	Cerro Toledo Rhyolite	74.44	0.09	10.74	1.07	0.06	0.00	0.19	4.06	3.93	0.02
CDM3-B	Valle Grande Rhyolite	75.07	0.10	11.56	1.19	0.05	0.20	0.43	4.10	4.75	0.04
080999-2-1	El Rechuelos Rhyolite	74.51	0.10	11.20	0.54	0.06	0.00	0.36	3.79	4.07	0.02

Both the Cerro Toledo Rhyolite glass and Mount Taylor glass is common in Quaternary alluvium of the Rio Grande as far south as Chihuahua and was frequently used as a toolstone source in prehistory (Church 2000; Shackley 1997). It is impossible to determine, however, in a finished artifact whether the raw material was procured from the primary or secondary sources, unless the artifact is very large (>5 to 10 cm), when it can be assumed that the artifact was procured from nearer the source.

COLLECTION LOCALITIES

The collection localities discussed here are not the result of a systematic survey to collect and record all the potential sources in the Jemez Mountains, but the result of an attempt to understand the secondary depositional regime of the sources flowing out from the Jemez Mountains into the surrounding stream systems, as noted above. The emphasis here was on understanding the secondary distribution of the major sources that appear in the archaeological record in the northern Southwest—El Rechuelos, Cerro Toledo Rhyolite, and Valle Grande. Additionally, the obsidian sample collection localities for those sources submitted by LANL are not described here specifically, but are plotted on Figure 10.5 and discussed in general below. The results of the analysis will be discussed below.

El Rechuelos

El Rechuelos is mistakenly called "Polvadera Peak" obsidian in the archaeological vernacular (see also Glascock et al. 1999). Polvadera Peak, a dacite or rhyodacite dome, did not produce artifact-quality obsidian. The obsidian artifacts that appear in the regional archaeological record are from El Rechuelos Rhyolite as properly noted by Baugh and Nelson (1987). Indeed, El Rechuelos obsidian is derived from a number of small domes north, west, and south of Polvadera Peak as noted by Baugh and Nelson (1987) and Wolfman (1994; see also Figure 10.5 here). Collections here were made at two to three small coalesced domes near the head of Cañada del Ojitos and as secondary deposits in Cañada del Ojitos (collection locality 080999 in Table 10.2). The center of the domes is located at UTM 13S 0371131/3993999 north of Polvadera Peak on the Polvadera Peak quadrangle. The three domes are approximately 50 meters in diameter each and exhibit an ashy lava with rhyolite and aphyric obsidian nodules up to 15 cm in diameter, but dominated by nodules between 1 and 5 cm. Core fragments and primary and secondary flakes are common in the area.

Small nodules under 10 to 15 mm are common in the alluvium throughout the area near Polvadera Peak. It is impossible to determine the precise origin of these nodules. Presumably they are remnants of various eruptive events associated with El Rechuelos Rhyolite. The samples analyzed, the results of which are presented in Table 10.2, are statistically identical to the data presented in Baugh and Nelson (1987) and Glascock et al. (1999).

El Rechuelos obsidian is generally very prominent in northern New Mexico archaeological collections. Although it is not distributed geologically over a large area, it is one of the finest raw materials for tool production in the Jemez Mountains. Its high quality as a toolstone probably explains its desirability in prehistory. Cerro Toledo Rhyolite and Valle Grande Rhyolite, while present in large nodule sizes, often have devitrified spherulites in the glass, so more careful selection had to be made in prehistory. In nearly 500 nodules collected from the El Rechuelos area, few of the nodules exhibited spherulites or phenocrysts in the fabric. Additionally, El Rechuelos glass is megascopically distinctive from the other two major sources in the Jemez Mountains. It is uniformly granular in character, apparently from ash in the matrix. Cerro Toledo and Valle Grande glass is generally not granular and more vitreous.

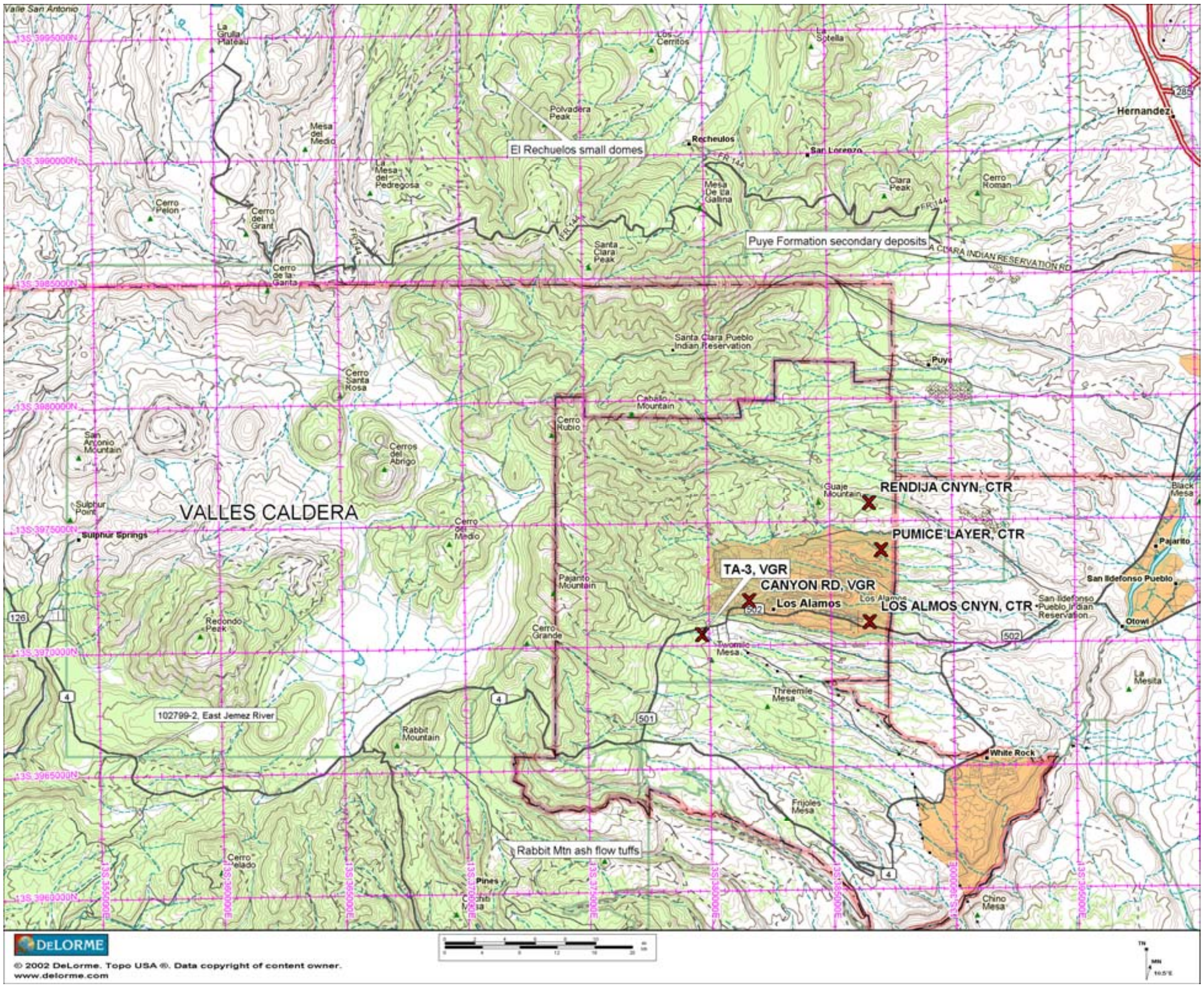

Figure 10.5. Obsidian collection localities in the Jemez Mountain region. Localities marked with an "X" are LANL marekanite collections as analyzed in the tables here. The others are collection localities by this lab as discussed here.

Table 10.2. Source standard elemental concentrations for El Rechuelos Rhyolite obsidian. Samples with "PP" prefix are those from the Wolfman collections as discussed in Wolfman (1994) and Glascock et al. (1999), and analyzed with energy-dispersive X-ray fluorescence spectroscopy (EDXRF) at Berkeley. Those with a "080999" prefix are from this study and locality discussed above and analyzed with WXRF at Berkeley (instrument settings as in Shackley 1998a, and http://www.swxrflab.net/ philipspw2400. htm).

SAMPLE	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Ba
PP-1[1]	543	451	6538	160	9	21	76	48	51
PP-2	560	434	7055	165	10	22	79	52	51
PP-3	526	430	6362	157	9	23	76	48	50
PP-1B	588	436	6504	149	4	25	68	49	n.m.
PP-2B	689	420	6922	156	2	23	75	45	n.m.

SAMPLE	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Ba
080999-2-1				151	11	23	79	46	16
080999-2-2				157	11	24	80	48	20
080999-2-3				154	11	24	81	47	21
080999-2-4				148	11	24	78	46	17
080999-1-1				147	10	23	78	45	16
080999-1-2				150	10	23	79	46	20
080999-1-3				146	10	23	77	45	15
080999-1-4				147	10	23	78	45	11
080999-1-5				146	10	22	77	45	17
080999-1-6				148	10	23	78	46	10

[1] Ti, Mn, and Fe not measured with WXRF; n.m. = no measurement.

Rabbit Mountain Ash Flow Tuffs and Cerro Toledo Rhyolite

Known in the vernacular as "Obsidian Ridge," this obsidian is derived from the Cerro Toledo Rhyolite/Rabbit Mountain eruptions, and following Baugh and Nelson (1987) and the geological literature are all classified as Cerro Toledo Rhyolite (Bailey et al. 1969; Gardner et al. 1986; Heiken et al. 1986; Self et al. 1986; Smith et al. 1970; Figures 10.1 and 10.5).

While Obsidian Ridge has received all the "press" as the source of obsidian from Cerro Toledo Rhyolite on the southern edge of the caldera, the density of nodules and nodule sizes on ridges to the west is greater by a factor of two or more. The tops of all these ridges, of course, are remnants of the Rabbit Mountain ash flow and base surge, and the depth of canyons like Cochiti Canyon is a result of the loosely compacted tephra that comprises this plateau. At Locality 081199-1 (UTM 13S 0371337/3962354), nodules on the ridge top are up to 200 per m^2 with over half that number of cores and flakes (Figures 10.6 and 10.7). This density of nodules and artifacts forms a discontinuous distribution all the way to Rabbit Mountain. The discontinuity is probably due to cooling dynamics and/or subsequent colluviation. Where high-density obsidian is exposed, prehistoric production and procurement are evident. At the base of Rabbit Mountain, the density is about 1/8 that of Locality 081199-1, and south of this locality the density falls off rapidly. At Locality 081199-1, nodules range from pea gravel to 16 cm in diameter (Figures 10.6 and 10.7 and Table 10.3). Flake sizes suggest that 10-cm-size nodules were typical in prehistory.

Figure 10.6. Locality 081199-1 south of Rabbit Mountain in the ash flow tuff. This locality has the highest density of artifact-quality glass of the Rabbit Mountain ash flow area. The apparent black soil is actually all geological and archaeological glass; one of the highest densities of geological and archaeological obsidian in the Southwest.

Figure 10.7. Mix of high-density geological obsidian and artifact cores and debitage (test knapping) at Locality 081199-1 south of Rabbit Mountain. Nodules ≈200/m^2, cores and debitage ≈100/m^2, some of the latter could be modern. Elemental concentrations for samples from this locality are shown in Table 10.3.

Cerro Toledo Rhyolite obsidian both from the northern domes and Rabbit Mountain varies from an excellent aphyric translucent brown glass to glass with large devitrified spherulites that make knapping impossible. This character of the fabric is probably why there is so much test knapping at the sources—a need to determine the quality of the nodules before transport. While spherulites in the fabric occur in all the Jemez Mountain obsidian, it seems to be most common in the Cerro Toledo glass and may explain why Valle Grande obsidian occurs in sites a considerable distance from the caldera even though it is not secondarily distributed outside the caldera in any quantity while Cerro Toledo obsidian is common throughout the Rio Grande alluvium. Indeed, in Folsom period contexts in the Albuquerque basin, Valle Grande obsidian was selected for tool production almost exclusively even though Cerro Toledo obsidian is available almost on-site in areas such as West Mesa (LeTourneau et al. 1996). So, while Cerro Toledo Rhyolite obsidian is and was numerically superior in the Rio Grande Basin, it wasn't necessarily the preferred raw material.

Table 10.3. Elemental concentrations for Cerro Toledo Rhyolite obsidian in the Jemez Mountains. All measurements in parts per million (ppm). Samples with numeric designations from Shackley's surveys. Those with alpha-numeric surveys from the Wolfman and LANL collections. Samples with Ti, Mn, and Fe concentrations analyzed by EDXRF. All others analyzed by WXRF. Instrumental conditions for both instruments discussed in Shackley (1998a).

SAMPLE	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Ba
BCC-1	429	600	10616	217	5	66	192	97	44
BCC-3	552	552	9986	215	5	66	187	97	49
BCC-4	583	547	10102	214	5	62	183	99	42
OR-1	543	550	10278	222	0	66	192	103	43
OR-2	432	425	8727	190	4	59	175	94	42
OR-3	531	534	9921	216	6	65	188	97	42
OR-4	457	577	10218	218	5	69	188	99	42
OR1B	491	536	9810	214	0	63	182	103	
OR2B	633	408	8242	179	1	58	162	92	
CCA-1	341	499	9446	197	4	60	174	90	39
CCA-2	338	516	9714	211	6	66	189	98	0
CCA-3	317	529	9759	208	0	60	184	97	41
081199-1-1				199	7	62	178	96	0
081199-1-2				198	7	61	177	94	1
081199-1-3				200	7	62	179	96	1
081199-1-4				207	6	63	187	99	1
081199-1-5				204	6	63	181	98	4
081199-1-6				204	7	63	184	99	9
081199-1-7				205	6	63	182	99	0
081199-1-8				217	7	67	193	105	15
080900-1				205	8	63	177	100	19
080900-2				204	7	62	175	99	3
080900-3				201	7	62	172	97	3

SAMPLE	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Ba
080900-A1				203	8	62	177	99	73
080900-A2				204	7	63	175	99	14
080900-A4				203	6	63	176	98	0
080900-A5				209	6	65	184	103	5
080900-A6				210	7	62	171	97	1

Valle Grande Rhyolite

While the primary domes like Cerro del Medio of Valle Grande Rhyolite (also called Valles Rhyolite and Cerro del Medio) were not originally visited for this study due to restrictions on entry to the caldera floor, surveys of the major stream systems radiating out from the caldera were examined for secondary deposits; San Antonio Creek and the East Jemez River, as well as the canyons eroding the outer edge of the caldera rim. In 2005 and 2006, the University of California, Berkeley, Archaeological Petrology Field School in collaboration with the VCNP began a more systematic collection of Cerro del Medio source standards from the dome complex, and collections along San Antonio Creek in the caldera proper. These data are included in Table 10.4.

In 1956, two geology graduate students from the University of New Mexico published the first paper on archaeological obsidian in the American Southwest, a refractive index analysis of Jemez Mountains obsidian (Boyer and Robinson 1956). In their examination of the Jemez Mountains sources, they noted that obsidian did not occur in the alluvium of San Antonio Creek where it crosses New Mexico State Highway 126, but did occur “in pieces as large as hen’s eggs, but the material is not plentiful and must be searched for with care” in the East Jemez River alluvium where it crosses State Highway 4 (Boyer and Robinson 1956:336). A return to the latter locality, courtesy of Ana Steffen of VCNP (Locality 102799-2), exhibited about the same scenario as that recorded 43 years earlier. The alluvium exhibits nodules up to 40 mm in diameter at a density up to 5/m^2, but generally much lower. Boyer and Robinson did find nodules up to 15.5 cm in diameter along the upper reaches of San Antonio Creek as shown in their plate reproduced here (Boyer and Robinson 1956:337; Figure 10.8).

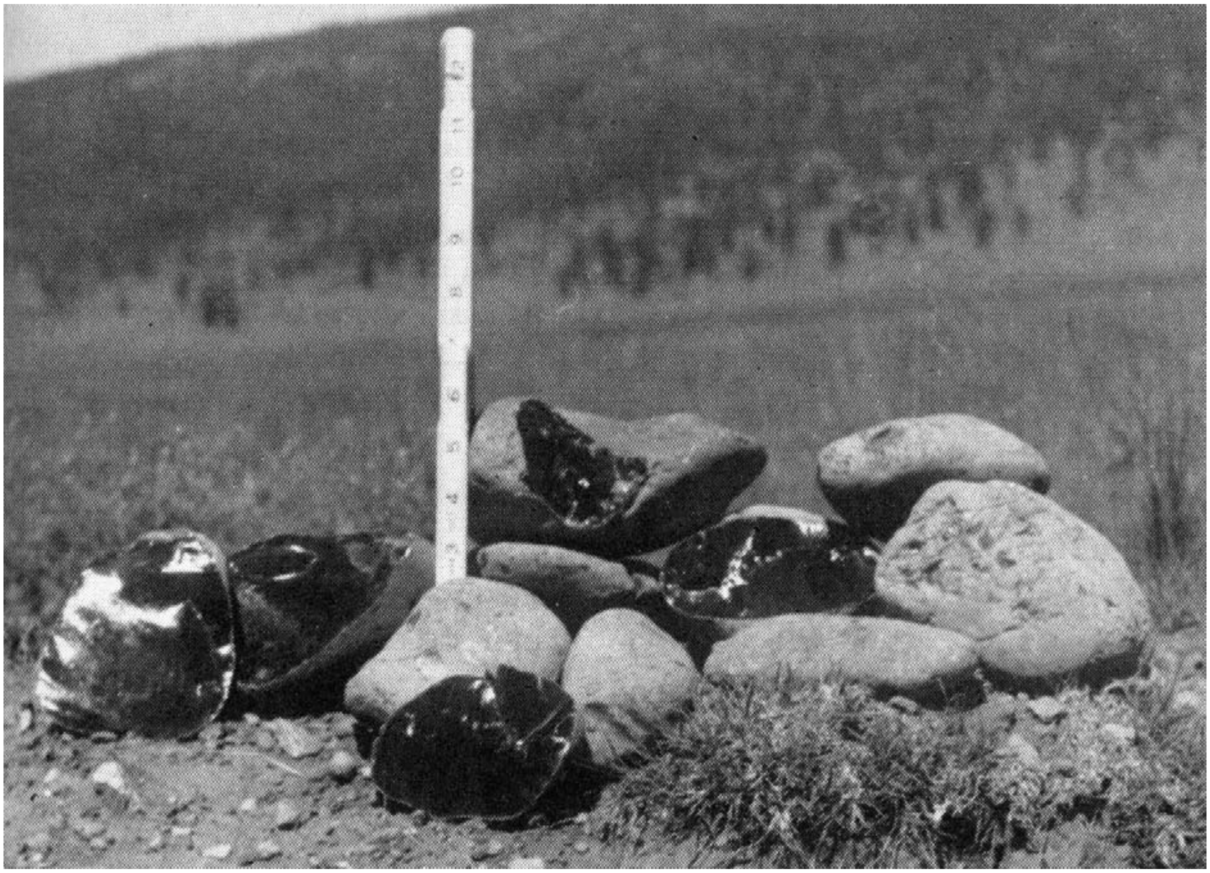

Figure 10.8. Valle Grande Rhyolite obsidian nodules photographed by Boyer and Robinson collected along San Antonio Creek in the caldera (1956:337).

My survey along San Antonio Creek from its junction with State Highway 126 for 10 miles upstream did not reveal any obsidian, as in the Boyer and Robinson study. Both Phil Letourneau and Ana Steffen discovered the same in similar surveys. It appears then that Valle Grande Rhyolite obsidian does not enter secondary contexts outside the caldera, at least in nodules of any size compared to Cerro Toledo Rhyolite. The 2005 and 2006 surveys along San Antonio Creek in the caldera indicate that by the time the secondary deposits reach the caldera rim, the nodule size is near pea gravel in diameter.

Valle Grande Rhyolite obsidian exhibits a fabric that seems to be a combination of El Rechuelos and Cerro Toledo. Some of the glass has that granular texture of El Rechuelos and some has devitrified spherulites similar to Cerro Toledo, and much of it is aphyric black glass. Flakes of Valle Grande obsidian can be indistinguishable from El Rechuelos or Cerro Toledo in hand sample. An elemental analysis of samples collected by Dan Wolfman from Cerro del Medio and the nodules in San Antonio Creek in this study are identical, indicating that Cerro Toledo glass does not enter the East Jemez River system (see Table 10.4).

In the Valle Grande Rhyolite obsidian so far analyzed from both Cerro del Medio proper and secondary deposits in the caldera, it is apparent that there is considerable variability in Rb (140 to 184 ppm; Table 10.4). Ana Steffen at the VCNP has noticed significant variability in ferric versus ferrous iron (Steffen, 2005 personal communication). It would be worthwhile to sample the Cerro del Medio dome complex in a variety of areas in order to determine both the level of variability and the spatial distribution of that variability.

Table 10.4. Elemental concentrations for Valle Grande Rhyolite obsidian in the Jemez Mountains. All measurements in parts per million (ppm). Samples with numeric designations from Shackley's surveys. Those with alpha-numeric surveys from the Wolfman and LANL collections. Samples with Ti, Mn, and Fe concentrations analyzed by EDXRF. All others analyzed by WXRF. Instrumental conditions for both instruments discussed in Shackley (1998a).

SAMPLE	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Ba	La	Ce
102799-2-1				155	10	43	168	54	30		
102799-2-2				157	10	44	172	55	25		
102799-2-3				159	10	44	169	55	35		
102799-2-4				158	10	43	171	55	27		
102799-2-5				160	9	43	170	54	41		
102799-2-6				154	10	42	167	54	39		
102799-2-7				159	9	43	174	54	47		
102799-2-8				162	10	44	168	55	41		
102799-2-9				158	10	43	170	55	45		
102799-2-10				166	10	43	168	54	23		
102799-2-11				176	10	43	168	55	29		
102799-2-12				140	11	40	178	53	26		
102799-2-13				154	11	42	164	54	42		
102799-2-14				144	10	41	179	55	25		
102799-2-15				172	10	44	177	55	23		
CM-3-D	912	486	11600	184	5	47	181	52	30	38	76
CM-2-A	729	341	9030	158	5	40	173	52	26	34	67
CDMA-1				160	10	44	173	56	31		
CDM3B				159	10	44	174	56	39		
CDMV-1				158	10	44	173	55	32		
CDMA-2				158	10	43	174	55	34		
CDMA-3-B				156	10	43	172	54	35		
CDM 3-1				178	10	42	170	54	62		
CDM 3-2				158	10	44	174	55	38		
CDM 3-3				156	10	43	171	54	27		
CDM 1A				156	10	43	172	54	31		
CDM CM1				159	10	44	174	56	28		
CDM CM-3-E				161	11	43	172	54	55		

Canovas Canyon Rhyolite and Bear Springs Peak

The oldest (Tertiary: ca. 8 to 9 mya) obsidian source in the Jemez Mountains is the Bear Springs Peak dome complex, part of the Canovas Canyon Rhyolite domes and shallow intrusions (Tcc and Tcci) as reported by Kempter et al. (2003). Located at the far southern end of the Jemez Mountains, just south and adjacent to Jemez Pueblo Nation land, this Tertiary Period source exhibits only relatively small marekanites now, most smaller than 2 cm in diameter (see Figure 10.1). Although the nodule size was apparently small, Bear Springs Peak obsidian was used in prehistory, and was recovered in samples analyzed from Early Historic period contexts at Zuni Pueblo, probably a result of relationships between the Zuni and Jemez in the 17th century (Shackley 2005a). The data as analyzed by Craig Skinner and my lab, suggest that this may be the "Bland Canyon & Apache Tears" source as reported by Glascock et al. (1999:863), collected by Wolfman and reported by him in 1994 (Table 10.5).

Table 10.5. Elemental concentrations for Bear Springs Peak obsidian in the Jemez Mountains. All measurements in parts per million (ppm). Skinner and Shackley analyses combined.

Element	N	Minimum	Maximum	Mean	1 Std. Deviation
Ti	15	279	630	460	112
Mn	24	227	609	398	117
Fe	9	6245	7685	6593	431
Rb	24	106	128	116	5
Sr	24	36	54	43	4
Y	24	16	27	21	2
Zr	24	100	114	108	4
Nb	24	40	61	53	5
Ba	15	293	717	352	102

As with many of the Tertiary Period sources in the Southwest, Bear Springs Peak obsidian is present as marekanites in perlitic lava at the Bear Springs Peak dome proper and domes trending to the northeast toward and into Jemez Pueblo land. Nodules up to 5 cm occur as remnants in the perlite not unlike the environment at Sand Tanks (Shackley 2005a:20). The density of the nodules from pea gravel to 5 cm in the perlite lava is as much as $100/m^2$, although most of the marekanites are under 2 cm. The glass itself is aphyric and nearly transparent in thin flakes similar to Cow Canyon and Superior obsidian, and some have noticeable dark black and nearly clear banding. It is an excellent media for tool production so that bipolar flakes are easily produced and pressure flaking is effective.

The marekanites have eroded into the stream systems to the south possibly as far as the Rio Grande, but marekanites bearing the chemistry have never been recorded in the southern Rio Grande alluvium as reported by Church (2000). Most likely the nodules are expended in the sediment load long before reaching the Rio Grande or have been covered by subsequent Quaternary sediments. It is safe to conclude that artifacts assigned to Bear Springs Peak would have to be originally procured at or near the Bear Springs dome complex. Probably the reason this source is not found in archaeological contexts more frequently is that it simply cannot "compete" with the large nodule sources just to the north including Cerro Toledo Rhyolite, Valle Grande Rhyolite, and El Rechuelos obsidian. Finally, a new geology map for the Bear Springs Peak Quad is in draft form (Kempter et al. 2003).

MAGMATIC RELATIONSHIP BETWEEN THE GLASS SOURCES

The relatively short time period of eruptive events that produced artifact-quality obsidian in the Jemez Mountains from El Rechuelos to Valle Grande Rhyolite is reflected in the elemental chemistry as reported by a number of others discussed above (e.g., Baugh and Nelson 1987; Broxton et al. 1995; Gardner et al. 1986; Glascock et al. 1999). This relationship is readily evident in three-dimensional and biplots of the incompatible elemental composition of these sources as shown in Figures 10.9 and 10.10, the analysis of major and minor elements shown in Tables 10.2 through 10.4. Rubidium, zirconium, and yttrium are most sensitive in separating these sources. Indeed, a biplot of the elemental concentrations Zr versus Y can effectively separate all four Jemez Mountains sources, although it is NOT sufficient to eliminate the possibility that the analyzed artifacts could be from outside the Jemez Mountains group (Figures 10.9 and 10.10).

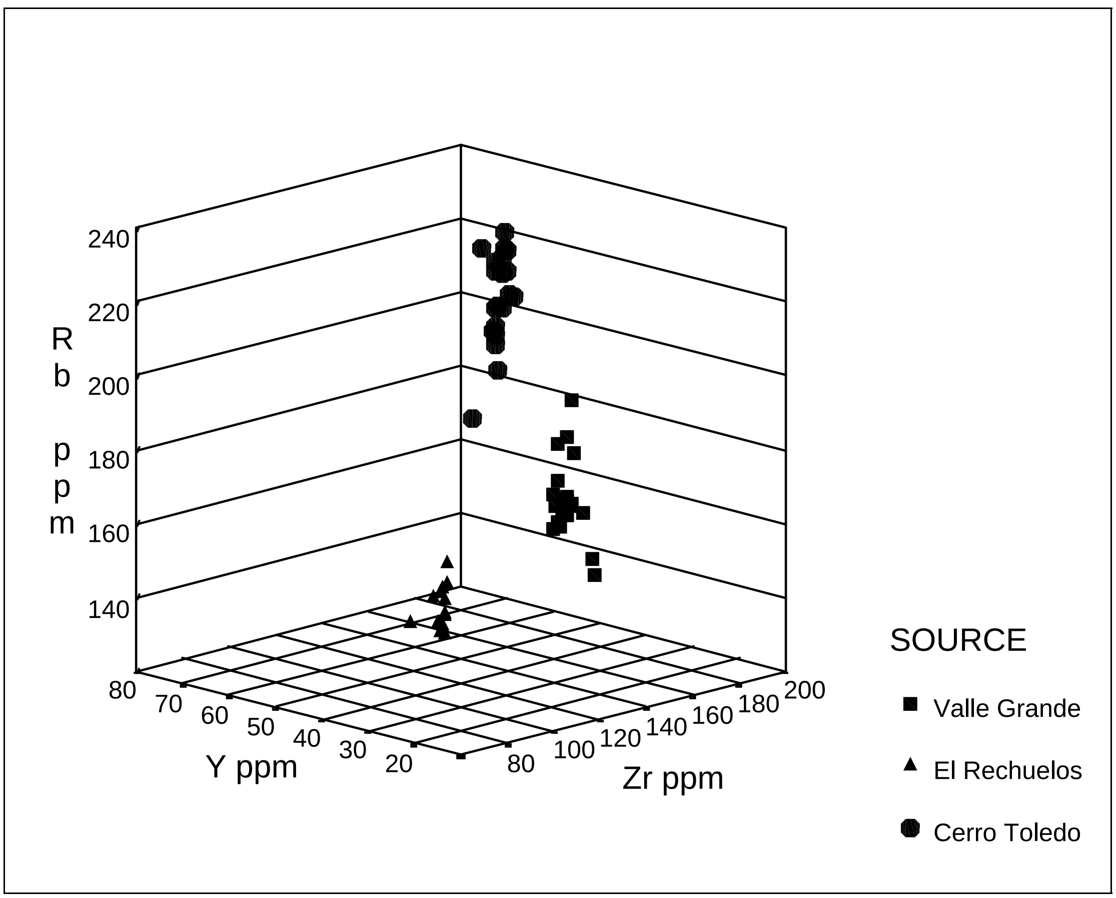

Figure 10.9. Rb, Y, Zr three-dimensional plot of Valle Grande, El Rechuelos, and Cerro Toledo Rhyolite obsidian source standards.

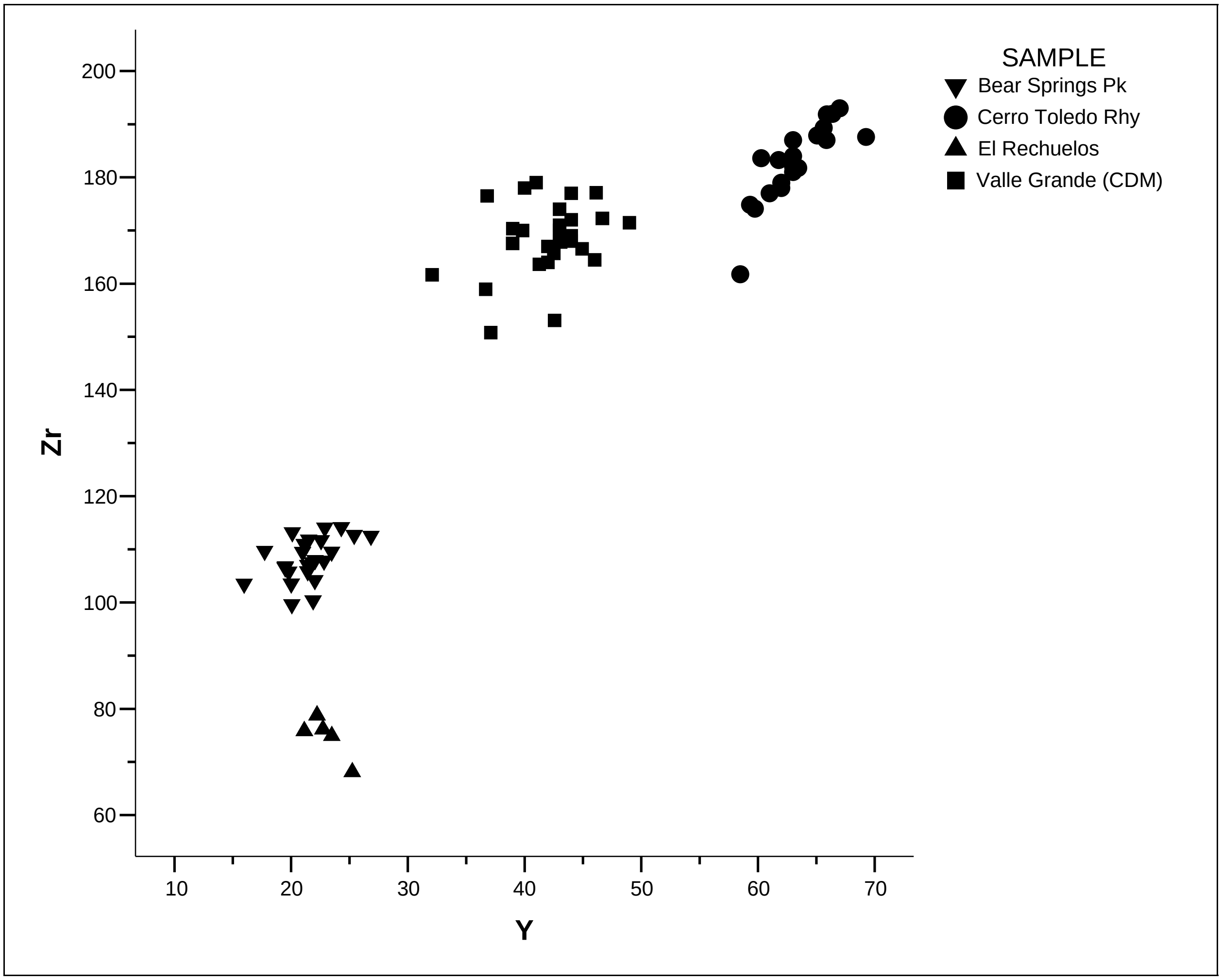

Figure 10.10. Zr versus Y biplot of the elemental concentrations for Valle Grande (Cerro del Medio), El Rechuelos, Cerro Toledo Rhyolite, and Bear Springs Peak obsidian source standards. High variability in Valle Grande and Cerro Toledo data are the result of the analysis of small secondary distribution nodules (see Davis et al. 1998).

THE LANL STUDY

A number of marekanite (obsidian) and ignimbrite or tephra samples were submitted for non-destructive WXRF analysis, in part to enlarge the secondary depositional study, and in part to determine the relationship between the marekanites and the ignimbrite or tuff that they are contained within (Table 10.6 and Figures 10.11 and 10.12). While this nondestructive study is certainly not as thorough as a more intensive analysis with prepared pellets and WXRF, the results are revealing. Most of these localities have been described by David Broxton in field notes from July 2002.

Table 10.6. WXRF nondestructive elemental analysis of obsidian and other rock samples from the LANL collection. Some samples submitted were too friable for nondestructive analysis.

Sample	Locality	Rb	Sr	Y	Zr	Nb	Ba	Source
Marekanites (obsidian)								
LCT-1-1	Los Alamos Cn	183	7	58	164	91	55	Cerro Toledo Rhy
LCT-1-2		168	6	54	149	83	63	Cerro Toledo Rhy
RC-4-1	Rendija Cn	202	6	61	169	97	4	Cerro Toledo Rhy
RC-4-2		199	5	62	170	98	4	Cerro Toledo Rhy
RC-4-3		203	7	63	173	99	13	Cerro Toledo Rhy
RC-4-4		205	6	64	178	102	8	Cerro Toledo Rhy
TA-3-1	TA-58	154	9	43	166	55	31	Valle Grande Rhy
TA-3-2		155	9	42	160	54	12	Valle Grande Rhy
PL-5-1	pumice near Rendija Cn	200	6	63	169	99	5	Cerro Toledo Rhy
PL-5-2		197	6	62	171	98	0	Cerro Toledo Rhy
PL-5-3		191	6	60	166	95	12	Cerro Toledo Rhy
BV07-02-16-1	Canyon Road	145	10	40	155	51	1	Valle Grande Rhy
BV07-02-16-2		149	9	43	161	53	26	Valle Grande Rhy
BV07-02-16-3		150	9	43	164	54	53	Valle Grande Rhy
Rock and Ignimbrite samples								
BV07-02-13-1	SR 502 road cut	16	479	27	132	16	516	
BVO7-02-10-1	Los Alamos Cn	153	25	52	200	67	37	
BVO7-02-11-1	Los Alamos Cn	125	28	43	202	55	40	
BVO7-02-14-1	SR 502 road cut	360	11	104	255	195	18	
BVO7-02-16-1	Canyon Road	145	48	50	161	49	835	
BVO7-02-17-1	Canyon Road	141	26	44	175	55	195	
BVO7-02-17-2	Canyon Road	146	29	46	173	55	639	
BVO7-02-18-1	Ski Hill Road	137	222	45	145	42	1493	
BVO7-02-18-2	Ski Hill Road	131	172	51	160	47	874	
BVO7-02-5-1	Los Alamos	311	27	108	284	160	92	
BVO7-02-8-1	Los Alamos	209	31	77	199	103	26	
RGM-1		145	102	24	215	8	769	standard
BHVO-1		10	405	27	177	20	134	standard

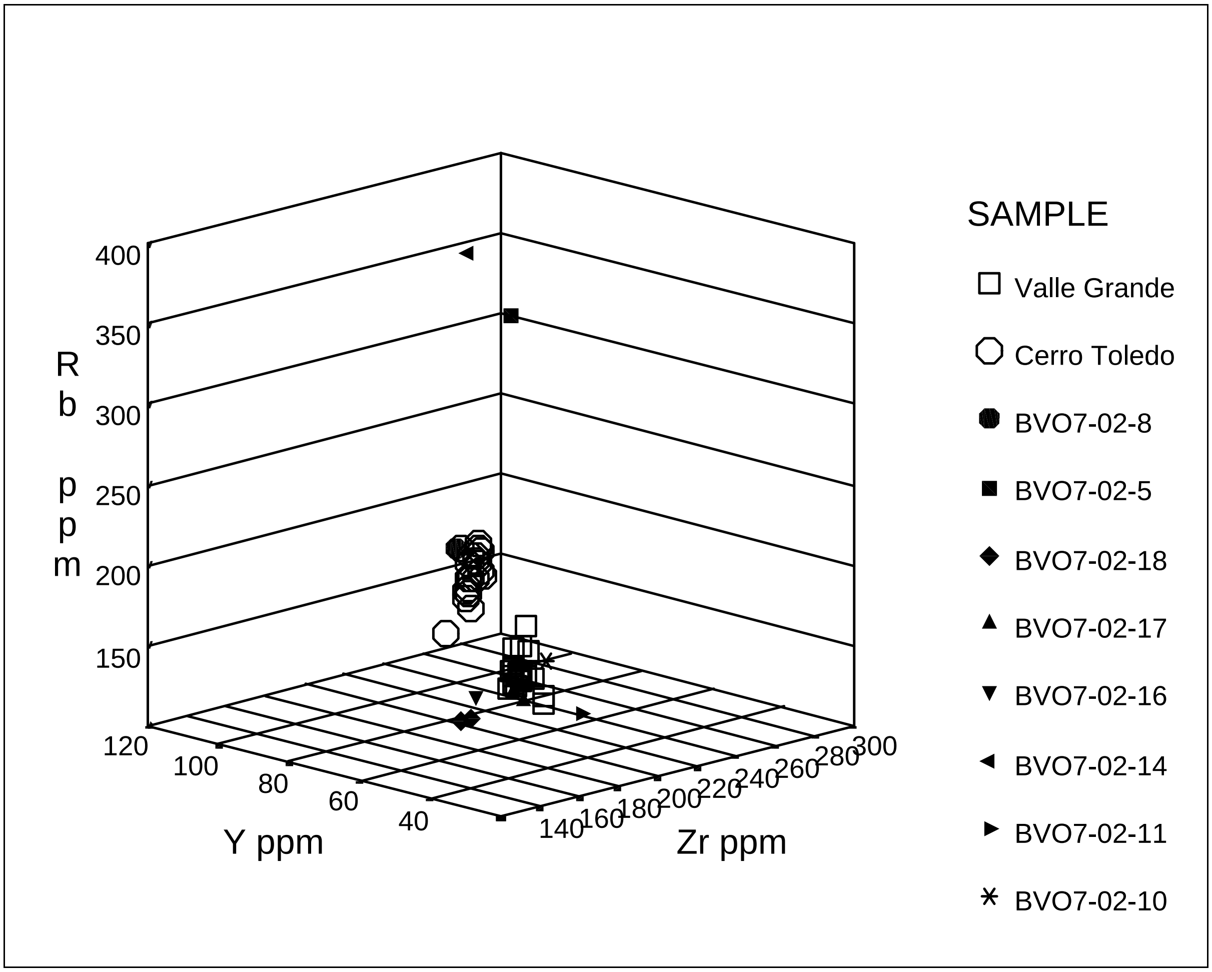

Figure 10.11. Rb, Y, Zr three-dimensional plot of Valle Grande Rhyolite and Cerro Toledo Rhyolite obsidian source standards and rock samples submitted by LANL. Samples from localities 5 and 14 are probably not rhyolite based on these elements analyzed.

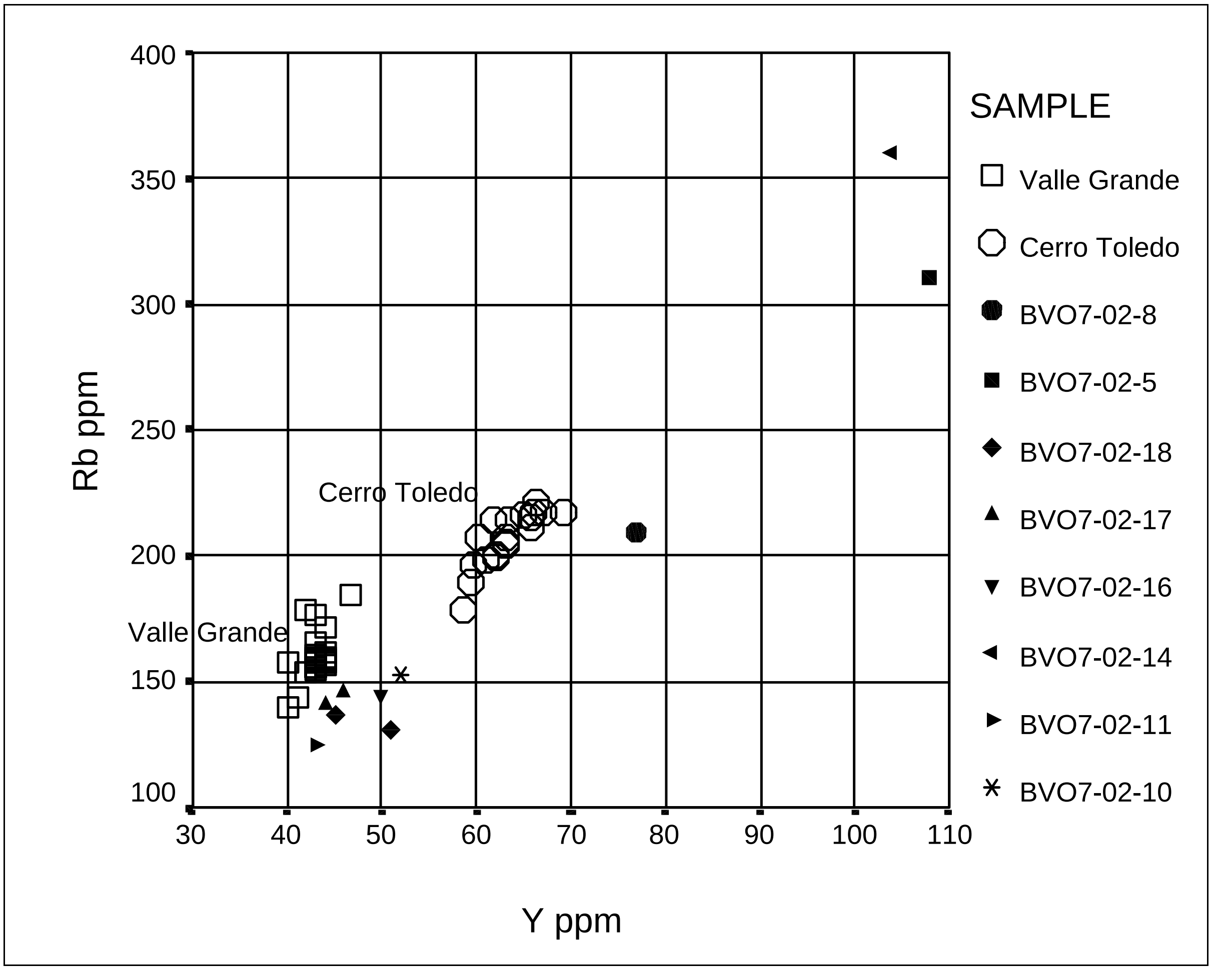

Figure 10.12. Rb, Y biplot of Valle Grande Rhyolite and Cerro Toledo Rhyolite obsidian source standards and rock samples submitted by LANL. Samples from localities 5 and 14 are probably not rhyolite based on these elements analyzed.

Obsidian Samples

Obsidian marekanite samples from five localities were submitted for analysis as shown in Table 10.6. While most of the samples were obsidian associated with the Cerro Toledo Rhyolite events and the Bandelier Tuff, a few of the samples appear to be post-Bandelier and exhibit an elemental composition consistent with Valle Grande Rhyolite obsidian (TA-3 and BV-07-02-16 localities; see Table 10.6, and Figures 10.11 and 10.12). While the sample is small here, it does appear that Valle Grande obsidian occurs in what Broxton designates as "post-Bandelier" sediments and these are in the western portion of LANL property closest to Cerro del Medio. Importantly, although this is the first example of Valle Grande obsidian *outside* the caldera rim, the nodule sizes are quite small, possibly representing small pieces of rhyolite lava quenched as pyroclastics during the eruption. I would stand by the conclusion that no archaeologically significant Valle Grande obsidian has eroded outside the caldera.

Rock Sample Analysis

Figures 10.10 and 10.11 exhibit the Rb, Y, and Zr plots of Cerro Toledo Rhyolite and Valle Grande Rhyolite obsidian source standard data and the submitted tephra samples, without the basalt or dacite lava included. Immediately apparent is that the vast majority of samples, based on these three elements, are most similar to Valle Grande, the post-Bandelier event, although none of the rock samples plot within the range of variability of the glass. This is typical of rhyolite versus obsidian, where post-emplacement weathering and other processes affect the crystalline lava more than glass (Shackley 1990; Zielinski et al. 1977). Additionally, concentration of Ba and Sr in feldspars, such as sanidine in rhyolites will often elevate the concentration of these elements relative to the obsidian produced by the same event in X-ray fluorescence analyses. This appears to be the case in this dataset in the obsidian recovered from locality BV-07-02-16 where the obsidian, consistent with Valle Grande glass, is relatively low in Ba and Sr, while the tephra sample is high in Ba and Sr (Table 10.6). I would, however, if given these samples as a blind test, suggest that they were somehow related to the Valle Grande Rhyolite.

Prehistoric Procurement and Secondary Deposition

The LANL study expands the range of the larger secondary depositional study. While some very small Valle Grande Rhyolite marekanites occur outside the caldera, their small size makes them insignificant as a raw material source. Cerro Toledo Rhyolite obsidian is a much more viable raw material source, apparently, in association with the Bandelier Tuff all around the perimeter of the caldera, including the LANL area and sediments further south and east. While it is impossible to determine whether obsidian artifacts recovered from sites in the LANL property were produced from primary or secondary sources, for Valle Grande at least, if the artifacts are larger than about 15 or 20 mm, the raw material probably came from the caldera floor near Cerro del Medio. With artifacts produced from Cerro Toledo Rhyolite obsidian, inferences about procurement are more difficult. Since large nodules (>30 mm) are common in sediments outside the caldera, these artifacts could be procured anywhere.

This study and the greater secondary depositional study reveal that an understanding of both primary and secondary sources of raw material are crucial in reconstructing procurement, exchange, and group interaction, and simple conjecture that obsidian is located somewhere in the Jemez Mountains yields but simple conclusions.

THE DACITE STUDY

More recently, a collaborative study between LANL, the Archaeological XRF Lab at Berkeley, and the Smithsonian Institution, has focused on the dacite used frequently for biface production in the Paleoindian and Archaic periods and for flake tools during the ceramic periods (Vierra et al. 2005; Shackley 2005b).

For a number of years we have noticed a very-fine-grained what appeared to be mafic or basalt raw material source in late Paleoindian contexts in northern New Mexico and southern Colorado. Indeed, a number of Cody, Plainview, and Folsom bifaces are produced from this material. Pegi Jodry and Brad Vierra have been working for a number of years with collectors and others, and determined that there were two possible very fine-grained volcanics that could be the sources for these raw materials—San Antonio Mountain in far northern New Mexico, in the Taos Plateau Volcanic Field, and Cerros del Rio, on the east side of Bandelier National Monument right above the river. After reconnaissance collections at the two probable sources, the short story is that the vast majority of "basalt" artifacts were indeed produced from one of these sources (Table 10.7).

However, these two "basalt" sources are not basalt at all. The San Antonio Mountain volcanics have been called basalt by archaeologists for years, despite Lipman and Mehnert's (1979) early analysis indicating a "rhyodacite." As you can see by the major compound rock classification, these rocks are firmly dacites (Figure 10.13). So, the two primary volcanic sources other than obsidian used by Late Paleoindian and Early Archaic knappers in the northern Rio Grande is a fine-grained dacite. Additionally, as originally reported by Newman and Nielsen (1987), a third dacite dome is located just east of Cerro Montoso, and this third source, called the Newman Dome here, takes care of that small group of dacite artifacts that are not produced from the other two "major" sources of dacite (Table 10.7). The elemental chemistry of these three sources is quite distinct (Figure 10.14). These analyses will form the database for future studies of volcanic rocks used in regional prehistory.

Table 10.7. Elemental concentrations for the three dacite sources in northern New Mexico. All measurements in parts per million. BHVO is a U.S. Geological Survey Hawaiite basalt source standard.

Source/Sample	Ti	Mn	Fe	Zn	Ga	Rb	Sr	Y	Zr	Nb
San Antonio Mountain										
061805-1-1	3610	742	36816	81	20	56	633	23	270	22
061805-1-2	3395	632	34262	80	17	55	591	21	246	16
061805-1-3	3683	548	34428	73	22	54	602	20	253	22
061805-2-1	3425	497	31906	77	20	52	515	22	201	27
061805-2-2	3665	633	35857	82	22	57	564	25	240	13
061805-2-3	3389	646	34805	79	21	57	602	22	247	28
061805-3-1	3561	609	35020	80	19	62	568	24	250	18
061805-3-2	3227	617	31823	75	24	61	569	24	256	10
061805-3-3	3521	651	32938	69	20	59	570	18	254	19
061805-4-1	3421	567	32598	79	20	56	532	22	233	30
061805-4-2	3300	550	33599	74	23	59	558	17	226	22
061805-4-3	3391	605	33415	71	20	52	546	23	230	17
061805-5-1	3581	716	35773	88	22	63	581	18	249	17
061805-5-2	3537	684	34228	78	24	59	591	26	255	24
061805-5-3	3143	586	32011	71	21	61	581	20	245	19
061805-6-1	4485	767	44577	98	23	69	653	19	269	20
061805-6-2	3264	674	35090	83	23	61	572	23	256	20
061805-6-3	3326	765	35273	81	18	57	573	23	244	18

Source/Sample	Ti	Mn	Fe	Zn	Ga	Rb	Sr	Y	Zr	Nb
061805-6-4	3393	631	34996	78	19	61	572	15	242	31
Cerro del Rio										
3	3356	2583	29734	80	19	47	814	6	197	19
1	2813	553	28290	76	20	41	771	15	193	23
2	3363	640	33390	71	24	40	822	14	207	20
4	3505	636	33790	89	18	49	826	16	200	12
5	3497	627	33069	70	21	44	839	11	202	28
9	3297	671	31776	71	19	49	806	15	208	19
7	3393	699	34613	71	22	47	878	19	213	21
8	3226	896	31766	71	19	39	813	15	198	32
6	3001	645	30915	73	19	39	818	16	180	19
10	3256	639	30699	74	19	42	814	13	206	25
Newman Dome										
1987 sample				62		50	214	15	82	8
Berkeley analysis				67		51	217	15	84	8
BHVO-2 (standard)	16071	1638	98090	70	23	10	382	19	162	17

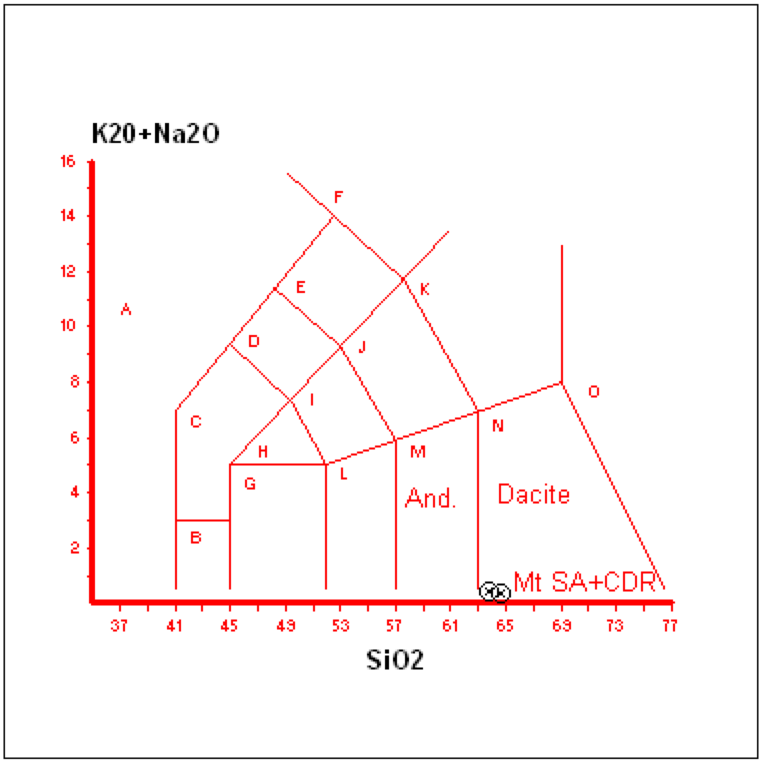

Figure 10.13. Cox et al. (1979) classification analysis of one San Antonio Mountain and Cerros del Rio sample.

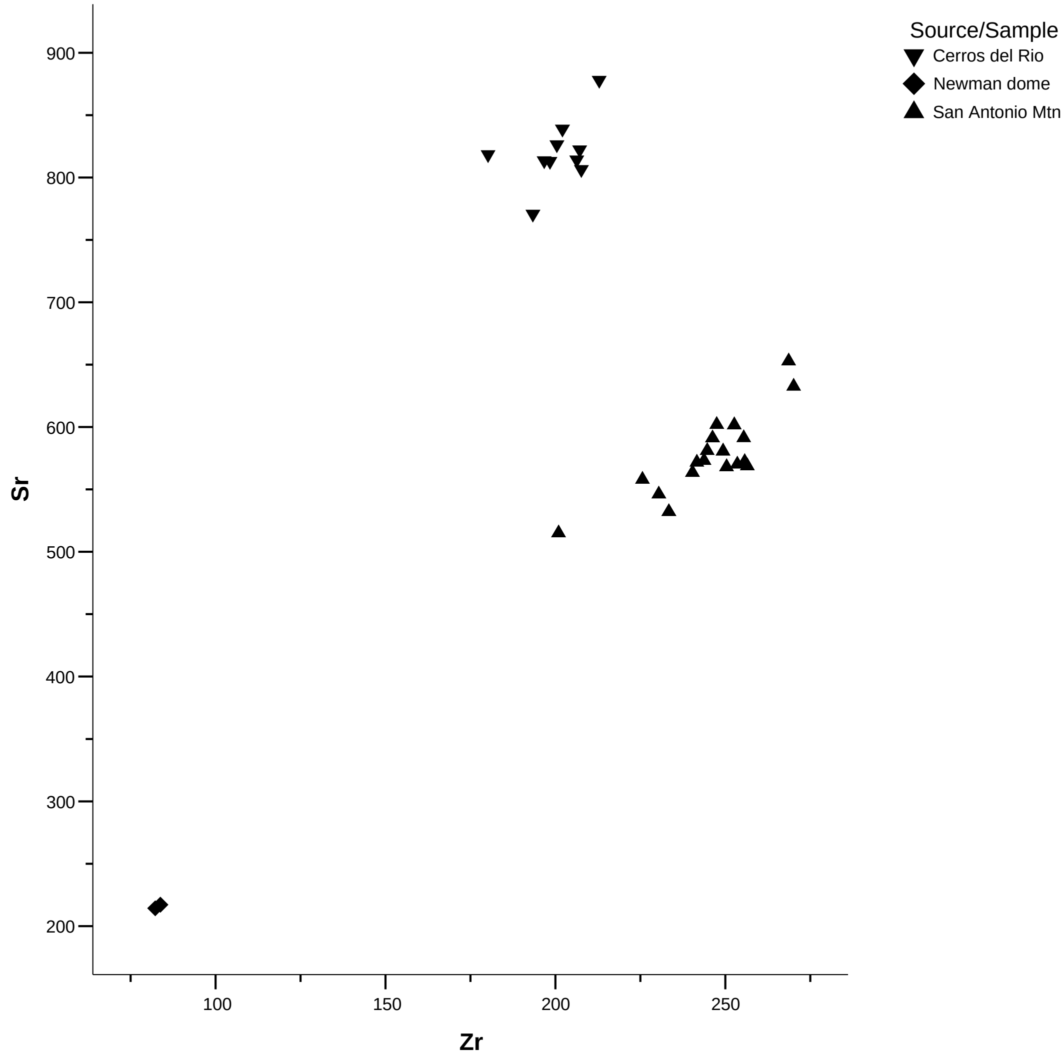

Figure 10.14. Sr versus Zr plot of the three dacite sources in northern New Mexico, from the data in Table 10.7.

CHAPTER 11
OBSIDIAN HYDRATION DATING BY INFRARED SPECTROSCOPY

Christopher M. Stevenson

INTRODUCTION

The obsidian hydration dating method provides an age estimate for natural glass artifacts based upon the penetration depth of diffused molecular water into the obsidian surface. A successful implementation of the dating method requires an estimation of the water diffusion coefficient and the precise measurement of the depth of diffusion. In this paper, the fundamental process behind water diffusion in obsidian is considered and it is demonstrated that infrared spectroscopic analysis of the glass matrix and hydrated layer has the potential to provide precise estimates of the critical variables. It is argued that the use of an IR approach will result in a more unified approach to the problem and result in a higher level of analytical precision.

The water diffusion process in obsidian has been poorly understood for many years and has lacked a good theoretical understanding. As a result, archaeometric studies evaluated the suitability of experimental designs to estimate diffusion coefficients through comparison with external chronological data (Stevenson 2000; Stevenson et al. 1998). Convergence in age estimates between obsidian samples and radiocarbon assays implied that the methods were appropriate even though a thorough explanation was lacking. However, investigations in the field of glass science have changed this situation. Hydrogen profiling of the hydrated layer has demonstrated that concentration-dependent diffusion is the dominant process (Anovitz et al. 1999) rather than the Fickian model previously proposed (Friedman and Long 1976). In addition, experimentation has shown that the *structural* water within the unaltered glass matrix in the form of hydroxyl and molecular water controls the forward advancement of the hydration layer (Stevenson et al. 1998; Tomozawa 1985) and the mobile species within the hydration layer is *molecular* water (Zhang and Behrens 2000) (Figure 11.1). Both of these key variables may be precisely estimated by infrared spectroscopy and have the potential to greatly improve the dating process. In this paper, the value of IR technology in measuring the structural water concentration and the extent of surface hydration is discussed.

PREVIOUS OBSIDIAN HYDRATION STUDIES IN NEW MEXICO

The obsidian hydration dating method has been extensively applied over the last 20 years in the New Mexico region with major projects occurring at Ft. Bliss in the Sonoran desert and within the Jemez Mountains (see Vierra and Harmon 2006 for a summary). Much of this earlier work was spurred by new developments in the method that included the use of high-temperature-derived hydration constants (Friedman and Long 1976; Michels 1983; Stevenson et al. 1989) for the estimation of archaeological rates at ambient conditions. A variety of experimental designs were used that included hydrothermal reaction at elevated pressure and vapor hydration at one atmosphere. Many of these initial experiments have been subsequently revised. However, the utility of the induced hydration approach has been demonstrated as a viable experimental approach and one that continues today. In this paper, I continue to refine the induced hydration approach by the addition of infrared spectroscopy to the pool of analytical options.

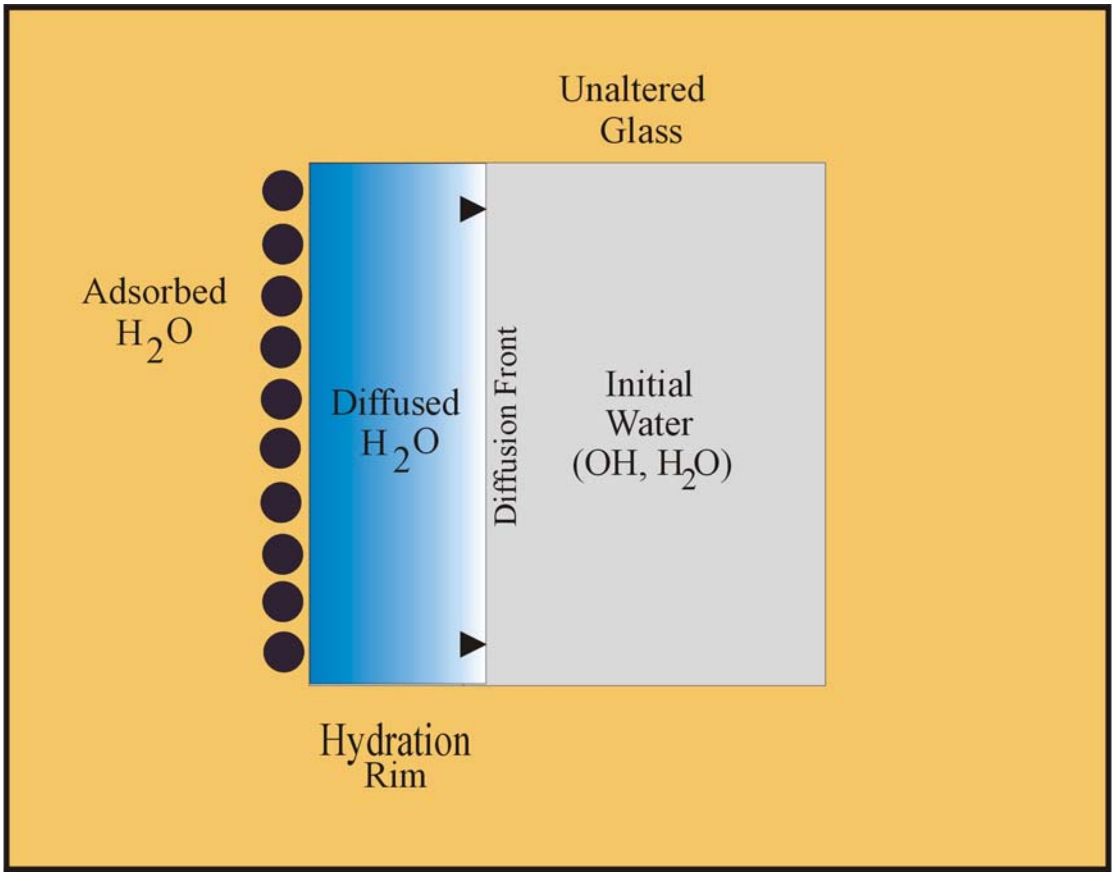

Figure 11.1. A schematic of the hydration layer showing the various forms of water on, and within, the glass.

This early laboratory work was accompanied by an effort to model the hydration history of sites and regions. Ground temperature and soil relative humidity were investigated as functions of elevation, aspect, depth below surface, and ground cover (Mundy 1993; Ridings 1991). The outcome of these studies revealed that precise estimates of these variables were highly complex, difficult to replicate, and inherently variable. For example, although a general relationship exists between altitude and declining temperature, there were always outliers that could not be explained by the modeling process. These same difficulties in developing temperature prediction equations have been encountered in regional studies conducted in New Zealand where the influence of micro-topographic differences and surface vegetation were recognized as having a profound influence (Jones et al. 1997). For the moment, it appears that high-resolution studies of soil temperature and relative humidity are required for each site under study.

Each of these avenues of investigation have raised questions and promoted the development of methodological improvements. Several recent reviews of the obsidian hydration dating method have tracked these events (Stevenson et al. 1998; Stevenson et al. 2000). These reviews stress two important points that will impact the use of obsidian hydration dating over the long term.

First, it is critical to understand the depositional context from which a datable artifact is recovered. How did that artifact cycle through the society, how was it discarded, and what cultural and natural processes result in its burial? Only then can the dated event (use/manufacture of the obsidian tool) be linked to the target event (Dean 1978), which may be the occupation of a pueblo room or the filling of a trash pit. If the depositional history of the artifact can be understood, then appropriate temperature and humidity values can be applied. Second, the direct measurement of glass structural water content is critical. Obsidian sources will exhibit a range in structural water concentration and even small differences can alter hydration rate estimates. It is no longer appropriate to infer that an obsidian source is uniform in structural water even though the trace element chemistry is highly uniform across the flow. Such uniformity must be demonstrated on a case-by-case basis. Only with this control over glass composition and context can the changes in approach to obsidian hydration dating discussed below be evaluated against other chronological indicators in the archaeological record.

Water Diffusion in Glass

The model of water diffusion in amorphous silicates developed by Doremus (1969) is the most appropriate descriptor of water diffusion in rhyolitic glass at low temperature because it accounts for the patterning in much of the experimental data (Doremus 1995). In a vapor environment, molecular water enters the glass network and reacts with the silicon-oxygen network to form SiOH groups:

$$\text{Si-O-Si} + H_2O = \text{SiOH} + \text{OHSi}$$

The molecular water is the mobile species while the newly formed OH groups are relatively fixed. It is assumed that OH group formation lags behind the movement of mobile water molecules and does not reach equilibrium.

It was also assumed in previous model development that the initial concentration of water in the glass is zero. However, obsidians may have structural water concentrations up to several weight percent. This will serve to exponentially increase the diffusion coefficient for ambient molecular water (D) as concentration increases (Stevenson et al. 1998; Zhang and Behrens 2000; Zhang et al. 1991). In the diffusion process this is believed to occur because the bonds of the Si-O-Si network are broken with the activation energy determined by the energy needed to break a single Si-O bond (Bruckner 1970; McMillan et al. 1994). The occurrence of greater amounts of SiOH in the network may weaken the neighboring Si-O-Si bonds, causing them to easily break and therefore lower the overall activation energy. It therefore becomes critical to determine the concentration of water within each sample to be dated.

It has been demonstrated that structural water is present within unhydrated obsidian as both molecular water (H_2O_m) and as hydroxyl (OH) (Newman et al. 1986; Silver and Stolper 1989; Stolper 1982). The sum of both species is referred to as the total water concentration (H_2O_t). Silver et al. (1990) demonstrated the relationship between the two species as a function of total water concentration. To develop obsidians of varying water content, obsidian from Mono Craters, California, was heated and quenched in a cold seal reactor at varying temperatures and cooling rates. Spectroscopic analysis revealed that at total water concentration of less than about 3 percent (weight percent) hydroxyl is the dominant species (Figure 11.2). As H_2O_t increases, the concentration of OH reaches a plateau at around 1 percent concentration. In contrast to this, molecular water is not detectable by infrared analysis when the total water is less than about 0.3 percent but then the concentration increases rapidly. The experimental data shows this trend to continue up to about 3 percent H_2O_m (Silver et al. 1990).

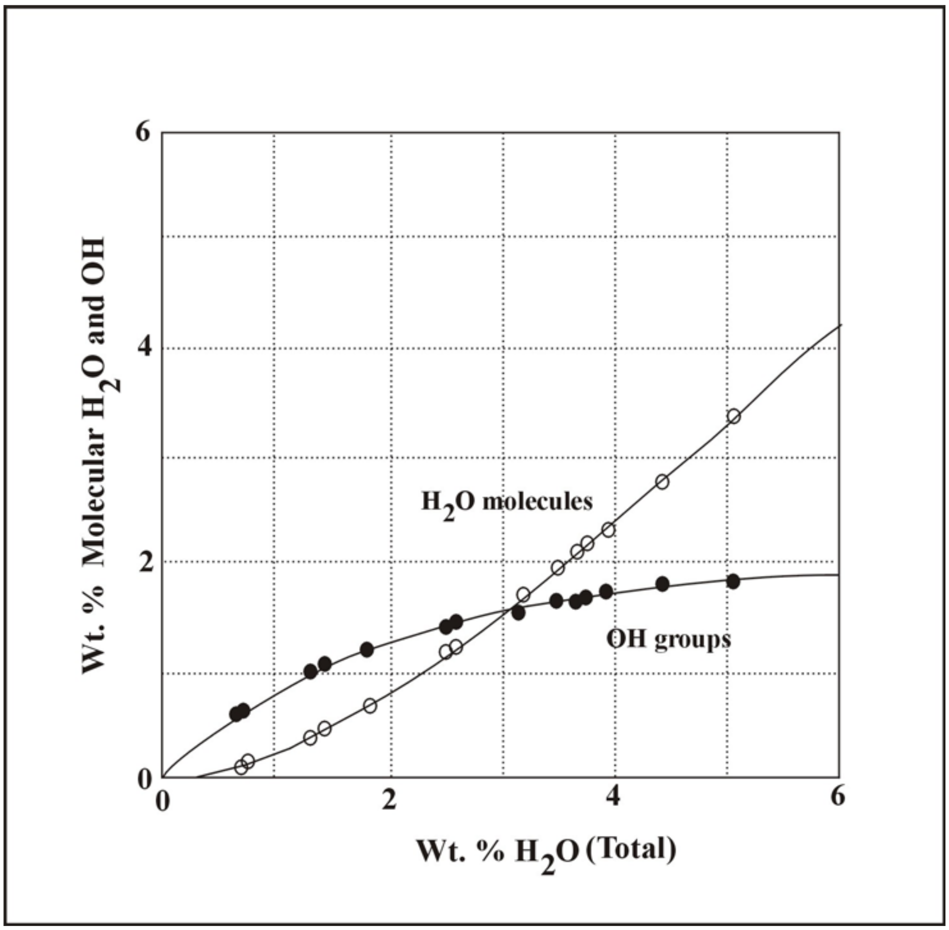

Figure 11.2. The proportional concentration between OH groups and H_2O molecules in obsidian (from Silver et al. 1990).

The diffusion of water in amorphous silicates is also strongly correlated with the concentration of water within the surface hydration layer (Drury et al. 1962; Lee et al. 1974; Nogami and Tomozawa 1984). This phenomenon is referred to as concentration-dependent diffusion. Within a narrow compositional range, the anhydrous component of the glass has little influence on the mobility of water (Behrens and Nowak 1997). Under ambient temperatures (0 to 30^o C), the diffusion coefficient does not follow the non-steady-state diffusion process and cannot be mathematically estimated with Fick's second law. Instead, as water enters the glass network the structure is depolymerized and allows additional water to enter the glass at a faster rate. This changing diffusion coefficient results in the formation of an S-shaped concentration-depth profile (Figure 11.3). However, experimental work shows that the leading edge of the diffusion profile advances into manufactured and natural glasses at the square root of time (Lanford et al. 1979; Stevenson et al. 1998; Tsong et al. 1980).

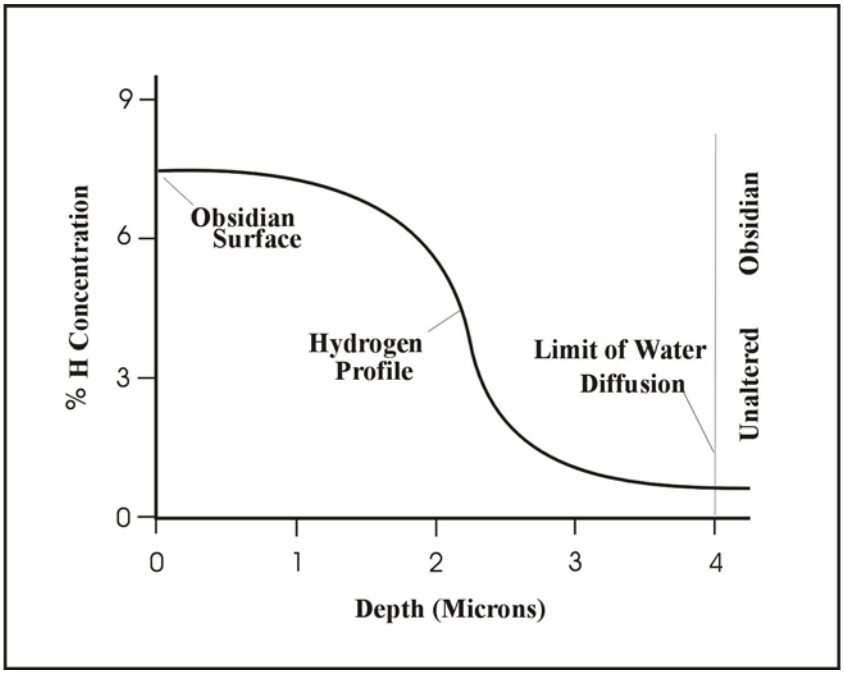

Figure 11.3. Concentration-dependent diffusion profile for obsidian.

The Hydration Dating Method

Based upon the discussion of water diffusion in obsidian, the implementation of the dating method will require two steps. The first step is to determine the depth of molecular water penetration into the glass from the surface. Conventional approaches have used optical microscopy because of the low cost. However, the uncertainty associated with each measurement is +/-0.25 um. This magnitude of error can lead to very generalized age estimates because of the wide standard deviations and defeats the objective of arriving at a precise chronological estimate. Secondary ion mass spectrometry (SIMS) has been used to significantly increase precision to +/-0.05 to 0.1 um, but the cost per sample is prohibitive for routine application. Infrared technology offers a compromise of high precision and lower cost. For example, the infrared photoacoustic (PAS) accessory (McClelland et al. 1993) has been used to successfully measure the absorbance of surface hydration layers and has been correlated with SIMS depth values to provide a highly precise depth calibration (Stevenson et al. 2000).

The second critical step is to determine the diffusion coefficients of H_2O_m at a specified ambient temperature as a function of the amount of glass structural water. Hydrothermal experimentation on obsidian and tektites with initial water concentrations between 0.01 percent and 0.4 percent have shown that the diffusion of molecular water (D) is exponentially related to initial concentration (Stevenson et al. 1998). The magnitude of D varies in response to OH at low structural water concentration and is further increased when structural H_2O_m is present. It is therefore critical to distinguish between OH and H_2O_m when assessing glass composition. Infrared transmission measurement on 0.5- to 2.0-mm-thick parallel-sided glass wafers have a precision of less than 2 percent (Newman et al. 1986) and is the conventional approach although determinations of H_2O_m have been successfully achieved by micro-reflectance Fourier transform infrared spectroscopy (FTIR) (G. Moore and McMillan 2000).

Infrared Spectroscopy

Infrared spectroscopy is a very useful technique for analyzing organic compounds, such as water, in the mid-infrared region (2.5 to 16 um; 5000 to 900 cm^{-1}). It is based on the principle that infrared radiation is absorbed by covalently bonded atoms, or molecules, and causes them to vibrate at the same frequency as the light source. A spectrum is created when a molecular vibration absorbs light at a specific frequency. This is very useful in the analysis of materials because there are several functional groups, or associations of atoms, that vibrate at the same frequency irrespective of the material in which they occur. One such association is hydrogen and oxygen; the focus of this study. A discussion of the properties of light, the types of vibrations and the determination of peak intensities and widths is covered in detail by B. Smith (1999) and the reader is referred to that paper for the fundamentals.

IR transmission spectroscopy has been extensively used to measure water in both manufactured and natural glasses (Bartholomew et al. 1980; Ihinger et al. 1999; Nowak and Behrens 1995; Scholze 1966; Wakabayashi and Tomozawa 1989). The concentration of water in obsidian has been the focus of extensive research because important clues exist about the eruptive history of volcanoes (Newman et al. 1988; Zhang and Behrens 2000). As a result, the number of water species in obsidian, their band locations, and absorption coefficients have been presented in detail (Newman et al. 1986; Zhang et al. 1997). In this paper, the focus was measuring the structural water (OH, H_2O_m) as well as the surface-diffused water (H_2O_m). An accurate determination will provide control over the critical parameters that control the hydration process.

Water Band Assignments

When the energy of the infrared light matches the vibrational energy level of a molecule it will be absorbed and excite the molecule causing the atoms to move. These complex vibrations can be partitioned into a set of *modes* (bending, stretching, contracting) that occur at specified frequencies within the infrared spectrum (Table 11.1). The total number of modes can be calculated. For a linear molecule such as hydroxyl (OH), the number of modes is estimated from the formula *3N-5*, where *N* is the number of atoms in the molecule. In the case of OH where only two atoms are present, the number of modes is equal to one. For a non-linear molecule such as water, the formula is *3N-6* and the number of modes is equal to three for this three-atom molecule (B. Smith 1999).

Table 11.1. Water species, IR band location, and vibrational motion.

Band Location (cm^{-1})	Water Species	Vibration Motion
7100	OH	OH stretching, 1st overtone
	H_2O	OH stretching, 1st overtone
5200	H_2O	Combination OH stretching and HOH bending
4500	OH	Combination of Si-OH and Al-OH stretching
4000	OH	Uncertain
	H_2O	Uncertain
3570	OH	Fundamental stretching
	H_2O	Fundamental stretching
1630	H_2O	Fundamental bending

Figure 11.4 shows an infrared absorbance spectrum from 900 and 7100 cm^{-1} for an obsidian sample with the characteristic water peaks.

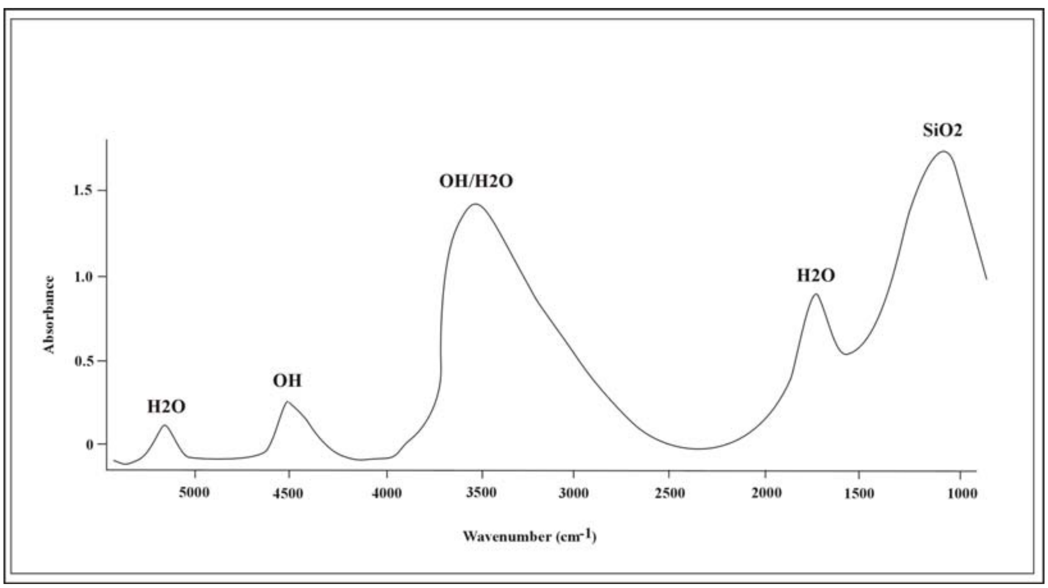

Figure 11.4. Water band locations in obsidian between 900 and 5200 cm^{-1}.

Six water bands are present within the wavenumber range (Newman et al. 1986). At 1630 cm^{-1}, there is a nearly symmetrical band that represents the fundamental bending mode of molecular water. The next band at 3570 cm^{-1} is a fundamental OH stretch for both hydroxyl and molecular water. It is a wide band whose asymmetry is generated by the numerous hydrogen bonds with other constituents of the glass. The small shoulder at 4000 cm^{-1} is a water band of uncertain assignment. It has been variously interpreted to represent hydrogen bonded to silanol groups, molecular water and hydroxyl, and just molecular water. The band at 4500 cm^{-1} is a well-documented combination stretch of OH groups bonded as Si-OH and possibly OH-Al within the glass structure. The next at 5200 cm^{-1} is a band generated by basic OH stretching and HOH bending of molecular water. The last band at 7100 cm^{-1} is outside of the fundamental region and represents the first overtone of a fundamental OH stretch that occurs both in hydroxyl and molecular water (Newman et al. 1986).

The measurement uncertainty associated with all bands is less than 5 percent except for the band at 4000 cm^{-1}. At this wavenumber, background subtraction procedures are problematic and prevent highly repeatable measurements. The best precision can be obtained with the 3570 cm^{-1} water band where a 0.02 error in absorbance units translates into a 2 percent error at one unit of sample absorbance and a 4 percent error when the total absorbance is 0.5 units. This makes the 3570 cm^{-1} desirable for the measurement of very low amounts of structural water (<0.10%) in obsidian (Newman et al. 1986). Other less absorbing bands such as the molecular water bands at 1630 cm^{-1} and 5200 cm^{-1} , and the OH band at 4500 cm^{-1}, are more suitable for measuring greater water concentration levels (>0.10%) that compose the hydration layer.

Water Band Calibration

A quantitative determination of water concentration can be accomplished using Beer's law where weight percent concentration is related to absorbance intensity:

$$A = \varepsilon * l * c$$

where: A = absorbance, l = path length through the material expressed in microns or millimeters, c = the concentration in parts per million or weight percent, and ε is the molar absorptivity or a proportionality constant. This last value is an absolute measure of infrared absorbance at a specified wavenumber for a molecule. It is used to relate concentration to absorbance and must be empirically determined for each water band in the obsidian. To accomplish this, the intensity of infrared spectra is often compared with water concentrations determined by manometry.

The calibration of water bands in rhyolitic glass was initially attempted by Stolper (1982) and then quantified by Newman et al. (1986) for the concentration of total water between 0 and 2.5 percent. Ihinger et al. (1999) subsequently revised the molar absorptivity values based on refined manometry data but the molar absorptivities of Newman et al. (1986) were widely used for many years. A little more than 10 years later, Zhang et al. (1997) demonstrated that ε was not constant. They demonstrated that the ratio of the OH band at 4520 cm^{-1} to the H^2O band at 5230 cm^{-1} changed as a function of total water concentration, thus violating the fundamental assumption necessary for quantitative determinations. Zhang et al. (1997) developed new calibrations for these two water bands to compensate for changing values of ε that we will use in this analysis. This calibration can accurately calculate the concentration of total water up to 2.7 percent and is reported to be six times more reproducible than the previous calibration. The final equations for calculating the weight percent concentrations of H_2O_t, OH and H_2O_m are

$$H_2O_t = a_o A_{5230} + (b_o + b_1 A_{5230} + b_2 A_{4520}) A_{4520}$$

$H_2O_m = a_o A_{5230}/H_2O_t$

$OH = (b_o + b_1A_{5230} + b_2A_{4520}) A_{4520}/ H_2O_t$

where: a_o = 0.04217 +/- 0.0013 mm

b_o = 0.04024 +/- 0.0023 mm

b_1 = -0.02011 +/- 0.0051 mm^2

b_2 = 0.0522 +/- 0.0051 mm^2

Application of IR Spectroscopy to Obsidian Hydration Dating

The discussion of the obsidian hydration dating method demonstrated that molecular water from the environment enters the glass at a constant rate and forms an increasingly thick water rich surface layer over time. The rate of molecular water diffusion is dictated by the quantity of structural water present within the unaltered glass if temperature and other environmental parameters remain constant. IR spectroscopic analysis can obtain precise estimates of each water species (H_2O_m, OH) within the bulk matrix and on the surface of the glass. However, different IR sampling methods need to be used for bulk glass and the surface characterization.

Structural Water Measurement

Quantitative measurement of OH and H_2O_m in the unhydrated glass matrix may be obtained on transparent obsidians using the calibration constants discussed above. In this procedure, parallel-sided 1-mm-thick sections, approximately 1 cm^2 in area, are cut from an artifact or geological sample with a slow-speed wafering saw equipped with a diamond blade. Each side is polished to a 2-um finish using a variety of polishing grits to prevent scattering of the infrared beam. A mechanical polisher is commonly used so that the parallel sides are retained during the abrasion of the sample.

The prepared sample is placed on a sample mount within the spectrometer compartment and the infrared beam is passed through the sample (Figure 11.5). Absorption of the infrared light is converted into an infrared spectrum. The intensity of the water bands at 4500 cm^{-1} (OH) and 5200 cm^{-1} (H_2O) are determined by measurement of the peak heights using a flat background drawn at a tangent to the minima of each spectra. The measured absorbance values are then converted to water concentration values in units of weight percent.

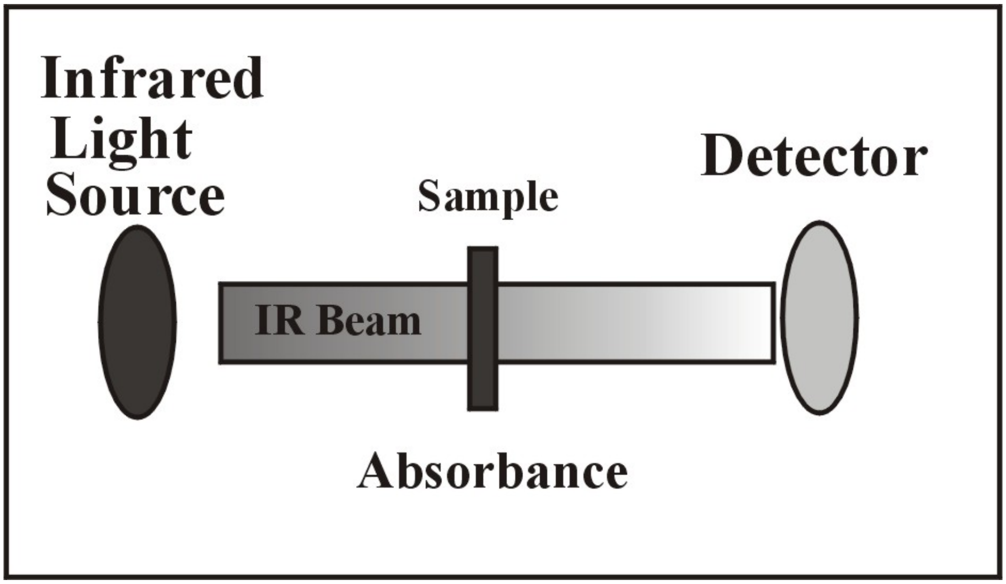

Figure 11.5. Infrared transmission measurement.

In order to obtain high-quality results, care must be taken to avoid imperfections and inclusions in the obsidian. Small voids or bubbles reduce the total quantity of glass exposed to the infrared beam and can lower water values. In contrast, concentrations of microlites may block the infrared beam and mimic a higher absorbance. This will inflate the final concentration. To avoid erroneous results it is necessary to avoid both voids and microlites by sampling regions of clear glass. To do this, a small aperture 3 to 6 mm in diameter is placed over the sample to allow only the preferred area to receive infrared light. The procedure will result in a representative value of water within the glass matrix. However, the use of a smaller sample area will result in a lower signal-to-noise ratio and a larger number of scans may be required to obtain satisfactory results. The analysis of opaque obsidians is not possible in transmission.

Our analysis of a variety of obsidians over the years has shown that total structural water content may vary significantly. Obsidians located within the American Southwest reflect this wide concentration range with total water values occurring between 0.10 percent and 1.58 percent. Table 11.2 lists the water concentration values for eight sources in Arizona and New Mexico. The Superior and Red Hill sources have been characterized with two to three separate samples and show that water concentrations may vary within a source. The remaining assays are on single samples. These data show the differences in structural water between obsidian sources but do not reflect the internal variation within each source. It is clear that if the infrared approach to obsidian hydration dating is to be correctly applied, each obsidian artifact represented within a lithic assemblage will need to be characterized to determine the concentration range of structural water. Some sources may have a restricted concentration range and may be represented by a single value with a low standard deviation. Other sources (e.g., Red Hill) may be highly variable. In this case, it may be required to assess the structural water content for each artifact to be dated. Only then can the correct rate constants be calculated.

Table 11.2. Structural water concentrations for some Southwestern obsidian sources.

Source	Location	Percent OH	Percent H_2O	Percent H_2O_t	A	E	Rate
Superior	Arizona	0.21–0.28	0	0.21–0.28	2.12/2.63	82703/81586	23.6/33.6
Antelope Wells	New Mexico	0.16	0	0.16	1.69	83760	16.5
Government Mtn.	New Mexico	0.18	0	0.18	1.87	83302	19.3
Gwynn Canyon	New Mexico	0.16	0	0.16	1.69	83760	16.5
Mule Creek	New Mexico	0.10	0	0.10	1.06	85585	8.2
Obsidian Ridge	New Mexico	0.24	0	0.24	2.35	82185	27.9
Polvadera Peak	New Mexico	0.24	0	0.24	2.35	82185	27.9
Red Hill	New Mexico	0.74–0.87	0.52–0.71	1.26–1.58	4.74/5.15	77811/77183	97.7/114.9

Hydration Layer Water Measurement

The optical measurement of the hydration layer at high magnification has been the standard for over 50 years. Determination of the inward limit of the diffusion front and thickness measurement relies on a change in the refractive index of the glass that is caused by the incorporation of molecular water into the matrix. The optical approach has produced much useful data but is fraught with many potential errors that can arise in sample preparation and focusing techniques (Jackson 1984; Stevenson et al. 1989). More importantly, a comparison of optically measured samples with layer hydrogen profiles conducted by SIMS revealed that optical measurements do not consistently occur at the diffusion front boundary (Anovitz et al. 1999). Infrared spectroscopy has the potential to overcome these problems by the elimination of sample preparation and through direct measurement of the diffusing species (H_2O_m).

The determination of the water concentration level within a hydration layer can be obtained with an infrared photoacoustic accessory (Figure 11.6). In this technique, a sample less than 10 mm in diameter is placed in a helium-filled chamber equipped with a high sensitivity microphone. The specimen absorbs the infrared radiation and undergoes an oscillatory heating and becomes a source of thermal waves. The waves within the bulk sample propagate to the surface and into the helium atmosphere. The photoacoustic signal is generated at the surface and is caused by the thermal expansion of the gas (McClelland et al. 1993). The magnitude of the signal varies in proportion to the concentration of the water species. The absorbance values are calculated from integrated peak areas. Each absorbance value represents an averaged measure for the entire surface of the sample exposed to the 5-mm-diameter infrared beam.

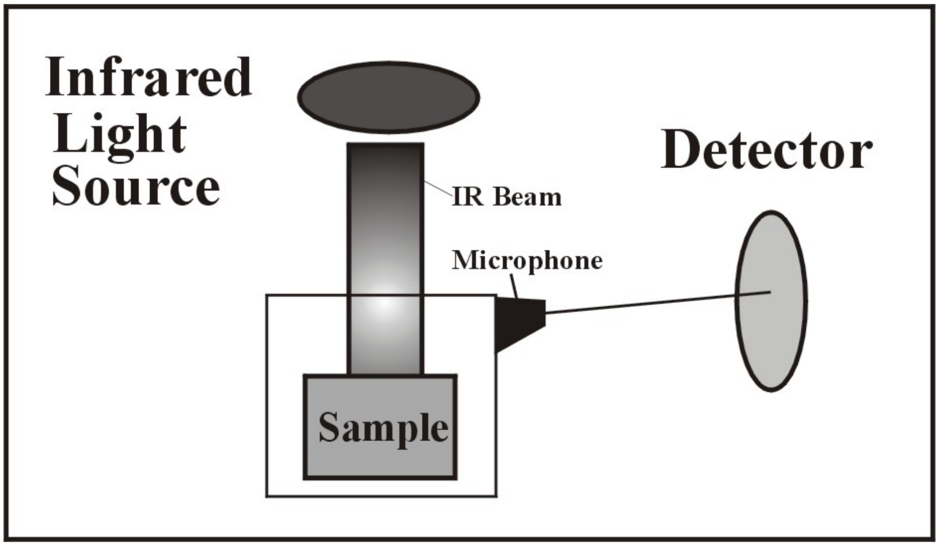

Figure 11.6. Infrared photoacoustic measurement.

No calibrations currently exist for the conversion of PAS band intensities to water concentration values. However, PAS absorbance intensities have been correlated with hydration layer depth measurements as determined by SIMS (Stevenson et al. 2000). Quantitative estimates of hydration layer thickness can be made up to a depth of 15 um (Figure 11.7).

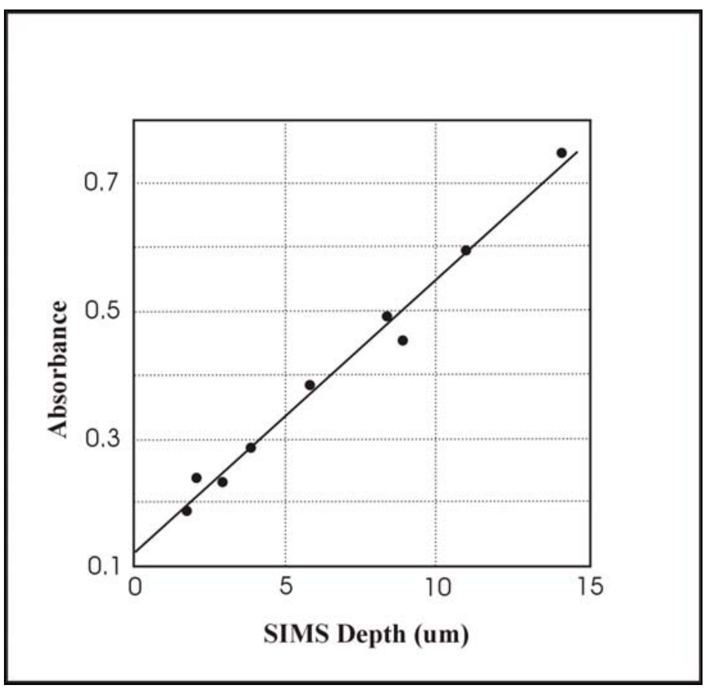

Figure 11.7. The relationship between infrared absorbance and depth of the hydration layer as determined by SIMS (after Stevenson et al. 2000).

The assumption behind this calibration is that water concentration, as reflected by absorption, will increase proportionally over time as diffusion proceeds. The linear relationship between IR absorption values and thickness supports this assumption.

Estimation of the Diffusion Coefficients

The diffusion coefficients for many types of obsidian have been empirically determined through hydrothermal experiments conducted at elevated temperatures. In the previous work of the author and others, glasses from different sources were hydrated in a vapour environment to determine the water diffusion coefficient at single temperature (160^{o}C) and at multiple temperatures (150 to 180^{o}C) to calculate the temperature dependence of diffusion or the activation energy. The coefficients were calculated from the optical thickness measurement of the induced hydration layers formed under known times of exposure to water vapour (Stevenson et al. 1998). These results provide the numerical constants for the Arrhenius equation so that a diffusion coefficient may be extrapolated to archaeological site conditions where temperatures are lower (10 to 30^oC). The experimental coefficients were regressed with the glass structural water concentrations (Figure 11.8a, 11.8b) to develop prediction equations for the high-temperature-rate constants:

Pre-exponential (A) = 2.35 * (ln (percent OH)/ln (10))^2

Activation Energy (E) = 76642 + (8943 * (ln percent OH))

The infrared analysis of a sample of New Mexico obsidians (Table 11.2) has yielded water content values that range between 0.10 percent and 0.71 percent OH. Estimation of a diffusion coefficient for an ambient site temperature of 25^{o}C is accomplished with the Arrhenius equation:

K = A exp E/R*T

where: K = archaeological diffusion coefficient (um^2/1000 years)
A = preexponential (um^2/day at 160^{o}C)
E = activation energy (Joules/mol)
R = universal gas constant
T = temperature (Kelvin)

This yields a diffusion coefficient that reflects the structural water concentration of the obsidian, a value may be used to convert measured hydration rim values to archaeological age estimates.

CONCLUSIONS

Water diffusion in glass is a complex problem. However, the fundamental components of the process are now beginning to be understood. It is clear that concentration-dependent diffusion accounts for the movement of molecular water into the glass structure. It is also established that the initial rate of molecular water diffusion is controlled by the quantity of structural water present within the glass matrix as a result of the incomplete removal of volatiles as the obsidian changes from a melt to a solid.

As a result of this understanding, it is possible to match the analytical methods to the problem at hand. Infrared spectroscopy is one method particularly suited to directly measuring the quantity of water in glass and the various species (OH, H_2O). Structural water can be quantitatively measured by simple infrared transmission and has replaced the difficult wet chemical methods. The amount of water in the hydration layer can be semi-quantitatively determined by infrared photoacoustic spectroscopy. An error estimate has not yet been determined for this application but we anticipate that it will approach that of other IR techniques and will only be several percent. This is preferable to the optical approach that involves extensive sample preparation and the estimation of the layer thickness under conditions of low resolution (+/-0.2 um).

The challenge for the immediate future requires that the calibration for the estimation of diffusion coefficients and activation energies from OH concentration be redone (Figure 11.8a and 11.8b). This calibration was developed by optical methods. Although there is a strong correlation between PAS signal intensity and SIMS depth, we anticipate that greater precision can be obtained if PAS is used to determine diffusion coefficients and activation energies on experimental samples. This is not a trivial experiment, but when completed it will tie all aspects of the obsidian hydration method to infrared spectroscopy.

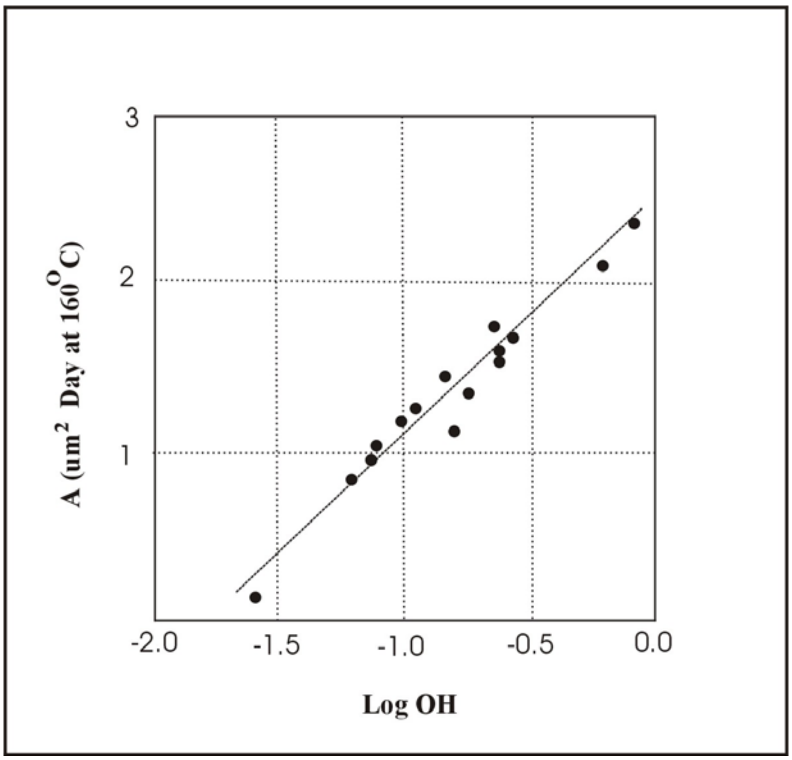

Figure 11.8a. The relationship between obsidian OH concentration and the pre-exponential.

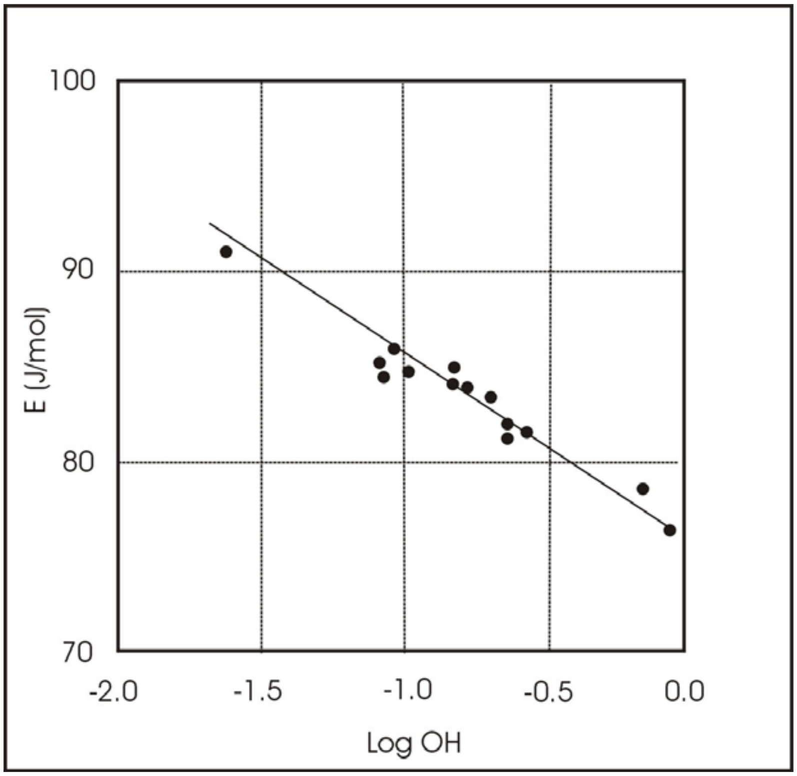

Figure 11.8b. The relationship between obsidian OH concentration and the activation energy.

CHAPTER 12
LUMINESCENCE DATING IN ARCHAEOLOGY

James Feathers

INTRODUCTION

Luminescence dating has long been treated with skepticism by American archaeologists (Feathers 2000). Although its popularity has been increasing lately, it remains under-utilized despite many recent advances in methodology and its potential for resolving chronological problems (Feathers 2003; Roberts 1997). Part of the reason for its under-utilization has been a lack of understanding of the rather arcane physics that underlie the method. This report is an attempt to increase this understanding.

Luminescence dating was developed in the 1960s and 1970s in the context of dating pottery and other ceramics. It has since been applied to dating burned lithics (Valladas 1992) and hearthstones as well as to dating buried sediments (Aitken 1985, 1998). In the case of pottery and burned lithics, the event dated is the last time the object was exposed to sufficient heat to reset the luminescence clock. For sediments the event dated is the last exposure to sufficient light. Often times these events are the ones that the archaeologist is interested in. Pottery is dated to when it was made or last used. Hearths can be dated to when the stones were heated, adobe when the bricks were made, and lithics either when they were heat-treated or accidentally burned during use. Sediments are dated to the time of their deposition. The convergence of the event of interest and the event that can be dated is the main strength of luminescence in archaeological applications (Feathers 2003). Unlike the case for radiocarbon, where dating artifacts often relies on association with organic matter, luminescence does not usually depend on making such connections.

The disadvantage of luminescence is the complicated underlying physics and the large number of variables that must be estimated to derive a date. This means that luminescence often has less precision than other dating methods, although methodological advances in the last few years (e.g., Murray and Wintle 2000) have improved considerably both precision and accuracy (Murray and Olley 2002). Error terms of less than 10 percent are commonplace. During some periods of time, such as the late prehistoric period (in the Americas), when radiocarbon has low resolution due to the flatness of the calibration curve, luminescence has been shown to outperform radiocarbon (e.g., Feathers 2005a; Lipo et al. 2005).

PHYSICAL BACKGROUND

Luminescence dating is rooted in what for most archaeologists is the unfamiliar world of solid state physics (Aitken 1985, 1998; Bøtter-Jensen et al. 2003). The phenomenon of luminescence is defined as light emitted from a substance after absorption of energy from an external source (Chen and McKeever 1997). What distinguishes luminescence from similar phenomena such as fluorescence is a time lag between the absorption of energy and the emission of light.

Luminescence can be used for dating for two reasons. First, the time lag, during which the substance remains in an excited or metastable state, may extend for millions of years, thereby providing a stable clock. Second, the metastable state can be removed in a matter of minutes or seconds by a stimulus, most commonly heat or light. When the stimulus is heat, the emitted light is called thermoluminescence (TL). When the stimulus is light, it is called optically stimulated luminescence (OSL). Such stimuli are, in effect, zeroing mechanisms and represent the events that are dated.

The external source of energy for dating applications is naturally occurring radioactivity in the sample and its immediate surroundings. Because such radioactivity is a continual process, the absorbed energy is built up through time, usually at a constant rate, until release by heat or light. This accumulated dose is called the paleodose, or equivalent dose (D_e). Dividing by the dose rate yields an age.

Luminescence is explained by reference to energy band theory (Figure 12.1) (Bøtter-Jensen et al. 2003, Chen and McKeever 1997; McKeever and Chen 1997). In complex crystalline solids with three-dimensional arrays of atoms, various energy levels of individual atoms overlap and form bands. In insulating materials, such as most constituents in ceramics or sediments, a gap is present between a lower band called the valence band, which corresponds to the ground state, and a higher band called the conduction band. In the valence band, electrons are closely tied to their parent atoms. The ionizing ability of natural radioactivity removes electrons from their parents and raises them across the gap to the conduction band where they can move about freely. In theory electrons cannot occupy energy levels within the gap, because of quantum rules, and if radioactivity (e.g., from ^{14}C) lacks the energy to raise electrons across the gap, no ionization occurs. When an electron is removed from an atom, the vacancy left behind in the valence band is called a hole. Electrons from an adjacent atom can fill the hole, creating a new hole in the adjoining atom. In this way holes can diffuse through the valence band in a similar way that electrons move through the conduction band. In ideal crystals, electrons that have been excited to the conduction band will return to the valence band and recombine with a hole once the energy from the external source is removed. But natural crystals contain defects in the form of substitutions, displaced atoms and lattice distortions. These can create localized charge deficiencies (balanced by an opposite charge deficiency elsewhere in the crystal). Electrons in the conduction band or holes diffusing through the valence band become attracted to these defects and can be "trapped." These traps occupy energy levels within the otherwise forbidden gap.

Once an electron or hole becomes trapped, a stimulus is required to remove them from the trap to the corresponding delocalized band. The amount of energy required to accomplish this is called the trap depth. Shallow traps require very little stimulus (heat or light) to empty and do so in a relatively short time under ambient conditions. Deep traps require high-energy stimulus to empty and can remain populated for very long periods of time. These latter traps are used for dating. When an electron or hole is released from a trap, it may recombine with opposite charge at another trap, called a recombination center, and both return to the ground state. The process of recombination is what results in the emission of light, or luminescence. Recombination centers have very high energy depth and release of charge from them is much more likely via recombination than from stimulus. Figure 12.1 illustrates the various transitions.

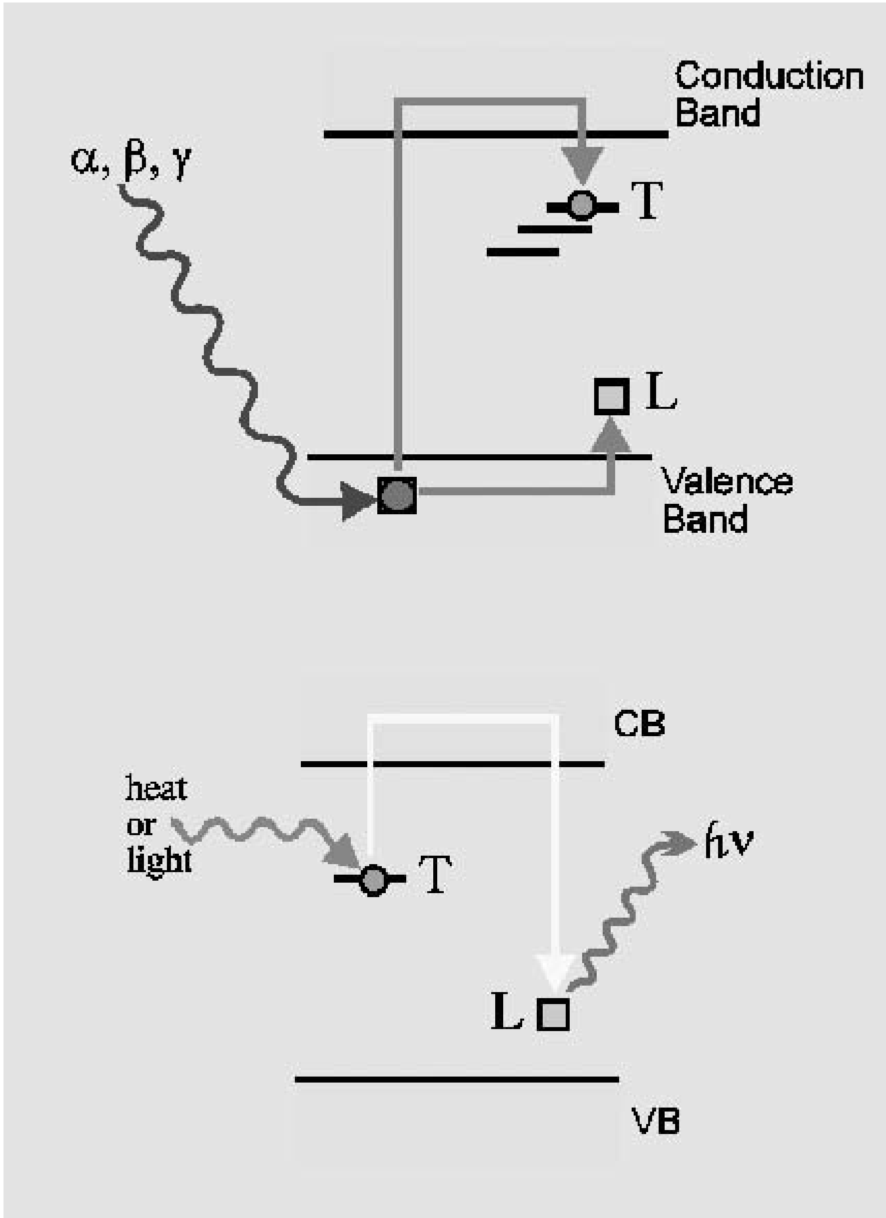

Figure 12.1. Energy level diagrams showing traps and various charge transitions. The ground state is represented by the valence band, while the conduction band is an excited state. Between the bands is a forbidden zone, which nevertheless contains energy levels associated with localized charge deficiencies caused by crystalline defects. T represents electron traps of various depths, while L represents a hole trap called a recombination or luminescence center. In the top diagram, ionizing radiation (alpha, beta or gamma radiation) lifts electrons to the conduction band where some of them are trapped at T. Electron vacancies or holes are trapped at L. In the bottom diagram heat or light provides a stimulus that releases the electron from the trap to the conduction band, where it then recombines with the hole at a recombination center resulting in the emission of photons (*h*υ). These diagrams were constructed by Dorothy Godfrey-Smith.

Figure 12.2 shows the full process involved. The horizontal axis is time and the vertical axis is the amount of absorbed energy in terms of the number of electrons and holes populating traps. Because luminescence is emitted when the traps are emptied, the luminescence signal intensity is proportional to the amount of trapped charge and can also be represented by the vertical axis. At some point in deep geological time, when the crystal is first formed, the traps are empty. With time, exposure to natural radioactivity ionizes atoms in the crystal and the traps begin to populate. Eventually, all the traps are filled and no additional radioactivity will increase the amount of trapped charge. This saturated level defines an upper limit to dating, which is around 100,000 years for quartz and perhaps a million years for feldspar. Then at some point in prehistoric time—when a pot was fired or when sediments associated with artifacts were exposed to light and deposited—the traps are emptied. After the pot is removed from heat or the sediments are buried, electron and hole traps begin to be repopulated and absorbed energy rebuilds. When the materials are transported to the lab and measured by heating (TL) or exposure to light (OSL), the resulting luminescence intensity is proportional to the amount of trapped charge accumulated since the last zeroing event. If the dose rate has been constant over this time, the luminescence intensity is proportional to time.

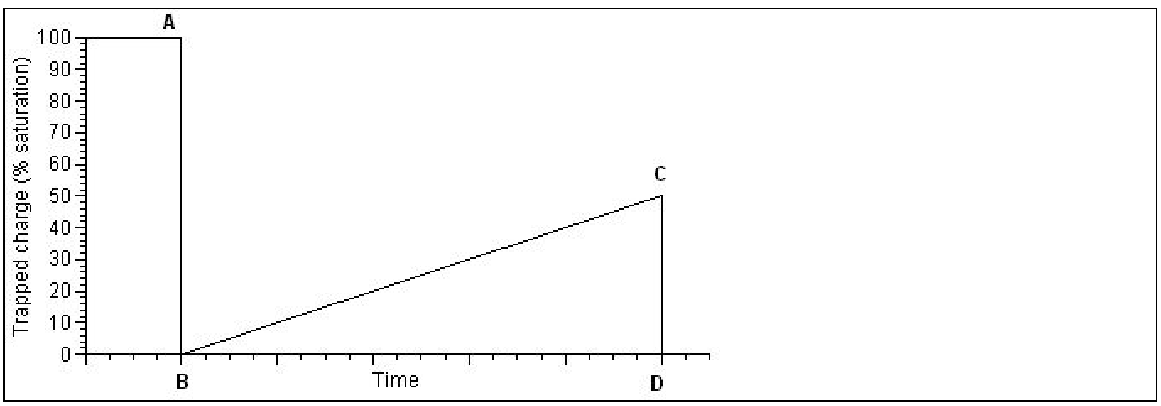

Figure 12.2. Schematic of the dating process. At some point in geological time (not shown) the traps are empty. Continual radioactivity results in filling of the traps until they are all filled to some saturation point (A). An event in prehistory, either exposure to heat or to light (B), empties the traps. As time goes on, the traps start filling again, until point C when the traps are emptied in the laboratory by applying heat (TL) or light (OSL), this time measuring the luminescence. The intensity of the signal is proportional to the amount of trapped charge, which if the dose rate is constant can be related to the time elapsed from B to D. (Figure from Feathers 2003).

RADIOACTIVITY

Can the dose rate be assumed constant through time? The principle contributors to the natural dose rate come from ^{40}K and the decay chains of ^{232}Th and ^{238}U. ^{232}Th and ^{238}U are parent radionuclides, the decay of which is the first of a series of decays through a number of daughter radionuclides until a stable isotope of lead is reached. The daughters have half lives much shorter than those of the parents, the consequence of which leads, in the absence of any other geological process, to the activities of daughter and parents becoming the same. This condition where parent and daughters decay at the same rate is called secular equilibrium. The half lives of the two parents and of ^{40}K are very long, on the order of 10^9 years. Because the decay rates are so slow (but nevertheless measurable), radioactive composition changes only very slightly over archaeological time, meaning that the decay rate is virtually constant. The radioactivity measured today will almost be the same as what it would have been at the time of zeroing had it been measured then. Of course, radioactivity is not the only process affecting composition. Various geological processes, such as leaching, ion-exchange, or addition/removal of overburden, can alter the concentration of radionuclides within the effective range of the sample (about 30 cm). In many cases the effects of such processes are not significant and the constant dose rate assumption is safe. Changed concentrations can often be detected (and some times corrected) by the presence of systematic changes down a profile or by a condition of disequilibrium in the decay chains (where selective daughters or the parent have been added or removed) (Krbetschek et al. 1994). The possibility of changes in dose rate is something that always has to be taken into account in dating, but samples that cannot be dated because of it are not common (Olley et al. 1996). In addition to the major contributors to the dose rate, there are minor contributions from ^{87}Rb, ^{235}U (parent of another decay chain) and cosmic radiation. The latter can be significant for surface samples that have little internal radioactivity.

Another variable affecting radioactivity is the moisture content of the sample and its surroundings. Moisture absorbs radioactivity at a different rate than the sample, such that higher moisture contents mean a lower dose rate to the sample. Some estimate of past moisture content, which can change dramatically over time, is necessary, although large uncertainties in this estimation can be tolerated.

MEASUREMENTS

Two sets of measurements are required to produce a date. One is to measure the equivalent dose (D_e). This is done by calibrating the natural luminescence signal, measured on selected portions of the sample, against artificial radiation provided in the laboratory. The amount of radiation needed to produce a given amount of luminescence is called the sensitivity. The challenge is to make sure the natural signal and the calibrating signal are responding to the same sensitivity, and various procedures including a preheat to a temperature of about 200 to 260°C before each measurement are applied to accomplish this (Wintle and Murray 1998). The preheat is also designed to remove any unstable signal from shallow traps. The second set of measurements is to estimate the dose rate both of the sample and its immediate surroundings. These normally take place in the laboratory but field assessments of radioactivity are also employed—and recommended for complex environments.

The portion of the sample useful for dating is governed by both the composition and the effective ranges of various types of radioactivity. Terrestrial radioactivity consists of alpha, beta, and gamma radiation. Alpha particles are helium nuclei with high energies and short ranges, on the order of about 20 µm. Beta particles are electrons with medium ranges of up to 2 mm. Gamma particles are high-energy photons with ranges up to 30 cm in soil. ^{40}K is a beta and gamma emitter, while the various steps of the decay chains emit all three. Some minerals, such as quartz, have little internal radioactivity, so that sand-sized quartz particles, for example, are affected just on their surfaces by alpha radiation. If a sample containing both coarse-grained quartz and fine grains were mixed together, the luminescence signal of the mixture could not readily be related to the dose rate because some of the luminescence is a function of just betas and gammas and some a function of betas, gammas, and alphas. One alternative is to measure luminescence on just coarse grains, usually either quartz or feldspars. Both produce luminescence signals that are responsive to dose and neither have internal sources of alpha irradiation. For quartz, the outer surfaces of the grains are removed by hydrofluoric acid, so that the luminescence is only a function of betas and gammas, easing analysis. Only a very weak etch can be applied to feldspars without dissolving the whole grain, but alpha radiation still only plays an insignificant role. Potassium-based feldspars do have internal beta radiation from ^{40}K. If the sample is fine-grained, like many ceramics, an option is to isolate polymineral fine grains, usually 1 to 8 or 4 to 11 μm. These are small enough to not attenuate alpha radiation, so the luminescence is a function of all three. Sample preparation then is a matter of isolating either coarse grains of quartz or feldspar or fine grains for measurement.

A further complication with alpha irradiation if fine grain measurements are being made is the lower efficiency of alpha particles in producing luminescence. Because alphas are so energetic and so short-ranged, they saturate all the traps in their immediate vicinity before they use up all their energy. The remaining energy goes to waste, in terms of luminescence, with the result that alphas are only about one-tenth as effective at producing luminescence as betas or gammas. This has to be taken into account when determining the dose rate. It is usually measured by comparing luminescence sensitivity determined by either alpha or beta irradiation. The ratio is called the b-value (Huntley et al. 1988).

The gamma radiation that affects the sample luminescence arises largely from outside the sample, because of its relatively long range. An estimation of the radioactivity of the immediate surroundings of the sample is therefore necessary. This can be measured in the field either by implanting radiation-sensitive dosimeters or by using portable gamma spectrometers. If the environment is relatively homogeneous, a representative sediment sample can also be collected and measured in the laboratory. This is what is normally done for ceramic dating. Figure 12.3 illustrates radioactive ranges and their effects on samples.

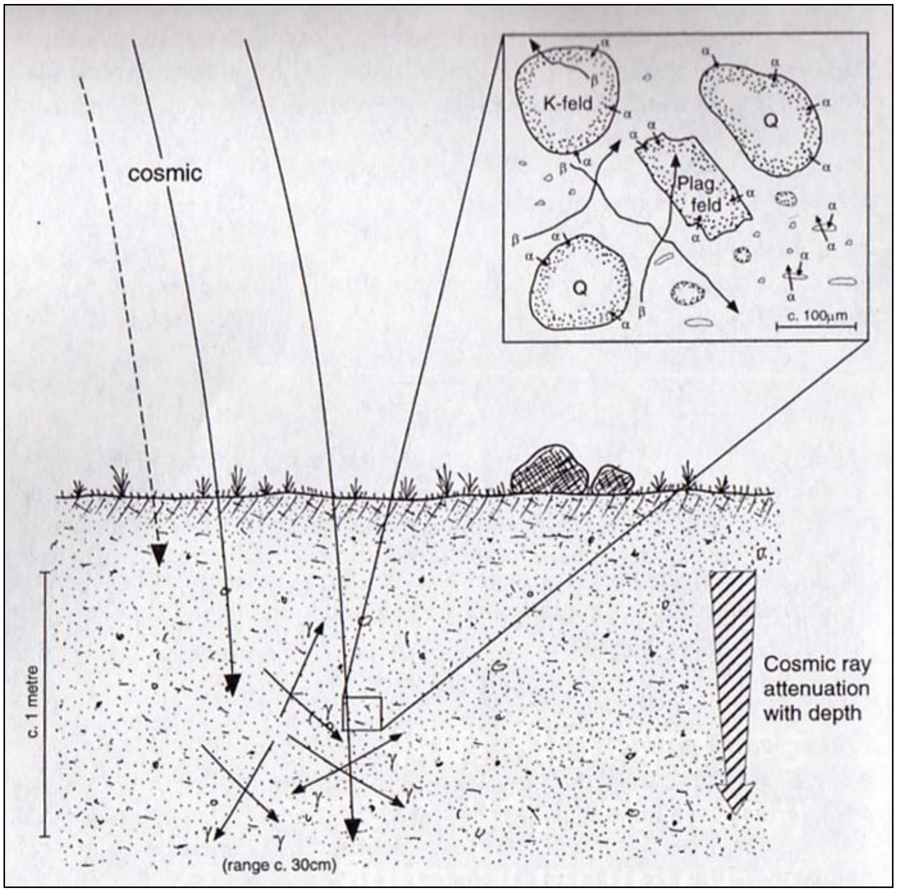

Figure 12.3. Ranges of different kinds of radiation are shown for typical sediment. The inset shows the penetration range of beta and alpha particles for different grain sizes. Dating is usually performed on either sand-sized grains of quartz or feldspar or on polymineral fine grains (4 to 11µm). (Figure by Stephen Stokes [Aitken 1998]).

Quartz and feldspar are both ubiquitous minerals, but they have their advantages and disadvantages. Feldspars have brighter luminescence signals and saturate at higher levels, making them useful for both very old and very young samples (Duller 1997). They are also the only mineral that responds significantly to infrared light stimulation (called IRSL), so that mineral separation is not necessary. But they suffer from a malady called anomalous fading. This is the loss of electrons through time under ambient conditions from traps that have sufficient depth that the electrons should not escape. It is explained by a concept in quantum theory called tunneling. If fading has occurred, the age will be underestimated, although various procedures have been proposed to circumvent fading or correct for its effects (Huntley and Lamothe 2000). Because it does not exhibit fading, quartz is often the preferred mineral for dating. But some quartz has low sensitivity and it saturates at relatively young ages (as young as ~ 50,000 years), so feldspars are commonly employed as an alternative. Polymineral fine grains may also suffer from anomalous fading, because feldspars often dominate the signal from them.

Calibration against artificial irradiation to determine D_e is accomplished through construction of a growth curve plotting irradiation against luminescence (Aitken 1985). Two general methods are used. The first, called additive dose, involves applying increments of artificial dose to aliquots still containing the natural signal. D_e is determined by extrapolating the growth curve to the dose axis, a procedure that assumes the growth curve is the same shape in the extrapolated region as among the measured points. The assumption is often not valid (particularly for young samples) and the extrapolation is often with poor precision (common for old samples). The second, called regeneration, involves first reducing the natural signal to background on aliquots and then giving increments of dose to them. The growth curve is thus constructed from zero and D_e is determined by interpolating the natural signal into the growth curve. The problem with regeneration is possible sensitivity changes brought about in the process of reducing the natural signal to background. Sensitivity changes are caused by the redistribution of trapped charge that can alter preferred pathways of recombination. If the sensitivity changes, the regenerated growth curve may not have the same slope as the curve of which the natural signal is a part. In such cases, interpolation will produce an inaccurate D_e.

Traditionally, D_e has been measured using multi-aliquots. One set of aliquots is used to construct an additive dose curve and a second set (usually the ones from which the natural signal was measured on the first set) is used for regeneration. D_e is determined by an additive dose extrapolation corrected by an offset determined by the dose intercept of the regeneration curve (called supralinearity correction). Alternatively, the slope of the regeneration curve is adjusted by a multiplicative factor to match the sensitivity of the additive curve. The two curves are then shifted along the dose axis into coincidence by an amount equal to the D_e. This is called the slide method (Prescott et al. 1993) (Figure 12.4). The original authors of the slide method used the multiplicative factor just to test for sensitivity change and questioned whether it could be used to correct for it, but our laboratory has shown empirically, at least for TL on ceramics, that the slide method, even using the correction, produces the same answer as the method using supralinearity correction but often with better precision.

More recently, D_e from OSL has been determined using growth curves constructed on single aliquots. This has the obvious advantage of obviating the need to normalize among aliquots and has some other distinct benefits for sediment dating, which will be discussed later. The first attempt was using an additive dose technique (Duller 1995), but this did not overcome the extrapolation problems of additive dose and required some problematic corrections for successive measurements. A regeneration procedure became possible when a means to correct for sensitivity change was discovered. This was accomplished by administering a small test dose after each regeneration measurement (including the natural) (Murray and Wintle 2000). The OSL signal from the test dose has the same sensitivity as the regeneration measurement preceding it, allowing a way to normalize all measurements to the same sensitivity. This method is called single-aliquot regenerative dose (SAR) and is now the preferred method for measuring D_e with OSL (Table 12.1). A practical single-aliquot technique for TL has not been devised.

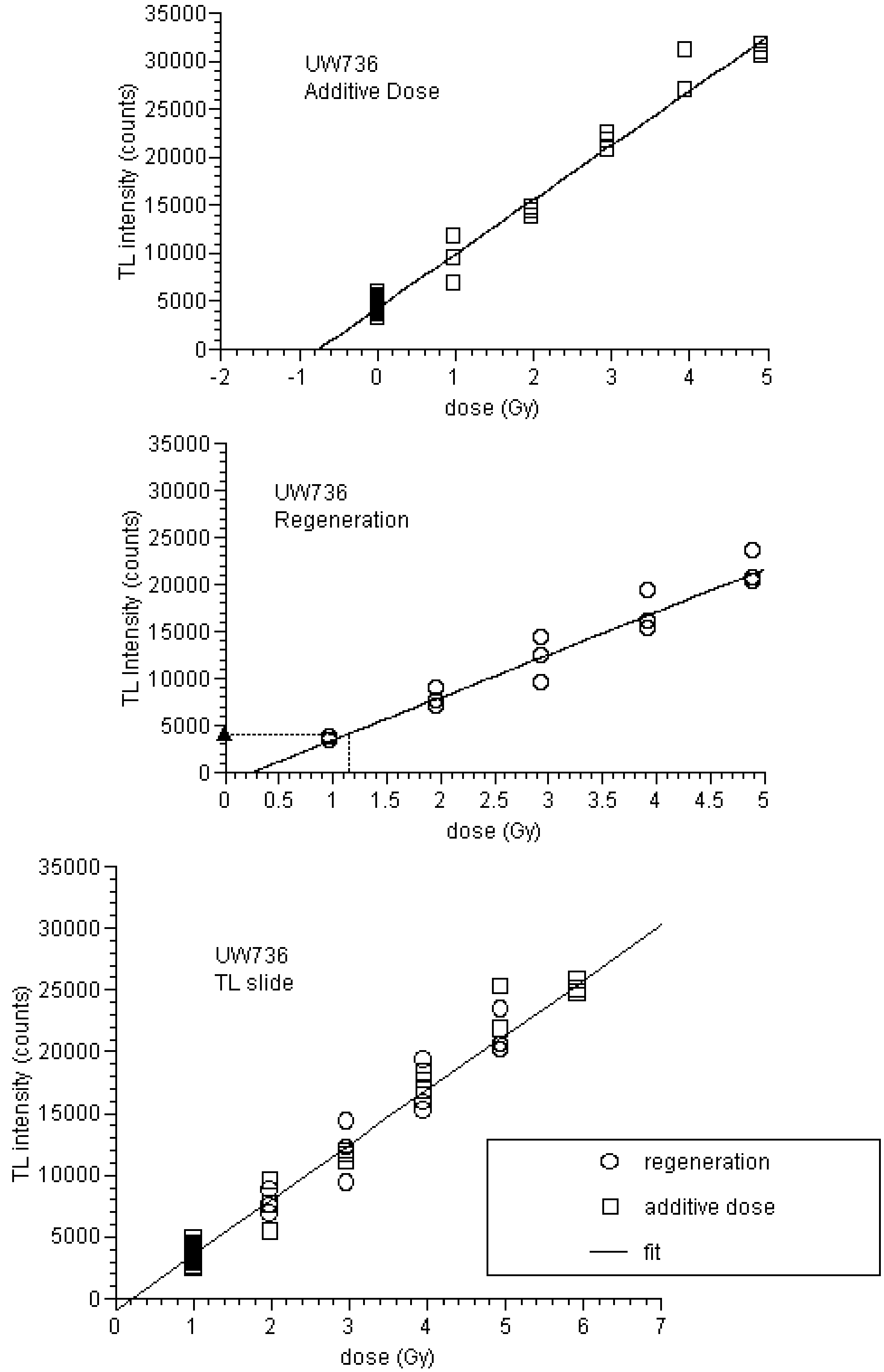

Figure 12.4. TL intensity. The top diagram shows an additive dose growth curve. The x-axis is artificial radiation dose administered in the laboratory (in Gy, the unit of absorbed dose). The points at zero dose represent the natural signal. Increments of dose are added to aliquots still containing the natural signal to construct the curve. Extrapolation from the

natural signals to the x-axis gives the amount of dose required to achieve the natural level. The middle diagram shows a regeneration growth curve, where increments of dose are administered to aliquots that have been zeroed. The natural signal is then interpolated into the curve as shown. The bottom diagram shows the additive dose and regeneration curves brought into coincidence by adjusting the regeneration points by a scale factor to make them parallel to the additive dose points and by shifting the points along the x-axis by an amount taken to be the equivalent dose. The sample is a prehistoric ceramic from New Mexico (Figure from Feathers 2003).

Table 12.1. Typical SAR sequence on single aliquot (Murray and Wintle 2000).

1. Dose (= 0 Gy if natural signal)
2. Preheat (e.g., 260°C for 10 seconds)
3. OSL (e.g., 60s at 125°C, stimulation using blue light, emission in UV), gives L_i
4. Fixed test dose (e.g., 5 Gy)
5. Cut heat (e.g., 160°C)
6. OSL (same as step 3), gives T_i
7. Repeat steps 1-6 for a range of regeneration doses bracketing the natural dose, a zero dose and a repeat (or recycle) point
8. Calculate L_i/T_i for natural and regeneration points and construct regeneration curve to determine D_E

DATING CERAMICS AND LITHICS

Dating ceramics are usually straightforward, because the heat necessary to make the ceramic is sufficient to reset fully the luminescence signal. This is not always the case with hearth stones or burned cherts. Sufficient heat from hearths does not always penetrate to the center of the rocks that form the hearth, requiring to sample near the surface or in the case of coarse-grained rocks using single-grain dating to isolate those grains most likely to have been heated sufficiently. Cherts were often heated in antiquity to improve flaking abilities, but often not high enough for luminescence dating (Dunnell et al. 1994). Cherts suitable for dating are often those that have been accidentally heated high enough, either by finding their way into a fire or by overheating during manufacture.

For either ceramics or lithics that have been heated sufficiently, luminescence provides a potential for dating that few other methods can match. For example, luminescence can be applied successfully to surface finds (Dunnell and Feathers 1994). This obviates the need for excavation to find datable material and thereby provides a cost-efficient way of dating for regional surveys. The ability of luminescence to date artifacts directly opens many opportunities (Feathers 2005a). It allows dating of small sites that lack diagnostics or other datable material. It allows the teasing apart of multiple occupations or otherwise mixed assemblages. By dating many artifacts from a single occupation, it allows estimations of occupation duration.

A drawback of luminescence dating of ceramics or lithics is lower precision than is obtainable from methods such as radiocarbon. In our laboratory, relative errors on ceramic or lithic dates average about 10 percent. Lower precision is a consequence of the large number of variables that must be estimated to achieve a date and therefore the propagation of the errors from each. Inaccurate estimations of any one variable can also lead to systematic errors. These often stem from changes in dose rate through time, varying moisture contents (which affect the dose rate), and anomalous fading. Our laboratory is experimenting with using OSL and IRSL on fine grains for determining D_e. These have the advantage of allowing single aliquot methods that provide higher precision. We predict that relative errors of as low as 5 percent can be achieved. By measuring first with IRSL and then with OSL, called the double SAR method (Banerjee et al. 2001; Roberts and Wintle 2001), it may also be possible to circumvent fading on fine grains if the IRSL can largely remove the feldspar signal, so that the subsequent OSL stems largely from quartz. Work needs to be done to see how b-value differs among OSL, IRSL, and TL.

As already mentioned, luminescence for some periods can currently provide better resolution than radiocarbon because of the flatness of the radiocarbon calibration curve.

DATING SEDIMENTS

Because of its utility in geology, luminescence research has focused on sediment dating, rather than ceramics or lithics. Dating sediments is more difficult because of a stronger possibility that sunlight was not of sufficient intensity to reset the luminescence signal at the time of deposition and also because of the propensity of sediments to become mixed through turbation processes after deposition (Bateman et al. 2003). In either case, some grains will provide the correct age of deposition, while others will not.

The luminescence community has addressed this question in two ways. One is to base dating on the most bleachable components of the luminescence signal. OSL has gained popularity over TL because it involves traps that are much more readily emptied by sunlight (although a rapidly bleaching TL component can be isolated in quartz, the procedure is cumbersome.) Even within OSL, there are some components more bleachable than others and efforts have been made to detect partial bleaching by comparison of fast and slow components (Bailey et al. 2003; Singarayer and Bailey 2003). A popular method for this is the use of linear modulated OSL (LM-OSL), where the intensity of stimulating light is steadily increased during exposure (Bulur et al. 2000). The early part of the resulting curve is associated with the fast component, the latter part with slower components (Olley et al. 2004a; Yoshida et al. 2003).

Another way to assess partial bleaching or mixing from turbation is by dating single grains, or less desirably single aliquots with a small number of grains (Roberts et al. 1999). Most work has been done with quartz, but some with feldspar (Lamothe et al. 1994). To make this practical, special instrumentation has been developed that uses a finely tuned green light laser to stimulate single grains that have been isolated in grids on specially designed sample holders (Bøtter-Jensen et al. 2003). The resulting distribution of D_e values is not easy to interpret. Some of the variation is due to differences in precision (bright grains have higher precision than dull ones), differences in microdosimetry (at the scale of individual grains, dose rates will vary from grain to grain) and differences in luminescence properties (fading, thermal transfer) (Galbraith et al. 2005). The challenge is to separate out these kinds of variation (which are largely random) from those caused by partial bleaching or turbation. Statistical models have been applied to determine an over-dispersion value that expresses the percentage of variation that cannot be accounted for by differential precision (Galbraith et al. 1999). For single grains, over-dispersion values of less than 10 to 15 percent are rare, and some have observed from independently dated samples that values less than about 20 percent represent single-aged samples (Olley et al. 2004a, 2004b). Geological evidence is often used to decide what portion of the distribution will likely represent the best age estimate. For example, for fluvial sediments, where partial bleaching is often a concern because of transport turbidity and the filtering effects of water on sunlight, the distributions are often positively skewed with a long tail of larger values (Jain et al. 2004; Wallinga 2002). In this case a "minimum age" is calculated to represent the best bleached grains. Minimum age models, which statistically isolate the lowest value grains that could form a single-age distribution, have also been applied to dating paleosols (Bush and Feathers 2003) and in sand dunes where there is evidence of deflation (Feathers et al. 2005).

Despite these problems, sediment dating has great potential in archaeology. Single-grain dating can be used to assess stratigraphic integrity (if sediments are mixed or not), which is very important for controversial issues such as pre-Clovis occupation. Evidence of mixing can also help with questions concerning site formation.

SAMPLE COLLECTION

Archaeologists collecting samples for luminescence dating only need to remember four guidelines. One is to avoid exposing the sample to radiation that will affect the luminescence signal: heat, light, X-rays. Ceramics are not usually a problem during the collecting process because the sherd surfaces can be exposed to light. In the laboratory, the outer surfaces are removed and only the internal portion is used for luminescence measurements. For the same reason, lithics are not usually a problem unless they are translucent. In the latter case they should be placed in an opaque container soon after collection. Unconsolidated sediments require more care to avoid light. A common practice is to collect the samples from cleared profiles or by coring using opaque cylinders. The ends of the cylinders will be exposed to light but they can be removed in the laboratory and the inner part used for dating. Airport X-rays are some times a problem and samples should be sent ground freight when possible.

The second guideline is to think about the radioactive environment. Because gamma radiation has a range of about 30 cm in sediment, anything within 30 cm of the sample will contribute to the dose rate of the sample. This is why for ceramics and lithics, it is customary to collect a sediment sample from adjacent to the sample. Assuming this sediment is representative of the radioactivity surrounding the sample, the gamma dose rate can be measured from it. Ideally one should choose sample locations where the radioactive environment is not too complex, so that this assumption holds. Samples from deposits that are homogeneous in composition will have the least ambiguity in determining the external dose rate. If complex environments cannot be avoided, consideration of how the external dose rate will be determined is necessary. Additional samples may need to be collected or on site dosimetry measurements may be advisable. In all cases, consultation with the luminescence specialist before collection is recommended. (Because the radioactivity of the sample itself also needs to be measured, it is important not to alter the composition in any way. Adding glue or other substances to repair or label ceramics, for examples, should be avoided.

The third guideline is to select samples that have a high probability of having been zeroed at the time of interest. Again ceramics are usually not a problem, although specimens that are particularly soft, indicating very low firing temperatures, should be avoided. For lithics, choose samples that have clear evidence of heat damage. Sediments are more problematic and consultation with geologists about how they were deposited is advised. Aeolian deposits are usually well exposed to sunlight during deposition. Fluvial deposits can be problematic since water attenuates shorter wavelengths of light and high sediment load can further reduce light penetration. Colluvial sediments may also be problematic, depending on the mode of deposition. Even where bleaching is not complete, however, single-grain dating may allow isolation of those grains that were well-exposed.

The fourth guideline is the collection of sufficient sample. Ceramics should be at least 3 cm in diameter and 5 mm thick. In this case, bigger is better. Lithics should be somewhat larger to allow for difficulties in preparation. Samples for measuring radioactivity need only be about 100 g. Sediment samples for dating need to be about 400 g, depending on the grain-size distribution.

A final requirement is to provide the dating specialists with full provenience information on the sample, including latitude, longitude, altitude, depth of burial, stratigraphic relationships, sediment textures, and observations about moisture content. A profile map or photograph of sample contexts is useful.

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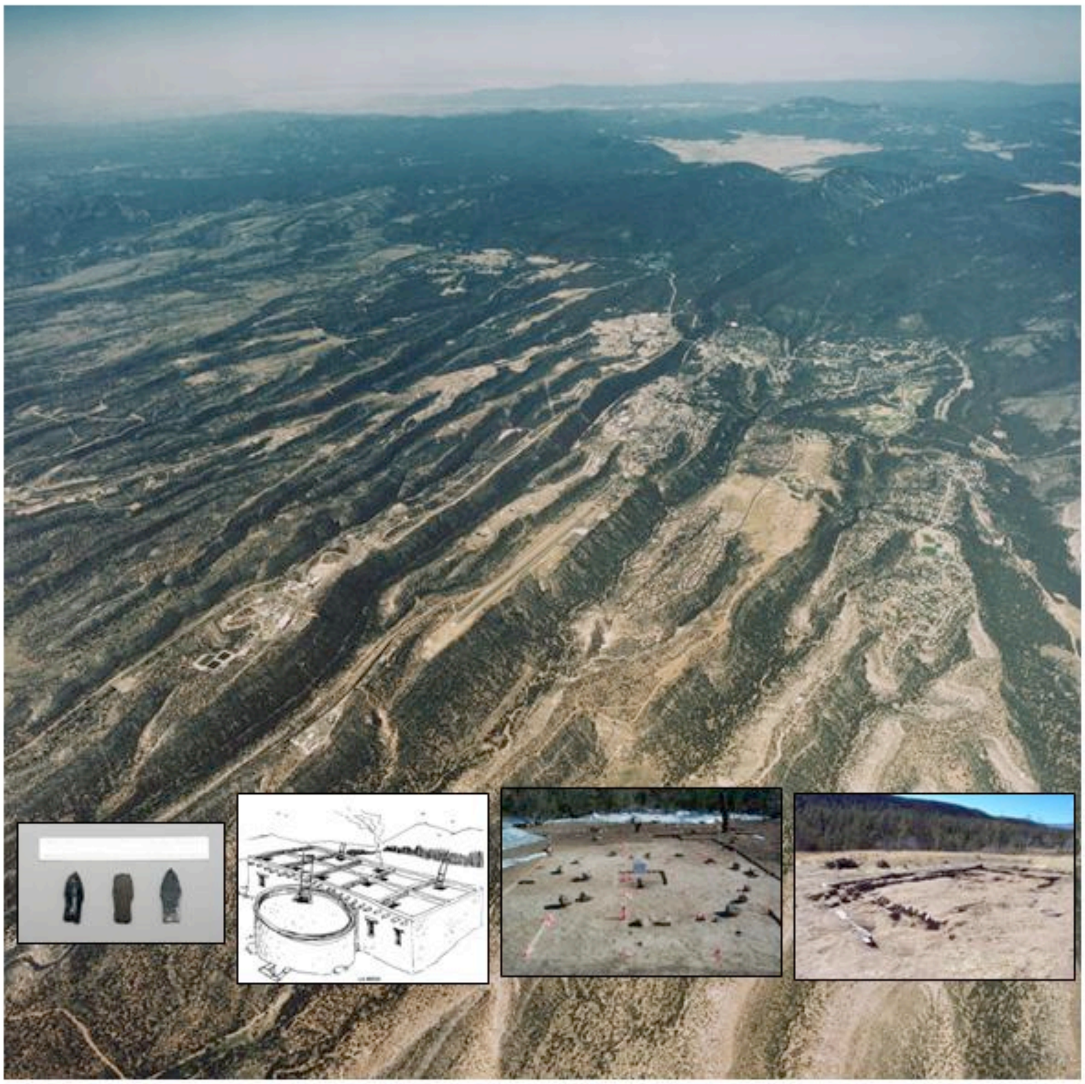

VOLUME 2: SITE EXCAVATIONS

Edited by Bradley J. Vierra, Kari M. Schmidt, and Brian C. Harmon

Ecology and Air Quality Group, Los Alamos National Laboratory
June 2008

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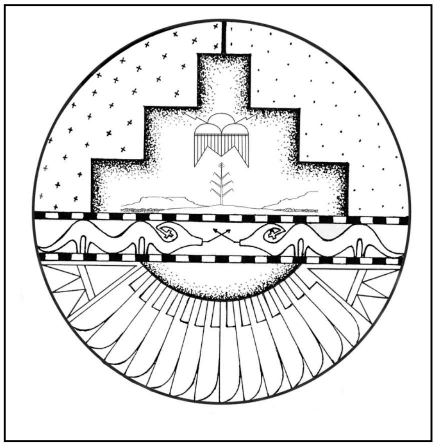

Artistic representation of the Pajarito Plateau; drawn by Aaron Gonzales.

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Title

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Contents

Chapter 13: Introduction to the Land Conveyance and Transfer Excavations, by Bradley J. Vierra ... 1
Field Methods ... 1
Site Types ... 3
Laboratory Methods ... 6
Land Tracts ... 7
Project Staff ... 12

Chapter 14: White Rock Tract (A-19): LA 12587, by Brian C. Harmon and Janet L. McVickar ... 15
Introduction and Site Setting ... 15
Site Description ... 15
Field Methods ... 17
Site Stratigraphy ... 20
Surface Collection ... 30
Site Excavation ... 32
Site Chronology and Assemblage ... 140
Site Occupational History ... 170
Summary of Site Excavations ... 171

Chapter 15: White Rock Tract (A-19): LA 12587 (Area 8), by Kari M. Schmidt ... 173
Introduction and Site Setting ... 173
Site Description ... 173
Field Methods ... 174
Stratigraphy ... 179
Site Excavation ... 182
Site Chronology and Assemblage ... 184
Summary ... 190

Chapter 16: White Rock Tract (A-19): LA 86637, by Kari M. Schmidt and Michael D. Kennedy ... 191
Introduction and Site Setting ... 191
Site Description ... 191
Field Methods ... 192
Stratigraphy ... 194
Site Excavation ... 198
Site Chronology and Assemblage ... 201
Summary ... 213

Chapter 17: White Rock Tract (A-19): LA 127625, by Kari M. Schmidt and Michael D. Kennedy ... 215
Introduction and Site Setting ... 215
Site Description ... 216
Field Methods ... 216

Stratigraphy.......... 218
Site Excavation.......... 219
Site Chronology and Assemblage.......... 219
Summary.......... 225

Chapter 18: White Rock Tract (A-19): LA 127631, by Kari M. Schmidt.......... 227
Introduction and Site Setting.......... 227
Site Description.......... 227
Field Methods.......... 227
Stratigraphy.......... 229
Site Excavation.......... 229
Site Chronology and Assemblage.......... 233
Summary.......... 241

Chapter 19: White Rock Tract (A-19): LA 128803, by Kari M. Schmidt.......... 243
Introduction and Site Setting.......... 243
Site Description.......... 243
Field Methods.......... 244
Stratigraphy.......... 247
Site Excavation.......... 247
Site Chronology and Assemblage.......... 250
Summary.......... 258

Chapter 20: White Rock Tract (A-19): LA 128804, by Kari M. Schmidt.......... 259
Introduction and Site Setting.......... 259
Site Description.......... 259
Field Methods.......... 259
Stratigraphy.......... 260
Site Excavation.......... 261
Site Chronology and Assemblage.......... 263
Summary.......... 270

Chapter 21: White Rock Tract (A-19): LA 128805, by Kari M. Schmidt.......... 271
Introduction and Site Setting.......... 271
Site Description.......... 271
Field Methods.......... 271
Stratigraphy.......... 272
Site Excavation.......... 275
Site Chronology and Assemblage.......... 278
Summary.......... 289

Chapter 22: Airport-South Tract (A-5-1): LA 86533, by Jennifer E. Nisengard.......... 291
Introduction and Site Setting.......... 291
Site Description.......... 291
Field Methods.......... 291
Surface Collection.......... 292

Analyses 293
Summary and Conclusions 296

Chapter 23: Airport-South Tract (A-5-1): LA 139418, by Jennifer E. Nisengard, Kari M. Schmidt, and Bradley J. Vierra 297
Introduction and Site Setting 297
Site Description and Field Methods 297
Stratigraphy 299
Site Excavation 300
Site Chronology and Assemblage 307
Construction History 320
Summary and Conclusions 320

Chapter 24: Airport-East Tract (A-3): LA 86534, by Kari M. Schmidt 323
Introduction and Site Setting 323
Site Description 323
Field Methods 327
Site Stratigraphy 332
Surface Collection 343
Site Excavation 344
Artifact and Sample Analyses 413
Summary of Site Excavations 435

Chapter 25: Airport-Central Tract (A-7): LA 135290, by Bradley J. Vierra 439
Introduction and Site Description 439
Field Methods 439
Site Geomorphology 443
Site Stratigraphy 443
Surface Collection 446
Site Excavation 447
Artifact and Sample Analysis 519
Site Occupational History 545
Summary 548

Chapter 26: Airport-Central Tract (A-7): LA 141505, by Bradley J. Vierra 549
Introduction and Site Setting 549
Field Methods 549
Stratigraphy 551
Site Excavation 552
Site Chronology and Assemblage 558
Summary 567

Chapter 27: Airport Tract: Airport Sites 1 and 2, by Charlie Steen and Bradley J. Vierra 569
Introduction 569
Site Descriptions 569

Chapter 28: Rendija Tract (A-14): LA 15116, by Gregory D. Lockard 575
Introduction and Site Setting 575
Field Methods 575
Stratigraphy........ 577
Site Excavation 578
Site Chronology and Assemblage 582
Summary........ 590

Chapter 29: Rendija Tract (A-14): LA 70025, by Michael J. Dilley and Bradley J. Vierra........ 591
Introduction........ 591
Field Methods 591
Stratigraphy........ 593
Site Excavation 593
Site Chronology and Sample Analysis........ 598
Summary........ 605

Chapter 30: Rendija Tract (A-14): LA 85403, by Gregory D. Lockard 607
Introduction........ 607
Field Methods 607
Stratigraphy........ 610
Site Excavation 611
Site Chronology and Assemblage 618
Summary........ 625

Chapter 31: Rendija Tract (A-14): LA 85404, by Gregory D. Lockard 627
Introduction........ 627
Field Methods 627
Stratigraphy........ 630
Site Excavation 631
Site Chronology and Assemblage 635
Summary........ 644

Chapter 32: Rendija Tract (A-14): LA 85407 (Serna Homestead), by Gregory D. Lockard........ 645
Introduction........ 645
Field Methods 646
Stratigraphy........ 648
Site Excavation 650
Site Chronology and Assemblage 671
Summary........ 695

Chapter 33: Rendija Tract (A-14): LA 85408, by Gregory D. Lockard 697
Introduction........ 697
Field Methods 697

Stratigraphy 700
Site Excavation 701
Site Chronology and Assemblage 705
Summary 713

Chapter 34: Rendija Tract (A-14): LA 85411, by Gregory D. Lockard 715
Introduction 715
Field Methods 715
Stratigraphy 719
Site Excavation 720
Site Chronology and Assemblage 732
Summary 746

Chapter 35: Rendija Tract (A-14): LA 85413, by Gregory D. Lockard 747
Introduction 747
Field Methods 747
Stratigraphy 751
Site Excavation 752
Site Chronology and Assemblage 755
Summary 765

Chapter 36: Rendija Tract (A-14): LA 85414, by Gregory D. Lockard 767
Introduction 767
Field Methods 767
Stratigraphy 771
Site Excavation 772
Site Chronology and Assemblage 775
Summary 782

Chapter 37: Rendija Tract (A-14): LA 85417, by Gregory D. Lockard 783
Introduction 783
Field Methods 784
Stratigraphy 787
Site Excavation 789
Site Chronology and Assemblage 794
Summary 802

Chapter 38: Rendija Tract (A-14): LA 85859, by Steven R. Hoagland 803
Introduction 803
Previous Investigations at LA 85859 804
Field Methods 804
Stratigraphy 806
Site Excavation 810
Site Chronology and Assemblage 822
Excavation Summary 836

Chapter 39: Rendija Tract (A-14): LA 85861, by Gregory D. Lockard 839
Introduction..... 839
Field Methods 839
Stratigraphy..... 842
Site Excavation 844
Site Chronology and Assemblage 848
Summary..... 860

Chapter 40: Rendija Tract (A-14): LA 85864, by Steven R. Hoagland 861
Introduction..... 861
Previous Investigations..... 861
Field Methods 862
Stratigraphy..... 863
Site Excavation 865
Site Chronology and Assemblage 870
Summary..... 877

Chapter 41: Rendija Tract (A-14): LA 85867, by Gregory D. Lockard 879
Introduction..... 879
Field Methods 880
Stratigraphy..... 881
Site Excavation 884
Site Chronology and Assemblage 887
Summary..... 895

Chapter 42: Rendija Tract (A-14): LA 85869, by Brian C. Harmon..... 897
Introduction..... 897
Site Description..... 898
Previous Investigations..... 898
Field Methods 899
Stratigraphy..... 901
Surface Collection..... 902
Site Excavation 902
Site Chronology and Assemblage 913
Site Summary..... 928

Chapter 43: Rendija Tract (A-14): LA 86605, by Michael J. Dilley and Bradley J. Vierra..... 929
Introduction..... 929
Field Methods 929
Stratigraphy..... 930
Site Excavation 933
Site Chronology and Assemblage 935
Summary of Site Excavations..... 943

Chapter 44: Rendija Tract (A-14): LA 86606, by Gregory D. Lockard 945
Introduction........ 945
Field Methods 945
Stratigraphy........ 950
Site Excavation 951
Site Chronology and Assemblage 955
Summary of Site Excavations........ 964

Chapter 45: Rendija Tract (A-14): LA 86607, by Gregory D. Lockard 965
Introduction........ 965
Field Methods 965
Stratigraphy........ 968
Site Excavation 969
Site Chronology and Assemblage 972
Summary of Site Excavations........ 976

Chapter 46: Rendija Tract (A-14): LA 87430, by Gregory D. Lockard 977
Introduction........ 977
Field Methods 977
Stratigraphy........ 980
Site Excavation 981
Site Chronology and Assemblage 987
Summary of Site Excavations........ 999

Chapter 47: Rendija Tract (A-14): LA 99396, by Brian C. Harmon........ 1001
Introduction and Site Setting 1001
Site Description........ 1002
Previous Investigations........ 1002
Field Methods 1003
Stratigraphy........ 1004
Surface Collection........ 1009
Site Excavation 1009
Site Chronology and Assemblage 1018
Site Summary........ 1032

Chapter 48: Rendija Tract (A-14): LA 99397, by Brian C. Harmon........ 1033
Introduction, Site Setting, and Site Description 1033
Previous Investigations........ 1034
Field Methods 1035
Stratigraphy........ 1035
Surface Collection........ 1040
Site Excavation 1041
Site Chronology and Assemblage 1042
Site Summary........ 1052

Chapter 49: Rendija Tract (A-14): LA 127627, by Michael J. Dilley and Bradley J. Vierra ... 1053
Introduction ... 1053
Field Methods ... 1053
Stratigraphy ... 1054
Site Excavation ... 1056
Site Chronology and Assemblage ... 1058
Summary of Site Excavations ... 1067

Chapter 50: Rendija Tract (A-14): LA 127633, by Michael J. Dilley and Bradley J. Vierra ... 1069
Introduction ... 1069
Field Methods ... 1069
Stratigraphy ... 1072
Site Excavation ... 1073
Site Chronology and Assemblage ... 1075
Summary of Site Excavations ... 1080

Chapter 51: Rendija Tract (A-14): LA 127634, by Gregory D. Lockard ... 1081
Introduction ... 1081
Field Methods ... 1081
Stratigraphy ... 1084
Site Excavation ... 1085
Site Chronology and Assemblage ... 1091
Summary of Site Excavations ... 1102

Chapter 52: Rendija Tract (A-14): LA 127635, by Michael J. Dilley and Bradley J. Vierra ... 1103
Introduction ... 1103
Field Methods ... 1103
Stratigraphy ... 1105
Site Excavation ... 1106
Site Chronology and Assemblage ... 1112
Summary of Site Excavations ... 1124

Chapter 53: Rendija Tract (A-14): LA 135291, by Michael J. Dilley and Bradley J. Vierra ... 1125
Introduction ... 1125
Field Methods ... 1125
Stratigraphy ... 1126
Site Excavation ... 1129
Site Chronology and Assemblage ... 1132
Summary of Site Excavations ... 1140

Chapter 54: Rendija Tract (A-14): LA 135292, by Gregory D. Lockard ... 1143
Introduction ... 1143

Field Methods ... 1143
Stratigraphy ... 1145
Site Excavation ... 1147
Site Chronology and Assemblage ... 1151
Summary of Site Excavations ... 1161

Chapter 55: Testing for Site Eligibility in the TA-74 and White Rock Y Tracts, by Steven R. Hoagland ... 1163
Introduction ... 1163
TA-74 Tract ... 1163
White Rock Tract ... 1199
Conclusion ... 1209

References Cited ... Vol. 4

Appendices ... Vol. 4

List of Figures

Figure 13.1. Distribution of sites within the White Rock Tract ... 8

Figure 13.2. Distribution of sites within the Airport Tract ... 10

Figure 13.3. Distribution of sites within the Rendija Canyon Tract ... 11

Figure 13.4. Distribution of sites within the TA-74 and White Rock Y Tracts ... 12

Figure 13.5. 2005 Cultural Resources Team ... 13

Figure 14.1. Final map of LA 12587, including excavated areas ... 16

Figure 14.2. Area map of LA 12587, excluding Area 8 ... 18

Figure 14.3. Surface distribution of ceramic artifacts (including Area 8) ... 31

Figure 14.4. Room 1 plan view ... 34

Figure 14.5. Room 1, east wall profile ... 37

Figure 14.6. Feature 2 plan view and profile ... 38

Figure 14.7. Room 2 plan view ... 40

Figure 14.8. Room 2 east wall ... 44

Figure 14.9. Feature 4 plan view ... 46

Figure 14.10. Feature 4 after excavation... 47

Figure 14.11. Feature 4 profile 48

Figure 14.12. Feature 5 plan view 49

Figure 14.13. Feature 5 after excavation... 50

Figure 14.14. Feature 20 plan view 51

Figure 14.15. Feature 11, postholes 1 and 2... 53

Figure 14.16. Room 4/5 plan view 54

Figure 14.17. Room 4/5, Floor 3 57

Figure 14.18. Room 4/5, Floor 2 58

Figure 14.19. Room 4/5, Floor 1 59

Figure 14.20. Room 4/5 southeast corner 61

Figure 14.21. Feature 1 plan view and profile.. 63

Figure 14.22. Feature 1 64

Figure 14.23. Feature 1 with surrounding floor removed 65

Figure 14.24. Feature 16 66

Figure 14.25. Room 6 plan view 68

Figure 14.26. Feature 7 plan view 71

Figure 14.27. Room 7 plan view 72

Figure 14.28. Room 7 73

Figure 14.29. Room 7 west wall profile.. 76

Figure 14.30. Feature 6 initial construction plan view 77

Figure 14.31. Feature 6 initial construction 78

Figure 14.32. Feature 6 remodeled hearth... 78

Figure 14.33. Feature 6 remodeled hearth plan view and profile 79
Figure 14.34. Room 8 plan view 82
Figure 14.35. Room 9 plan view 86
Figure 14.36. Room 3 after excavation 88
Figure 14.37. Room 3 plan view and profile 89
Figure 14.38. Room 3 north wall profile 90
Figure 14.39. Stratigraphic relationship between Roomblocks 1 and 3 94
Figure 14.40. Room 10 plan view and profile 95
Figure 14.41. Room 11 plan view and profile 99
Figure 14.42. Room 11 north wall 101
Figure 14.43. Room 12 plan view 102
Figure 14.44. Room 13 plan view 105
Figure 14.45. Room 14 plan view 107
Figure 14.46. Room 15 plan view 110
Figure 14.47. Room 16 plan view and profile 112
Figure 14.48. Room 17 plan view 115
Figure 14.49. Room 18 plan view 117
Figure 14.50. Room 18, Stratum 310 119
Figure 14.51. Rooms 19 to 21 plan view 120
Figure 14.52. Room 19 underlies Feature 22 121
Figure 14.53. Room 22 east wall 125
Figure 14.54. Feature 3 plan view 126
Figure 14.55. Feature 13 127

Figure 14.56. Feature 13 plan view 128

Figure 14.57. Feature 18 130

Figure 14.58. Feature 18 profile 131

Figure 14.59. Feature 22 plan view 132

Figure 14.60. Feature 22 profile 133

Figure 14.61. Feature 22 134

Figure 14.62. Midden profile at 101N/122 to 125E 136

Figure 14.63. Summary of dating results 144

Figure 14.64. Edge angle distribution for retouched pieces 156

Figure 14.65. Retouched flake, notch, uniface, endscraper, and drill 157

Figure 14.66. Bifaces and projectile points 157

Figure 14.67. One- and two-hand manos 159

Figure 15.1. Surface collection of Area 8 175

Figure 15.2. Distribution of ceramics on the surface of the site 176

Figure 15.3. Distribution of chipped stone materials on the surface of the site 177

Figure 15.4. Distribution of ground stone and FCR across the surface of the site 178

Figure 15.5. Unit 51N/118E at the end of excavation 181

Figure 15.6. Unit 36N/103E at the end of excavation 182

Figure 16.1. Surface artifact distribution at LA 86637 192

Figure 16.2. North-south view of LA 86637 193

Figure 16.3. 103N/79E, looking north 199

Figure 16.4. Soil profiles from LA 86637 200

Figure 16.5. Multi-directional core (top and side) 207

Figure 16.6. Projectile points.. 209

Figure 17.1. General overview of LA 127625.. 215

Figure 17.2. Collection of surface artifacts at LA 127625... 217

Figure 17.3. Post-excavation profiles of Test Pits 1 and 2... 220

Figure 17.4. Core (FS 37) from LA 127625.. 223

Figure 18.1. LA 127631 before excavation... 228

Figure 18.2. LA 127631 after excavation 231

Figure 18.3. Bifacial core on fieldhouse floor... 233

Figure 18.4. Plan view of excavated fieldhouse.. 234

Figure 19.1. Plan view and profile of the grid garden 244

Figure 19.2. Hoe recovered from surface of grid garden... 245

Figure 19.3. LA 128803 before excavation with southwest grid visible 246

Figure 19.4. Trench through LA 128803; wall at bottom, middle wall in center, and lower wall at top of photo 246

Figure 19.5. Hoe from LA 128803 251

Figure 20.1. LA 128804 before excavation; pin flags represent artifacts.......................... 260

Figure 20.2. Overview of the check dam site.. 262

Figure 21.1. LA 128805 before excavation... 272

Figure 21.2. Surface distribution of artifacts collected at LA 128805............................... 273

Figure 21.3. LA 128805 after excavation 276

Figure 21.4. Plan view and profile drawing of LA 128805 277

Figure 21.5. Uniface recovered at LA 128805 285

Figure 22.1. Establishing the grid at LA 86533 with the Nikon DTM.............................. 292

Figure 22.2. Distribution of surface artifacts at LA 86533 ... 293

Figure 22.3. Late Archaic projectile point ... 295

Figure 23.1. Distribution of chipped stone artifacts and features at LA 139418 ... 298

Figure 23.2. Plan view and profile of LA 139418 after excavation ... 302

Figure 23.3. East wall profile of Grid 1 ... 303

Figure 23.4. The tuff block wall that separates Grids 2 and 3 ... 303

Figure 23.5. East profile of Grid 2 with geomorphologic strata defined ... 304

Figure 23.6. A concentration of small tuff blocks encountered near the wall separating Grids 2 and 3 ... 305

Figure 23.7. Area 2 artifact scatter ... 306

Figure 23.8. Distribution of ceramics, ground stone artifacts, and features at LA 139418 ... 308

Figure 23.9. Late Archaic stemmed point from LA 139418 ... 313

Figure 23.10. LA 139418 post-excavation ... 321

Figure 24.1. Gridded units before excavation in western area of LA 86534 ... 324

Figure 24.2. Test pit in midden area where roomblock eventually was uncovered ... 325

Figure 24.3. Final plan view map of LA 86534 ... 326

Figure 24.4. Map showing the general areas at LA 86534 ... 328

Figure 24.5. Room 9 wall exposed in test pit; note rubble flush with bladed surface ... 330

Figure 24.6. Perimeter of Room 9 being exposed before mechanical excavation of the fill ... 331

Figure 24.7. Removal of kiva fill in the west half of Stratum 1 ... 332

Figure 24.8. Profile of the E115 line through the roomblock ... 333

Figure 24.9. Surface collection in Area 1 ... 343

Figure 24.10. Map showing the distribution of surface artifacts ... 345

Figure 24.11. Western portion of Area 2 just before the end of excavation 347

Figure 24.12. Profile of the E104 line in the western portion of Area 2............................ 348

Figure 24.13. Roomblock and kiva.. 349

Figure 24.14. Wall foundation of upright stones in situ, Room 2 350

Figure 24.15. Room 4 (back, center) floor.. 351

Figure 24.16. Histogram showing room size at LA 86534 352

Figure 24.17. Room 1, post-excavation 353

Figure 24.18. Hearth (Feature 4) in Room 1 357

Figure 24.19. Plan view and profile of Feature 4 358

Figure 24.20. Plan view map of Room 2 after excavation 360

Figure 24.21. Plan view and profile of Feature 2 365

Figure 24.22. Hearth (Feature 2) in Room 2 366

Figure 24.23. Plan view of Room 3 floor after excavation 367

Figure 24.24. Plan view of Room 4 floor after excavation 371

Figure 24.25. Floor in Room 4 372

Figure 24.26. Plan view of Room 5 floor after excavation 376

Figure 24.27. Feature 5 (hearth) in center of Room 5... 378

Figure 24.28. Plan view of Room 6 floor after excavation 382

Figure 24.29. Feature 12, an amorphous pit in Room 6.. 387

Figure 24.30. Feature 13, a milling bin.. 388

Figure 24.31. Plan view of Room 7 after excavation 390

Figure 24.32. Plan view of Room 8 after excavation 394

Figure 24.33. Room 9 after excavation.. 397

Figure 24.34. Plan view of Room 9 after excavation 400

Figure 24.35. Room 9, masonry construction above bedrock 401

Figure 24.36. Room 9, floor niche (Feature 6) 404

Figure 24.37. Room 9, wall niche (Feature 7) 405

Figure 24.38. Room 9, ventilator shaft and other kiva features 406

Figure 24.39. Room 9, Feature 15 as it appeared in October 2002 407

Figure 24.40. Room 9, Feature 15 as it appeared in December 2002 408

Figure 24.41. Plan view and profile of Feature 16 409

Figure 24.42. Room 9, Feature 16 410

Figure 24.43. Room 9, Features 16, 17, and 19 411

Figure 24.44. Room 9, Feature 20 412

Figure 24.45. Comparison of dated materials from LA 86534 416

Figure 24.46. Retouched flake, denticulate, uniface, and projectile points 424

Figure 24.47. Axe and hammerstones 426

Figure 24.48. Reconstruction of LA 86534 after excavation 437

Figure 25.1a. Photograph of the roomblock before it was excavated (looking north) 440

Figure 25.1b. Photograph of the roomblock after it was excavated (looking north) 440

Figure 25.2. Test trench profile of room stratigraphy 441

Figure 25.3. LA 135290 site excavation map 442

Figure 25.4. Surface artifact distribution 447

Figure 25.5. Photograph of Room 1 449

Figure 25.6. Room 1 floor map 450

Figure 25.7. Room 1, north wall 452

Figure 25.8. Room 1, south wall........ 453

Figure 25.9. Photograph of Room 2........ 455

Figure 25.10. Room 2 floor map 456

Figure 25.11. Photograph of Features 1, 3, 4, and 6........ 458

Figure 25.12. Features 1, 3, 4, 6, and 11 plan view........ 459

Figure 25.13. Photograph of Feature 11........ 461

Figure 25.14. Feature 11 plan view and cross section........ 462

Figure 25.15. Rooms 1 and 2 north walls 464

Figure 25.16. Photograph of Room 3 (looking north) 467

Figure 25.17. Room 3 plan view 468

Figure 25.18. Northwest corner of Room 3 with offset walls in foreground........ 470

Figure 25.19. Photograph of Room 4, Floor 3 and Room 5, Floor 2........ 472

Figure 25.20. Room 4, Floor 3, and Room 5, Floor 2, plan view 473

Figure 25.21. Photograph of Room 4, Floor 2 474

Figure 25.22. Room 4, Floor 2, plan view 475

Figure 25.23. Photograph of Room 4, Floor 1 476

Figure 25.24. Room 4, Floor 1, plan view 477

Figure 25.25. Room 4, north wall........ 479

Figure 25.26. Photograph of Room 5, Floor 2 481

Figure 25.27. Photograph of Room 5, Floor 1 482

Figure 25.28. Room 5, Floor 1, plan view 483

Figure 25.29. Photograph of Room 5, south wall........ 485

Figure 25.30. Photograph of Room 5, north wall........ 486

Figure 25.31. Photograph of Room 6, Floor 3 488

Figure 25.32. Room 6, Floor 3, plan view 489

Figure 25.33. Room 6 postholes 490

Figure 25.34. Room 6, Floor 2, plan view 491

Figure 25.35. Photograph of Floors 1 and 3 492

Figure 25.36. Room 6, Floor 1, plan view 493

Figure 25.37. Room 6, Floor 1, Feature 2 postholes 494

Figure 25.38. Burned west wall in Room 6 495

Figure 25.39. Photograph of Room 7 497

Figure 25.40. Room 7 plan view 498

Figure 25.41. Photograph of Room 8 501

Figure 25.42. Room 8 plan view 502

Figure 25.43. Photograph of Feature 9 503

Figure 25.44. Feature 9 plan view and cross section 504

Figure 25.45. Feature 9, upper and lower hearth 505

Figure 25.46. Room 8, west wall 506

Figure 25.47. Room 8, south wall 506

Figure 25.48. Photograph of Rooms 9A and 9B 509

Figure 25.49. Rooms 9A and 9B plan view 510

Figure 25.50. West wall of Rooms 9A and B 512

Figure 25.51. Feature 15 plan view 514

Figure 25.52. Photograph of Feature 15 515

Figure 25.53. Photograph of tuff rocks surface cluster 517

Figure 25.54. Histogram showing room size at LA 135290 520

Figure 25.55. Comparison of dated materials from LA 135290 523

Figure 25.56. Single-directional, multi-face core (top and front) 531

Figure 25.57. Retouched flake, perforator, biface, and projectile points 532

Figure 25.58. Two-hand mano and maul 534

Figure 25.59. Polishing stone and miscellaneous ground stone 535

Figure 25.60. Plan view of roomblock 546

Figure 25.61. Photograph of roomblock (south) 547

Figure 26.1. Plan view and profile maps of LA 141505 550

Figure 26.2. Room 1 after excavation 552

Figure 26.3. Room 2 after excavation 554

Figure 26.4. Feature 3 after excavation 556

Figure 26.5. Feature 4 after excavation 557

Figure 26.6. Photo of LA 141505 after excavation with test pit in foreground 558

Figure 27.1. Plan map of Airport Site 2 (after Steen 1977: Figure A-46) 570

Figure 27.2. Airport Site 2 excavations (looking northeast?) 571

Figure 27.3. Frederick Worman at airport site excavations 572

Figure 28.1. Post-excavation photograph of Room 1 at LA 15116 576

Figure 28.2. Plan view and profile drawings of Room 1 at LA 15116 577

Figure 28.3. Single-face core 586

Figure 29.1. Pre-excavation photo of LA 70025 592

Figure 29.2. Post-excavation photo of LA 70025 594

Figure 29.3. Plan view and profile of LA 70025 595

Figure 29.4. Interior of the east wall of Room 1 597

Figure 30.1. LA 85403 before excavation............ 608

Figure 30.2. Plan view and profile of fieldhouse at LA 85403 609

Figure 30.3. Post-excavation photograph of the fieldhouse at LA 85403 610

Figure 30.4. South wall of LA 85403 613

Figure 30.5. Features 1 and 2 in Room 1 614

Figure 30.6. Plan view drawings of Features 1 and 2 615

Figure 30.7. Feature 1 after excavation............ 616

Figure 31.1. LA 85404 before excavation............ 628

Figure 31.2. Plan view and profile views of LA 85404 629

Figure 31.3. Post-excavation photograph of LA 85404 630

Figure 31.4. A patch of burned floor in Room 1 632

Figure 31.5. Projectile point and unifaces from LA 85405............ 639

Figure 32.1. View of the cabin area before excavation 647

Figure 32.2. Site map and surface collection at LA 85407 648

Figure 32.3. Profiles of the cabin (Rooms 1 and 2) where excavations were concentrated 649

Figure 32.4. Plan view of cabin (Rooms 1 and 2) 651

Figure 32.5. Post-excavation photo of Area 1, the cabin 652

Figure 32.6. *In situ* mano and metate just outside the cabin 653

Figure 32.7. *In situ* remnants of the cabin floor 655

Figure 32.8. *In situ* floorboard located just outside the cabin 656

Figure 32.9. Rock feature (Feature 1) located north of the cabin............ 659

Figure 32.10. Plan view and profile of Feature 1 (horno)............ 660

Figure 32.11. Patch of oxidized soil associated with a burned adobe surface in Feature 1. 661

Figure 32.12. Post-excavation photo of Feature 2 (possible privy) 662

Figure 32.13. Plan view of Feature 2, a circular rock feature identified as a possible privy 663

Figure 32.14. Post-excavation photo of Room 3, the shed 664

Figure 32.15. Plan view of Room 3, the shed 665

Figure 32.16. Plan view of Feature 3, the corral 668

Figure 32.17. Plan view of Feature 4, the reservoir... 670

Figure 32.18. Retouched flake and projectile point... 685

Figure 33.1. Photo of the mound at LA 85408 before excavation 698

Figure 33.2. Plan view and profile of the fieldhouse at LA 85408.................................... 699

Figure 33.3. Post-excavation of the fieldhouse at LA 85408 700

Figure 33.4. West profile of the geological test pit (unit 104N/101E) 704

Figure 33.5. Cobble uniface and single-directional core 709

Figure 34.1. Pre-excavation photo of the mound at LA 85411 716

Figure 34.2. Post-excavation photo of the fieldhouse at LA 85411 717

Figure 34.3. Plan view and profile of LA 85411... 718

Figure 34.4. Room 1 after excavation.. 720

Figure 34.5. Living surface identified in Room 1 722

Figure 34.6. Pit hearth (Feature 1) in Room 1 at LA 85411 724

Figure 34.7. Plan view and profile of Feature 1 725

Figure 34.8. Post-excavation photograph of Room 2 at LA 85411.................................... 726

Figure 34.9. Post-excavation photo of Feature 2 at LA 85411 729

Figure 34.10. Plan view and profile drawings of Feature 2 (hearth) in Room 2 at LA 85411 730

Figure 34.11. Photograph of the north profile of Test Pit 1 (103N/107E) 731

Figure 34.12. Photograph of the west profile of Test Pit 2 (subfloor excavation of the northernmost 35 cm of that portion of 103N/101E that is within Room 1) 731

Figure 34.13. Cobble uniface 738

Figure 34.14. Endscraper and San Jose dart point 739

Figure 34.15. Axe from LA 85411 741

Figure 35.1. Pre-excavation photograph of the mound at LA 85413 748

Figure 35.2. Post-excavation photograph of LA 85413 749

Figure 35.3. Plan view and profile of LA 85413 750

Figure 35.4. Cobble uniface from LA 85413 759

Figure 35.5. Axe from LA 85413 761

Figure 36.1. Pre-excavation photograph of LA 85414 768

Figure 36.2. Plan view and profile of LA 85414 769

Figure 36.3. Post-excavation photograph of the fieldhouse at LA 85414 770

Figure 36.4. Area 2, a rock concentration located southwest of Room 1 770

Figure 37.1. Pre-excavation photograph of LA 85417 785

Figure 37.2. Plan view and profile of LA 85417 786

Figure 37.3. Post-excavation photograph of the fieldhouse at LA 85417 787

Figure 37.4. Burned floor in Room 1 at LA 85417 789

Figure 37.5. Plan view and profile of Feature 1, a small ashpit or hearth 792

Figure 37.6. Post-excavation of Feature 1, a possible hearth 793

Figure 37.7. Two-hand mano from LA 85417 798

Figure 38.1. Schematic of the excavations at LA 85859 803

Figure 38.2. Schematic of grid unit excavations at LA 85859 811

Figure 38.3. Profile of the 90N grid line 813

Figure 38.4. Dacite cobble and boulder outcrop forming western site occupation boundary 815

Figure 38.5. Dacite cobble and boulder barrier (upper center) with a hollow situated directly downslope to the east 816

Figure 38.6. Profile of the 114E grid line 820

Figure 38.7. Grid unit excavation with dacite barrier (center) and southwest-to-northeast-trending drainage channel slightly above 821

Figure 38.8. Bifacial core from LA 85859 826

Figure 38.9. Retouched flakes (top) and biface fragments (bottom) 828

Figure 38.10. Biface flake platform angles 829

Figure 38.11. One-hand cobble mano 830

Figure 39.1. Pre-excavation photograph of LA 85861 840

Figure 39.2. Plan view and profile of the fieldhouse at LA 85861 841

Figure 39.3. Post-excavation photograph of the fieldhouse at LA 85861 842

Figure 39.4. Plan view and profile drawing of Feature 1, a hearth 846

Figure 39.5. Post-excavation photograph of Feature 1, a hearth 847

Figure 39.6. Bifacial core 853

Figure 39.7. Retouched flake, biface, and uniface from LA 85861 854

Figure 39.8. Hoe and grooved abrader from LA 85861 855

Figure 40.1. Post-excavation plan view of the structure at LA 85864 863

Figure 40.2. Feature 2 (hearth) exposed with 1993 test pit located directed to the west..... 866

Figure 40.3. Feature 2 plan view and profile 867

Figure 40.4. Post-excavation photo of the hearth excavated in the tipi ring at LA 85864 .. 868

Figure 40.5. Post-excavation photo of LA 85864 looking east 868

Figure 40.6. LA 85864 site excavation surface profiles 869

Figure 40.7. Post excavation photo of the western end of LA 85864................................ 870

Figure 40.8. Post-excavation photo of the eastern end of LA 85864 871

Figure 41.1. Pre-excavation photograph of LA 85867 880

Figure 41.2. Plan view and profile map of LA 85867 882

Figure 41.3. Post-excavation photograph of LA 85867.. 883

Figure 41.4. Bifacial core from LA 85867... 890

Figure 41.5. Two-hand mano 892

Figure 42.1. Plan view of the excavations at LA 85869 897

Figure 42.2. Surface debitage distribution at LA 85869 903

Figure 42.3. Plan view of Feature 2, a tipi ring.. 904

Figure 42.4. Post-excavation photograph of Feature 2, a tipi ring 905

Figure 42.5. Plan view of Feature 4, a tipi ring.. 908

Figure 42.6. Feature 5, an alignment of dacite cobbles 911

Figure 42.7. Feature 6, a cobble circle.. 912

Figure 43.1. Pre-excavation photograph of LA 86605 930

Figure 43.2. Plan view and profile map of LA 86605 931

Figure 43.3. Post-excavation photograph of LA 86605.. 932

Figure 44.1. Pre-excavation photograph of LA 86606 946

Figure 44.2. Post-excavation plan view and profile map of LA 86606............................. 947

Figure 44.3. Post-excavation photograph of the fieldhouse at LA 86606 948

Figure 44.4. Post-excavation photograph of Feature 1, a rock alignment 948

Figure 44.5. Plan view drawing of Feature 1, a rock alignment.. 949

Figure 44.6. Two-hand mano from LA 86606 959

Figure 44.7. Axe fragment from LA 86606 960

Figure 45.1. Pre-excavation photograph of LA 86607 966

Figure 45.2. Plan view and profile of the fieldhouse at LA 86607..................................... 967

Figure 45.3. Post-excavation photograph of the fieldhouse at LA 86607 968

Figure 46.1. Pre-excavation photograph of LA 87430 978

Figure 46.2. Plan view and profile drawing of the fieldhouse at LA 87430....................... 979

Figure 46.3. Post-excavation photograph of the fieldhouse at LA 87430 980

Figure 46.4. Plan view and profile drawing of Feature 1, a slab-lined hearth 984

Figure 46.5. Post-excavation photograph of Feature 1, a slab-lined hearth........................ 985

Figure 46.6. Single-directional, single-face cores 991

Figure 46.7. Projectile point and bifaces from LA 87430.. 993

Figure 47.1. Plan view drawing of LA 99396 1001

Figure 47.2. Profile of Trench 4 at LA 99396 1007

Figure 47.3. Profile of Trench 2 at LA 99396 1008

Figure 47.4. Profile of Trench 3 at LA 99396 1008

Figure 47.5. LA 99396 surface chipped stone debitage.. 1009

Figure 47.6. LA 99396 surface ceramic artifacts 1010

Figure 47.7. Feature 1, partially excavated 1011

Figure 47.8. Plan view of Feature 2... 1012

Figure 47.9. Photograph of Feature 2 at LA 99396 1013

Figure 47.10. Profile of Feature 2 at LA 99396 1013

Figure 47.11. Post-excavation photograph of Feature 3 1015

Figure 47.12. Feature 5 plan view and profile.......... 1017

Figure 47.13. Dating methods comparison from LA 99396 1020

Figure 47.14. Uniface, endscraper, and projectile points.......... 1027

Figure 48.1. Plan view map of LA 99397.......... 1033

Figure 48.2. 107E profile at LA 99397.......... 1037

Figure 48.3. Profile of the stump hole at 100N 1038

Figure 48.4. Profile of Trench 1 1039

Figure 48.5. Profile of 117.1N/67.3E.......... 1040

Figure 48.6. Surface artifact distribution 1041

Figure 48.7. Retouched flake, biface fragment, and projectile point.......... 1047

Figure 48.8. Biface platform angles.......... 1047

Figure 49.1. LA 127627 before excavation.......... 1054

Figure 49.2. LA 127627 plan view and profile 1055

Figure 49.3. LA 127627, Room 1.......... 1057

Figure 49.4. Two-hand mano 1062

Figure 50.1. Pre-excavation photograph of the feature at LA 127633 1070

Figure 50.2. Plan view and profile of the excavations in Area 1 1071

Figure 50.3. Post-excavation photograph of Feature 1 1072

Figure 50.4. Profile of the 98E line in Area 2 1075

Figure 51.1. Pre-excavation photograph of LA 127634 1082

Figure 51.2. Plan view and profile drawing of the fieldhouse at LA 127634.......... 1083

Figure 51.3. Post-excavation photograph of LA 127634 1083

Figure 51.4. Post-excavation photograph of Feature 2, an entryway/staircase 1087

Figure 51.5. Feature 2, a slab-lined hearth at LA 127634.. 1088

Figure 51.6. Post-hole (Feature 3) 1089

Figure 52.1. Plan view and profile drawing of LA 127635 1104

Figure 52.2. Post-excavation photograph of LA 127635 1105

Figure 52.3. Post-excavation photograph of Feature 2 (hearth) 1109

Figure 52.4. Plan view and profile drawing of the hearth (Feature 2) at LA 127635 1110

Figure 52.5. Two-hand mano from LA 127635 1118

Figure 53.1. Pre-excavation photograph of LA 135291 1126

Figure 53.2. Plan view and profile drawing of LA 135291 1127

Figure 53.3. Post-excavation photograph of the fieldhouse at LA 135291........................ 1128

Figure 53.4. Post-excavation photograph of Feature 1 1130

Figure 53.5. Plan view and profile drawing of Feature 2... 1131

Figure 54.1. Pre-excavation photograph of LA 135292 1144

Figure 54.2. Plan view and profile drawing of LA 135292 1145

Figure 54.3. Post-excavation photograph of the fieldhouse at LA 135292........................ 1146

Figure 54.4. Burned patch of earth in Room 1 at LA 135292.. 1148

Figure 54.5. Profile of the north wall in the geologic test pit... 1151

Figure 54.6. Biface and projectile point.. 1156

Figure 54.7. Mano and axe from LA 135292.. 1157

Figure 55.1. LA 21596 geographic positioning system (GPS) differential map................ 1165

Figure 55.2. Plan view of Garden Plot A at LA 21596.. 1167

Figure 55.3. Plan view of Garden Plot B at LA 21596 1168

Figure 55.4. Plan view of overhang at LA 86528 1171

Figure 55.5. Post-testing photo of LA 86528 looking northwest 1172

Figure 55.6. LA 86531 GPS differential map 1175

Figure 55.7. Plan view of artifact scatter at LA 86531 1176

Figure 55.8. Photo of LA 86531, Test Units 2 and 3 looking north 1177

Figure 55.9. LA 110121 GPS differential map 1180

Figure 55.10. Plan view of artifact scatter at LA 110121 1181

Figure 55.11. LA 110126 GPS differential map 1183

Figure 55.12. Plan view of the one-room structure at LA 110126 1184

Figure 55.13. Photo of LA 110126 looking southeast 1185

Figure 55.14. LA 110130 GPS differential map 1187

Figure 55.15. Plan view of structure at LA 110130 1188

Figure 55.16. Post-testing photo of LA 110130 looking east 1189

Figure 55.17. LA 110132 GPS differential map 1191

Figure 55.18. Plan view of potential structure at LA 110132 1192

Figure 55.19. LA 110133 GPS differential map 1194

Figure 55.20. LA 117883 GPS differential map 1196

Figure 55.21. LA 61034 GPS differential map 1200

Figure 55.22. LA 61035 GPS differential map 1204

Figure 55.23. Post-excavation photo of Test Pit 1 at LA 65035 1206

List of Tables

Table 13.1. Artifact and sample abbreviations 7

Table 13.2. White Rock Tract ceramic artifact type by vessel form 8

Table 13.3. White Rock Tract lithic artifact type by material type 9

Table 14.1. Backhoe trenches.. 20

Table 14.2. Stratigraphic sequence used during excavation of LA 12587......................... 24

Table 14.3. Room dimension summary for Roomblock 1 32

Table 14.4. Room 1 stratigraphy 35

Table 14.5. Room 1 artifact counts by stratum... 35

Table 14.6. Room 1 wall dimensions (extant wall segments).. 36

Table 14.7. Room 1 analyzed samples by stratum 37

Table 14.8. Room 2 stratigraphy 40

Table 14.9. Room 2 artifact counts by stratum... 41

Table 14.10. Room 2 wall dimensions (extant walls segments) 45

Table 14.11. Room 2 analyzed samples by stratum 45

Table 14.12. Room 4/5 stratigraphy 55

Table 14.13. Room 4/5 artifact counts by stratum.. 56

Table 14.14. Room 4/5 wall dimensions (extant wall segments)...................................... 60

Table 14.15. Room 4/5 analyzed samples by stratum 62

Table 14.16. Room 6 stratigraphy 67

Table 14.17. Artifact counts by stratum in Room 6... 69

Table 14.18. Room 6 wall dimensions (extant wall segments)... 69

Table 14.19. Room 6 analyzed samples by stratum 70

Table 14.20. Room 7 stratigraphy 73

Table 14.21. Room 7 artifact counts by stratum.. 74

Table 14.22. Room 7 dimensions (extant wall segments) 75

Table 14.23. Room 7 analyzed samples by stratum 76

Table 14.24. Room 8 stratigraphy 83

Table 14.25. Room 8 artifact counts by stratum 83

Table 14.26. Room 8 wall dimensions (extant wall segments) 84

Table 14.27. Room 8 analyzed samples by stratum 84

Table 14.28. Room 9 stratigraphy 85

Table 14.29. Room 9 artifact counts by stratum 85

Table 14.30. Room 9 wall dimensions (extant wall segments) 87

Table 14.31. Room 9 analyzed samples by stratum 87

Table 14.32. Room 3 stratigraphy 88

Table 14.33. Room 3 artifact counts by stratum 90

Table 14.34. Room 3 wall dimensions 91

Table 14.35. Room 3 analyzed samples by stratum 91

Table 14.36. Room dimension summary for Roomblock 3 92

Table 14.37. LA 12587 stratigraphic summary 93

Table 14.38. Room 10 stratigraphy 96

Table 14.39. Room 10 artifact counts by stratum 97

Table 14.40. Room 10 wall dimensions (extant wall segments) 97

Table 14.41. Room 10 analyzed samples by stratum 98

Table 14.42. Room 11 stratigraphy 98

Table 14.43. Room 11 artifact counts by stratum 100

Table 14.44. Room 11 wall dimensions (extant wall segments) 101

Table 14.45. Room 11 analyzed samples by stratum.. 101

Table 14.46. Room 12 stratigraphy... 103

Table 14.47. Room 12 artifact counts by stratum.. 103

Table 14.48. Room 12 wall dimensions (extant wall segments)....................................... 104

Table 14.49. Room 13 stratigraphy... 104

Table 14.50. Room 13 artifact counts by stratum.. 106

Table 14.51. Room 13 wall dimensions (extant wall segments)....................................... 106

Table 14.52. Room 14 stratigraphy... 108

Table 14.53. Room 14 artifact counts by stratum.. 108

Table 14.54. Room 14 wall dimensions (extant wall segments)....................................... 108

Table 14.55. Room 14 analyzed samples by stratum.. 109

Table 14.56. Room 15 stratigraphy... 109

Table 14.57. Room 15 artifact counts by stratum.. 111

Table 14.58. Room 15 wall dimensions (extant wall segments)....................................... 111

Table 14.59. Room 16 stratigraphy... 113

Table 14.60. Room 16 artifact counts by stratum.. 113

Table 14.61. Room 16 wall dimensions (extant wall segments)....................................... 113

Table 14.62. Room 16 analyzed samples by stratum.. 114

Table 14.63. Room 17 stratigraphy... 114

Table 14.64. Room 17 artifact counts by stratum.. 114

Table 14.65. Room 17 wall dimensions (extant wall segments)....................................... 116

Table 14.66. Room 17 analyzed samples by stratum.. 116

Table 14.67. Room 18 stratigraphy... 118

Table 14.68. Room 18 artifact counts by stratum 118

Table 14.69. Room 18 wall dimensions (extant wall segments) 118

Table 14.70. Room 19 artifact counts by stratum 121

Table 14.71. Room 19 wall dimensions (extant wall segments) 122

Table 14.72. Room 20 artifact counts by stratum 122

Table 14.73. Room 20 wall dimensions (extant wall segments) 123

Table 14.74. Room 21 wall dimensions (extant wall segments) 123

Table 14.75. Room 22 wall dimensions (extant wall segments) 124

Table 14.76. Feature 22 artifact counts by stratum 133

Table 14.77. Midden stratigraphy 135

Table 14.78. Midden artifact counts by stratum 135

Table 14.79. Midden analyzed samples by excavation unit 136

Table 14.80. Burial 1 NAGPRA ceramic artifacts 137

Table 14.81. Burial 1 NAGPRA lithic artifacts 138

Table 14.82. Burial 1 NAGPRA other artifacts 138

Table 14.83. Burial 2 NAGPRA ceramic artifacts 139

Table 14.84. Burial 2 NAGPRA lithic artifacts 139

Table 14.85. Burial 3 NAGPRA ceramic artifacts 140

Table 14.86. Burial 3 NAGPRA lithic artifacts 140

Table 14.87. Systematic sample of ceramic and lithic artifacts and macrobotanical samples 141

Table 14.88. LA 12587 radiocarbon dating results 142

Table 14.89. LA 12587 archaeomagnetic dating results 142

Table 14.90. LA 12587 thermoluminescence dating results 143

Table 14.91. LA 12587 obsidian hydration dating results 143

Table 14.92. Distribution of ceramic types at LA 12587 145

Table 14.93. Distribution of ceramic wares at LA 12587 146

Table 14.94. Distribution of Santa Fe Black-on-white rim orientation 147

Table 14.95. Distribution of Santa Fe Black-on-white rim shape 147

Table 14.96. Distribution of Santa Fe Black-on-white rim decoration.............................. 147

Table 14.97. Distribution of Santa Fe Black-on-white primary rim designs 148

Table 14.98. Distribution of Santa Fe Black-on-white number of design motifs 148

Table 14.99. Lithic artifact type by material type 150

Table 14.100. Obsidian source samples 153

Table 14.101. Core type dimensions (mm) and weight (g)... 154

Table 14.102. Debitage reduction stages 154

Table 14.103. Retouched pieces 155

Table 14.104. Projectile point metrical (mm) and descriptive data.................................. 158

Table 14.105. Identified faunal remains from all contexts at LA 12587 160

Table 14.106. Identified faunal remains, minus probable intrusive rodents,
from LA 12587 161

Table 14.107. Ubiquity of flotation sample carbonized plant remains from LA 12587...... 162

Table 14.108. Ubiquity of flotation sample wood charcoal taxa from LA 12587............... 164

Table 14.109. Ubiquity of vegetal sample wood charcoal from LA 12587........................ 166

Table 14.110. *Zea mays* cob morphometrics (in mm) from LA 12587 167

Table 14.111. Pollen types identified by taxa and common names with sample frequency 168

Table 15.1. Geomorphologic analysis of test pits in Area 8, Test Pit Number 4,

51N/118E; inside main artifact scatter ... 179

Table 15.2. LA 12587 (Area 8), White Rock Land Transfer Parcel, Test Pit # 2, 36N/103E; outside main artifact scatter ... 180

Table 15.3. Stratigraphic sequence used during excavation at Area 8 ... 180

Table 15.4. Obsidian hydration dates for Area 8 at LA 12587 ... 184

Table 15.5. Distribution of ceramic types from Area 8 of LA 12587 ... 185

Table 15.6. Temper by ware for ceramics from Area 8 of LA 12587 ... 185

Table 15.7. Lithic artifact type by material type from Area 8 at LA 12587 ... 186

Table 15.8. Obsidian source samples ... 187

Table 15.9. Core type dimensions (mm) and weight (gm) ... 188

Table 15.10. Flotation sample plant remains from Area 8 at LA 12587 ... 189

Table 16.1. Stratigraphic sequence used in the field at LA 86637 ... 194

Table 16.2. Stratigraphy in unit 103N/79E ... 196

Table 16.3. Stratigraphy of 108N/137 ... 197

Table 16.4. Obsidian hydration dates for LA 86637 ... 201

Table 16.5. Ceramic types from LA 86637 ... 202

Table 16.6. Tradition by ware for ceramics from all contexts ... 202

Table 16.7. Temper by ware for all contexts ... 203

Table 16.8. Form by ware for LA 86637 ceramics ... 203

Table 16.9. LA 86637 lithic artifact type by material type ... 204

Table 16.10. Obsidian source samples from LA 86637 ... 205

Table 16.11. Core type dimensions (mm) and weight (gm) ... 206

Table 16.12. Debitage reduction stages ... 206

Table 16.13. Retouched pieces from LA 86637 ... 208

Table 16.14. Projectile point metrical (mm) and descriptive data.................................... 208

Table 16.15. Flotation sample plant remains from Test Pits 1 and 2................................ 210

Table 16.16. Pollen types identified by taxa and common names with sample frequency.. 210

Table 17.1. Ceramic types from LA 127625.. 217

Table 17.2. Stratigraphic sequence used during excavation at LA 127625....................... 218

Table 17.3. Obsidian hydration dates for LA 127625 219

Table 17.4. Tradition by ware for the LA 127625 ceramic assemblage............................ 221

Table 17.5. Temper by ware for the LA 127625 ceramic assemblage 221

Table 17.6. Ware by vessel form for the LA 127625 ceramic assemblage........................ 221

Table 17.7. Lithic artifact type by material type at LA 127625....................................... 222

Table 17.8. Obsidian source samples.. 222

Table 17.9. Core type dimensions (mm) and weight (gm)... 223

Table 17.10. LA 127625 flotation sample plant remains... 224

Table 17.11. LA 127625 flotation sample wood charcoal taxa by count and weight in grams.. 224

Table 18.1. Stratigraphy of 108N/104E located 4 m north of the fieldhouse 230

Table 18.2. Geomorphological profile of LA 127631 231

Table 18.3. Stratigraphic sequence used during excavation at LA 127631....................... 232

Table 18.4. Radiocarbon dates from LA 127631 235

Table 18.5. Obsidian hydration dates for LA 127631 235

Table 18.6. Distribution of ceramic types from LA 127631.. 235

Table 18.7. Tradition by ware for LA 127631 ceramics.. 236

Table 18.8. Temper by ware for LA 127631 ceramics 236

Table 18.9. Form by ware for LA 127631 ceramics 236

Table 18.10. Lithic artifact type by material type from LA 127631 237

Table 18.11. Obsidian source samples 237

Table 18.12. Core type dimensions (mm) and weight (gm) 238

Table 18.13. Flotation sample plant remains from LA 127631 239

Table 18.14. Vegetal sample wood charcoal taxa, by count and weight in grams, from LA 127631 240

Table 19.1. Geomorphological characteristics of the LA 128803 deposits 248

Table 19.2. Stratigraphic sequence used during excavations at LA 128803 249

Table 19.3. Radiocarbon dates from LA 128803 250

Table 19.4. LA 128803 flotation sample plant remains 252

Table 19.5. Pollen types identified by taxa and common names with sample frequency ... 254

Table 19.6. Pollen and flotation samples selected for analysis 256

Table 20.1. Geomorphological characteristics of soils in Test Pit 1 261

Table 20.2. Stratigraphic sequence used during excavation at LA 128804 263

Table 20.3. Obsidian hydration dates for LA 128804 264

Table 20.4. Distribution of ceramic types from LA 128804 265

Table 20.5. Tradition by ware for LA 128804 ceramics 265

Table 20.6. Temper by ware for ceramics from LA 128804 266

Table 20.7. Form by ware for LA 128804 ceramics 266

Table 20.8. Lithic artifact type by material type from LA 128804 267

Table 20.9. Obsidian source samples 268

Table 20.10. Flotation sample plant remains from LA 128804 269

Table 21.1. Geomorphological characteristics of test pit at LA 128805; pit located 1 m

southeast of southeast corner of fieldhouse 274

Table 21.2. Stratigraphic sequence used during excavations at LA 128805 274

Table 21.3. Radiocarbon dates from LA 128805 278

Table 21.4. Obsidian hydration dates for LA 128805 278

Table 21.5. Ceramic types from LA 128805 279

Table 21.6. Tradition by ware for LA 128805 ceramics 280

Table 21.7. Temper by ware for LA 128805 ceramics 281

Table 21.8. Form by ware for LA 128805 ceramics 281

Table 21.9. Lithic artifact type by material type at LA 128805 282

Table 21.10. Obsidian source samples 283

Table 21.11. Core type dimensions (mm) and weight (gm) 283

Table 21.12. Debitage reduction stages 283

Table 21.13. Flotation sample plant remains from LA 128805 285

Table 21.14. Flotation sample wood charcoal taxa by count and weight in grams from LA 128805 287

Table 21.15. LA 128805 room fill, vegetal sample carbonized plant remains, by count and weight in grams 287

Table 22.1. Ceramic types from LA 86533 293

Table 22.2. Lithic artifact type by material type from LA 86533 294

Table 22.3. Projectile point metrical (mm) and descriptive data 295

Table 23.1. Areas defined during the excavation of LA 139418 298

Table 23.2. Stratigraphic descriptions for LA 139418 299

Table 23.3. LA 139418 artifact counts by stratum 300

Table 23.4. Artifacts recovered from Grid 1 304

Table 23.5. Artifacts recovered from Grid 2 304

Table 23.6. Artifacts recovered from Grid 3 304

Table 23.7. Radiocarbon dates from LA 139418 308

Table 23.8. Obsidian hydration dates for LA 139418 309

Table 23.9. LA 139418 (Area 1, grid garden) ceramic types.................... 309

Table 23.10. LA 139418 (Areas 2, 3, and 4) ceramic types.................... 310

Table 23.11. Area 1 lithic artifact type by material type 311

Table 23.12. Areas 2, 3, and 4 lithic artifact type by material type.................... 311

Table 23.13. Obsidian source samples.................... 312

Table 23.14. Pollen and flotation samples selected for analysis from LA 139418 314

Table 23.15. Charcoal samples from LA 139418.................... 314

Table 23.16. Flotation sample plant remains from LA 139418.................... 315

Table 23.17. Vegetal wood charcoal taxa, by count and weight in grams from
LA 139418.................... 316

Table 23.18. Pollen types identified by taxa and common names with sample frequency
from LA 139418 316

Table 24.1. Designated areas at LA 86534 327

Table 24.2. General stratigraphic descriptions for LA 86534 334

Table 24.3. General artifact counts by stratum.................... 338

Table 24.4. Summary of soil morphology at LA 86534 341

Table 24.5. Room dimensions and floor area.................... 351

Table 24.6. Room 1 artifact counts by stratigraphic units 354

Table 24.7. Room 1 wall measurements 355

Table 24.8. Chipped stone artifacts recovered from sampled units in Room 1.................... 355

Table 24.9. Samples selected for analysis in Room 1 ... 356

Table 24.10. Room 2 artifact counts by stratigraphic units ... 361

Table 24.11. Room 2 wall measurements ... 362

Table 24.12. Samples selected for analysis in Room 2 ... 363

Table 24.13. Chipped stone artifacts recovered from sampled units in Room 2 ... 363

Table 24.14. Room 3 artifact counts by stratigraphic units ... 368

Table 24.15. Room 3 wall measurements ... 369

Table 24.16. Samples selected for analysis in Room 3 ... 369

Table 24.17. Chipped stone artifacts recovered from sampled units in Room 3 ... 370

Table 24.18. Room 4 artifact counts by stratigraphic units ... 373

Table 24.19. Room 4 wall measurements ... 374

Table 24.20. Samples selected for analysis in Room 4 ... 374

Table 24.21. Chipped stone artifacts recovered from sampled units in Room 4 ... 375

Table 24.22. Room 5 artifact counts by stratigraphic units ... 377

Table 24.23. Room 5 wall measurements ... 379

Table 24.24. Samples selected for analysis in Room 5 ... 379

Table 24.25. Chipped stone artifacts recovered from sampled units in Room 5 ... 380

Table 24.26. Room 6 artifact counts by stratigraphic units ... 383

Table 24.27. Room 6 wall measurements ... 384

Table 24.28. Samples selected for analysis in Room 6 ... 384

Table 24.29. Chipped stone artifacts recovered from sampled units in Room 6 ... 385

Table 24.30. Room 7 artifacts by stratigraphic units ... 391

Table 24.31. Room 7 wall measurements ... 391

Table 24.32. Samples selected for analysis in Room 7 392
Table 24.33. Chipped stone artifacts recovered from sampled units in Room 7 392
Table 24.34. Room 8 artifacts by stratigraphic units 395
Table 24.35. Room 8 wall measurements 395
Table 24.36. Samples selected for analysis in Room 8 396
Table 24.37. Chipped stone artifacts recovered from sampled units in Room 8 396
Table 24.38. Room 9 artifacts by stratigraphic units 399
Table 24.39. Samples selected for analysis in Room 9 402
Table 24.40. Chipped stone artifacts recovered from sampled units in Room 9 403
Table 24.41. Radiocarbon dates from LA 86534 413
Table 24.42. LA 86534 archaeomagnetic set results 414
Table 24.43. TL dates from burned plaster samples at LA 86534 414
Table 24.44. Obsidian hydration dates for LA 86534 415
Table 24.45. Comparison of dated materials from LA 86534 416
Table 24.46. Ceramic types from all contexts at LA 86534 417
Table 24.47. Tradition by ware for ceramics from all contexts at LA 86534 418
Table 24.48. Temper by ware for ceramics from all contexts at LA 86534 418
Table 24.49. LA 86534 lithic artifact type by material type 420
Table 24.50. Obsidian source samples 422
Table 24.51. Core type dimensions (mm) and weight (g) 422
Table 24.52. Debitage reduction stages 423
Table 24.53. Retouched pieces from LA 86534 424
Table 24.54. Projectile point metrical (mm) and descriptive data 425

Table 24.55. Identified faunal remains from all contexts at LA 86534 427

Table 24.56. Ubiquity of flotation sample carbonized plant remains at LA 86534 428

Table 24.57. Ubiquity of flotation sample wood charcoal taxa at LA 86534 429

Table 24.58. Pollen types identified by taxa and common names with sample frequency from LA 86534 430

Table 24.59. Identified pollen remains from the four intact hearths at LA 86534 433

Table 24.60. Identified wood charcoal from flotation remains from hearths at LA 86534 . 434

Table 24.61. Identified macrobotanical remains from hearths at LA 86534 435

Table 24.62. Identified faunal remains in heavy fraction samples from hearths at LA 86534.. 435

Table 25.1. LA 135290 site stratigraphy descriptions 443

Table 25.2. Room 1 wall measurements 451

Table 25.3. Room 1 artifact counts by stratigraphic unit 453

Table 25.4. Samples selected for analysis in Room 1 454

Table 25.5. Room 2 wall measurements 464

Table 25.6. Room 2 artifact counts by stratigraphic unit 465

Table 25.7. Samples selected for analysis in Room 2 465

Table 25.8. Room 3 wall measurements 470

Table 25.9. Room 3 artifact counts by stratigraphic unit 471

Table 25.10. Samples selected for analysis in Room 3 471

Table 25.11. Room 4 wall measurements 478

Table 25.12. Room 4 artifact counts by stratigraphic unit 479

Table 25.13. Samples selected for analysis in Room 4 480

Table 25.14. Room 5 wall measurements 485

Table 25.15. Room 5 artifact counts by stratigraphic unit 486

Table 25.16. Samples selected for analysis in Room 5 487

Table 25.17. Room 6 wall measurements 495

Table 25.18. Room 6 artifact counts by stratigraphic unit 496

Table 25.19. Samples selected for analysis in Room 6 496

Table 25.20. Room 7 wall measurements 499

Table 25.21. Room 7 artifact counts by stratigraphic unit 499

Table 25.22. Samples selected for analysis in Room 7 499

Table 25.23. Room 8 wall measurements 507

Table 25.24. Room 8 artifact counts by stratigraphic unit 507

Table 25.25. Samples selected for analysis in Room 8 507

Table 25.26. Room 9A wall measurements 512

Table 25.27. Room 9B wall measurements 512

Table 25.28. Room 9A artifact counts by stratigraphic unit 513

Table 25.29. Samples selected for analysis in Room 9A 513

Table 25.30. Room 9B artifact counts by stratigraphic unit 513

Table 25.31. Samples selected for analysis in Room 9B 513

Table 25.32. Area 2 artifact counts by stratigraphic unit 516

Table 25.33. Samples selected for analysis in Area 2 516

Table 25.34. Area 3 artifact counts by stratigraphic unit 517

Table 25.35. Samples selected for analysis in Area 3 518

Table 25.36. Area 4 artifact counts by stratigraphic unit 518

Table 25.37. Samples selected for analysis in Area 4 519

Table 25.38. Room dimensions and floor area ... 519

Table 25.39. Radiocarbon dates from LA 135290 ... 521

Table 25.40. Archaeomagnetic dates from LA 135290 ... 521

Table 25.41. Thermoluminescence dates from LA 135290 ... 522

Table 25.42. Obsidian hydration dates for LA 135290 ... 523

Table 25.43. Comparison of dated materials from LA 135290 ... 524

Table 25.44. Ceramic types from all contexts at LA 135290 ... 524

Table 25.45. Distribution of temper by ware at LA 135290 ... 526

Table 25.46. Distribution of wares at LA 135290 ... 526

Table 25.47. Distribution of vessel form by ware at LA 135290 ... 527

Table 25.48. LA 135290 lithic artifact type by material type ... 528

Table 25.49. Obsidian source samples ... 530

Table 25.50. Core type dimensions (mm) and weight (gm) ... 530

Table 25.51. Debitage reduction stages ... 531

Table 25.52. Retouched pieces ... 533

Table 25.53. Projectile point metrical (mm) and descriptive data ... 533

Table 25.54. Identified faunal remains from all contexts at LA 135290 ... 536

Table 25.55. Identified faunal remains, minus pocket gophers, from LA 135290 ... 536

Table 25.56. Ubiquity of flotation sample carbonized plant remains from LA 135290 ... 537

Table 25.57. Ubiquity of flotation sample wood charcoal taxa from LA 135290 ... 539

Table 25.58. Ubiquity of vegetal sample carbonized plant remains from LA 135290 ... 539

Table 25.59. *Zea mays* cob morphometrics from LA 12587, LA 86534, and LA 135290 .. 540

Table 25.60. Pollen types identified by taxa and common names with sample frequency from LA 135290 ... 542

Table 26.1. Stratigraphy descriptions from LA 141505 551

Table 26.2. Artifact counts by stratigraphic unit from LA 141505 551

Table 26.3. Wall measurements for Room 1 553

Table 26.4. Wall measurements for Room 2 555

Table 26.5. Samples from LA 141505 selected for analysis 558

Table 26.6. Distribution of ceramic types from LA 141505 559

Table 26.7. Tradition by ware for LA 141505 ceramics 559

Table 26.8. Temper by ware for LA 141505 ceramics 560

Table 26.9. Form by ware for LA 141505 ceramics 560

Table 26.10. Lithic artifact type by material type 561

Table 26.11. Core type dimensions (mm) and weight (g) 562

Table 26.12. Flotation sample plant remains from LA 141505 562

Table 26.13. Flotation sample wood charcoal taxa by count and weight in grams from LA 141505 563

Table 26.14. Vegetal sample plant remains by count and weight in grams from LA 141505 563

Table 26.15. Pollen types identified by taxa and common names with sample frequency from LA 141505 564

Table 27.1. Ceramic types from Airport 1 site 572

Table 27.2. Ceramic types from Airport 2 site 573

Table 27.3. Distribution of temper by ware at the Airport 2 site 573

Table 27.4. Comparison of average *Zea mays* kernel measurements (mm) at Airport 2, LA 12587, and LA 135290 574

Table 28.1. LA 15116 strata descriptions 578

Table 28.2. LA 15116 soil horizon descriptions from the north profile of the geological test

pit (grid unit 103N/101E) 578

Table 28.3. LA 15116 artifact counts by strata 578

Table 28.4. LA 15116 Room 1 wall measurements 581

Table 28.5. LA 15116 artifact counts by grid unit 582

Table 28.6. Samples selected for analysis from LA 15116 582

Table 28.7. Distribution of ceramics types from LA 15116 583

Table 28.8. Tradition by ware for LA 15116 ceramics 583

Table 28.9. Temper by ware for LA 15116 ceramics 583

Table 28.10. Vessel form by ware for LA 15116 ceramics 584

Table 28.11. LA 15116 lithic artifact type by material type 584

Table 28.12. Core type dimensions (mm) and weight (g) 585

Table 28.13. Flotation sample plant remains, count, and abundance per liter from LA 15116 587

Table 28.14. Flotation sample wood charcoal by count and weight in grams 587

Table 28.15. Pollen types identified by taxa and common names with sample frequency 588

Table 29.1. Stratigraphic descriptions from sediments at LA 70025 593

Table 29.2. Soil horizon descriptions from geomorphic test pit profile at LA 70025 593

Table 29.3. Artifact counts by strata 593

Table 29.4. Room 1 wall measurements 596

Table 29.5. Artifact counts by grid unit 598

Table 29.6. Soil samples selected for analysis from LA 70025 599

Table 29.7. Ceramic types from LA 70025 599

Table 29.8. Tradition by ware for LA 70025 ceramics 599

Table 29.9. Temper by ware for LA 70025 ceramics 600

Table 29.10. Vessel form by ware for LA 70025 ceramics 600

Table 29.11. Lithic artifact type by material type at LA 70025 601

Table 29.12. Core type dimensions (mm) and weight (g).. 601

Table 29.13. Flotation sample plant remains showing count and abundance per liter 602

Table 29.14. Flotation sample wood charcoal by count and weight in grams 602

Table 29.15. Pollen types identified by taxa and common names with sample frequency.. 603

Table 30.1. LA 85403 strata descriptions 610

Table 30.2. LA 85403 soil horizon descriptions from the west profile of 102N/100E 611

Table 30.3. LA 85403 soil horizon descriptions from the west profile of the geological test pit (the southern half of that portion of 102N/101E that is within Room 1) 611

Table 30.4. LA 85403 artifact counts by strata 611

Table 30.5. Room 1 wall measurements 613

Table 30.6. Artifact counts by grid unit 617

Table 30.7. Samples selected for analysis from LA 85403 618

Table 30.8. Distribution of ceramics types from LA 85403 619

Table 30.9. Tradition by ware for LA 85403 ceramics 619

Table 30.10. Temper by ware for LA 85403 ceramics 619

Table 30.11. Vessel form by ware for LA 85403 ceramics 619

Table 30.12. Lithic artifact type by material type 620

Table 30.13. Core type dimensions (mm) and weight (g).. 620

Table 30.14. Flotation plant remains, count, and abundance per liter from LA 85403 621

Table 30.15. Flotation sample wood charcoal by count and weight in grams 622

Table 30.16. Pollen types identified by taxa and common names with sample frequency.. 623

Table 31.1. LA 85404 strata descriptions 630

Table 31.2. LA 85404 soil horizon descriptions from the north profile of 103N/102E 631

Table 31.3. LA 85404 soil horizon descriptions from the west profile of 102N/100E 631

Table 31.4. LA 85404 artifact counts by strata 631

Table 31.5. LA 85404 Room 1 wall measurements........ 634

Table 31.6. LA 85404 artifact counts by grid unit........ 635

Table 31.7. Samples selected for analysis from LA 85404........ 635

Table 31.8. Ceramic types from LA 85404........ 636

Table 31.9. Tradition by ware for LA 85404 ceramics........ 636

Table 31.10. Temper by ware for LA 85404 ceramics 637

Table 31.11. Vessel form by ware for LA 85404 ceramics 637

Table 31.12. Lithic artifact type by material type 638

Table 31.13. Obsidian source samples........ 638

Table 31.14. Core type dimensions (mm) and weight (g)........ 639

Table 31.15. Flotation plant remains, count, and abundance per liter from LA 85404....... 640

Table 31.16. Flotation sample wood charcoal by count and weight in grams from LA 85404........ 641

Table 31.17. Pollen types identified by taxa and common names with sample frequency.. 642

Table 32.1. Strata descriptions from LA 85407 649

Table 32.2. Artifact counts by strata at LA 85407........ 649

Table 32.3. Artifact counts by area at LA 85407 650

Table 32.4. Average artifact count per grid unit by area at LA 85407 650

Table 32.5. Room 1/2 wall measurements 656

Table 32.6. Artifact counts from Area 1 by grid unit 658

Table 32.7. Area 3 (horno) artifact counts by grid unit 662

Table 32.8. Area 4 artifact counts by grid unit... 664

Table 32.9. Artifact counts by grid unit in Area 5 667

Table 32.10. Samples selected for analysis from LA 85407... 671

Table 32.11. Tree-ring dated samples from the Serna Homestead.................................... 671

Table 32.12. Ceramic types from LA 85407 672

Table 32.13. Tradition by ware for LA 85407 ceramics.. 672

Table 32.14. Temper by ware for LA 85407 ceramics 673

Table 32.15. Vessel form by ware for LA 85407 ceramics 673

Table 32.16. Comparison of artifacts from the McDougall and Serna homesteads by primary functions 681

Table 32.17. Lithic artifact type by material type 683

Table 32.18. Obsidian source samples... 684

Table 32.19. Flotation sample plant remains, count, and abundance per liter 688

Table 32.20. Room 1, post-occupational fill vegetal sample plant remains 691

Table 32.21. Flotation sample wood charcoal by count and weight in grams 691

Table 32.22. Pollen types identified by taxa and common names with sample frequency.. 692

Table 33.1. LA 85408 strata descriptions 700

Table 33.2. LA 85408 soil horizon descriptions from the west profile of the geological test pit (104N/101E).. 701

Table 33.3. LA 85408 artifact counts by strata 701

Table 33.4. Room 1 wall measurements 703

Table 33.5. LA 85408 artifact counts by grid unit.. 703

Table 33.6. Samples selected for analysis from LA 85408.. 705

Table 33.7. Ceramic types from LA 85408 705

Table 33.8. Tradition by ware for LA 85408 ceramics 706

Table 33.9. Temper by ware for LA 85408 ceramics 706

Table 33.10. Vessel form by ware for LA 85408 ceramics 706

Table 33.11. Lithic artifact type by material type from LA 85408 707

Table 33.12. Obsidian source samples 708

Table 33.13. Core type dimensions (mm) and weight (g) 708

Table 33.14. Flotation plant remains, count, and abundance per liter from LA 85408 710

Table 33.15. Pollen types identified by taxa and common names with sample frequency .. 711

Table 34.1. LA 85411 strata descriptions 719

Table 34.2. LA 85411 soil horizon descriptions from the north profile of Geological Test Pit 1 (103N/107E) 719

Table 34.3. LA 85411 soil horizon descriptions from the west profile of Test Pit 2 719

Table 34.4. LA 85411 artifact counts by strata 720

Table 34.5. LA 85411 Room 1 wall measurements 723

Table 34.6. LA 85411 Room 2 wall measurements 728

Table 34.7. LA 85411 artifact counts by grid unit 732

Table 34.8. Samples selected for analysis from LA 85411 732

Table 34.9. Archaeomagnetic results from LA 85411 733

Table 34.10. TL dates from Biscuit A ceramics at LA 85411 734

Table 34.11. Obsidian hydration dates for LA 85411 734

Table 34.12. Ceramic types from LA 85411 735

Table 34.13. Tradition by ware for LA 85411 ceramics 735

Table 34.14. Temper by ware for LA 85411 ceramics 735

Table 34.15. Vessel form by ware for LA 85411 ceramics 736

Table 34.16. Lithic artifact type by material type 736

Table 34.17. Obsidian source samples.. 738

Table 34.18. Core type dimensions (mm) and weight (g)... 739

Table 34.19. Projectile point metrical (mm) and descriptive data..................................... 740

Table 34.20. Flotation plant remains, count, and abundance per liter from LA 85411....... 741

Table 34.21. Flotation wood charcoal by count and weight in grams from LA 85411....... 743

Table 34.22. Pollen types identified by taxa and common names with sample frequency.. 744

Table 35.1. LA 85413 strata descriptions 751

Table 35.2. LA 85413 soil horizon descriptions from the east profile of unit 101N/106E . 751

Table 35.3. LA 85413 soil horizon descriptions from below the exterior face of the northeast wall of Room 1 (in unit 107N/105E) 751

Table 35.4. LA 85413 artifact counts by strata 751

Table 35.5. LA 85413 Room 1 wall measurements.. 754

Table 35.6. LA 85413 artifact counts by grid unit.. 755

Table 35.7. Samples selected for analysis from LA 85413... 755

Table 35.8. Ceramic types from LA 85413... 756

Table 35.9. Tradition by ware for LA 85413 ceramics... 756

Table 35.10. Temper by ware for LA 85413 ceramics 756

Table 35.11. Vessel form by ware for LA 85413 ceramics 757

Table 35.12. Lithic artifact type by material type 758

Table 35.13. Obsidian source samples.. 759

Table 35.14. Core type dimensions (mm) and weight (g)... 760

Table 35.15. Debitage reduction stages 760

Table 35.16. Flotation plant remains, count, and abundance at LA 85413........ 762

Table 35.17. Wood charcoal taxa by count and weight in grams from LA 85413........ 762

Table 35.18. Pollen types identified by taxa and common names with sample frequency.. 763

Table 36.1. LA 85414 strata descriptions 771

Table 36.2. LA 85414 soil horizon descriptions from the east profile of unit 103N/107E . 771

Table 36.3. LA 85414 soil horizon descriptions from the east profile of Peterson and Nightengale's Unit A (within grid unit 102N/105E) 771

Table 36.4. LA 85414 artifact counts by strata 772

Table 36.5. LA 85414 Room 1 wall measurements........ 773

Table 36.6. LA 85414, Area 1 artifact counts by grid unit 774

Table 36.7. LA 85414, Area 2 artifact counts by grid unit 775

Table 36.8. Samples selected for analysis from LA 85414........ 775

Table 36.9. Ceramic types from LA 85414........ 775

Table 36.10. Tradition by ware for LA 85414 ceramics........ 776

Table 36.11. Temper by ware for LA 85414 ceramics 776

Table 36.12. Vessel form by ware for LA 85414 ceramics 776

Table 36.13. Lithic artifact type by material type 777

Table 36.14. Obsidian source samples........ 778

Table 36.15. Flotation plant remains, count, and abundance from LA 85414........ 779

Table 36.16. Pollen types identified by taxa and common names with sample frequency.. 780

Table 37.1. LA 85417 strata descriptions 788

Table 37.2. LA 85417 soil horizon descriptions from the west profile of unit 104N/102E 788

Table 37.3. LA 85417 soil horizon descriptions from the interior face of the west wall of Room 1 (within unit 104N/104E) 788

Table 37.4. LA 85417 artifact counts by strata 788

Table 37.5. LA 85417 Room 1 wall measurements........ 791

Table 37.6. LA 85417 artifact counts by grid unit........ 794

Table 37.7. Samples selected for analysis from LA 85417........ 794

Table 37.8. TL dates from ceramics at LA 85417........ 795

Table 37.9. Ceramic types from LA 85417........ 795

Table 37.10. Tradition by ware for LA 85417 ceramics........ 796

Table 37.11. Temper by ware for LA 85417 ceramics........ 796

Table 37.12. Vessel form by ware for LA 85417 ceramics........ 796

Table 37.13. Lithic artifact type by material type........ 797

Table 37.14. Core type dimensions (mm) and weight (g)........ 797

Table 37.15. Flotation plant remains, count, and abundance at LA 85417........ 799

Table 37.16. Wood charcoal taxa by count and weight in grams from LA 85417........ 799

Table 37.17. Pollen types identified by taxa and common names with sample frequency.. 800

Table 38.1. LA 85859 strata descriptions........ 808

Table 38.2. LA 85859 artifact counts by strata........ 809

Table 38.3. Excavation levels in 90N/110E........ 810

Table 38.4. East and northeast unit artifact tallies........ 818

Table 38.5. LA 85859 artifact counts by grid unit........ 822

Table 38.6. Samples selected for analysis from LA 85859........ 822

Table 38.7. Obsidian hydration dates for LA 85859........ 823

Table 38.8. Lithic artifact type by material type........ 824

Table 38.9. Obsidian source samples 825

Table 38.10. Core type dimensions (mm) and weight (g) 826

Table 38.11. Debitage reduction stages 826

Table 38.12. Retouched pieces 827

Table 38.13. Flotation sample plant remains from LA 85859 831

Table 38.14. Flotation sample wood charcoal taxa by count and weight in grams from LA 85859 833

Table 38.15. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 85859 833

Table 38.16. Pollen types identified by taxa and common names with sample frequency 833

Table 39.1. LA 85861 strata descriptions 842

Table 39.2. LA 85861 soil horizon descriptions from the north profile of 106N/104E 843

Table 39.3. LA 85861 soil horizon descriptions from the north profile of 108N/106E 843

Table 39.4. LA 85861 soil horizon descriptions from the exterior face of the north wall of Room 1 (within unit 107N/99E) 843

Table 39.5. LA 85861 artifact counts by strata 843

Table 39.6. LA 85861 Room 1 wall measurements 845

Table 39.7. LA 85861 artifact counts by grid unit 848

Table 39.8. Samples selected for analysis from LA 85861 848

Table 39.9. TL dates from LA 85861 849

Table 39.10. Ceramic types from LA 85861 849

Table 39.11. Tradition by ware for LA 85861 ceramics 850

Table 39.12. Temper by ware for LA 85861 ceramics 850

Table 39.13. Vessel form by ware for LA 85861 ceramics 850

Table 39.14. Lithic artifact type by material type 851

Table 39.15. Obsidian source samples 852

Table 39.16. Core type dimensions (mm) and weight (g) 853

Table 39.17. Flotation plant remains, count, and abundance from Feature 1 (hearth) 856

Table 39.18. Wood charcoal taxa by count and weight in grams from Feature 1 (hearth) .. 857

Table 39.19. Pollen types identified by taxa and common names with sample frequency .. 857

Table 40.1. Stratigraphic summary for LA 85864 864

Table 40.2. Artifact count by stratum 869

Table 40.3. Samples selected for analysis from LA 85864 871

Table 40.4. Radiocarbon data from LA 85864 872

Table 40.5. Archaeomagnetic date for LA 85864 872

Table 40.6. Flotation sample plant remains from LA 85864 873

Table 40.7. Flotation sample wood charcoal taxa by count and weight in grams from LA 85864 874

Table 40.8. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 85864 874

Table 40.9. Pollen types identified by taxa and common names with sample frequency ... 875

Table 41.1. LA 85867 strata descriptions 883

Table 41.2. LA 85867 soil horizon descriptions from the south profile of Peterson and Nightengale's Unit A (within unit 103N/102E) 883

Table 41.3. LA 85867 artifact counts by strata 884

Table 41.4. LA 85867 Room 1 wall measurements 886

Table 41.5. LA 85867 artifact counts by grid unit 887

Table 41.6. Samples selected for analysis from LA 85867 887

Table 41.7. Ceramic types from LA 85867 887

Table 41.8. Tradition by ware for LA 85867 ceramics 888

Table 41.9. Temper by ware for LA 85867 ceramics 888

Table 41.10. Vessel form by ware for LA 85867 ceramics 888

Table 41.11. Lithic artifact type by material type 889

Table 41.12. Obsidian source samples 890

Table 41.13. Core type dimensions (mm) and weight (g) 891

Table 41.14. Pollen types identified by taxa and common names with sample frequency 892

Table 42.1. Stratigraphic sequence used during excavation at LA 85869 901

Table 42.2. Artifact count by stratum at LA 85869 902

Table 42.3. Area 2 and Feature 2 artifact counts by stratigraphic units 906

Table 42.4. Area 4 and Feature 4 artifact counts by stratigraphic units 909

Table 42.5. Samples selected for analysis from LA 85869 913

Table 42.6. Radiocarbon dates from LA 85869 913

Table 42.7. Thermoluminescence dating 914

Table 42.8. Obsidian hydration dates for LA 85869 914

Table 42.9. Metal artifacts from LA 85869 916

Table 42.10. Glass beads from LA 85869 917

Table 42.11. Lithic artifact type by material type 919

Table 42.12. Obsidian source samples 920

Table 42.13. Debitage reduction stages 920

Table 42.14. Charred macrobotanical remains from LA 85869 921

Table 42.15. Flotation sample plant remains from LA 85869 923

Table 42.16. Flotation sample wood charcoal taxa by count and weight in grams 924

Table 42.17. Vegetal sample taxa, by count and weight in grams 924

Table 42.18. Pollen types identified by taxa and common names with sample frequency.. 925

Table 43.1. LA 86605 strata descriptions 931

Table 43.2. LA 86605 soil horizon descriptions from the south profile of the geological test pit located outside the structure (103N/101E) 933

Table 43.3. LA 86605 soil horizon descriptions from the south profile of grid unit 103N/102E located inside the structure 933

Table 43.4. LA 86605 artifact counts by strata 933

Table 43.5. Room 1 wall measurements 935

Table 43.6. Artifact distribution by grid unit 935

Table 43.7. Samples selected for analysis from LA 86605... 936

Table 43.8. Ceramic types from LA 86605.. 936

Table 43.9. Temper by ware for ceramics from LA 86605... 937

Table 43.10. Vessel form by ware for ceramics from LA 86605...................................... 937

Table 43.11. Lithic artifact type by material type.. 938

Table 43.12. Obsidian source samples.. 938

Table 43.13. Flotation plant remains, count, and abundance per liter from LA 86605....... 939

Table 43.14. Flotation sample wood charcoal from LA 86605 by count and weight in grams.. 940

Table 43.15. Pollen types identified by taxa and common names with sample frequency.. 941

Table 44.1. LA 86606 strata descriptions 950

Table 44.2. LA 86606 soil horizon descriptions from the north profile of the geological test pit (unit 101N/102E) and its eastern extension (within unit 101N/103E) 950

Table 44.3. LA 86606 artifact counts by strata 951

Table 44.4. LA 86606 Room 1 wall measurements... 953

Table 44.5. LA 86606, Area 1 artifact counts by grid unit 954

Table 44.6. LA 86606, Area 2 artifact counts by grid unit 955

Table 44.7. Samples selected for analysis from LA 86606.. 955

Table 44.8. Ceramic types from LA 86606.. 955

Table 44.9. Tradition by ware for LA 86606 ceramics.. 956

Table 44.10. Temper by ware for LA 86606 ceramics 956

Table 44.11. Vessel form by ware for LA 86606 ceramics 956

Table 44.12. Lithic artifact type by material type 957

Table 44.13. Obsidian source samples.. 958

Table 44.14. Core type dimensions (mm) and weight (g)... 958

Table 44.15. Flotation plant remains, count and abundance from LA 86605 961

Table 44.16. Wood charcoal taxa by count and weight in grams...................................... 961

Table 44.17. Pollen types identified by taxa and common names with sample frequency.. 962

Table 45.1. LA 86607 strata descriptions 968

Table 45.2. LA 86607 soil horizon descriptions from the north profile of the geological test pit (unit 103N/100E).. 969

Table 45.3. LA 86607 artifact counts by strata 969

Table 45.4. LA 86607 Room 1 wall measurements.. 971

Table 45.5. LA 86607 artifact counts by grid unit.. 972

Table 45.6. Samples selected for analysis from LA 86607... 972

Table 45.7. Ceramic types from LA 86607.. 973

Table 45.8. Tradition by ware for LA 86607 ceramics... 973

Table 45.9. Temper by ware for LA 86607 ceramics 973

Table 45.10. Vessel form by ware for LA 86607 ceramics 973

Table 45.11. Pollen types identified by taxa and common names with sample frequency.. 974

Table 46.1. LA 87430 strata descriptions 981

Table 46.2. LA 87430 soil horizon descriptions from the south profile of 103N/102E...... 981

Table 46.3. LA 87430 artifact counts by strata 981

Table 46.4. LA 87430 Room 1 wall measurements.. 983

Table 46.5. LA 87430 artifact counts by grid unit.. 987

Table 46.6. Samples selected for analysis from LA 87430... 987

Table 46.7. TL date from ceramics at LA 87430 988

Table 46.8. Ceramic types from LA 87430.. 988

Table 46.9. Tradition by ware for LA 87430 ceramics... 989

Table 46.10. Temper by ware for LA 87430 ceramics 989

Table 46.11. Vessel form by ware for LA 87430 ceramics 989

Table 46.12. Lithic artifact type by material type 990

Table 46.13. Obsidian source samples.. 991

Table 46.14. Core type dimensions (mm) and weight (g)... 992

Table 46.15. Projectile point metrical (mm) and descriptive data..................................... 992

Table 46.16. Flotation plant remains, count and abundance per liter at LA 87430............ 994

Table 46.17. Flotation sample wood charcoal by count and weight in grams 995

Table 46.18. Pollen types identified by taxa and common names with sample frequency.. 996

Table 47.1. Trench dimensions.. 1004

Table 47.2. Stratigraphic sequence used during excavation 1004

Table 47.3. Artifact count by stratum 1006

Table 47.4. Features 1, 2, and 7 artifact counts by stratigraphic units 1014

Table 47.5. Samples selected for analysis from LA 99396 1018

Table 47.6. Radiocarbon dates from LA 99396 1019

Table 47.7. Archaeomagnetic date from LA 99396 1019

Table 47.8. Thermoluminescence dates from LA 99396 1020

Table 47.9. Obsidian hydration dates from LA 99396 1021

Table 47.10. Ceramic types from LA 99396 1022

Table 47.11. Temper by ware for ceramics from LA 99396 1022

Table 47.12. Vessel form by ware for ceramics from LA 99396 1022

Table 47.13. Lithic artifact type by material type from the surface scatter 1023

Table 47.14. Lithic artifact type by material type from Features 2 and 7 1024

Table 47.15. Obsidian source samples 1025

Table 47.16. Core type dimensions (mm) and weight (g) 1025

Table 47.17. Debitage reduction stages 1026

Table 47.18. Flotation sample plant remains from LA 99396 1028

Table 47.19. Flotation sample wood charcoal taxa by count and weight in grams from LA 99396 1029

Table 47.20. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 99396 1029

Table 47.21. Pollen types identified by taxa and common names with sample frequency 1030

Table 48.1. Stratigraphic summary of LA 99397 1036

Table 48.2. Artifact count by stratum 1037

Table 48.3. Artifact density: chipped stone/m^3 by area 1042

Table 48.4. Samples selected for analysis from LA 99397 1042

Table 48.5. Radiocarbon dates from LA 99397 1043

Table 48.6. Obsidian hydration dates for LA 99397 1043

Table 48.7. Lithic artifact type by material type 1044

Table 48.8. Obsidian source samples 1045

Table 48.9. Core type dimensions (mm) and weight (g) 1046

Table 48.10. Debitage reduction stages 1046

Table 48.11. Projectile point metric (mm) and descriptive data 1048

Table 48.12. Charred macrobotanical remains from LA 99397 1048

Table 48.13. Pollen types identified by taxa and common names with sample frequency.. 1049

Table 49.1. LA 127627 strata descriptions 1056

Table 49.2. LA 127627 soil horizon descriptions from the south profile of the geological test pit 1056

Table 49.3. LA 127627 artifact counts by strata 1056

Table 49.4. LA 127627 Room 1 wall measurements 1058

Table 49.5. Artifact distribution by grid unit 1058

Table 49.6. Samples selected for analysis from LA 127627 1058

Table 49.7. Ceramic types from LA 127627 1059

Table 49.8. Temper by ware for ceramics from LA 127627 1060

Table 49.9. Vessel form by ware for ceramics from LA 127627 1060

Table 49.10. Lithic artifact type by material type 1061

Table 49.11. Obsidian source samples 1061

Table 49.12. Core type dimensions (mm) and weight (g) 1062

Table 49.13. Flotation plant remains, count, and abundance per liter from LA 127627 1063

Table 49.14. Flotation sample wood charcoal by count and weight in grams 1064

Table 49.15. Pollen types identified by taxa and common names with sample frequency.. 1064

Table 50.1. Area 1 strata descriptions 1072

Table 50.2. Area 2 strata descriptions 1073

Table 50.3. Samples selected for analysis from LA 127633 1076

Table 50.4. Core type dimensions (mm) and weight (g) 1076

Table 50.5. Flotation plant remains, count and abundance per liter from LA 127633 1076

Table 50.6. Flotation sample wood charcoal by count and weight in grams 1077

Table 50.7. Pollen types identified by taxa and common names with sample frequency ... 1077

Table 51.1. LA 127634 strata descriptions 1084

Table 51.2. LA 127634 soil horizon descriptions from the north profile of the geological test pit (103N/100E) 1084

Table 51.3. LA 127634 artifact counts by strata 1084

Table 51.4. LA 127634 Room 1 wall measurements 1086

Table 51.5. LA 127634 artifact counts by grid unit 1090

Table 51.6. Samples selected for analysis from LA 127634 1091

Table 51.7. Thermoluminescence dates from ceramics at LA 127634 1091

Table 51.8. Obsidian hydration dates for LA 127634 1092

Table 51.9. Distribution of ceramics types from LA 127634 1092

Table 51.10. Tradition by ware for LA 127634 ceramics 1093

Table 51.11. Temper by ware for LA 127634 ceramics 1093

Table 51.12. Vessel form by ware for LA 127634 ceramics 1093

Table 51.13. Lithic artifact type by material type 1094

Table 51.14. Obsidian source samples 1095

Table 51.15. Flotation plant remains, count, and abundance per liter from LA 127634..... 1096

Table 51.16. Flotation sample wood charcoal by count and weight in grams 1098

Table 51.17. Pollen types identified by taxa and common names with sample frequency.. 1100

Table 52.1. LA 127635 strata descriptions.. 1106

Table 52.2. LA 127635 soil horizon descriptions from geomorphic test pit profile 1106

Table 52.3. LA 127635 artifact counts by strata 1106

Table 52.4. LA 127635 Room 1 wall measurements... 1108

Table 52.5. LA 127635 artifact counts by grid unit... 1112

Table 52.6. Samples selected for analysis from LA 127635 by FS#................................. 1112

Table 52.7. Thermoluminescence date from ceramics at LA 127635............................... 1113

Table 52.8. Obsidian hydration dates for LA 127635 1113

Table 52.9. Ceramic types from LA 127635... 1114

Table 52.10. Tradition by ware for LA 127635 ceramics.. 1115

Table 52.11. Temper by ware for LA 127635 ceramics 1115

Table 52.12. Vessel form by ware for LA 127635 ceramics 1115

Table 52.13. Lithic artifact type by material type 1116

Table 52.14. Obsidian source samples... 1117

Table 52.15. Core type dimensions (mm) and weight (g).. 1117

Table 52.16. Flotation plant remains, count and abundance per liter from LA 127635...... 1119

Table 52.17. Flotation sample wood charcoal by count and weight in grams from LA 127635.. 1121

Table 52.18. Pollen types identified by taxa and common names with sample frequency.. 1122

Table 53.1. LA 135291 strata descriptions.. 1128

Table 53.2. LA 135291 soil horizon descriptions from the east profile of 103N/105E 1129

Table 53.3. LA 135291 artifact counts by strata 1129

Table 53.4. LA 135291 Room 1 wall measurements.. 1132

Table 53.5. LA 135291 artifact distribution by grid unit.. 1132

Table 53.6. Samples selected for analysis from LA 135291... 1132

Table 53.7. Ceramic types from LA 135291.. 1133

Table 53.8. Temper by ware for ceramics from LA 135291... 1133

Table 53.9. Vessel form by ware for ceramics from LA 135291 1134

Table 53.10. Lithic artifact type by material type 1134

Table 53.11. Core type dimensions (mm) and weight (g)... 1135

Table 53.12. Flotation plant remains, count and abundance per liter from LA 135291 1136

Table 53.13. Flotation sample wood charcoal by count and weight in grams from LA 135291 1137

Table 53.14. Pollen types identified by taxa and common names with sample frequency.. 1138

Table 54.1. LA 135292 strata descriptions.. 1146

Table 54.2. LA 135292 soil horizon descriptions from the north profile of the geological test pit (102N/101E).. 1146

Table 54.3. LA 135292 soil horizon descriptions from the north profile of 102N/103E 1147

Table 54.4. LA 135292 artifact counts by strata 1147

Table 54.5. LA 135292 Room 1 wall measurements.. 1149

Table 54.6. LA 135292 artifact counts by grid unit.. 1150

Table 54.7. Samples selected for analysis from LA 135292... 1152

Table 54.8. Ceramic types from LA 135292.. 1152

Table 54.9. Tradition by ware for LA 135292 ceramics... 1153

Table 54.10. Temper by ware for LA 135292 ceramics 1153

Table 54.11. Vessel form by ware for LA 135292 ceramics 1153

Table 54.12. Lithic artifact type by material type 1154

Table 54.13. Obsidian source samples.. 1155

Table 54.14. Core type dimensions (mm) and weight (g).. 1155

Table 54.15. Flotation plant remains, count, and abundance per liter from LA 135292..... 1157

Table 54.16. Flotation sample wood charcoal by count and weight in grams from LA 135292.. 1158

Table 54.17. Pollen types identified by taxa and common names with sample frequency.. 1159

Table 55.1. Lithic artifact type by material type from LA 117833 1197

Table 55.2. Excavation recovered artifacts from LA 117883 1198

Table 55.3. LA 61034 infield ceramic analysis.. 1201

Table 55.4. Lithic artifact type by material type from LA 61034 1201

Table 55.5. Artifacts recovered during excavation of LA 61034...................................... 1202

Table 55.6. Infield ceramic analysis from LA 61035 1205

Table 55.7. Lithic artifact type by material type from infield analysis at LA 61035 1205

Table 55.8. Artifacts recovered during excavation at LA 61035 1207

CHAPTER 13
INTRODUCTION TO THE LAND CONVEYANCE AND TRANSFER EXCAVATIONS

Bradley J. Vierra

Although the Pajarito Plateau has witnessed almost 100 years of archaeological research, very little of this work has been published in synthetic volumes. Most notable of the published reports is the work of Hewett and Wilson at the large Classic period sites of Otowi and Tsirege (Hewett 1906, 1938; Wilson 1916a, 1918b). In the 1950s to 1970s, there was a resurgence in the excavation of sites on the Pajarito Plateau. Worman, Steen, and the Los Alamos Archaeological Society were responsible for this increase, but little of it has been fully published (see Fretwell 1954, 1959; Maxon 1969; Poore 1981; Steen 1974, 1977, 1982; Worman 1967; Worman and Steen 1978; and Young 1954 for exceptions). More recently, three major survey projects have been conducted on the Pajarito Plateau. The Pajarito Archaeological Research Project (PARP) (Hill and Trierweiler 1986; Hill et al. 1996), the Bandelier Archaeological Survey (BAS) (Powers and Orcutt 1999b), and the Land Conveyance and Transfer Project (Hoagland et al. 2000). In the latter two cases, detailed reports presenting the results of these surveys were completed. Reports were also done for small-scale excavations conducted by Washington State University in conjunction with the BAS Project (Kohler 1989, 1990; Kohler and Linse 1993; Kohler and Root 1992b). For the PARP, however, only a series of theses and dissertations and a single summary article were written. All of this underscores the general lack of data currently available regarding the archaeology of the Pajarito Plateau. Nonetheless, three synthetic volumes have recently been produced that provide archaeological overviews of the Pajarito Plateau (Kohler 2004; Powers 2005; Vierra and Schmidt 2006).

This chapter provides a detailed review of the project field and laboratory methods. The results of the site excavations are presented in a series of descriptions for the White Rock, Airport, and Rendija Canyon tracts in Volume 2. As such, it represents the largest archaeological excavation dataset for the Pajarito Plateau.

FIELD METHODS

Geomorphic evaluations were conducted at each tract by Steve Reneau and Paul Drakos to assess the geomorphic context and integrity of the sites (see Volume 3, Chapter 57). Their assessments included a review of the previous geomorphic studies done in the project area, as well as digging a series of shovel test holes in various locations throughout the tracts. One- by one-m soil test pits were also hand excavated at each of the archaeological sites to identify the natural geomorphic sequence.

Geophysical studies using ground-penetrating radar (GPR) were also conducted at a select sample of sites to identify the presence of subsurface features (e.g., see Conyers and Goodman 1997). The GPR survey was conducted by Jennifer Nisengard, Kimberly Henderson, and John Isaacson and the results were interpreted primarily by Henderson (see Volume 3, Chapter 70).

The use of this technique was often limited by surface vegetation that obscured buried features, but did provide useful information in some cases.

Fieldwork began with a field assessment of each site. The crew initially walked over the site area and delineated the site boundaries and identified the presence of artifact concentrations and features. A central site datum and baselines for a 1- by 1-m grid system were established. The baselines were oriented to magnetic north, with the exception of LA 85859, LA 85464, and all of the tested sites, which were oriented to true north. The datum was located at the 100N/100E grid point with an elevation of 10.0 m. The intersection of the southwest corner of each grid determined its grid coordinates. Site elevation worked the same as topographic elevation (i.e., increasing with elevation). Site maps included a detailed topographic map. These maps contained topographic features, the site datum, surface collected areas, excavation units, the relationship of the site and features to other natural and cultural features, activity areas, site and provenience boundaries, and in some cases, point-provenienced artifacts. Each map was documented with a legend, site number, scale, north arrow, names of the recorders, and the date the map was drawn. Controlled surface collections were conducted and all materials were bagged separately by individual grid unit.

Site excavation involved the hand excavation of grid units. This technique was used to define the extent, depth, and character of subsurface deposits. Excavations were carried out by natural stratigraphic layer, or in cases where the stratum was greater than 10 cm in thickness, in arbitrary 10-cm levels. A stratum was defined as a distinct depositional unit. Descriptions for strata included soil kind, texture, compactness, and color (Munsell soil chart). Excavation units were profiled. Features were recorded in three dimensions when appropriate and included a cross-section with feature descriptions, including information on measurements, nature of the fill, stratigraphic context, construction data, and the relationship to other features. With the exception of pollen, soil, and macrobotanical samples, all hand-excavated materials were screened through 1/8-in. mesh. The only exception was the three tipi rings at LA 85869; the soil matrix in these features was sieved through 1/16-in. mesh.

A daily log was maintained by each crew chief. These notes included summary information on daily activities and preliminary interpretations of site excavations. A series of recording forms were designed to document the expected variability at the sites, including a field specimen catalog, instrument mapping form, stratigraphy form, grid excavation form, sample log, feature form, room floor form, room summary form, photographic log, auger form, and burial form.

All samples suitable for dating (e.g., radiocarbon, archaeomagnetic, or obsidian hydration), pollen analysis, and macrobotanical analysis were recovered during fieldwork, and later selected for analysis on the basis of their potential to answer specific research questions. A catalog of all samples (sample log) was maintained throughout the project. Pollen and flotation samples were taken from each cultural stratum and feature. A trowel cleaned with distilled water and dried with a sterile laboratory wipe was used to take each pollen sample. Approximately one cup of sediment was collected and placed within a whirly-pac. Flotation samples consisted of two liters of sediment placed within a set of paper bags.

The sites, and the components that make up the sites, were photographed with a digital camera and black-and-white film. These photographs served as records of each excavation unit and feature and as evidence of disturbance. Primary documentation photographs contained a scale and north arrow. A photographic log was used to record all exposures, including photograph number, subject and provenience, direction of photograph, photographer, and date.

Human remains were encountered during site excavations. A comprehensive agreement between the United States Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, and San Ildefonso Pueblo in compliance with the Regulations of the Native American Graves Protection and Repatriation Act (NAGPRA) Title 43, Part 10, Subpart A was implemented before initiation of the project. This agreement outlined our field excavation, laboratory analysis, temporary storage, and final disposition procedures for the remains, associated funerary objects, sacred objects, and objects of cultural patrimony defined by NAGPRA and in consultation with San Ildefonso Pueblo. This agreement was also reviewed by Santa Clara Pueblo. Monitors from San Ildefonso Pueblo were present during the White Rock and Airport Tract excavations, with monitors from San Ildefonso and Santa Clara Pueblos being present during the excavations in the Rendija Tract. These monitors were responsible for observing the excavations, identifying any sacred objects, and reviewing the treatment of human remains.

SITE TYPES

Artifact Scatters

Artifact scatters consisted of Archaic lithic scatters or Ceramic period lithic and ceramic scatters. The surface areas of the sites were collected in 1- by 1-m grid units and the artifact distributions and features were identified. The surface artifact data were used to produce artifact density maps using Surfer Ver. 7.0. These maps are located in the individual chapters. Block excavations focused on the areas containing features and/or artifact concentrations (i.e., possible activity areas). Systematic augering and isolated 1- by 1-m test pits were also placed in other portions of the site to determine the nature and extent of subsurface deposits. Given the general lack of features on these sites, obsidian hydration dating was used when appropriate to develop a baseline for differentiating possible Archaic and Ceramic period sites and multiple site occupations. However, the Cerro Grande fire likely affected some of the surface materials present on the Rendija Canyon sites.

Roomblocks

Three Coalition period linear roomblocks were excavated. LA 86534 appeared to be disturbed, with a few rock alignments and a sparse surface artifact scatter. Initial excavations confirmed the partially disturbed nature of the site, but test pits identified the presence of an intact roomblock and kiva. There were no surface indications of a kiva, and the GPR study failed to identify the buried features because of the vegetation cover. LA 12587 also contained several areas of masonry blocks that may have represented a small roomblock. Excavations determined that the site was a multi-component site and included a fieldhouse and two separate roomblocks. In contrast, LA 135290 consisted of a single linear-shaped mound that was in good condition. Excavations revealed the presence of an intact roomblock within the mound.

A basic stratigraphic sequence was identified during previous excavations conducted at Coalition period pueblos at Los Alamos National Laboratory. This sequence includes four major stratigraphic units at a typical roomblock site. From top to bottom these layers include 1) a recent surface soil, 2) a cap of rubble debris, 3) post-occupational fill that may or may not include some roofing material, and 4) interior room floor surfaces. Like the artifact scatters, surface collections were conducted in the site area, including the rubble mound, areas peripheral to the mound, and middens.

Isolated features and artifact concentrations were also identified during this process. Middens were lacking at LA 86534 and LA 135290, but were characterized by a concentration of artifacts located east of the roomblock at LA 12587. Excavations at the roomblocks began by defining wall alignments. Preliminary north-south trenches were excavated across the rubble areas to define wall alignments and the nature of subsurface deposits. Excavations continued by exposing the top of the wall alignments, until the outline of the roomblock was defined. Once the outline was defined, a map was made and individual rooms were designated by a sequential series of numbers (i.e., 1-n). Stratigraphic profiles were drawn and room fill was removed in natural layers. Each interior room floor was mapped. Maps included the location of features, samples, and all artifacts lying directly on the floor. Pollen samples were taken from underneath artifacts lying on the floor, features, and other locations where the context might preserve these remains. After all the floor artifacts were removed, samples taken, and the features excavated, a single subfloor test pit was excavated to identify the presence of any earlier floors or features.

Block excavations or a series of test pits were also excavated in the plaza areas surrounding the roomblocks. It was hoped that GPR studies would identify the presence of any subsurface features (e.g., kivas) located in this area, but the kiva at LA 86534 was identified by backhoe trenching across the plaza area to the east of the roomblock. The single kiva was excavated using the same method as those employed during the excavation of the roomblocks. Particular attention was also paid to identifying plaza features and activity areas. A midden was identified only at LA 12587 and a systematic set of test pits were hand excavated as were a series of backhoe trenches in the midden area. Care was taken to identify and remove individual strata to isolate a complete stratigraphic sequence. Lastly, small block excavations were also conducted around other features identified at the site. These excavations included possible agricultural features at LA 12587 and rock alignments in the plaza at LA 135290.

Fieldhouses

Possible fieldhouses consist of one- to three-room structures. These small structures were excavated using the same techniques discussed for the roomblocks. In addition, limited excavations were conducted around the periphery of the structure to identify the presence of any exterior occupational surfaces, features, and activity areas. The limited excavations consisted primarily of a single row of 1- by 1-m units located adjacent to the north, west, and south sides of the fieldhouses; however, a larger block excavation was also excavated to the east of the fieldhouses since this is typically where midden deposits and activity areas are located. This excavation strategy was very successful in identifying the presence of exterior features and artifact scatters within the eastern sections of the site.

Agricultural Sites

Three agricultural sites were excavated, including two grid gardens (LA 128803 and LA 139418) and a possible check dam (LA 128804). Block excavations were conducted at the grid garden site to identify the construction techniques used for the feature. This approach included exposing rock alignments and excavating a cross-section through a series of grids that enabled the identification of the stratigraphic sequence present. Previous pollen studies in the area indicate that the surface of these ancient fields is relatively close to the modern surface. Samples taken from 0 to 20 cm below the surface yielded most of the cultigen pollen in one study (Smith 1997:7), whereas samples taken from deeper contexts within a B horizon yielded poor results (G. Dean 1989a, 1991, 1994). Pollen samples were therefore taken from the exposed stratigraphic column, including post-occupational fill, grid garden fill, and pre-occupational fill. In addition, samples were also taken from the exposed profile continuing outside and adjacent to the grid garden feature.

A trench was excavated perpendicular to the axis of the check dam, above and below the rock wall. The exposed stratigraphic sequence was documented, and a column pollen and flotation samples taken from above and below the rock wall.

Athabaskan Sites

Two possible Athabaskan sites were excavated in Rendija Canyon (LA 85864 and LA 85869). A metal detector survey was conducted by Charles Haecker to locate all metal artifacts at the site, including those immediately below the surface. Test pits were excavated within the rock rings at both of these sites (Peterson and Nightengale 1993). At LA 85864, a possible hearth consisting of a burned area was identified at a depth of 16 cm below the current surface. A radiocarbon date obtained from charcoal in this feature yielded a date of AD 130±60 BP, reflecting a 19th century occupation. A pit excavated within the rock ring at LA 85869 also exposed a burned area 5 to 15 cm below the surface that may have been the remains of an unprepared hearth. As a result, excavations focused on the areas in and around the rock rings, which included relocating and expanding the previous excavations. In addition, the area immediately surrounding the rings was excavated to identify any exterior features or activity areas.

Homestead Era Sites

A single Homestead era site (LA 85407) with a cabin and multiple features was excavated in Rendija Canyon. The site consisted of several features, including the remnants of a log cabin, an horno, remnants of a small log structure, a corral, and two trash areas. Most of the wooden structures were burned during the Cerro Grande fire, and only a few pieces of the cabin, structure, and corral remained at the time of excavation. Several wood fence posts also remained along the periphery of the site. Test excavations were conducted by Peterson and Nightengale (1993) in the area of the horno and a rock alignment. Burned portions of the horno were exposed, but no cultural materials were identified around the rock alignment. As a result, excavations at the site focused on the area of the cabin, the small structure, the corral, and the horno, and both trash areas were collected. Tree-ring samples were also taken from the remaining sections of the cabin and corral, and samples had previously been collected during the post-Cerro Grande fire assessment of the site (Nisengard et al. 2002; also Towner, Volume 1).

An historic log corral (LA 70026) had been recorded in Cabra Canyon, which drains into Rendija Canyon. This area was severely burned during the Cerro Grande fire and the wooden portions of the corral were totally destroyed. The site, therefore, could not be relocated and no further work was conducted.

A small section of a Homestead era wagon road (LA 86553) runs across the floor of Rendija Canyon, west of the Serna Homestead. The road segment could not be relocated during the post-Cerro Grande fire assessment. The area was severely burned and the fire appears to have obliterated any obvious surface evidence of the road. As a result, no further work was conducted at the site.

LABORATORY METHODS

After excavation, artifacts were washed, sorted, and rebagged following the Laboratory of Anthropology curation guidelines. These guidelines included providing provenience information on curation quality paper within each bag and using ziploc bags that are 4-mil thick. The field specimen (FS) catalog was cross-checked with the bags and entered into a Microsoft Excel database. The catalog included the following fields: site number, FS number, room number, feature number, grid coordinates, starting and ending elevations, stratum, level, date, recorder, and contents. The contents field consisted of lithics, ceramics, ground stone, bone, metal, glass, botanical, flotation, pollen, dendrological sample, or other (described in the field). Each bag was given an individual FS number, and the number of items within each bag was noted in the catalog.

Flotation samples were processed using the standard decant flotation system as described by Hammett and McBride (1993). Each sample was poured into a bucket of water, agitated gently until the botanical material floated to the surface, and then decanted onto a clean piece of chiffon material to dry. This botanical material is referred to as the light flotation (or fraction). The residue at the bottom of the bucket (called the heavy flotation or fraction) was rinsed to eliminate the soil matrix, dried, and examined to recover lithic and bone material. A soil processing form was filled out and included information on site number, FS number(s), total bags in flotation, volume of processed soil, weight of light flotation, weight of heavy flotation, and notes. Pollen washes were done on a few artifacts collected in the field, including ground stone artifacts such as manos and metates.

Table 13.1 presents the labels used on site maps and profiles in this volume. This primarily relates to the distribution of artifacts and samples in floor contexts, but can also be found in other illustrations and in the text. The number following the artifact/sample refers to its specific field specimen number.

Table 13.1. Artifact and sample abbreviations.

Artifact/Sample	Abbreviation
Ceramic sherd	C
Core	Core
Faunal element	Bone
Field specimen number	FS#
Flotation sample	F
Lithic	L
Macrobotanical	M
Mano	MA
Metate	ME
Other ground stone	G
Pollen sample	P
Projectile point	PP
Thermoluminescence sample	TL

LAND TRACTS

White Rock Tract (A-19)

The White Rock Tract (A-19) contains approximately 40 ha (100 ac) that range in elevation from 2133 to 2186 m (6400 to 6560 ft). The eastern tip of Mesita del Buey is located in the west-central portion of the tract. The remaining tract area is situated within the Cañada del Buey floodplain or along the slope that forms the northern edge of the canyon. Approximately 20 percent of the tract has been disturbed by development (roadway, electrical substation, power lines, pump station, and visitor center). The remaining undisturbed areas of the tract are covered with vegetation associated with a piñon-juniper woodland.

Four of the archaeological sites were located in the western section of the White Rock Tract along the eastern tip of Mesita del Buey (Figure 13.1). These sites include LA 12587 (roomblock and scatter), LA 127631 (fieldhouse), LA 128804 (check dam), and LA 128805 (fieldhouse). This area of the tract is characterized by a light to medium background scatter of artifacts. Tables 13.2 and 13.3 present information on ceramic and lithic artifact types for this scatter. A total of 60 ceramic and 353 lithic artifacts were collected from the background scatter between the sites. The ceramics include a range of Coalition and Classic period types, whereas, the lithic artifacts presumably represent Archaic and Ceramic period activities.

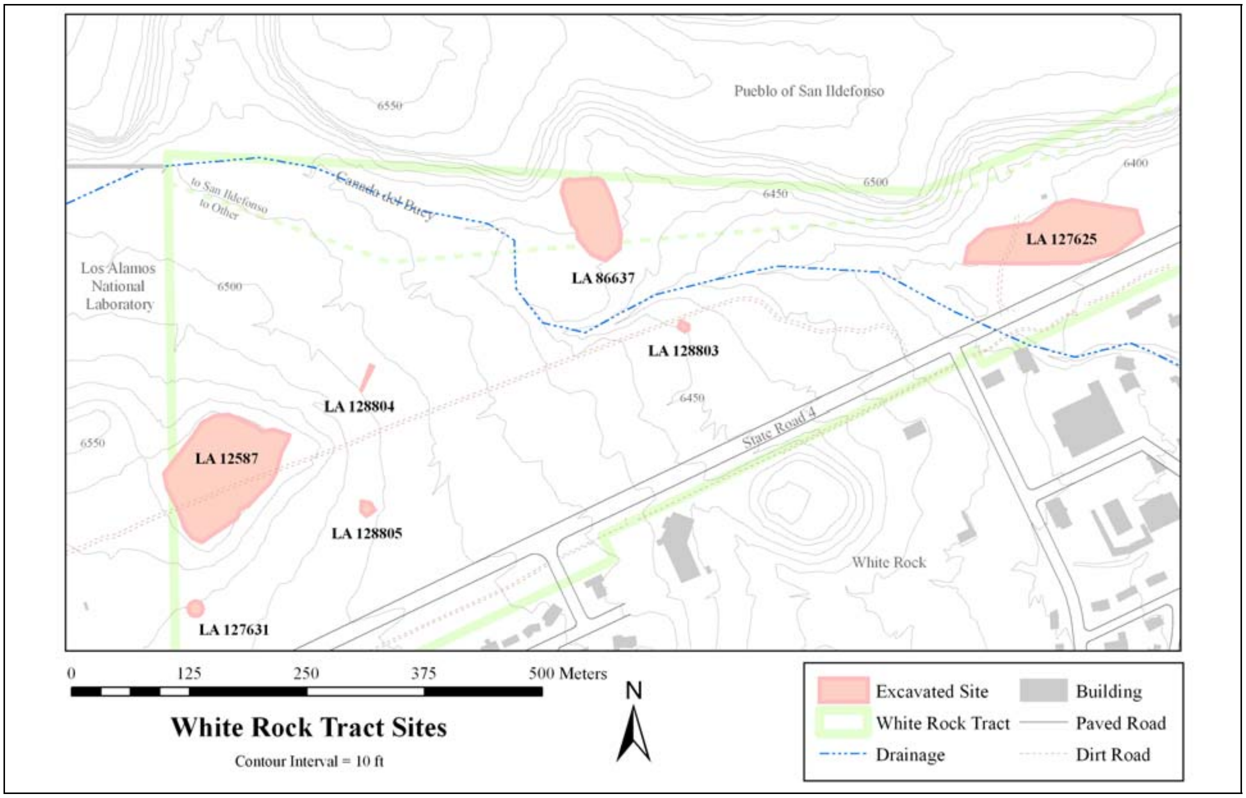

Figure 13.1. Distribution of sites within the White Rock Tract.

LA 128803 (grid garden) is situated on a slight east-trending slope and LA 86637 (artifact scatter) is situated at the southern end of a small ridge located in the central area of the tract. LA 127625 is a very light artifact scatter located in the partially disturbed area of the electrical substation at the eastern end of the tract.

Table 13.2. White Rock Tract ceramic artifact type by vessel form.

Artifact Type	Vessel Form			
	Bowl	Jar	Undetermined	Total
Undetermined	17	3	2	22
Santa Fe Black-on-white	8	0	0	8
Undetermined Biscuitware	4	5	0	9
Biscuit A (Abiquiu Black-on-gray)	7	0	0	7
Biscuit B-C body	18	0	0	18
Sankawi Black-on-cream	0	2	0	2
Plain body	0	4	0	4
Indented corrugated	0	5	4	9
Smeared-indented corrugated	0	99	0	99
Polished gray	0	1	0	1
Potsuwii incised	0	1	0	1
Red glazeware	2	2	0	4

Artifact Type	Vessel Form			
	Bowl	Jar	Undetermined	Total
Yellow glazeware	1	3	0	4
Unslipped glazeware	1	1	0	2
Polychrome glazeware	1	1	0	2
Total	**59**	**127**	**6**	**192**

Table 13.3. White Rock Tract lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	Vesicular basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Silicified wood	Quartz	Sandstone	Total
Cores	Core	2	0	0	0	0	0	0	2	1	3	0	1	0	9
	Subtotal	2	0	0	0	0	0	0	2	1	3	0	1	0	9
Debitage	Angular debris	3	0	0	0	0	0	3	17	0	3	0	0	0	26
	Core flake	38	0	1	4	0	0	72	93	2	3	2	0	0	215
	Biface flake	3	0	0	0	0	0	53	5	0	0	0	0	0	61
	Core trimming flake	0	0	0	0	0	0	2	1	0	0	0	0	0	3
	Microdebitage	0	0	0	0	0	0	3	2	0	0	0	0	0	5
	Undetermined flake	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Subtotal	44	0	1	4	0	0	134	118	2	6	2	0	0	311
Retouched Tools	Retouched piece	0	0	0	0	0	0	1	8	0	2	0	0	0	11
	Notch	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Biface	0	0	0	0	0	0	3	0	0	0	0	0	0	3
	Endscraper	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Perforator	0	0	0	0	0	0	0	2	0	0	0	0	0	2
	Perforator/notch	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	5	12	0	2	0	0	0	19
Ground Stone	One-hand mano	0	0	0	0	1	0	0	0	0	0	0	0	1	2
	Undetermined mano fragment	0	0	0	0	2	0	0	0	0	0	0	0	6	8
	Basin metate	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Undetermined metate fragment	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Undetermined ground stone	1	0	0	3	2	0	0	0	0	0	0	0	0	6
	Subtotal	1	0	0	3	5	0	0	0	0	0	0	0	9	18
Total		47	0	1	7	5	0	139	132	2	8	2	1	9	353

Airport Tract

The Airport Tract is located near the eastern end of the mesa that is situated between Pueblo and DP Canyons to the immediate east of the Los Alamos town site. The tract ranges in elevation from 2153 to 2196 m (7060 to 7200 ft) and includes about 82 ha (205 ac). The tract includes land along both sides of State Road 502, which serves as the main entrance to the community of Los Alamos. The northeastern portion of the tract has been disturbed by construction of the Los Alamos airport, and the construction of State Road 502, parking lots, a runway, and buildings have disturbed about 40 percent of the tract. The remaining undisturbed areas of the tract are covered with vegetation associated with a piñon-juniper woodland, with lesser amounts of ponderosa pine forest.

All the archaeological sites are situated at the eastern end of the Airport Tract. LA 86534 (roomblock), LA 135290 (roomblock), and LA 141505 (fieldhouse) are located along the north side of State Road 502 (Figure 13.2), while LA 86533 (scatter) and LA 139418 (grid garden) are located along the south side of the road. LA 86534 is in the Airport-East Tract (A-3), LA 135290 and LA 141505 are in the Airport-Central Tract (A-7), and LA 86533 and LA 139418 are in the Airport-South Tract (A-5-1).

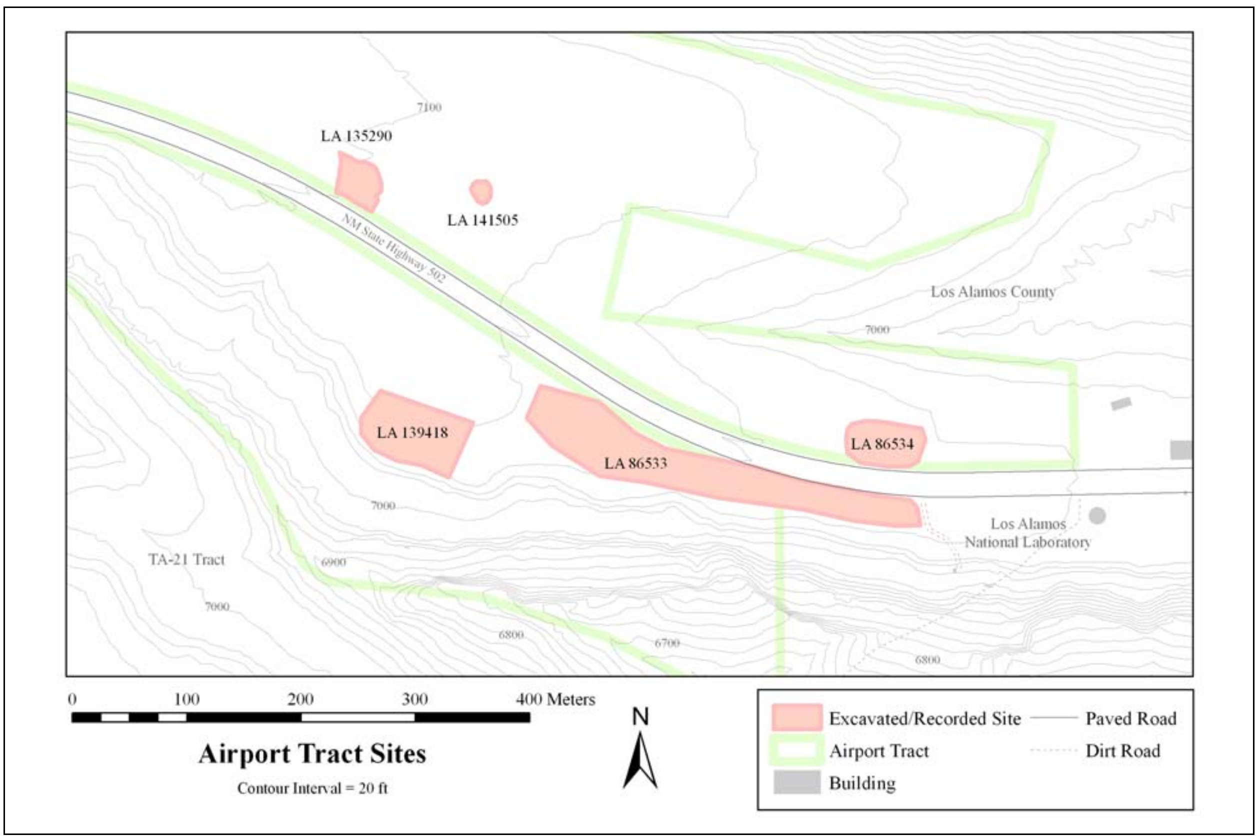

Figure 13.2. Distribution of sites within the Airport Tract.

Rendija Canyon Tract

The Rendija Canyon Tract (A-14) contains portions of Rendija and Cabra Canyons. Barranca Mesa forms the southern boundary and Guaje Mountain forms the northern boundary of Rendija Canyon. The tract is divided into canyon bottom along most of its southern section and mesa top in most of its northeastern section. Cabra Canyon is a tributary to Rendija Canyon at the northwestern end of the tract. The Rendija Canyon creek flows towards the east eventually connecting with Guaje Canyon. The tract contains about 364 ha (910 ac) that range in elevation from 2293 to 2426 m (6880 to 7280 ft). Approximately 8 ha (20 ac) of the tract have been developed by the Los Alamos Sportsman's Club. Off-road vehicle recreational activities have also disturbed a small portion of the tract on the northeastern mesa top. The canyon bottoms are primarily covered with ponderosa pine forest and the mesa top with piñon-juniper woodland.

The archaeological sites in Rendija Canyon are distributed between lowland (canyon bottom) and upland (mesa top) areas. Eleven sites are located within Rendija Canyon and three within nearby Cabra Canyon (Figure 13.3).

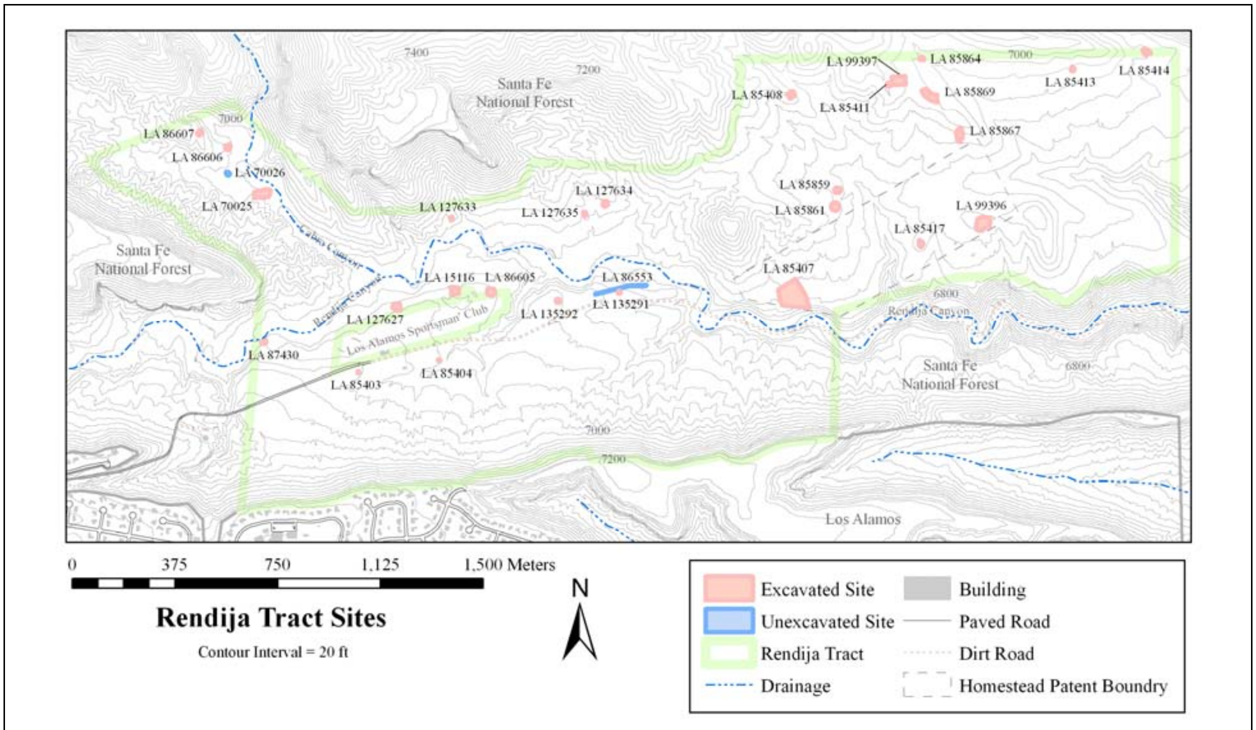

Figure 13.3. Distribution of sites within the Rendija Canyon Tract.

The remaining 13 sites are located on the mesa top in the northeastern section of the tract. The lowland sites consist of fieldhouses and a single isolated storage feature; whereas, the upland sites consist of fieldhouses, lithic scatters, Jicarilla Apache tipi rings, and the Serna Homestead site.

TA-74 and White Rock Y Tracts

The TA-74 (A-18-a) and White Rock Y (C-2) tracts are situated to the east of the Airport Tract. TA-74 contains 1100 ha (2715 ac) and the White Rock Y Tract contains 210 ha (540 ac). Together they bisect cross sections of Bayo and Barrancas Canyon, Pueblo Canyon, and Los Alamos Canyon from north to south. The area is covered with piñon-juniper woodland and contains stands of ponderosa pine. Elevations in the tracts range from 2013 to 2333 m (6040 to 7000 ft). Unlike the other tracts, the TA-74 and White Rock Y Tracts were not proposed for development by Los Alamos County. Instead, portions of the area were transferred to San Ildefonso Pueblo for historic preservation (including Otowi) and to Los Alamos County for open space. A total of 13 sites were tested to determine their eligibility for inclusion to the New Mexico State Register of Cultural Properties (Figure 13.4). More information on the preservation of these sites is provided in Masse et al. (Chapter 73, Volume 3).

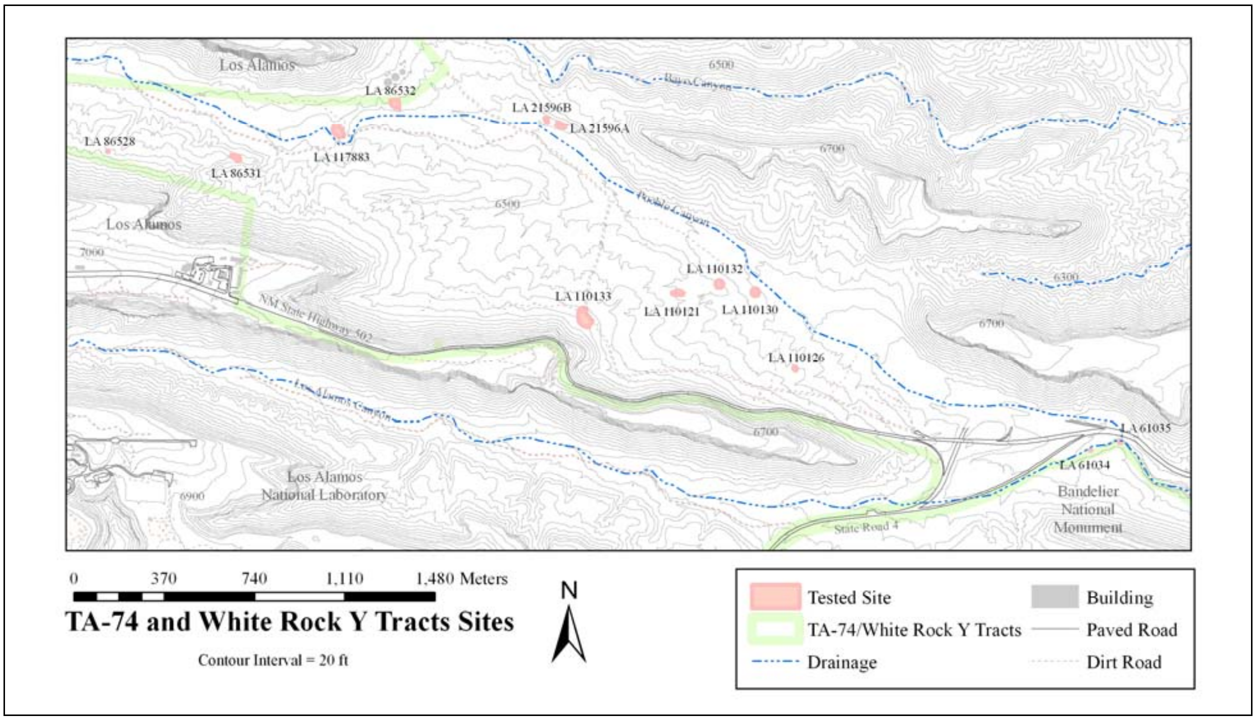

Figure 13.4. Distribution of sites within the TA-74 and White Rock Y Tracts.

PROJECT STAFF

The project would not have been completed without the hard work and commitment of its staff. Fifty individuals worked during the four-year excavation project from 2002 to 2005 (Figure 13.5; 2005 crew) and we want to thank all of them:

Project Director: Bradley Vierra

Crew Chiefs and Laboratory Directors: Sandi Copeland, Michael Dilley, Brian Harmon, Steve Hoagland, Michael Kennedy, Greg Lockard, Janet McVickar, Jennifer Nisengard, and Kari Schmidt.

Crew Members: Joseph (Woody) Aguilar, Bonnie Bagley, David Barsanti, Jennifer Boyd, Maggie Dew, Hannah Dodd (Lockard), Sam Duwe, Amy Fredericks, Truman Futch, Joaquin Gallegos, Kari Garcia, Kevin Hanselka, Mark Hungerford, Mia Jonsson, Bettina Kuru'es, Aaron Lenihan, Alan Madsen, Gerald Martinez, Bruce Masse, Ellen McGehee, Alysia McLain, Jay Nash, Karen Overton, Todd Pitezel, Rhonda Robinson, Sue Ruth, Marwin Shendo, Sherrie Sherwood, Joanne Tactikos, Chris Wenke, Jeannine Wood, Scott Worman, Marjorie Wright, and John Zarht.

San Ildefonso Pueblo Tribal Monitors: Aaron Gonzales and Timothy Martinez.

Santa Clara Pueblo Tribal Monitors: Paul Baca, Michael Chavarria, and Jeremy Yepa.

Figure 13.5. 2005 Cultural Resources Team.

CHAPTER 14
WHITE ROCK TRACT (A-19): LA 12587

Brian C. Harmon and Janet L. McVickar

INTRODUCTION AND SITE SETTING

LA 12587 is a multi-component Puebloan and Archaic site. The earliest occupation is represented by a lithic artifact scatter dating to the Late Archaic period; this component is described by Schmidt in Chapter 15 of this volume. The components discussed in this chapter consist of a seven-room pueblo and associated midden dating to the Late Coalition period, a partially completed 13-room pueblo dating to the Late Coalition or Early Classic period, and multiple surface agricultural features, including a grid garden and a one-room structure that probably date to the Early or Middle Classic period.

LA 12587 is situated on a wide ridge at the east end of Mesita del Buey at an elevation of 1979 m (6500 ft). The ground gently slopes away from the site to the north, south, and east. To the west the mesa ridge slowly rises to the Classic period pueblo of Tsirege (LA 170); which is 760 m from LA 12587. Cañada del Buey and the steep, 70-m-tall cliff face that defines its northern boundary lie 300 m to the north. Four hundred meters to the south is the wide floodplain of Pajarito Canyon. The site is located in piñon-juniper woodland and the overstory is an equal mix of these two species. The understory consists of scattered sagebrush, prickly pear cactus, and grama grasses.

A variety of soil types occur in the vicinity of LA 12587 and include Hackroy sandy loam, Penistaja sandy loam, Prieta silt loam, Servilleta loam, and Totavi gravelly loamy sand. Outcrops of tuff and basalt are also present (Nyhan et al. 1978). Outside of the colluvial mound surrounding the roomblocks the local stratigraphy consists of up to 17 cm of A and Bw horizons. Discontinuous remnants of an eroded Pleistocene soil (a Btk horizon) up to 16 cm thick underlay the Bw horizon. The Btk horizon is underlain by bedrock consisting of the Tshirege Member of the Bandelier Tuff.

A powerline and a dirt access road traverse the southern edge of the Puebloan components, separating them from the Archaic artifact scatter.

SITE DESCRIPTION

LA 12587 consists of two roomblocks, a midden, a one-room structure, and agricultural features (Figure 14.1). The smaller, earlier roomblock (Roomblock 1) consists of seven rooms (1, 2, 4/5, 6, 7, 8, and 9): three habitation rooms in the front (east) of the roomblock, three storage rooms in the back (west), and a fourth, larger back room contiguous to the south of the storage rooms. All the rooms contain plaster floors in variable states of preservation and each front room contains a hearth.

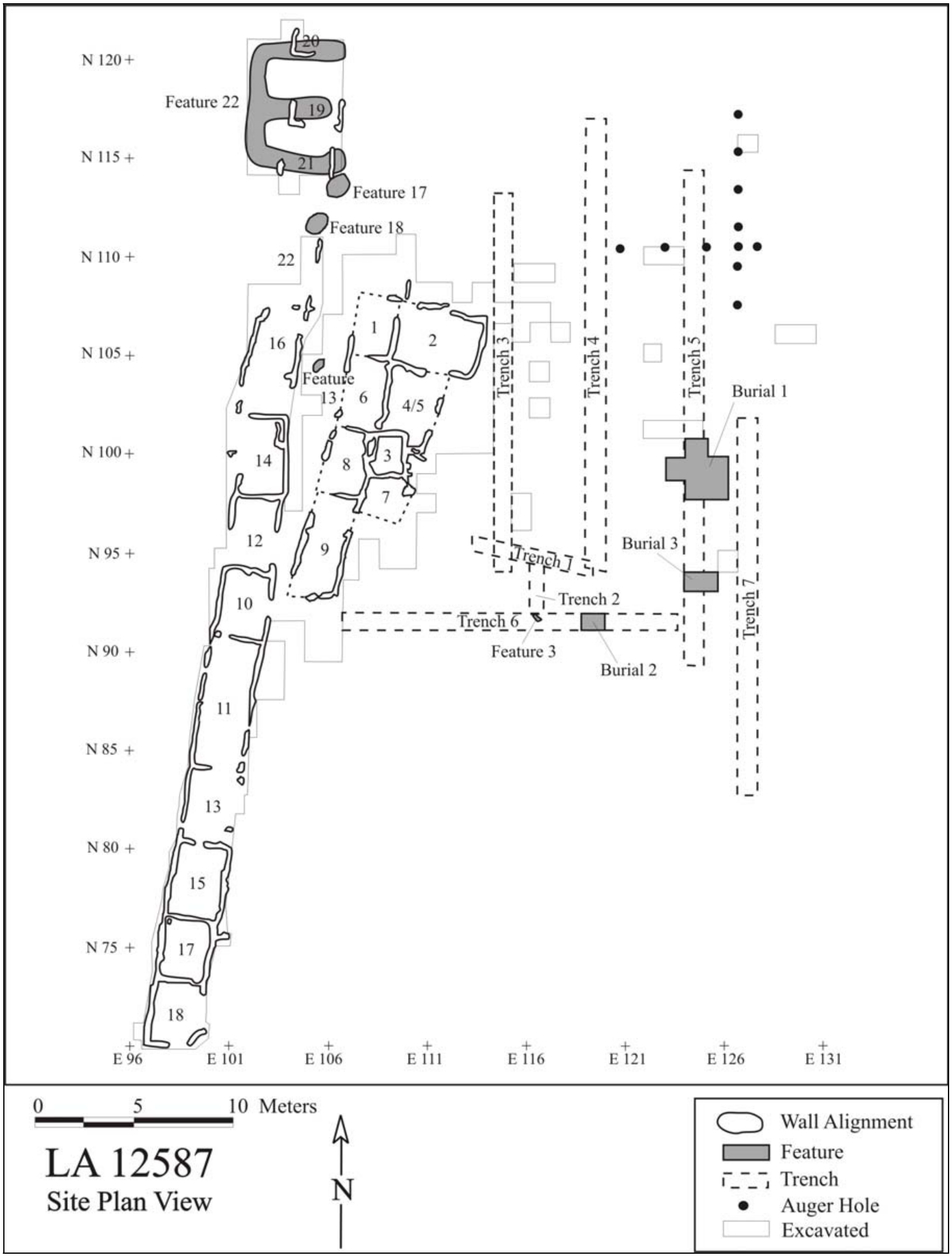

Figure 14.1. Final map of LA 12587, including excavated areas.

The roomblock measures 16 by 7 m and is oriented northeast-southwest. Superimposed over the roomblock is a one-room structure (Room 3, initially recorded as Roomblock 2) oriented north-south. An extensive midden is present to the east of Roomblock 1. Surface artifacts cover a 45- by 30-m area. Three burials were found in the midden.

Roomblock 3 is a linear, one-room-wide roomblock oriented roughly northeast-southwest and located immediately west of Roomblock 1. Thirteen rooms were identified in the 3- by 50-m roomblock. Most rooms consist only of a basal course of masonry. Very little wallfall was found, although a few rooms contained enough masonry to indicate that at least partial walls were once present. East-west-oriented rock berms overlay the three northernmost rooms of Roomblock 3. The berms are probably agricultural features and may be associated with Room 3. Additional alignments are present to the west and northeast of the roomblock complex but were not excavated.

FIELD METHODS

Work at LA 12587 began on June 5, 2002, and ended on March 6, 2003. Over the span of the field season two crews were employed. The summer crew consisted of Janet McVickar (crew chief), Brian Harmon (assistant crew chief), Joseph Aguilar, Sandi Copeland, Amy Fredericks, John (Kevin) Hanselka, Jennifer Nisengard, and Susan Ruth. Aaron Gonzales was the San Ildefonso tribal monitor. Bonnie Bagley, David Barsanti, Bettina Kuru'es, and F. Scott Worman worked at the site intermittently. The fall/winter crew consisted of Janet McVickar (crew chief), Brian Harmon (assistant crew chief), Sandi Copeland, Truman Futch, Mark Hungerford, Gregory Lockard, Jay Nash, Jennifer Nisengard, Karen Overton, and John Zahrt. Timothy Martinez was the San Ildefonso tribal monitor. Late in the season Michael Dilley, Steven Hoagland, Mia Jonsson, Michael Kennedy, W. Bruce Masse, Kari Schmidt, and Bradley Vierra assisted in the excavations. Leo Martinez operated the bobcat during surface scraping and trenching operations.

Both before, and during the course of excavation, geomorphic and ground-penetrating radar (GPR) evaluations were conducted. The project geomorphologists assessed the site's geomorphic context and integrity by digging shovel test holes around the site and by visits to the site during excavation (Drakos and Reneau, Volume 3). Five GPR surveys were conducted at the site to identify possible buried features and structures (Nisengard et al., Volume 3). These surveys suggested several possible locations for subsurface structures to the east of Roomblock 1. Excavation in these areas did not uncover any structures, and only undulations in the bedrock were found.

The 1- by 1-m grid system that was laid out on true north during the initial GPR survey was also used during excavation to facilitate data corroboration. The main site datum was designated as 100N/100E with an elevation of 10 m. Using the established grid, a 425-m^2 area was established over Roomblock 1 and 100 percent of the surface artifacts were collected by grid. A second surface collection area of 116 m^2 was located 16 m to the south. Collections were made in this area as the artifact screens were to be set up here.

After the surface collection was completed the site was divided into seven areas on the basis of specific surface manifestations (Figure 14.2)

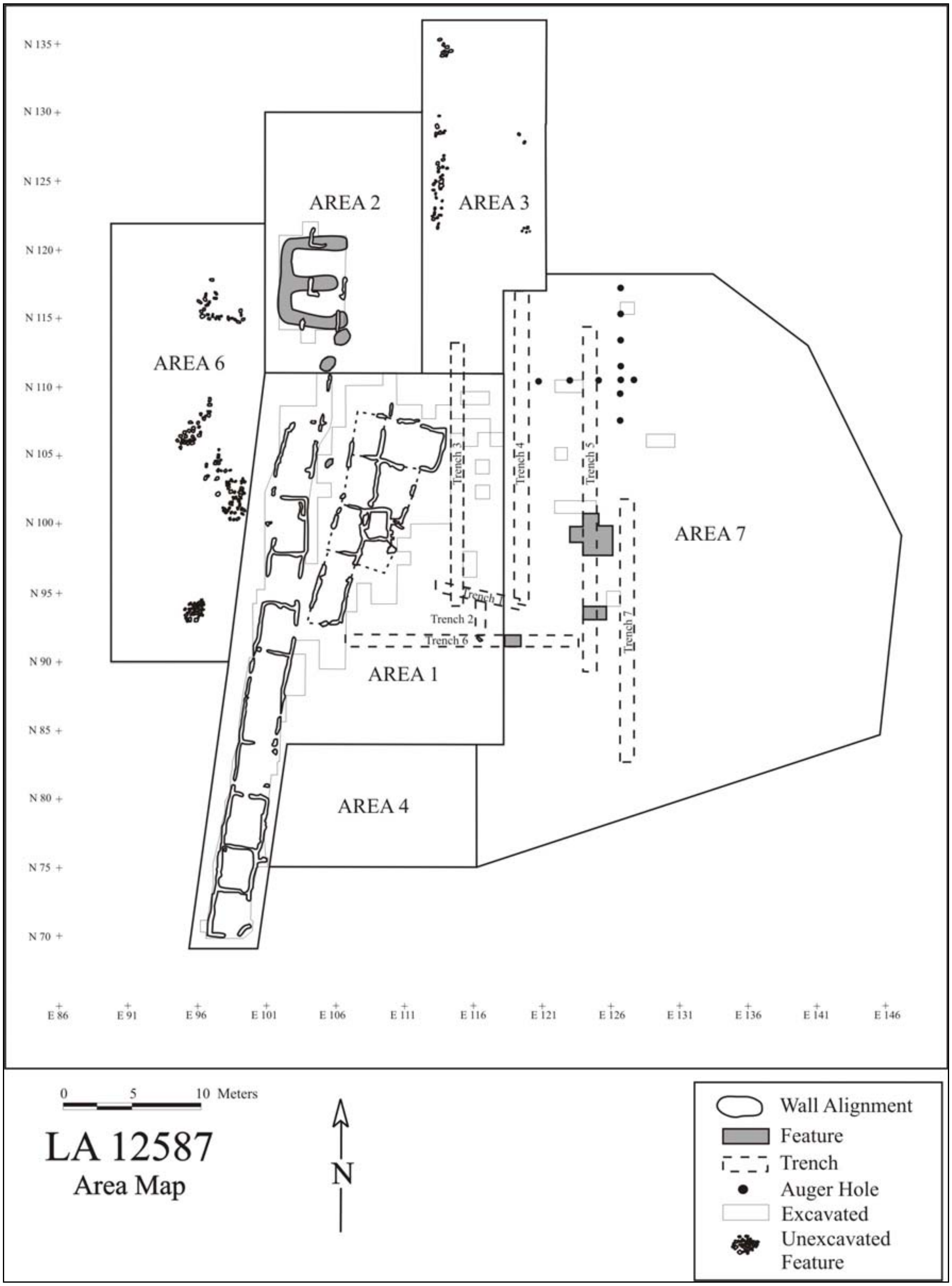

Figure 14.2. Area map of LA 12587, excluding Area 8.

Area 1 was first defined to include only Roomblock 1. It was later expanded to include Area 5 and Roomblock 3. Area 2, which is located immediately north of Area 1, includes several possible agricultural features. Area 3, which is east of Area 2, includes poorly defined alignments that may be additional structures or features. The southern surface collection area was defined as Area 4. Area 5 was originally established to include the alignments south of Area 1. This area was incorporated into Area 1 when it became evident that the alignments were part of Roomblocks 1 and 3. Area 6 lies west of Area 1 and incorporates alignments west of Roomblocks 1 and 3 thought to be additional structures. Area 7 is the midden. Area 8 is the Late Archaic lithic artifact scatter (see Chapter 15, this volume).

Excavation began by digging 1- by 1-m excavation units along the 109E line to form a north-south trench through Roomblock 1. Units were then excavated east and west of this trench to investigate exposed walls. The poor condition of the north and south walls made it difficult to identify individual rooms. For these reasons room numbers were not assigned until late in the field season.

Mechanical surface scraping south and west of Roomblock 1 resulted in the exposure of Room 9 and verified the suspicion that an additional roomblock (Roomblock 3) was present. In the course of excavation it became apparent that this roomblock was much larger than initially expected. Partial units were dug for the express purpose of exposing wall alignments. Initially this material was screened but subsequently the walls were exposed without screening. Instead of excavating entire room interiors, 1- and 2-m-wide trenches were excavated through the rooms from the east wall to the west wall to provide a representative sample of room fill.

Excavations in the midden (Area 7) were carried out with three goals in mind: to investigate possible alignments detected by the GPR, to determine if/where human burials were present, and to characterize the extent and nature of the midden. Several different excavation techniques were used to achieve these goals: auguring, hand excavation, mechanical surface scrapping, and mechanical trenching.

Possible alignments identified in the midden by the GPR were investigated by two intersecting series of auger holes. Five holes were dug every other meter along the 111N grid line, and six holes were dug every other meter along the 127E gridline. All 11 holes were dug to bedrock. No evidence for room fill or architecture was encountered during this process.

Hand excavation was used to characterize the nature of the midden. This was achieved by placing a series of 1- by 1-m units from north to south. These units are 116N/127E, 110N/122E, 110N/123E, 106N/129E, 106N/130E, 105N/122E, 101N/122E, 101N/124E, and 95N/126E. Units excavated east of Roomblock 1 that may be in the midden, but were not specifically part of the Area 7 investigations are 109N/115, 109N/116E, 107N/115E, 107N/116E, 106N/115E, 106N/117E, 104N/116E, 102N/116E, 98N/115E, and 97N/115E. A profile was drawn in units 101N/122 to 102N/124E.

Possible alignments detected by the GPR immediately southeast of Roomblock 1 were investigated by mechanical surface scraping and trenching (Trenches 1 and 2). The trenches were placed in an area thought to have the highest potential for a kiva. No evidence for room fill or architecture was encountered during this process.

Five additional trenches were excavated to ensure that Area 7 was fully investigated and that any features or burials outside the roomblocks would be encountered. Three north-south trenches (Trenches 3, 4, and 5) were placed 5 m apart. Trench 7, the farthest east and the last to be dug, was placed only 3 m from Trench 5. Trench 6 ran east-west and was placed to the south of Trenches 3 and 4. Fill from the trenches was not screened, although grab samples of cultural materials were collected in 3-m increments (excluding Trenches 1 and 2). Table 14.1 gives the locations and dimensions of the trenches. No structural features were encountered during trenching but three human burials were found. These were subsequently excavated by hand. The trenching process and excavation of the burials completed the work in Area 7.

Table 14.1. Backhoe trenches.

Trench #	Coordinates		Dimensions	
	From	To	Length (m)	Width (m)
1	95.8N/113E	95.1N/119.2E	6.6	0.80
2	92.6N/117.2E	95.4N/117.2E	2.6	0.80
3	117N/114E	97N/114E	20	0.80
4	116N/119E	98N/119E	18	0.80
5	116N/124E	98N/124E	18	0.80
6	92N/106E	92N/124E	18	0.80
7	102N/127E	83N/127E	19	0.80

Time constraints prevented the excavation of all the features present in Area 3 and Area 6, but two circular rock features (Features 17 and 18) in Area 2 were drawn in plan view, photographed, partially excavated, and sampled for pollen. Feature 18 was also drawn in profile.

SITE STRATIGRAPHY

This section is divided into two parts. The first part summarizes the geomorphic stratigraphy of LA 12587. This part is excerpted with minor modifications from Drakos and Reneau (see Volume 3). The second part summarizes the stratigraphic sequence used during excavation. For detailed discussions of the stratigraphy of specific areas or of specific strata, see the relevant parts of the Site Excavation section below.

Stratigraphy Derived from Geomorphological Examination (Paul Drakos and Steve Reneau)

The discontinuous Pleistocene soil underlying LA 12587 consists of an eroded Btk horizon (Bt horizon with Stage I carbonate). Pleistocene soil thickness in the site vicinity ranges from 0 to 16 cm. The remnant Pleistocene soil is inferred to be 100 to 200 ka or older. The Pleistocene soil at LA 12587 is a polygenetic soil in which the Bt horizon formed during the Pleistocene, and the Stage I carbonate formed later, probably during the Holocene. Evidence for the polygenetic nature of Pleistocene soils in the White Rock Tract is shown by several profiles where peds in Btk horizons exhibit translocated clay in ped interiors but are coated with carbonate.

Near the roomblocks, the Bt horizon is overlain by Bw horizons formed in eolian or reworked eolian sediment plus colluvium derived in part from Roomblock 1. In areas where the roomblocks are located close to one another, the Roomblock 3 walls are built on top of a lower Bwk or Bw horizon (typically a Bw2), which is overlain by a Bwk1 or Bw1 horizon. Upper Bw horizons are overlain by A horizons also formed in eolian or reworked eolian sediment plus colluvium derived in part from Roomblock 1. Total thickness of post-occupational soils in the vicinity of the roomblocks ranges from 10 to 54 cm. Greater sediment thickness corresponds in general to the roomblock locations, except for a mound of relatively thick sediment located immediately east and north of Roomblock 1. Outside of the colluvial mound surrounding the roomblocks, post-occupational soil thickness ranges from 0 cm on stripped bedrock surfaces east, north, and west of the roomblocks to 17 cm. The 17-cm A-Bw profile overlies a stripped Btk horizon and likely represents eolian deposition that occurred both during the Late Coalition period and that post-dates the Puebloan occupation (see below).

Roomblock 1 and Midden Deposits

Eolian or reworked eolian sediment is interpreted to largely comprise the upper soil that partially buries blocks of tuff derived from wall collapses. The upper soil also includes clasts of tuff derived from the roomblocks and a variety of ceramic and lithic artifacts, and is inferred to also contain the dissolved remnants of mortar and roofing material. The different soil components are well mixed, which indicates extensive bioturbation of the post-occupational soil by burrowing and other processes. Roomblock 1 is typically buried by 30 to 40 cm of young material that overlies the former floors and the underlying Btk horizon and Bandelier Tuff. The upper soil layers that post-date the occupation are anomalous in that Bw or Bwk horizons typically strongly effervesce, indicating the presence of $CaCO_3$; whereas, other young soils nearby do not effervesce. The reason for this is not certain. One hypothesis is that $CaCO_3$ was present in the mortar used in wall construction and that this material is weathered out of the mortar and concentrated in the post-occupation soil. A soil profile with post-occupational A-Bw horizons described in sheet trash deposits approximately 17 m east of Roomblock 1 also strongly effervesce, indicating that sediments derived from the roomblock contain significant $CaCO_3$. Sediments derived from the roomblock have been reworked east and north of the ruin, forming a colluvial apron at least 30 cm thick extending approximately 21 m east and 16 m north of the center of the roomblock.

Roomblock 3

Roomblock 3 is an Ancestral Puebloan roomblock that, based on stratigraphic relationships, is younger than Roomblock 1. In some areas, wall blocks are set on top of a lower (Bw2 or Bwk2) horizon that contains rubble and artifacts inferred to be derived from Roomblock 1. In other areas, Roomblock 3 walls are built either directly on Bandelier Tuff or on the remnant stripped Pleistocene soil. Roomblock 3 is typically buried by 20 to 30 cm of young soil that overlies the wall foundations, underlying soil horizons, and Bandelier Tuff. Post-occupation soils in Roomblock 3 also contain $CaCO_3$. There is a much smaller colluvial apron emanating from

Roomblock 3 (the 30-cm-thick deposit extends approximately 4 m east of Roomblock 3) than is associated with Roomblock 1, suggesting that Roomblock 3 walls were not built as high as were the walls forming Roomblock 1. These data support the hypothesis that Roomblock 3 was not completed.

Feature 22

A series of five soil descriptions were completed in the vicinity of Feature 22. The rock alignments of Feature 22 were constructed on top of a post-occupational Bw horizon 16 to 23 cm thick, and lie within, or are partly buried, by an A or AC horizon 9 to 15 cm thick. Shaped blocks, inferred to be part of the Roomblock 3 construction, occur within the Bw horizon and below the rock alignments.

Two profiles (12587-1 and 12587-5) were described outside and three profiles (12587-2, 12587-3, and 12587-4) were described inside the rock alignments. No textural differences were observed between profiles described inside versus outside the rock alignments. Soils described inside the rock alignments have a greater thickness (average 30 cm versus average 22 cm) than do the soils described immediately outside the rock alignments, due to generally thicker A horizons inside the rock alignments than outside the alignments. This is observed most clearly in comparing profiles 12587-2 and 12587-1, where the A or AC horizon thins from 15 cm inside to 8 cm outside the northern rock alignment. These observations indicate that the rock alignments are either acting to preferentially trap eolian or slopewash sediment, or that dirt was placed inside the alignments. The placement of dirt inside the rock alignments is suggested by the greater A horizon thickness and the absence of textural differences inside versus outside the rock alignments, and by the orientation of the alignments oblique to a slope with a relatively shallow gradient.

The presence of a 16- to 23-cm-thick Bw horizon formed in sediment composed predominantly of eolian or reworked eolian sediment underlying the agricultural rock alignments is evidence for significant eolian deposition during the Coalition (likely Late Coalition) period. Roomblock 1 was built on a stripped bedrock surface with remnant Pleistocene soils; therefore, deposition of the sediment underlying the possible agricultural rock alignments occurred subsequent to construction of Roomblock 1. Whereas eroding roomblocks provided a source for coarse colluvium, the predominantly fine-grained nature of upper Bw horizons indicates an eolian source for most of the sediment burying Roomblock 3 features. Additionally, thinner (9 to 15 cm) sediment partially buries Feature 22, indicating smaller inputs of eolian sediment or reworked eolian sediment following the last occupation. This sediment deposition could date to the latest Coalition period, the Classic period, or the Historic period.

Stratigraphic Sequence used During Excavation

Table 14.2 summarizes all the excavated strata at LA 12587. During the early stages of excavation a profusion of stratum numbers were assigned. It was subsequently determined that many of these strata represented a single depositional unit. As a result, many strata were combined and new stratum numbers were assigned. The numbers in the New Stratum Number are used throughout the text. The Old Stratum Number is included solely as a concordance to be used by researchers examining the original field notes, bags, and other provenience information.

Stratum 1 covers the entire site. It is composed of fine-grained, loose, unconsolidated brown sandy loam. The loam contains varying densities of artifacts, sparse vegetation, tuff blocks, fragmented tuff gravels, and, in some locations, tree duff. Below Stratum 1 the stratigraphy of each component varies and so will be described individually.

Roomblock 1

Most of the fill of Roomblock 1 consists of Stratum 10. With very few exceptions, wallfall and rooffall cannot be distinguished. The sediment of Stratum 10 is moderately compact brown sandy loam that is fine-grained with occasional tuff gravel inclusions. Stratum 10 contains wallfall composed of construction blocks, chinking stones, and chunks of adobe mortar. Artifacts, burned maize kernels and cob fragments, and bits of charcoal are also common, as are pieces of naturally derived tuff. Occasional lenses and pockets of charcoal staining are present in some rooms. Disturbance from roots, rodents, and insects is prevalent throughout this stratum.

Below Stratum 10, a shallow stratum was occasionally encountered within the rooms immediately above the floors (Stratum 70). This stratum is a loosely consolidated sandy loam that is 2 to 5 cm in depth and sometimes contains artifacts. Stratum 70 is interpreted as post-occupational fill that was deposited before the walls collapsed.

The uppermost floor surface across each room was given a stratum number (Strata 121, 122, 124, 126, 127, 128, and 129). Individual lower floor surfaces, floor matrices, and feature strata were also given stratum numbers. Because of the number and complexity of these strata they are not described here: full descriptions can be found in the Site Excavation section below.

Where Roomblock 1 was not built directly on bedrock it is underlain by either a Bw horizon (Stratum 170) or a Pleistocene-aged Btk horizon (Stratum 175). Because of extensive bioturbation, artifacts and charcoal are present in Stratum 175. Bedrock is the devitrified tuff unit (Qbt-1vc) of the Tshirege Member of the Bandelier Tuff. Stratum 200 was assigned to the Bw deposits immediately outside of the roomblock and below Stratum 1.

Midden

In the midden area, Stratum 1 is underlain by mixed A and B horizons, a Bw horizon, and a Bwk horizon. All of these horizons were assigned a single stratum (Stratum 60). Below Stratum 60, Stratum 175 was occasionally present. See the description of Area 7 in the Site Excavation section below for more details.

Table 14.2. Stratigraphic sequence used during excavation of LA 12587.

Old Stratum Number	New Stratum Number	Provenience	Thickness (cm)	Color	Texture	Description/ Comment
0	0	All Areas	0	10YR 4/3	sandy loam	Surface
1	1	All Areas	1-18	10YR 4/3	sandy loam	Unconsolidated surface soil
2-14, 17-19, 21-23, 25-26, 28-29, 33, 35-36, 41-42, 44, 47-52, 54, 59, 62, 64-65,68-70, 72-75, 78-81, 86-87, 89, 92-93, 96, 98, 100-101, 104, 105 109-111, 113, 115, 116, 118-119, 121, 127, 200	10	Roomblock 1	16-48	10YR 4.5/3	sandy loam	Roomblock 1, wallfall, and post-occupational fill
14	14	Room 4/5	9	7.5YR 5/3	sandy loam	Sediment from wall alignment in Room 4/5 Part of old Stratum 14 became new Stratum 10; the rest retained its old stratum number
83-84, 91, 99	20	Room 3	14-25	10YR 4/4	sandy loam	Room 3, fill
	21	Room 3	N/A	10YR 4/4	sandy loam	Room 3, wall fill
	60	Area 7	10-44	10YR 4/4	sandy loam	Midden, fill
38	70	Roomblock 1	2-11	10YR 4/3	sandy loam	Roomblock 1, fill below wallfall and above floor
	121	Room 1	0	10YR	silty clay	Room 1, floor surface

Old Stratum Number	New Stratum Number	Provenience	Thickness (cm)	Color	Texture	Description/ Comment
				7/1		
47	122	Room 2	0	10YR 7/1	silty clay	Room 2, floor surface Most material from old Stratum 47 became part of New Stratum 10; however, a few artifacts/samples from the floor became part of new Stratum 122
48	124	Room 4/5	0	Gley 2 7/10B	silty clay	Room 4/5, floor surface Most material from Old Stratum 48 became part of New Stratum 10; however, one artifact from the floor became part of New Stratum 124
	126	Room 6	0	10YR 6.5/1	silty clay	Room 6, floor surface
	127	Room 7	0	10YR 7/1	silty clay	Room 7, floor surface
	128	Room 8	0	10YR 7/1	silty clay	Room 8, floor surface
	129	Room 9	0	10YR 6/3	silty clay	Room 9, floor surface
34, 171	170	Roomblock 1	1-20	10YR 4/3.5	sandy loam	Roomblock 1, sub-floor soil

Old Stratum Number	New Stratum Number	Provenience	Thickness (cm)	Color	Texture	Description/ Comment
						Stratum 171 is not an old Stratum number, but Stratum 171 is the same as Stratum 170
	175	All Areas	2-12	7.5YR 4/5	sandy clay	Btk horizon
	200	Area 1	4-24	10YR 4/4	sandy loam	Roomblock 1, exterior
Sometimes 10	201	Roomblock 3	10-41	8.75YR 4/4	sandy loam	Roomblock 3, fill to base of walls
	202	Area 1	4-24	10YR 4/4	sandy loam	Roomblock 3 exterior
	203	Room 10	0.1-2	5YR 4/3	clay loam	Room 10, possible use surface
	204	Room 11	0.1-1	10YR 3/3	sandy clay loam	Room 11, possible use surface
	205	Room 11	9-12	8.75YR 3/3.5	sandy clay loam	Room 11 fill, ashy lens
Sometimes 10 or 201	208	Roomblock 3	3-35	7.5YR 4/3.5	sandy clay loam	Roomblock 3, soil below base of walls to bedrock
89	210	Room 1	1-3	7.5YR 4/3	silt loam/ash	Room 1, Feature 2, fill
	213	Roomblock 1	10-20	7.5YR 4/4	sandy loam	Feature 5, fill
	250	Room 4/5	15	7.5YR 4/4	silt loam	Room 4/5, Feature 1, upper fill

Old Stratum Number	New Stratum Number	Provenience	Thickness (cm)	Color	Texture	Description/ Comment
	251	Room 4/5	1	7.5 YR 4/2	ash	Room 4/5, Feature 1, lower fill
	252	Room 4/5	4	Gley 2 7/10B	silty clay	Room 4/5, Floor 2, matrix
	253	Room 4/5	3	7.5YR 5/4	clay	Room 4/5, Floor 1, matrix
	254	Room 4/5	N/A	N/A	N/A	Room 4/5, stones below Feature 1
	255	Room 4/5	3	Gley 2 7/10B	silty clay	Room 4/5, Floor 3, matrix
	256	Room 4/5	7-8	10YR 4/4	sandy loam	Room 4/5, Feature 16, fill
	260	Room 2	11-20	7.5YR 4/3	silt loam and ash	Room 2, Feature 4, upper fill
	261	Room 2	1-9	7.5YR 4/2	ash	Room 2, Feature 4, lower fill
	262	Room 2	6-11	7.5YR 4/4	sandy loam	Room 2, Feature 10, fill
	263	Room 2	3-6	7.5YR 4/4	sandy loam	Room 2, Feature 11, fill
	264	Room 2	1-2	7.5YR 7/1	hardened silt/ash	Room 2, Floor 1A, matrix
	265	Room 2	2	7.5YR 5/1	hardened silt/ash	Room 2, Floor 2A, matrix
	266	Room 2	1-2	7.5YR 7/1	hardened silt/ash	Room 2, Floor 3A, matrix

Old Stratum Number	New Stratum Number	Provenience	Thickness (cm)	Color	Texture	Description/ Comment
	267	Room 2	3-7	7.5YR 7/1	hardened silt/ash	Room 2, Floor 1B, matrix
	268	Room 2	2	7.5YR 7/1	hardened silt/ash	Room 2, Floor 1C, matrix
	269	Room 2	1.5	7.5YR 7/1	hardened silt/ash	Room 2, Floor 2C, matrix
	270	Room 7	4-10	10YR 4.5/3	sandy loam	Room 7, Feature 6, upper fill of hearth
	271	Room 7	7-10	10YR 8/1	consolidated ash	Room 7, Feature 6, lower fill of hearth
	272	Room 7	5-7	10YR 5/3	sandy loam	Room 7, Feature 12, fill
	273	Room 7	0.5-4	10YR 5/3	silty clay	Room 7, Floor 2, matrix
	280	Feature 22	7-15	10YR 4/4	sandy clay loam	Feature 22, fill
	290	Room 6	15	10YR 4/4	sandy loam	Room 6, Feature 7, fill
	300	Room 7	N/A	N/A	plaster/adobe	Room 7, Feature 6, later wall of hearth
	301	Room 7	11	10YR 4/4	sandy loam	Room 7, Feature 6, material between earlier and later hearth walls
	305	Room 4/5	1-3	7.5YR 4/6	sandy clay	Room 4/5, soil below Feature 1
	306	Room 4/5	N/A	N/A	clay	Room 4/5, Feature 1, plaster

Old Stratum Number	New Stratum Number	Provenience	Thickness (cm)	Color	Texture	Description/ Comment
	307	Room 7	23	10YR 4/4	sandy loam	Room 7, Feature 6, fill of ash box
	308	Room 7	5	7.5YR 4/6	ashy sandy loam	Room 7, Feature 6, ashy material below hearth base
	309	Room 7	N/A	N/A	plaster/adobe	Room 7, Feature 6, earlier wall of hearth
	310	Room 18	0	7.5YR 5/3	sandy loam	Room 18, possible use surface
	311	Room 2	18	7.5YR 4/3	silt and ash	Room 2, Feature 20, fill

Note: The average or most common color and soil texture for a given stratum is used. For range of variability see specific proveniences.

Roomblock 3

Four general strata are associated with Roomblock 3. Stratum 1 is underlain by Stratum 201. Stratum 201 is post-occupational fill. It is similar to Stratum 10, although it contains less wallfall and considerably less adobe. Near the surface, Stratum 201 is a sandy to silty loam. Near its base the stratum begins to grade into a sandy clay loam. The base of Stratum 201 was arbitrarily determined to be the base of the walls of Roomblock 3. The underlying Stratum 208 is a Bw horizon, composed in part, of Roomblock 1 colluvium. The lower portions of Stratum 208 are probably the same as Stratum 170. In places Stratum 175 is present. Strata associated with localized deposits (e.g., ash lenses and possible living surfaces) are described in the Site Excavation section below.

Stratum 202 was assigned to the Bw deposits immediately outside of the roomblock and below Stratum 1.

Room 3 and Feature 22

The fill of Room 3 (Stratum 20) was indistinguishable from Stratum 10. It was given a separate stratum number for analytical purposes. No floor was found in Room 3.

Below Stratum 1 the A and Bw horizons of Feature 22 were assigned a single stratum (Stratum 280). Where Feature 22 was underlain by Roomblock 3, Strata 201 and 208 were assigned as appropriate.

SURFACE COLLECTION

Figure 14.3 shows the distribution of ceramic artifacts from the surface-collected areas of the site (including Area 8). The distribution of lithic artifacts and total number of artifacts is essentially the same as the distribution of ceramic artifacts. The highest artifact density is located to the north-northeast of Roomblock 1, which is the northwest corner of the midden. The artifacts in Area 4 and at the northeast end of Area 8 define the southern edge of the midden. In contrast there is a relative paucity of artifacts over Roomblock 1 itself. Figure 14.3, coupled with in-field observations, indicates that the surface distribution of midden artifacts at LA 12587 resembles that seen at other Coalition period roomblocks on the Pajarito Plateau. There is a dense C-shaped scatter of artifacts terminating at the north and south end of the pueblo. The greatest density of artifacts is found 15 to 30 m in front of the pueblo, and there are relatively few artifacts on the pueblo mound (see Harmon and Binzen 2002, Figure 5.2; Schmidt, this volume, Figure 24.10; Vierra, this volume, Figure 25.4).

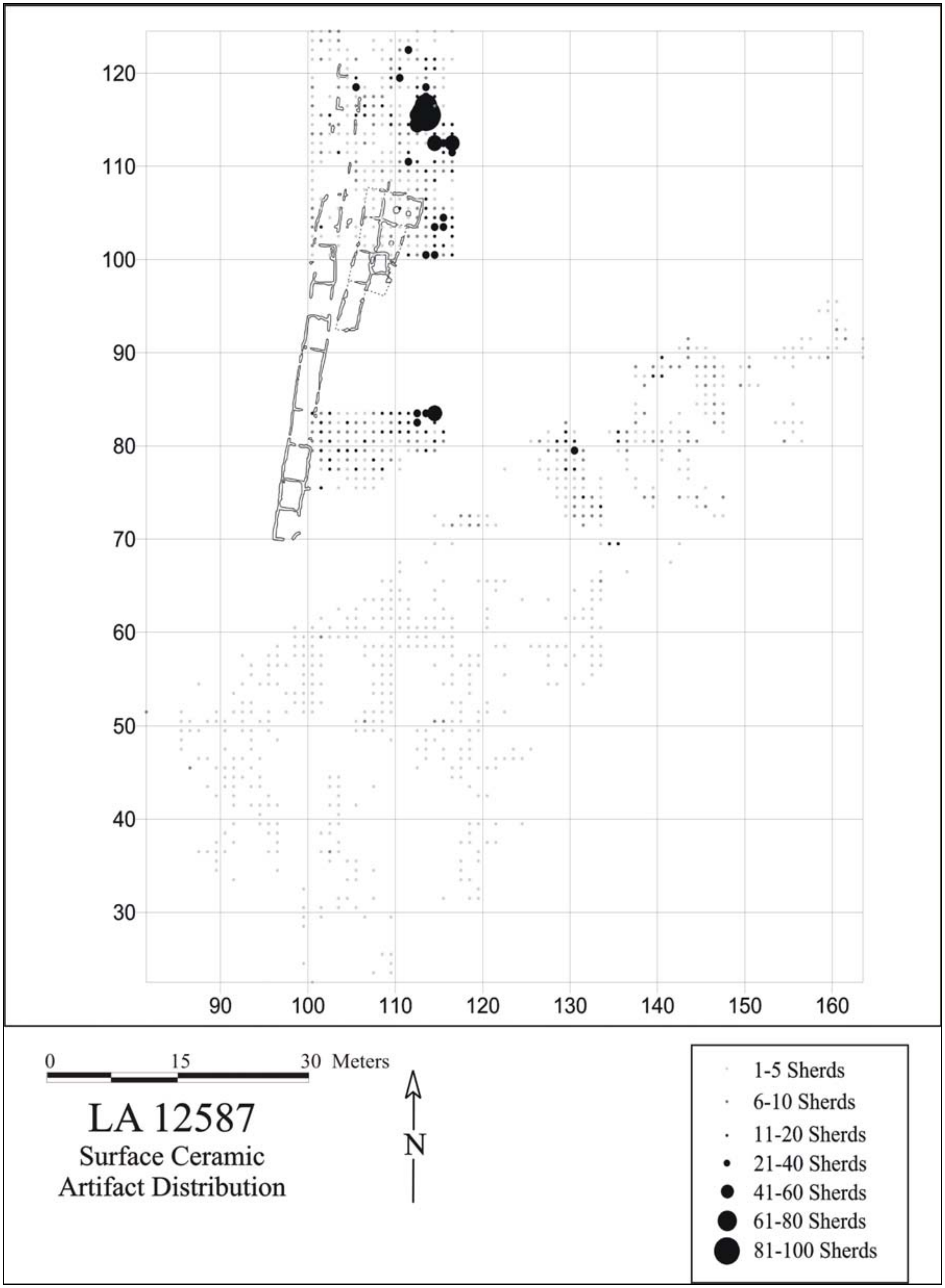

Figure 14.3. Surface distribution of ceramic artifacts (including Area 8).

SITE EXCAVATION

Area 1

Area 1 encompasses Roomblocks 1 and 3 and Room 3.

Roomblock 1

Roomblock 1 consists of two rows of rooms oriented approximately 12° east of true north. The front rooms (Rooms 2, 4/5, and 7) each contain a hearth and postholes and are interpreted as habitation rooms. An ash box and possible deflector in Room 7 may be indicative of ceremonial functions. Three of the back rooms (Rooms 1, 6, and 8) are smaller and each is paired with a front room. They are interpreted as storage rooms. A fourth back room, Room 9, is contiguous to Room 8 on the south side. The function of Room 9 is unclear, although in placement and in its lack of internal features it resembles a storage room. In floor area it resembles the front rooms. Table 14.3 shows the interior dimensions and area for each of the rooms.

Table 14.3. Room dimension summary for Roomblock 1.

Room	*Front*/Back Room	Length (m)	Width (m)	Floor Area (m^2)
1	Back	2.9	2.1	6.1
2	*Front*	*3.1*	*3.6*	*10.4*[1]
4/5	*Front*	*4.0*	*2.8*	*11.2*
6	Back	3.6	2.2	7.9
7	*Front*	*4.0*	*3.0*	*9.9 or 12.0*[2]
8	Back	3.5	2.1	7.4
9	Back	4.9	1.9	9.3

1. Room 2 is slightly L-shaped and thus its area cannot be calculated by simply multiplying length by width.
2. The exact size of Room 7 could not be determined. See the room description below.

Architecture. The rooms were constructed with shaped and unshaped tuff blocks and occasional dacite cobbles, adobe mortar, and chinking stones. One adobe block was encountered during excavation. As noted by earlier researchers (Steen 1977:43; Van Zandt 1999) roomblocks on the Pajarito Plateau often exhibit a variety of wall construction styles. Such is the case with Roomblock 1. Generally, four construction techniques were observed: wet laid coursed masonry, uncoursed upright block masonry, turtleback adobe construction, and a core and veneer construction.

Wet laid coursed masonry is constructed by horizontally laying shaped or unshaped tuff blocks onto a prepared mortar bed. Another layer of mortar is placed on top of the blocks and another course of blocks is laid horizontally onto it. These blocks are secured with additional mortar in the vertical joints. Chinking stones are inserted into both horizontal and vertical joints to prevent the mortar from cracking and to provide stability to the blocks.

The use of uncoursed upright block construction often occurs with the coursed masonry in a wall. It usually is employed for relatively short expanses and is quite variable in appearance. Generally, a thick bed of mortar is laid down and various sizes of masonry blocks and chinking stones are inserted into and on top of it. More adobe mortar is added, and additional blocks and chinking stones are added in a seemingly indiscriminate fashion. The result is a wall segment with abundant adobe interspersed with stones or irregular shapes and sizes. In Roomblock 1, segments of this construction technique terminate at large upright masonry blocks placed across the width of the wall. These cross-blocks help to stabilize the broad applications of mortar.

The third construction technique common in Roomblock 1 is the use of turtleback adobe. In this method, large blocks or slabs are secured in an upright position parallel to the length of the wall and then thick layers of adobe mortar are applied to the tops of these blocks until a relatively flat surface is achieved. This construction technique was used primarily in wall foundations; once the relatively horizontal mortar bed was achieved other techniques were used above it.

The final construction technique used was core and veneer. At LA 12587, the veneer consists of either upright tuff blocks or a thick layer of adobe and chinking stones. The core consists of sediment and rubble.

Many of the room corners of the pueblo were in poor condition, making bond/abut determinations difficult. Nevertheless, it appears that the central wall (the wall between the front and back rooms) was built first and then Rooms 1 to 8 were built off of it. Room 9 may be a later addition.

Floor construction in Roomblock 1 varied. The most common method of construction was initiated with the deposition of small tuff rocks over the irregular Bw or Btk horizon or the bedrock surface. A thick layer of adobe was placed over the rocks to create a level surface and was allowed to dry. One or more layers of plaster were then applied to the surface of the adobe and smoothed, resulting in an even floor surface. A floor surface was found in all nine rooms of Roomblock 1. Up to three floors had been constructed in the front rooms but no more than one floor was found in the back rooms. On some floors several layers of plaster had been applied, indicating the occurrence of (seasonal?) rejuvenation of the floor.

Room 1

Room 1 is located at the northwest corner of the roomblock (Figure 14.4). The interior is 6.1 m^2 (2.9 m long and 2.1 m wide) in size. Only one interior feature (Feature 2), a dacite cobble, and ash concentration were present.

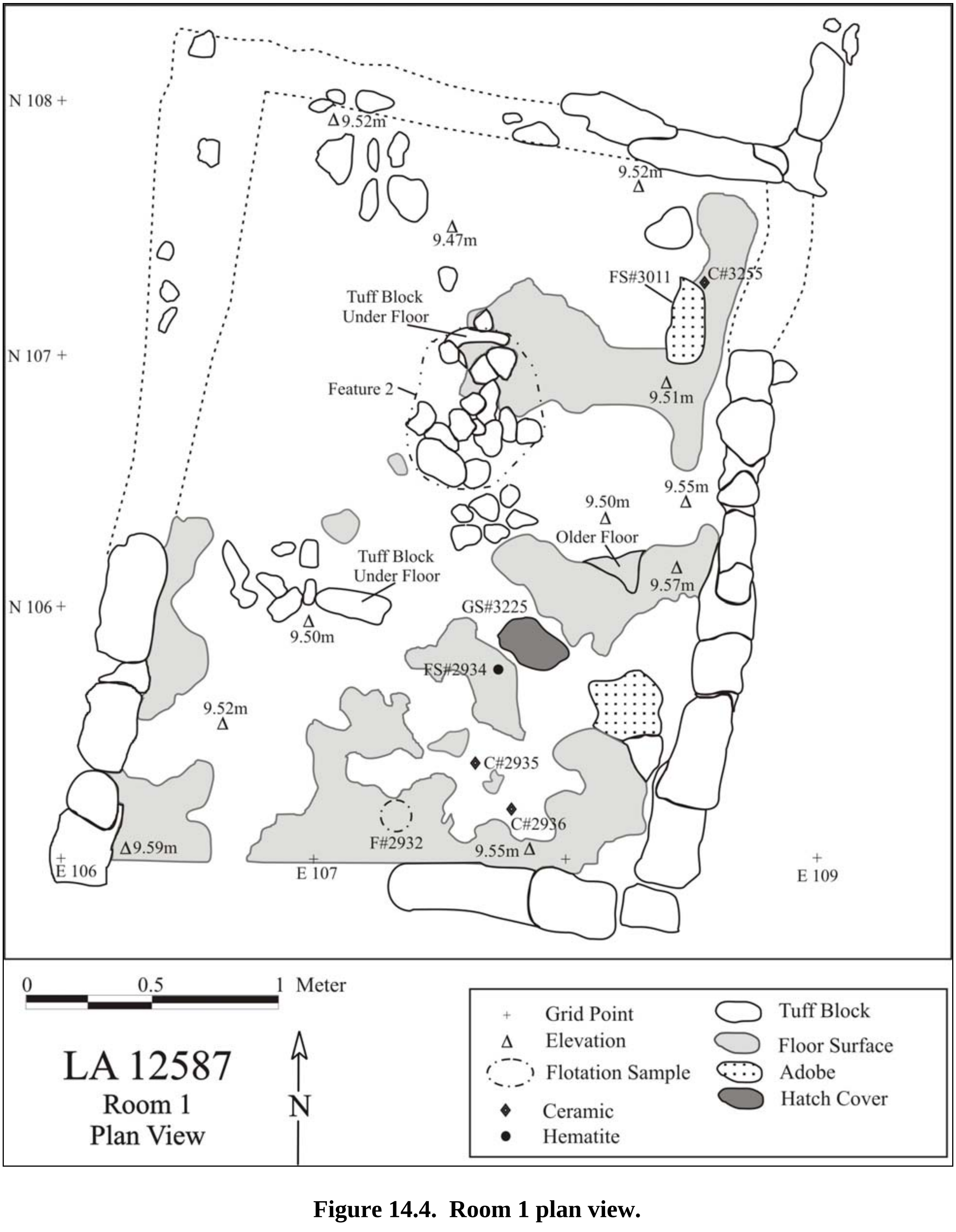

Figure 14.4. Room 1 plan view.

Stratigraphy. Table 14.4 summarizes the strata in Room 1. A large anthill, a small sagebrush, a prickly pear cactus, and pine duff were present on the surface of Room 1. The surface fill

(Stratum 1) consisted of a shallow stratum of loose, unconsolidated brown sandy loam that is present throughout the site. Tuff blocks, tuff cobbles, and artifacts were recovered from this stratum. Stratum 1 was underlain by post-occupational fill (Stratum 10), which ranged from 31 to 38 cm thick. The sediment was moderately consolidated brown sandy loam. Shaped and unshaped tuff blocks (approximately 35), chinking stones (approximately 250), chunks of adobe, and melted adobe were encountered in the room fill. No discernable rooffall or pre-structural collapse fill was observed. The room floor (Stratum 121), the sub-floor sediments (Stratum 170), and the fill of Feature 2 (Stratum 210) are described below.

Table 14.4. Room 1 stratigraphy.

Stratum	Thickness (cm)	Color	Texture	Description
0	0	10YR 4-5/3	sandy loam	Surface
1	2–5	10YR 4-5/3	sandy loam	Unconsolidated surface soil
10	31–38	10YR 4-5/3	sandy loam	Wallfall and post-occupational fill
121	0	10YR 7/1	silty clay	Floor surface
170	3–5	10YR 4/3	silt loam	Sub-floor soil
210	1–3	7.5YR 4/3	silt loam/ash	Feature 2, fill

Table 14.5 shows the artifact counts by stratum for Room 1. The "Other" category includes an adult human right talus (Field Specimen [FS] 1208), a freshwater shell fragment (FS 1012), a piece of gem-quality hematite (FS 2934), an adobe block (FS 3011), and several other miscellaneous samples. Noteworthy artifacts include a ceramic cloud blower pipe fragment (FS 1269), three pieces of turkey eggshell (FS 1175, FS 1371, and FS 1427), and two bone beads (FS 1287 and FS 1417).

Table 14.5. Room 1 artifact counts by stratum.

Stratum	Chipped Stone	Ceramics	Ground Stone	Nonhuman Bone	Other	Total
0	9	16	0	0	0	25
1	66	285	2	0	1	354
10	387	1803	27	26	6	2249
121	0	3	1	0	1	5
170	0	0	0	0	0	0
210	8	22	16	0	0	46
Total	**470**	**2129**	**46**	**26**	**8**	**2679**

Floor. Intact portions of plastered floor were present in the eastern and southeastern portions of the room. Extensive bioturbation and exposure after abandonment destroyed the remainder of the floor. Due to subsidence and rodent burrowing, the floor surface undulates and varies between elevations of 9.57 and 9.51 m. Floor plaster, which was whitish gray in color (10YR 7/1) and contained charcoal flecks, was applied over a layer of grayish brown adobe that covered soil in some places and bedrock in others. Before the adobe was laid down, irregular tuff rocks were used to fill depressions in Stratum 170 and the bedrock. In a few places the floor plaster still articulates with the interior wall plaster to form a continuous surface curving from floor to wall. In other areas there was probably never any coping between the floor plaster and the wall plaster. A small patch of floor on the east side of the room is 2 cm lower in elevation than the surrounding plaster. This difference in elevation does not appear to be the result of subsidence or bioturbation; instead, it appears that the floor was resurfaced at least once.

Three sherds were recovered from the floor surface and included a Santa Fe Black-on-white bowl sherd (FS 2935), an unidentified sherd (FS 2936), and a smeared-indented corrugated jar sherd (FS 3255). Other artifacts found on the floor included an andesite hatch cover fragment (FS 3225) and a piece of gem-quality hematite (FS 2934). An adobe brick (FS 3011) from the east wall was found on the floor in the northeast corner of the room. No pollen or macrobotanical samples were collected, but a single flotation sample (FS 2932) was collected from the floor. Taxa identified in this sample included four-wing saltbush (*Atriplex canascens*), cheno-ams (*Chenopodium/Amaranthus*), juniper (*Juniperus*), ponderosa pine (*Pinus ponderosa*), and maize (*Zea mays*).

Wall Construction. It appears that the east and west walls of the room were built first and then the north and south walls were abutted to them. Wall construction styles used in Room 1 include wet laid coursed masonry, uncoursed upright block masonry, and turtleback adobe construction.

None of the walls are complete although remnants of foundation adobe help to confirm the perimeter of the room where the walls are missing (Table 14.6). The preserved southern wall segment consists of one upright tuff block with the long axis situated parallel to the wall, two uprights that are perpendicular to the wall, and one horizontally laid tuff block on top of an adobe and cobble mass. The western wall segment consists of a single course of tuff blocks set into adobe mortar. A small amount of plaster remained on the interior of this wall. Aside from the eroded adobe foundation, the only other remnant of the north wall was a long, horizontally laid tuff block near the east end of the wall.

Table 14.6. Room 1 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	0.80	0.24	0.17
East	2.20	0.44	0.26
South	2.03	0.44	0.22
West	1.19	0.19	0.25

The east wall (Figure 14.5) is one of the best-preserved walls of the roomblock. It was built with shaped and unshaped tuff blocks, adobe, and adobe bricks. The basal course consists of upright unshaped tuff blocks that were secured into the Btk horizon. The uprights were then covered with multiple layers of adobe (turtlebacks) forming a thick platform upon which the overlying course was laid. The second course consists of masonry and chinking stones set in mortar.

The gap in the north end of the east wall may have provided access to Room 2. At this location the floor slopes gradually up and over a slightly raised adobe that may be the remains of a sill. In contrast, the floor south of this section slopes up, then abruptly terminates just before it encounters the wall. Here, the interior wall plaster extends down the wall surface but, instead of forming a coping with the floor plaster, it extends below the level of the floor.

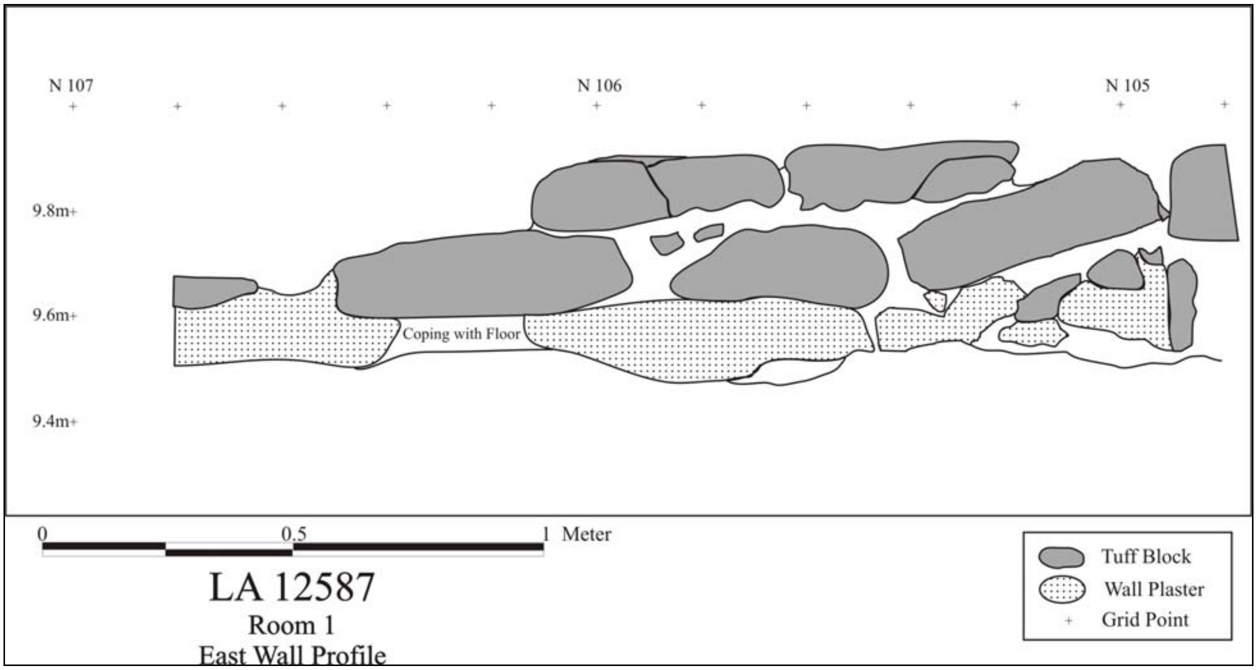

Figure 14.5. Room 1, east wall profile.

Artifacts and Samples. All the artifacts from units 106N/107E and 107N/107E were analyzed. All the macrobotanical material from unit 106N/107E was also analyzed. All the faunal remains were analyzed. All the artifacts found on the floor (except for FS 2936, which is missing) were analyzed and include a quartzite hoe fragment (FS 1396) and a shaped andesite slab fragment (FS 2868). Table 14.7 lists the samples analyzed from Room 1.

Table 14.7. Room 1 analyzed samples by stratum.

Stratum	Flotation	Pollen	Macrobotanical[1]
1	None	None	1029
10	1280	1251	1350
121	2932	None	None
170	None	None	None
210	1485, 2876	1484, 1486, 2875	None
Adobe Block	3011	None	None

1 In addition to the macrobotanical material from unit 106N/107E

Feature 2

A single feature was identified in Room 1 east of center and oriented north-south (Figure 14.6). Feature 2 is 100 cm long and 80 cm wide and consists of about 20 smooth and flattened cobbles, most of which are dacite. The cobbles range in size from 12.3 by 10.9 cm to 24.4 by 15.7 cm and are heavily coated with $CaCO_3$. Some of the cobbles overlap each other.

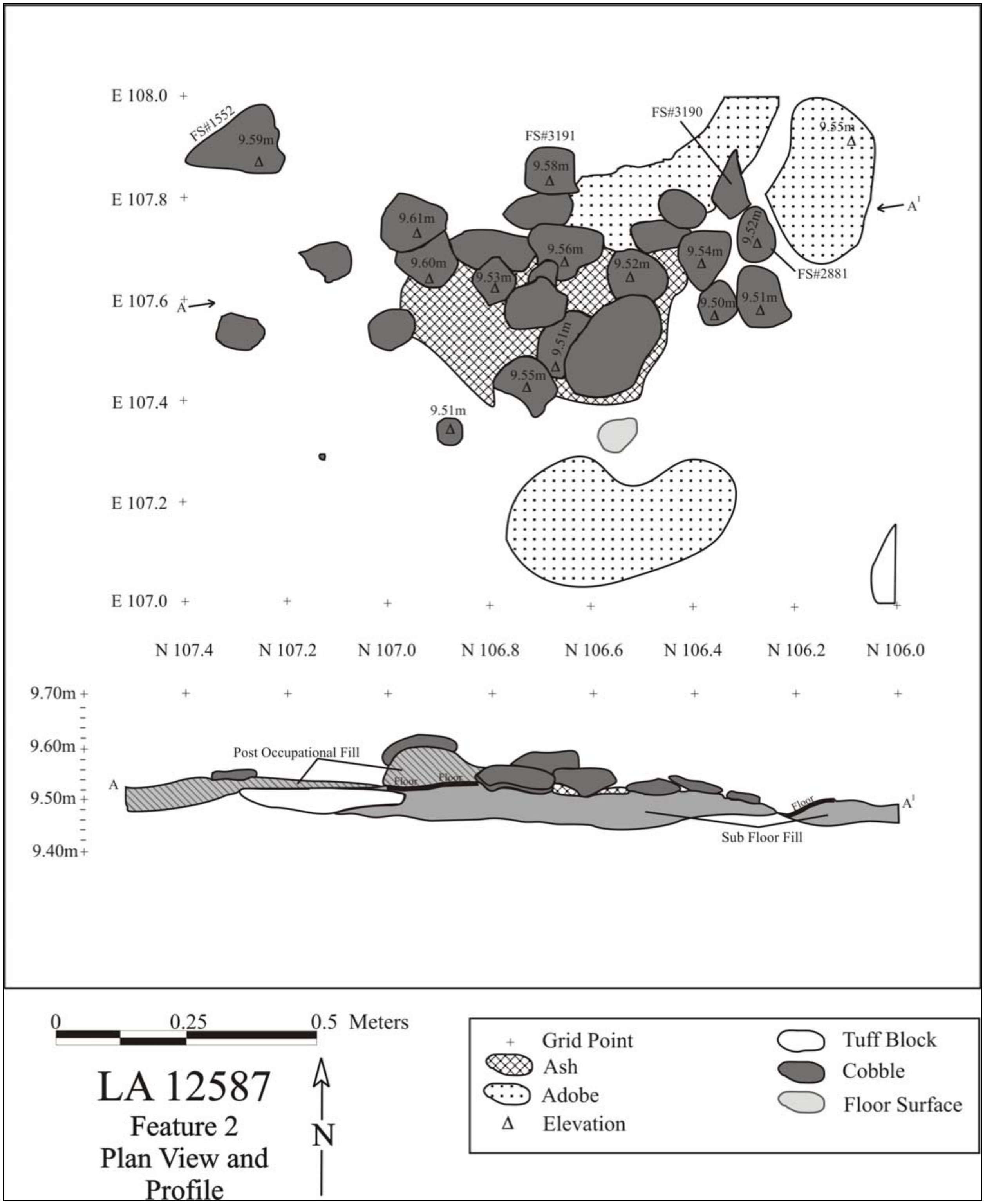

Figure 14.6. Feature 2 plan view and profile.

Three cobbles (FS 2881, FS 3190, and FS 3191) exhibit cultural modification. FS 2881 is a dacite cobble with a small (6.8 by 6.7 cm) circular area of grinding wear on one side. FS 3190 is a discoidal quartzite cobble. One face shows a small area of grinding, while the opposite face is dimpled as if it was used as an anvil. Two edges show battering. FS 3191 is a wedge-shaped dacite cobble that is ground on both faces. The narrow edge is unifacially flaked and may have been used for scraping. The cobbles were situated in a thin ashy matrix.

The floor surface had been destroyed beneath most of Feature 2. However, 5 cm of fill was present between one cobble and the floor surface at the north end of the feature. It is possible that the feature post-dates the abandonment of Room 1 but pre-dates its collapse. Several tabular piece of andesite (FS 1551, FS 1552, and FS 3189) covered the cobbles. These artifacts appear to be fragments of a hatch cover. Additional pieces of tabular andesite, possibly from the same hatch cover, were found in the room (e.g., FS 3225).

Two flotation samples (FS 1485 and FS 2876) and three pollen samples (FS 1484, FS 1486, and FS 2875) were analyzed from Feature 2. Taxa identified in the flotation samples included sagebrush (*Artemisia*), saltbush/greasewood (*Atriplex*/*Sarcobatus)*, cheno-ams, unidentified conifer (Gymnospermae), juniper, ponderosa pine, prickly pear cactus (*Opuntia*), cottonwood/willow (*Populus*/*Salix*), piñon pine, and maize. Taxa identified in the pollen samples include maize, cheno-ams, grass family (Poaceae), parsley family (Apiaceae), sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), spurge family (Euphorbiaceae), unidentified pine, piñon pine, juniper, and sagebrush.

The function of Feature 2 is unclear, although it appears to be a warming feature. The cobbles may have been heated elsewhere and brought in along with ash from the incinerated fuel. However, the cobbles do not appear to be thermally altered.

Room 2

Room 2 (Figure 14.7) is located in the northeast end of the roomblock. The interior east-west dimension of the room is 3.6 m and the north-south dimensions are 3.1 m on the west side and 2.4 m on the east side. The interior area is 10.4 m^2. Two hearths (Features 4 and 20) and two groups of postholes (Features 10 and 11) are present. A small exterior storage area (Feature 5) is associated with Room 2. A considerable amount of charred maize was found, indicating that the room was probably burned.

Stratigraphy. Table 14.8 summarizes the strata associated with Room 2. Several sagebrush were growing on top of Room 2 at the time of excavation. Stratum 1 consists of a shallow stratum of loose, unconsolidated sandy loam that is present throughout the site. Tuff blocks, tuff cobbles, and artifacts were recovered from this stratum. Stratum 1 is underlain by post-occupational fill, wallfall, and rooffall (Stratum 10). The stratum consists of moderately compact sandy loam with varying amounts of tuff gravel, fist-sized tuff rocks, and masonry. Wallfall consists of approximately 66 shaped and unshaped tuff blocks, approximately 56 fist-sized tuff rocks, and numerous chunks of adobe.

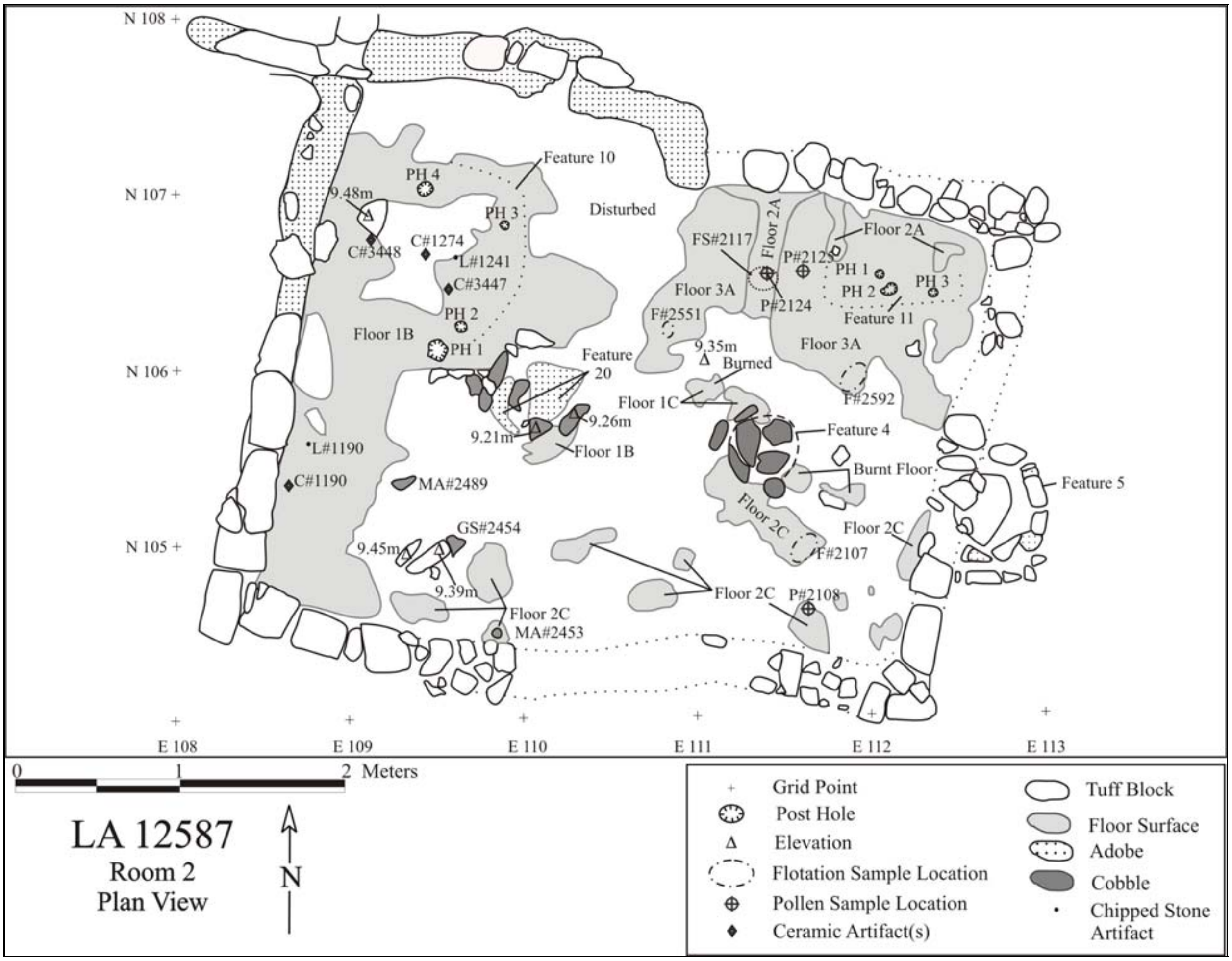

Figure 14.7. Room 2 plan view.

Rooffall was found in several places. In the southwest corner of the room, rooffall consists of reed-impressed adobe chunks, chunks of burned adobe, and a partly charred juniper beam fragment (FS 850). Large pieces of charcoal, chunks of heavily oxidized adobe, and a concentration of adobe chunks with roof material impressions were found in the southeast quadrant of the room. About 4 to 5 cm above the floor in the northeastern corner, a partially charred chunk of juniper wood was recovered (FS 2119) that may be a roof beam fragment. An abundance of charred maize kernels and cob fragments were recovered from Stratum 10. The densest concentration of charred maize was found in the southeast quadrant of the room.

Table 14.8. Room 2 stratigraphy.

Stratum #	Thickness (cm)	Color	Texture	Description
0	0	7.5YR 4/3	sandy loam	Surface
1	2–5	10YR 5/3, 7.5YR 4/3	sandy loam	Unconsolidated surface soil
10	34–48	7.5YR 4/3-4	sandy loam	Wallfall and post-

Stratum #	Thickness (cm)	Color	Texture	Description
				occupational fill
70	2–4	10YR 4/3	sandy loam	Fill below wallfall and above floor
122	0	10YR 7/1	silty clay	General floor surface
170	4–11	10YR 4/4, 7.5YR 4/6	sandy loam, clay loam	Sub-floor soil
213	10–20	7.5YR 4/4	sandy loam	Feature 5, fill
260	11–20	7.5 YR 4/3	silt loam and ash	Feature 4, upper fill
261	1–9	7.5YR 4/2	ash	Feature 4, lower fill
262	6–11	7.5YR 4/4	sandy loam	Feature 10, fill
263	3–6	7.5YR 4/4	sandy loam	Feature 11, fill
264	1–2	7.5YR 7/1	hardened silt/ash	Floor 1A, matrix
265	2	7.5YR 5/1	hardened silt/ash	Floor 2A, matrix
266	1–2	7.5YR 7/1	hardened silt/ash	Floor 3A, matrix
267	3–7	7.5YR 7/1	hardened silt/ash	Floor 1B, matrix
268	2	7.5YR 7/1	hardened silt/ash	Floor 1C, matrix
269	1.5	7.5YR 7/1	hardened silt/ash	Floor 2C, matrix
311	18	7.5YR 4/3	silt and ash	Feature 20, fill

A 2- to- 4-cm stratum of pre-wall collapse (Stratum 70) is present. Stratum 70 is less consolidated, sandier in texture, and contains less architectural material than Stratum 10. However, as in Stratum 10 there is an abundance of carbonized maize kernels and cob fragments. An ash lens was noted in Stratum 70, from which a flotation sample was taken (FS 2080). Taxa identified in this sample included pigweed (*Amaranthus*), sagebrush, saltbush/greasewood, goosefoot, unknown conifer, juniper, unidentified pine, piñon pine, ponderosa pine, cottonwood/willow, dropseed grass (*Sporobolus*), and maize.

The strata associated with the floors and features of Room 2 are discussed in the Floor and Features sections below. Table 14.9 shows the artifact counts by stratigraphic unit for Room 2. The 'Other' category includes an adult human right intermediate pedal phalanx (FS 787), an adult human right cuneiform (FS 1469), an adult human right intermediate pedal phalanx (FS 1515), an adult human right second metatarsal (FS 1941), an unidentified freshwater shell pendant (FS 895), a cf. *Anodonta* sp. umbo fragment (FS 1238), an unidentified freshwater shell fragment (FS 1522), a possible *Anodonta* sp. shell fragment (FS 2430), a biotite bead blank (FS 1199), a turquoise nugget (FS 1543), a possible pale green clay pigment fragment (FS 2478), a rock with pigment (FS 1569), a fragment of hematite (FS 1197), and a number of floor/roof samples. Other noteworthy artifacts include three bone beads (FS 1521 and FS 2830) and a possible ceremonial bundle (FS 2117). The bundle is described below.

Table 14.9. Room 2 artifact counts by stratum.

Stratum #	Chipped Stone	Ceramics	Ground Stone	Nonhuman Bone	Other	Total
0	19	86	0	0	0	105

Stratum #	Chipped Stone	Ceramics	Ground Stone	Nonhuman Bone	Other	Total
1	191	682	3	2	0	878
10	1013	4385	32	69	30	5529
70	64	206	2	6	4	282
122	3	7	3	5	0	18
170	7	32	1	2	0	42
213	0	0	0	0	0	0
260	1	12	0	6	0	19
261	3	6	7	5	0	21
262	0	0	0	0	0	0
263	0	0	0	0	0	0
264	0	1	0	0	0	1
265	0	0	0	0	1	1
266	0	0	0	0	0	0
267	0	1	0	0	1	2
268	0	0	0	0	0	0
269	0	0	0	0	0	0
311	2	0	5	0	1	8
Total	**1303**	**5418**	**53**	**95**	**37**	**6906**

Floors. At least three flooring episodes occurred in Room 2. Stratum 122 refers to the uppermost floor surface throughout the room, regardless of what flooring episode it is associated with (an association that cannot always be determined, as discussed below). Stratum 122 is patchy and undulating. Typically the floor was encountered at 9.41 or 9.42 m, although a range in elevation from 9.55 m to 9.39 m was recorded. The floor slopes up to the walls (coping) in all places where the floor and walls articulate. The floor surface is relatively well-preserved in the western portion of the room and in the northeast corner, but has deteriorated elsewhere. All the flooring episodes in Room 2 were performed using the same technique: an ashy light gray (7.5 to 10YR 7/1) plaster was applied over a layer of adobe. In places, tuff cobbles were used to create an even surface over bedrock and soil.

Since the floor was not contiguous across the room, it was divided into three areas. In Area A (the northeastern corner) there were three distinct floor layers. The uppermost floor (3A) is approximately 2 cm thick. The middle floor (2A) is of approximately equal thickness. Floors 2A and 3A exhibit a fine layering of plaster indicative of multiple resurfacing episodes. In some places, the undersides of Floors 3A and 2A exhibit grass-like impressions. The lowest floor (1A) is 1 to 2 cm thick.

The western portion of the room is Area B. Floor 1B is a single floor (3 to 7 cm thick) in which no sub-layers were discerned. Because of extensive floor deterioration between Areas A and B, the floor surfaces of these areas could not be correlated. It is possible that the floor in Area B formerly consisted of three layers, which were compressed over time to become one thick floor. The combined thickness of the floors in Area A approximates the thickness of Floor 1B. Underneath Floor 1B there are small and medium-sized tuff cobbles that form a foundation over the uneven bedrock. The tuff cobbles below a portion of the floor (at 106.3N/110.0E) are mortared together with adobe. Some of this adobe is smeared up against the vertical surface of the remaining floor; finger impressions are visible in this adobe. The purpose of this adobe and cobbles cluster is not clear. It may be the remains of a sub-floor feature.

Area C consists of isolated patches of floor in the southeastern third of the room. Two floors were identified. Floor 2C is the uppermost floor and is 0.5 cm thick. The lower floor (1C) is 1 to 4 cm thick. No resurfacing layers were evident in either floor. Some of the patches of Floor 1C around the younger hearth (Feature 4) were burned. Again, because of deterioration of the floor surfaces, the Area C floors could not be correlated with the floors in Areas A and B.

Six sherds were recovered from the floor surface (Stratum 122). These included five smeared-indented corrugated jar sherds (FS 1190, FS 3447, and FS 3448) and one Santa Fe Black-on-white bowl sherd (FS 1274). Two pieces of chalcedony debitage were recovered and included a core flake (FS 1190) and a piece of microdebitage (FS 1241). Three ground stone artifacts were recovered. These included a quartzite two-hand mano fragment (FS 2453), an andesite hatch cover fragment (FS 2454), and a dacite one-hand mano fragment (FS 2489).

In the northeast corner of the room, a number of burned chunks of adobe and a large piece of burned juniper wood (FS 2119) were found on the floor. A cluster of charred artifacts believed to be the remains of a ceremonial bundle (FS 2117) was found below the juniper fragment. It is possible FS 2119 is part of a roof beam from which the bundle was suspended. FS 2117 consists of four or five bird bone tubes, a basalt flake, a Santa Fe Black-on-white worked sherd, and a burned rock. All of these artifacts were found within a 16- by 16-cm area.

Each bone tube has one fragmented end and one cut/shaped end. The tubes are between 1.5 and 14 cm long. One of the bone tubes (11 cm long) has a medial perforation indicating that it might have been a whistle. All of the bone tubes were heavily burned to white/gray. One of the bone tubes is an ulna; the other tubes could not be identified to a specific skeletal element. The upper three tubes (11 cm, 14 cm, and 6 cm long, from north to south) were parallel to each other and aligned roughly west-northwest to east-southeast. The eastern ends of the tubes were fragmented and the west ends were cut and shaped. The west ends of the tubes were situated about 2.5 cm above the floor and the east ends were about 1 cm above the floor. When these three tubes were removed, a fourth tube was exposed parallel to and below the two northernmost tubes. This tube is also cut and shaped on the west end, fragmented on the east end, and 8.5 cm long. It was situated 0.5 cm above the floor. A fifth tube lay perpendicular to the other four tubes. It was in contact with the floor and lay below the eastern ends of the two northernmost tubes. It is 1.5 cm long and cut and shaped on one end. It is unclear if the short tube is a discrete item or part of one of the other tubes. The basalt flake, the worked sherd, and the burned rock were situated a few cm south of the bone tubes and were 0.5 to 1.0 cm above the floor.

Wall Construction. It appears that the west wall of the room was built first and then the north, south, and east walls were built as one unit. The north and south walls appear to be bonded with the east wall and abutted to the west wall. Table 14.10 gives the dimensions of the extant wall segments.

The remaining portions of the north wall consist of the western 1.86 m and a 0.96-m segment east of center. A thin remnant of adobe at floor level was all that remained of the rest of the wall. The extant segments were constructed by setting upright tuff blocks into a thick bed of adobe mortar (7 to 14 cm thick) that was laid onto Stratum 175. Adobe mortar was applied to the stone surfaces and to the interface of the masonry and the basal mortar. Only a single course of upright stones remained.

The eastern and western portions of the south wall remain. The wall consists of a basal course of core and veneer segments separated by upright tuff blocks and capped by horizontal tuff blocks. Dissection of the west end of the east segment revealed that the veneer consists of a thick layer of adobe and small tuff stones that was thickly plastered and smoothed. The core consists of sediment and rubble and appears to be material from the midden. No additional courses remain. The eastern end of this wall was heavily oxidized near floor level.

The best-preserved portion of the east wall is the southeast corner where it is bonded to the south wall (Figure 14.8). Although this wall was not dismantled to study its construction, it appears to consist of an adobe foundation capped by large tuff blocks. The basal course of the wall consists of segments of adobe mortar from which fist-sized tuff rocks protrude. It is likely that the segments consist of the same core and veneer construction that is found in the south wall. Vertical upright tuff blocks separate the segments. The overlying course consists of horizontally placed tuff blocks set in a mortar bed. No additional courses remain. The west wall is described in Room 1.

Figure 14.8. Room 2 east wall.

Table 14.10. Room 2 wall dimensions (extant walls segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	1.86, 0.96	0.27	0.29
East	3.0	0.35	0.25
South	1.4, 1.5	0.46	0.30
West	2.3	0.46	0.25

Artifacts and Samples. All the artifacts from units 105N/111E and 106N/111E were analyzed. All the macrobotanical material from unit 105N/111E was also analyzed. All the faunal remains were analyzed. All the artifacts found on the floor were analyzed and included an andesite axe fragment (FS 1670), a shaped andesite slab fragment (FS 2454), an El Rechuelos obsidian corner-notched Puebloan projectile point (FS 2340), a Cerro Toledo obsidian drill (FS 1705), one Pedernal chert core flake (FS 2886), and one chalcedony core flake (FS 2886). Table 14.11 lists the samples analyzed from Room 2.

Table 14.11. Room 2 analyzed samples by stratum.

Stratum	Flotation	Pollen	Macrobotanical[1]
10	758, 1092, 1200, 1579, 2555, 2831, 2832	None	None
70	2080	2123	1220
122	2107, 2551, 2592	2108, 2124, 2125	2169
170	957, 1000	None	965, 1003
213	2989, 2994	2988, 2993	2992
260	2644, 2645, 2646, 2666, 2667, 2668, 2711	2648	2712
261	2697, 2698, 2714	2715	None
262	None	3369, 3370	None
263	None	3394	None
264	None	3517, 3518	None
265	3558	3513, 3514	None
266	3557	3515, 3516	None
267	3560	3519	None
268	None	3520	None
269	None	3521	None
311	4138, 4139, 4197, 4198	4141	4146

1. In addition to the macrobotanical material from 105N/111E

Features

Feature 4 (Hearth). Feature 4 is a circular collared hearth situated 80 cm west of the east wall and 85 cm north of the south wall (Figures 14.9 and 14.10). The exterior diameter of the hearth is 60 cm, the interior diameter is 40 cm, and it is 29 cm deep. Eleven cobbles of assorted materials (andesite, dacite, quartzite, rhyolite, sandstone, and vesicular basalt) were used to line the sides and base of the hearth. Four of these cobbles were identified as manos or mano fragments (FS 4202, FS 4204, FS 4205, and FS 4207), and three were identified as grinding slabs (FS 4200, FS 4203, and FS 4206). Plaster covers the cobbles on the north, west, and south-

southeast sides of the hearth; elsewhere it has deteriorated. The cobbles forming the base of the hearth were mortared into place.

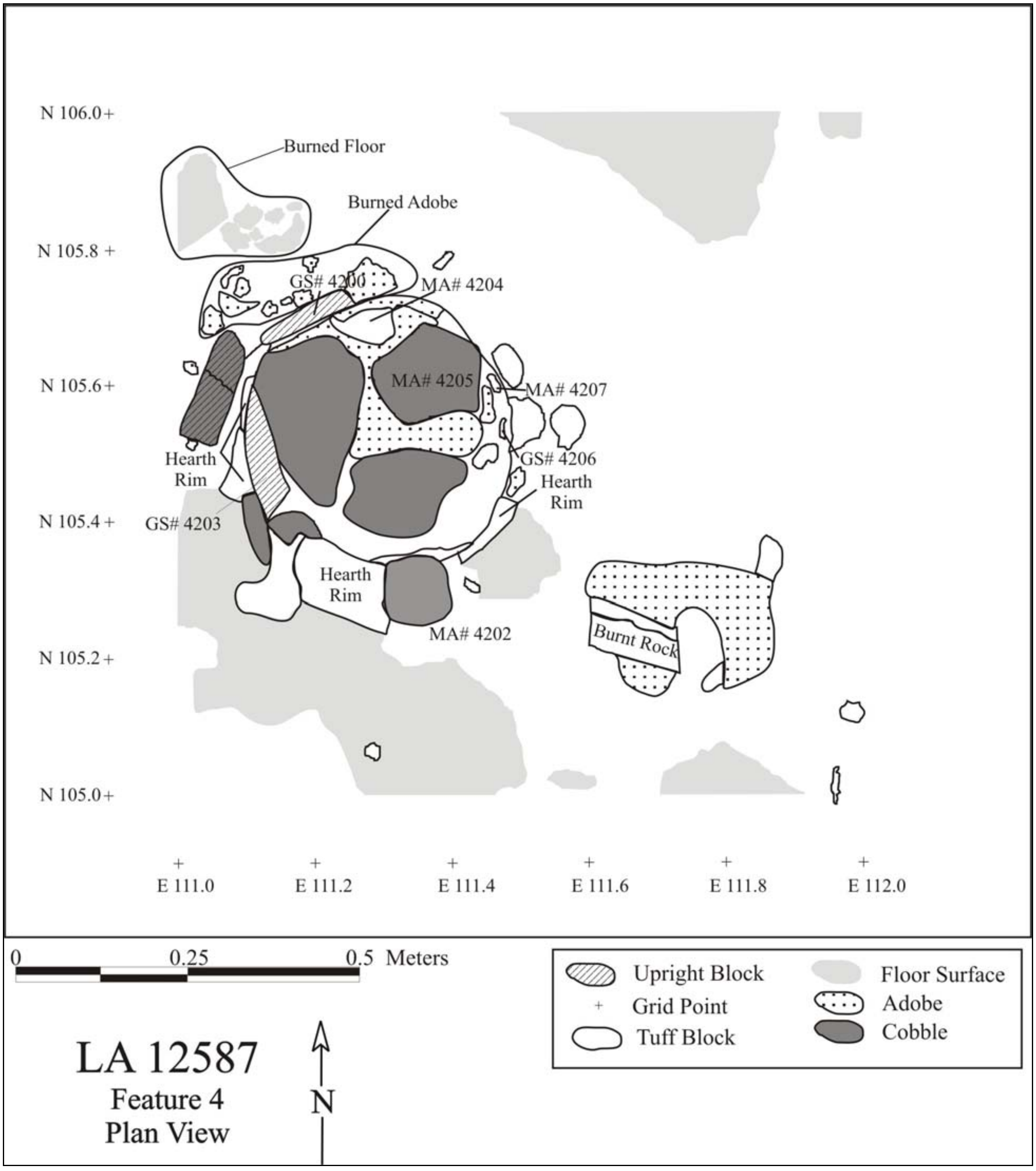

Figure 14.9. Feature 4 plan view.

Figure 14.10. Feature 4 after excavation.

The fill of the hearth consists of a mix of silt loam and ash (Stratum 260) and, in the southeast part of the hearth, a deposit of ash (Stratum 261) (Figure 14.11). The floor surrounding the hearth (Floor 2C to the south and east, Floor 1C to the north) is only partially preserved. Both the plastered floor and the damaged areas without plaster show evidence of burning. An upright dacite block set into adobe is located 14 cm east of the hearth. This block appears to be from the south side of a depression. It is possible that this is the remains of an ash pit; however, the area is so disturbed that a clear determination cannot be made. The hearth, the possible ash pit, and the external feature (Feature 5) are aligned east-northeast to west-southwest.

Ten flotation samples, two pollen samples, and one macrobotanical sample were taken from Feature 4. Taxa identified in the flotation sample included pigweed, sagebrush, goosefoot, saltbush/greasewood, cheno-ams, hedgehog cactus (*Echinocereus*), spurge (*Euphorbia*), Desert olive (*Foresteria*), unknown conifer, juniper, mint family (Labiatae), groundcherry (*Physalis*), unidentified pine, piñon pine, ponderosas pine, prickly pear, cottonwood/willow, purslane, oak (*Quercus*), buffalo burr, dropseed grass, and maize. Given the amount of bioturbation in Room 2 and the amount of maize present in the room, most or all of the maize recovered from Feature 4 is probably not directly associated with the use of the hearth. Taxa identified in the pollen samples taken from the hearth included maize, cholla (*Opuntia*), prickly pear, beeweed (*Cleome*), cheno-ams, grass family, sunflower family, spurge family, evening primrose (Onagraceae), fir (*Abies*), unidentified pine, piñon pine, juniper, and sagebrush. A macrobotanical sample from the hearth was submitted (FS 2712) and identified taxa included piñon pine, maize, and juniper.

Figure 14.11. Feature 4 profile.

An archaeomagnetic dating sample (set 1210) and a maize fragment (FS 2644) from the hearth were submitted for dating. The archaeomagnetic sample returned a number of possible dates but the preferred date interpretation is AD 1245–1310 (see Blinman and Cox, Volume 3). The maize fragment returned an age of 870±70 BP (Beta-183747) and a date of cal AD 1180 with a two-sigma date range of cal AD 1020–1280.

Feature 5 (Masonry Structure). Feature 5 is affixed to the exterior east wall of Room 2 (Figures 14.12 and 14.13). This feature is a small semicircular masonry structure that measures 64 cm north-south and 38 cm east-west and has a maximum depth of 20 cm. A poorly preserved use surface was evident surrounding the feature. It was constructed with small and medium-sized tuff rocks. Two courses were present on the south side of the feature, only a single course is present on the east and north sides. The west side is formed by the Room 2 wall. Adobe mortar was present in places on top of and between the rocks, but no plaster or adobe was evident inside the feature. The absence of thermal alteration on the interior indicates that Feature 5 was not a hearth or other thermal feature, but may have functioned as an external storage cist.

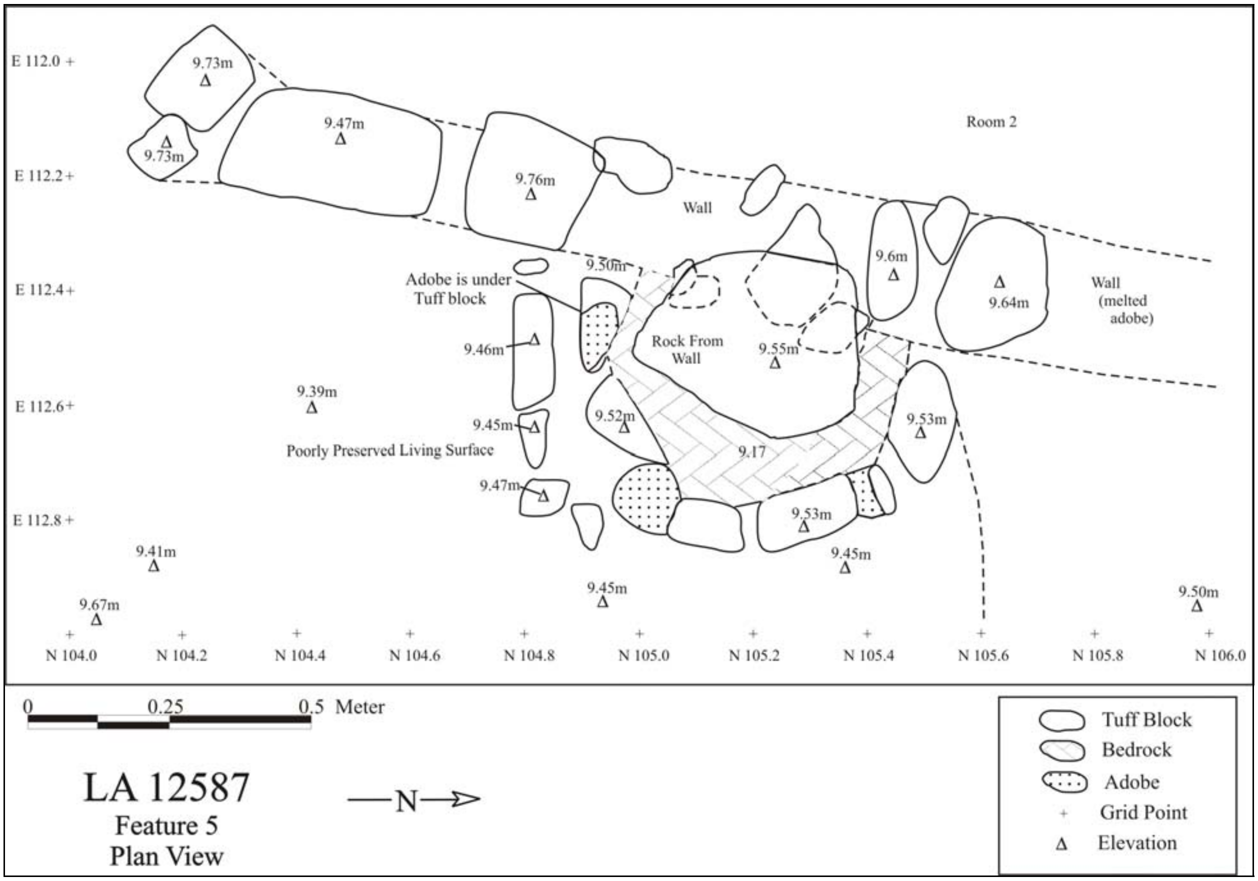

Figure 14.12. Feature 5 plan view.

A large tuff block that was once part of the Room 2 wall was found inside Feature 5. It is unclear if this block was intentionally placed, or if it simply fell into the feature. The fill of Feature 5 (Stratum 213) contained three pieces of lithic debitage (FS 2995), 17 ceramic sherds (FS 2991), and charcoal and charred maize. Below the base of the tuff rocks (the probable floor of the feature), cultural materials became less common. The fill was sterile at contact with bedrock. Charred botanical remains identified from two flotation samples (FS 2989 and FS 2994) consists of the following taxa: pigweed, sagebrush, saltbush/greasewood, goosefoot, cheno-ams, bugseed (*Corispermum*), unknown conifer, juniper, unidentified pine, piñon pine, ponderosa pine, prickly pear, cottonwood/willow, and maize. Two pollen samples were collected from the feature (FS 2988 and FS 2993) and taxa identified included maize, cholla, prickly pear, beeweed, cheno-ams, grass family, sunflower family, spurge family, fir, unidentified pine, piñon pine, juniper, oak, Mormon tea (*Ephedra*), and sagebrush. A macrobotanical sample was submitted (FS 2992) and maize remains were identified.

Figure 14.13. Feature 5 after excavation.

Feature 20 (Hearth). Feature 20 is a hearth that predates Feature 4; it was found below the tuff cobble foundation of Floor 1B (Figure 14.14). The hearth is located 1.1 m east of the west wall and 1.3 m north of the south wall. The presence of Feature 20 at this location may explain why Feature 4 was positioned so far to the east, rather than nearer the center of the room (as are the hearths in Rooms 4/5 and 7). The interior dimensions of the hearth are 45 cm north-south and 40 cm east-west; and it is 18 cm deep. The hearth is in poor condition, but portions of the adobe collar and plastered hearth wall remain on the southwest side. The rocks that lined the hearth remain on the north, northwest, and southeast sides. These rocks are all mano (FS 4137, FS 4142, and FS 4143) and metate (FS 4144 and FS 4210) fragments. The southern perimeter of the hearth is missing. Some plaster is present at the base of the hearth. Several rodent burrows were dug through Feature 20. Several small areas of floor surface were present on the southeast edge of the hearth and it may have been contemporaneous with Feature 20.

The fill (Stratum 311) consists of mixed silt and ash that became increasingly ashier with depth. Towards the base of the western side of the hearth, a lens of clean sandy fill was encountered during excavation. It is not clear whether this sandy deposit is cultural in origin or if it is a result of rodent burrowing.

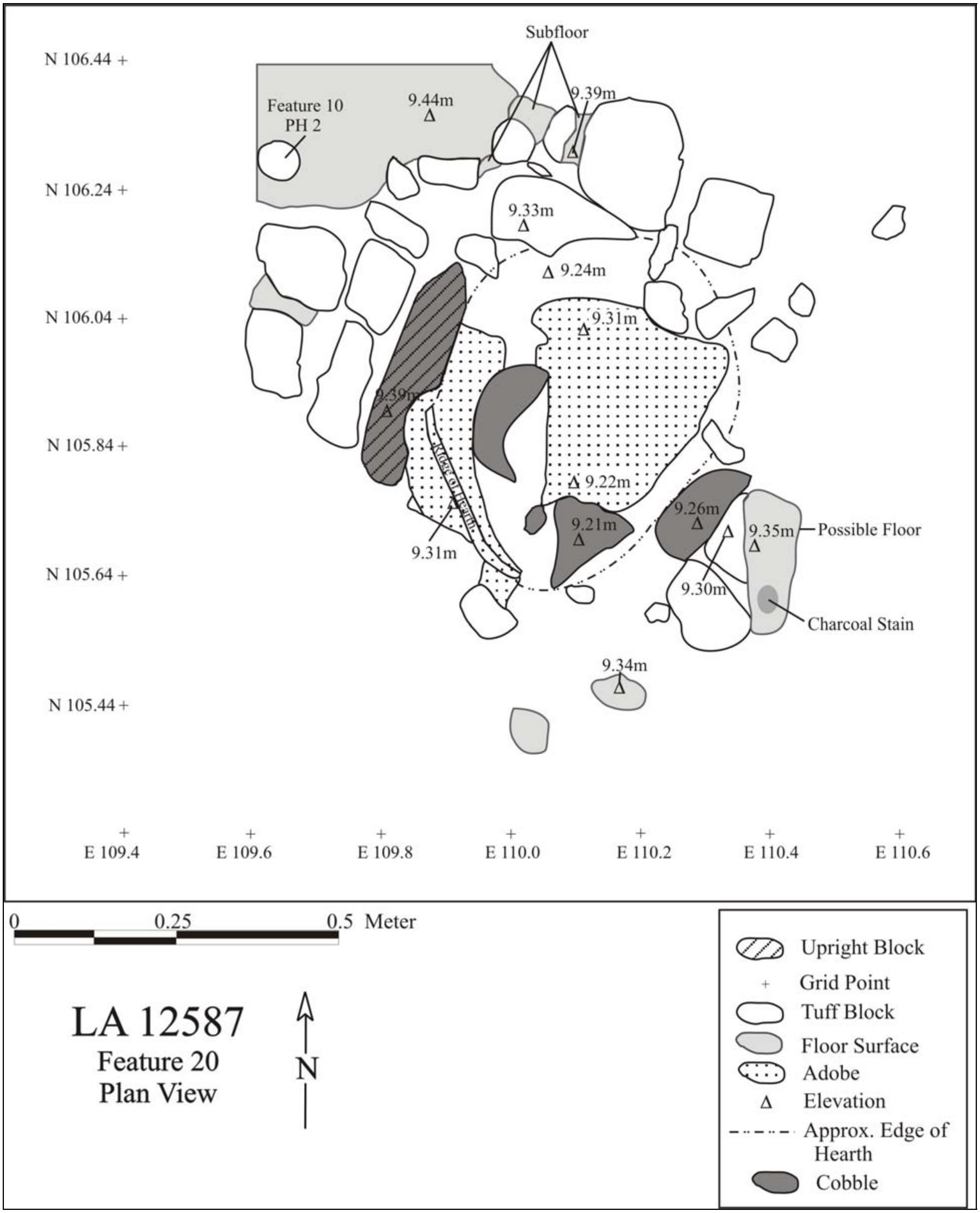

Figure 14.14. Feature 20 plan view.

Four flotation samples (FS 4138, FS 4139, FS 4197, and FS 4198), one pollen sample (FS 4141), and one macrobotanical sample (FS 4146) were taken from Feature 20. Charred wood from the following taxa were identified in the flotation samples: pigweed, saltbush/greasewood, mountain mahogany (*Cercocarpus*), squash/coyote gourd (*Cucurbita*), unknown conifer, juniper, oak, unidentified pine, cottonwood/willow, purslane, and maize. Taxa identified in the pollen sample included maize, beeweed, mint family, cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, rose family (Rosaceae), and sagebrush. A macrobotanical sample was submitted and saltbush/greasewood, piñon pine, maize, and juniper remains were identified. Given the rodent disturbance in Feature 20, most or all of this material is probably associated with the Room 2 assemblage at the time of abandonment and not with the use of the hearth.

Two archaeomagnetic sets (1214 and 1215) were submitted for analysis, a fragment of hearth plaster (FS 4209) was submitted for thermoluminescence dating, and a maize fragment (from FS 2644) was submitted for accelerator mass spectroscopy (AMS) radiocarbon analysis. The archaeomagnetic samples returned a highly precise date of circa AD 1200. The thermoluminescence sample returned a date of 1122±160 (two-sigma). The maize fragment returned a date of 650±40 BP (Beta-183748) and a date of cal AD 1300 with a two-sigma date range of cal AD 1280–1400. Since the maize fragment is probably associated with the room abandonment and since thermoluminescence dates tend to be too early (Harmon and Vierra, Volume 3), the archaeomagnetic dates are the best dates for this hearth.

Feature 10 (Postholes). This feature consists of three, possibly four, postholes that are associated with Floor 1B in the northwest quadrant of the room. The southernmost posthole, Posthole 1, is the largest (12 cm north-south by 11 cm east-west) and is pentagonal in shape (Figure 14.15). The posthole was plastered over so that it was only visible as an outline in the floor surface. It was not excavated. Posthole 2 is 10 cm to the northeast of Posthole 1 and measures 6 cm north-south by 7 cm east-west and is 11 cm deep. The fill of Posthole 2 was collected as a pollen sample (FS 3369). Taxa identified in this sample included cholla, prickly pear, beeweed, cheno-ams, grass family, sunflower family, mustard family (Brassicaceae), unidentified pine, piñon pine, juniper, and sagebrush. Posthole 2 may reflect a repositioning of the Posthole 1 post. Posthole 3 is located 52 cm north and 18 cm east of Posthole 2. It is 4 cm in diameter and 6 cm deep. The fill of Posthole 3 was collected for a pollen sample (FS 3370), and identified taxa included beeweed, cheno-ams, grass family, sunflower family, unidentified pine, piñon pine, juniper, and sagebrush. Both Postholes 2 and 3 extend through the full thickness of Floor 1B. A possible fourth posthole (Posthole 4) is located 40 cm northwest of Posthole 3. It is not clearly cultural and it was not excavated.

Feature 11 (Postholes). This feature consists of three postholes in the northeast corner of the room. Posthole 1 measures 5.5 cm by 4.5 cm and is 5 cm deep. Posthole 2 is located 5 cm southeast of Posthole 1. It measures 5.5 cm by 5.0 cm and is 6 cm deep. Postholes 1 and 2 have rounded plaster rims. Posthole 3 is approximately 20 cm east of Posthole 2. The edges of this hole are fragmented, making it difficult to determine the exact dimensions; it is probably 5 cm in diameter and 3 cm deep. All three postholes were built into all three floor layers (e.g., Floors 1A, 2A, and 3A).

Figure 14.15. Feature 11, postholes 1 and 2.

Room 4/5

Room 4/5 (Figure 14.16) is the middle room of the front row of rooms. The interior dimensions are 4.0 m north-south and 2.8 m east-west. The interior area is 11.2 m^2. A hearth (Feature 1), an isolated posthole (Feature 8), and a set of four postholes (Feature 16) are present. Room 4/5 was built as a single room but was subsequently divided by an east-west-running wall.

Stratigraphy. Table 14.12 summarizes the strata associated with Room 4/5. Several sagebrush and a small juniper tree were removed before excavation. Stratum 1 consisted of loose unconsolidated sandy loam and pine duff. Tuff blocks, tuff cobbles, and artifacts were recovered from this stratum. Stratum 1 is underlain by post-occupational fill, wallfall, and rooffall (Stratum 10). Stratum 10 consisted of moderately compact sandy loam with varying amounts of tuff gravel, cobbles, and masonry. Wallfall consisted of 60+ shaped and unshaped tuff blocks, 90+ tuff cobbles, and 120+ tuff chinking stones. Rodent disturbance was extensive in the room.

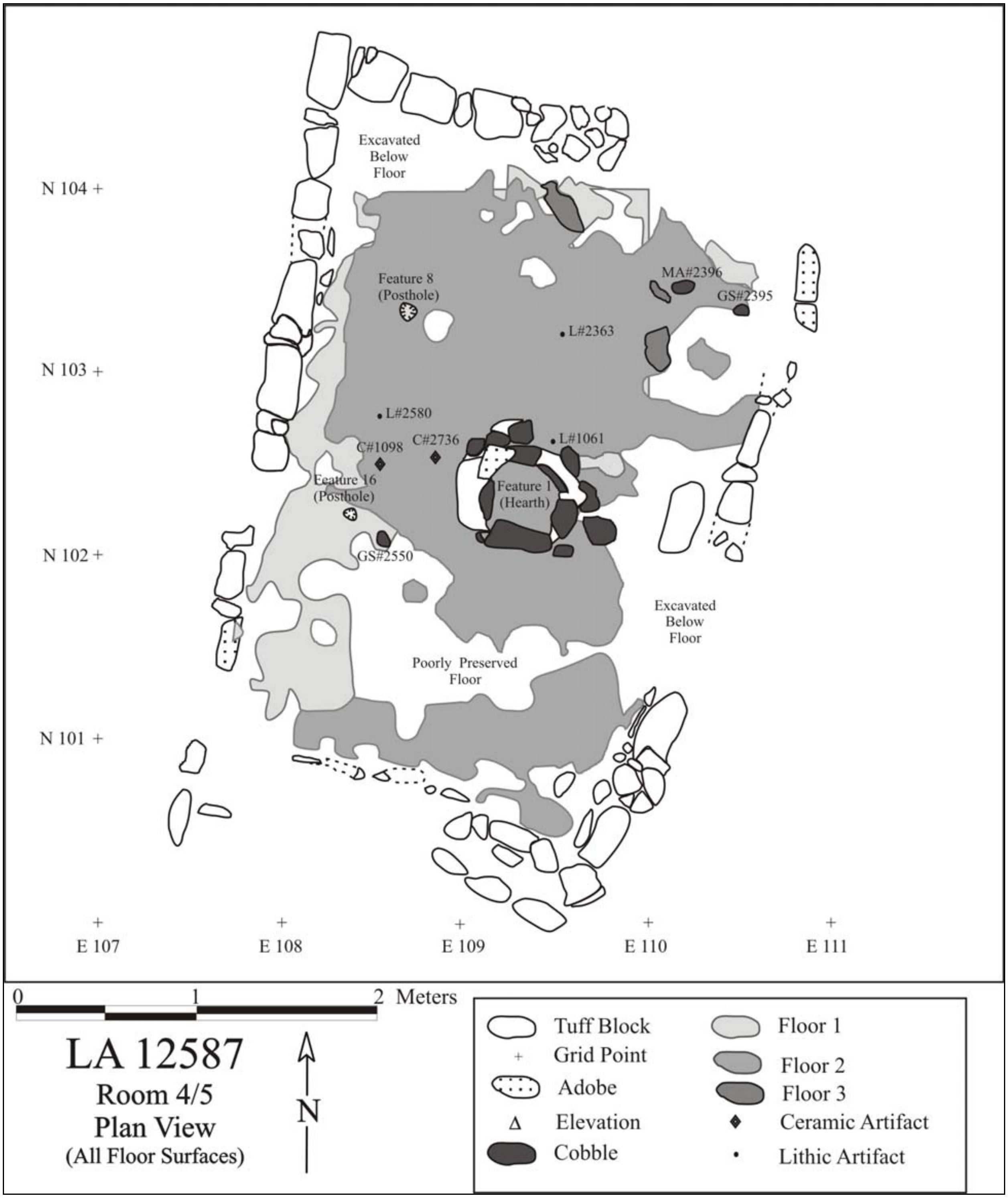

Figure 14.16. Room 4/5 plan view.

Table 14.12. Room 4/5 stratigraphy.

Stratum	Thickness (cm)	Color	Texture	Description
0	0	10YR 4-5/3	sandy loam	Surface
1	2-8	10YR 4-5/3	sandy loam	Unconsolidated surface soil
10	30-41	10YR 5/3	sandy loam	Wallfall and post-occupational fill
14	9	7.5YR 5/3	sandy loam	Sediment from wall alignment across Room 4/5 and top of Feature 1
70	10	10YR 4/3	sandy loam	Fill below wallfall and above floor
124	0	Gley 2 7/10B	silty clay	Floor surface across entire room
170	3-5	10YR 4/4	sandy clay loam	Sub-floor soil
250	15	7.5YR 4/4	silt loam	Feature 1, upper fill
251	1	7.5YR 4/2	ash	Feature 1, lower
252	4	Gley 2 7/10B	silty clay	Floor 2, matrix
253	3	7.5YR 5/4	silty clay	Floor 1, matrix
254	N/A	N/A	N/A	Stones below floor in Feature 1
255	3	Gley 2 7/10B	silty clay	Floor 3, matrix
256	7-8	10YR 4/4	sandy loam	Feature 16, fill
305	1-3	7.5YR 4/6	sandy clay	Soil below Feature 1
306	N/A	N/A	clay	Feature 1, plaster

An intermittently present stratum of sandy loam lying over the floor was designated as Stratum 70. Stratum 70 is similar to Stratum 10 although it is less consolidated and contains a greater amount of sand. Stratum 70 was probably deposited before most of the room collapse occurred. Stratum 14 is the fill and mortar in the east-west-oriented wall that divides the room. Artifacts in the sub-floor fill (Stratum 170) have probably been introduced through bioturbation. The strata associated with the floors and features of Room 4/5 are discussed in the subsequent section.

Table 14.13 shows the artifact counts by stratum for Room 4/5. The ‘Other’ category includes an adult human right capitate (FS 673), an adult human intermediate hand phalanx (FS 1059), an adult human left humerus fragment (FS 1242), an adult human right first metatarsal (FS 2319), an adult human right rib fragment (FS 2323), two unidentified human rib fragments (FS 2323), a freshwater shell fragment (FS 2686), and obsidian nodule (FS 2580), an unfired ceramic bird (turkey) effigy (FS 1416), and several miscellaneous samples. The bird effigy has a round body with wings and tail formed by pinching out the clay. The wings and tails were incised to suggest feathers, but the head was missing.

Table 14.13. Room 4/5 artifact counts by stratum.

Stratum	Chipped Stone	Ceramics	Ground Stone	Nonhuman Bone	Other	Total
0	10	31	1	0	0	42
1	174	296	3	0	0	473
10	412	1322	24	24	13	1795
14	2	10	0	0	0	12
70	4	8	0	0	1	13
124	2	2	3	0	1	8
170	1	1	0	0	0	2
250	2	0	0	0	0	2
251	0	0	5	2	0	7
252	64	169	2	2	1	238
253	0	0	0	0	2	2
254	0	0	2	0	0	2
255	0	0	0	0	0	0
256	1	0	0	0	0	1
305	0	0	0	0	0	0
306	0	0	0	0	0	0
Total	**672**	**1839**	**40**	**28**	**18**	**2597**

Floor. Two, possibly three, flooring episodes occurred in Room 4/5. Stratum 124 is the uppermost floor surface throughout the room, regardless of what flooring episode it is associated with. Stratum 124 is well-preserved in most of the room, especially in the north and the southeast corner, however the surface is undulating due to bioturbation and subsidence. In areas where floor and wall contact was preserved, coping was common. Each floor was built by applying plaster over a 1- to 5-cm-thick layer of adobe. There is no evidence of fill between the different floors, which suggests that they represent episodes of remodeling during a continuous occupation. It was sometimes difficult to trace the floor surfaces across the entire room. Different floors were most easily distinguished in the northern portion of the room and most difficult to distinguish in the southern portion. In places, tuff cobbles have been used beneath the floor to create an even surface over bedrock and soil.

In the northeast corner of the room there are three small patches of a final plastering episode (Figure 14.17). Although designated as Floor 3, it is not clear if these patches represent a reflooring episode or are just spot-repairs. The matrix of Floor 3 is Stratum 255. The western patch was collected as a flotation sample (FS 3308). Taxa identified in this matrix included pigweed, saltbush/greasewood, unknown conifer, juniper, unidentified pine, piñon pine, prickly pear, Douglas fir (*Pseudostoga menziesii*), oak, and maize.

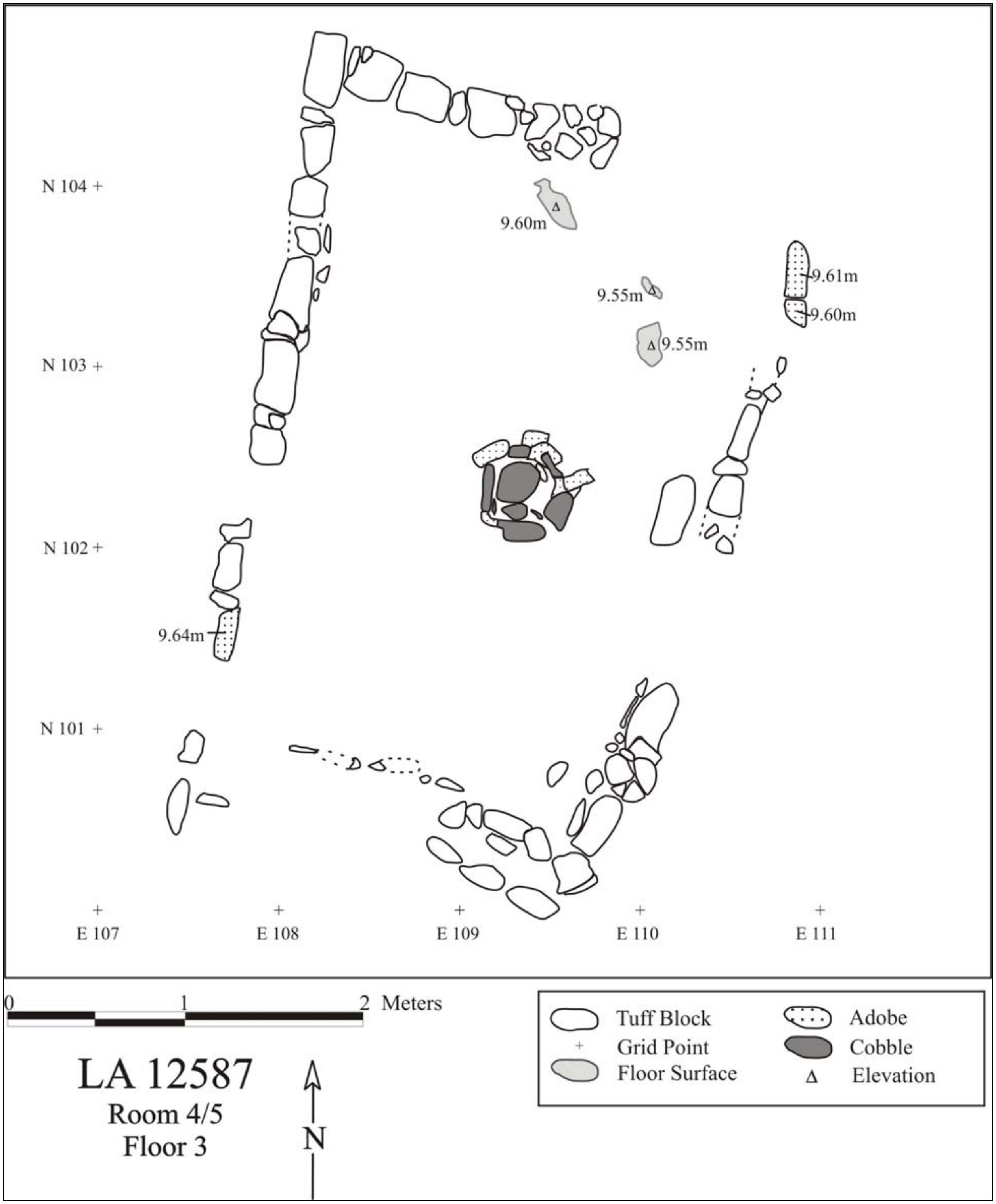

Figure 14.17. Room 4/5, Floor 3.

The youngest full floor is Floor 2 (Figure 14.18). The floor matrix (Stratum 252) is compact, indurated, and slightly ashy in content. It contains a surprisingly high number of artifacts (see

Table 14.13), suggesting that the floor matrix is composed of midden material. A patch of this floor was collected as a flotation sample (FS 3256) and identified taxa included pigweed, sagebrush, saltbush/greasewood, unknown conifer, juniper, unidentified pine, and maize. Floor 2 was removed in a 4-m^2 area to expose the lower floor and sub-floor deposits.

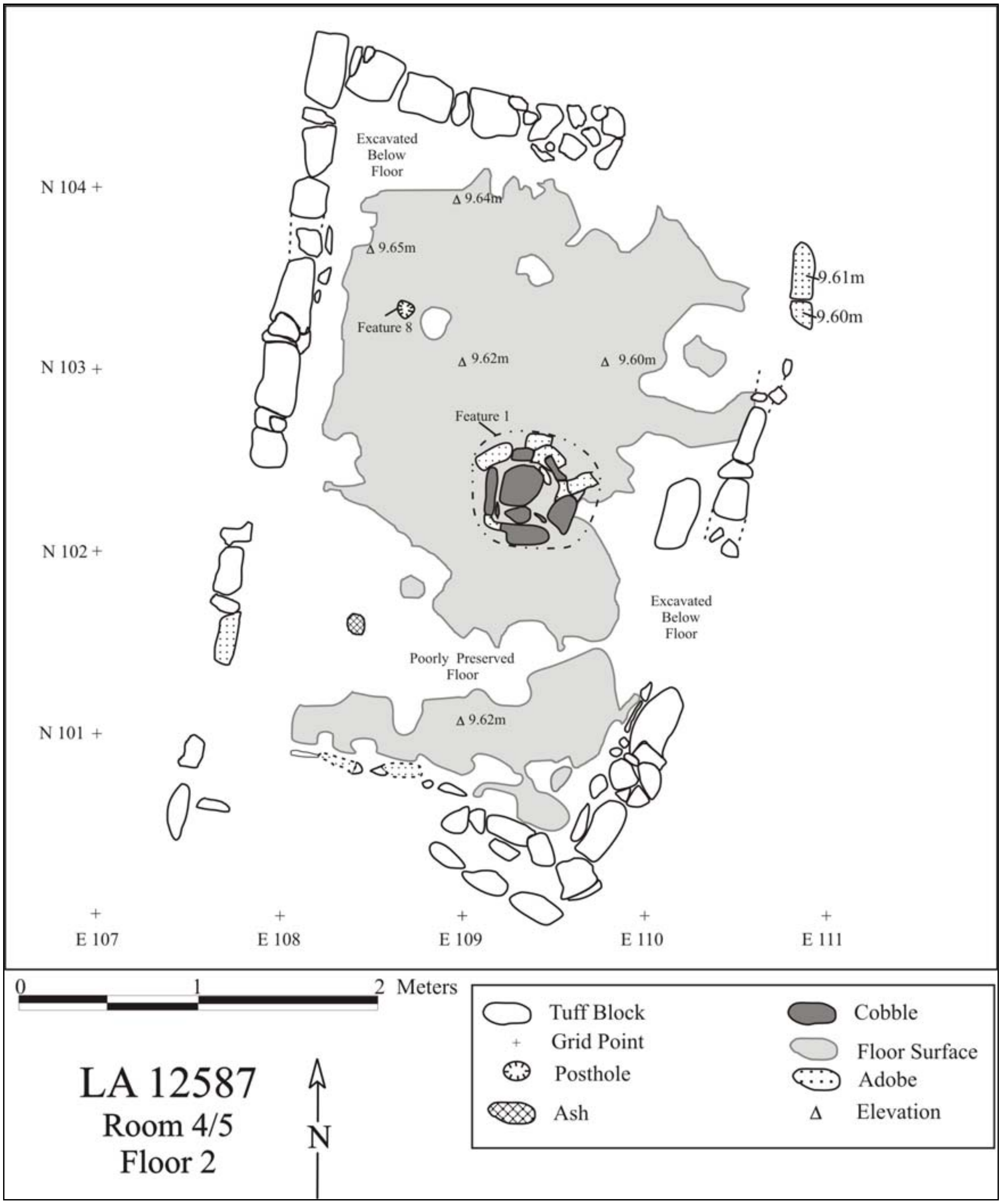

Figure 14.18. Room 4/5, Floor 2.

Floor 1 was immediately below Floor 2 (Figure 14.19). Like Floor 2, Floor 1 is uneven, of variable thickness, and well-preserved. However, screening of the floor matrix (Stratum 253) resulted in the recovery of no artifacts. Unlike Floor 2, this floor must have been made of sterile sediment rather than midden material. Possibly the floor was made before an accumulation of midden material was available. The base of the Floor 1 matrix exhibited impressions of what appears to be tall grass or thin reeds. A patch of Floor 1 was collected as a flotation sample (FS 3299) and identified taxa included juniper, unidentified pine, and maize.

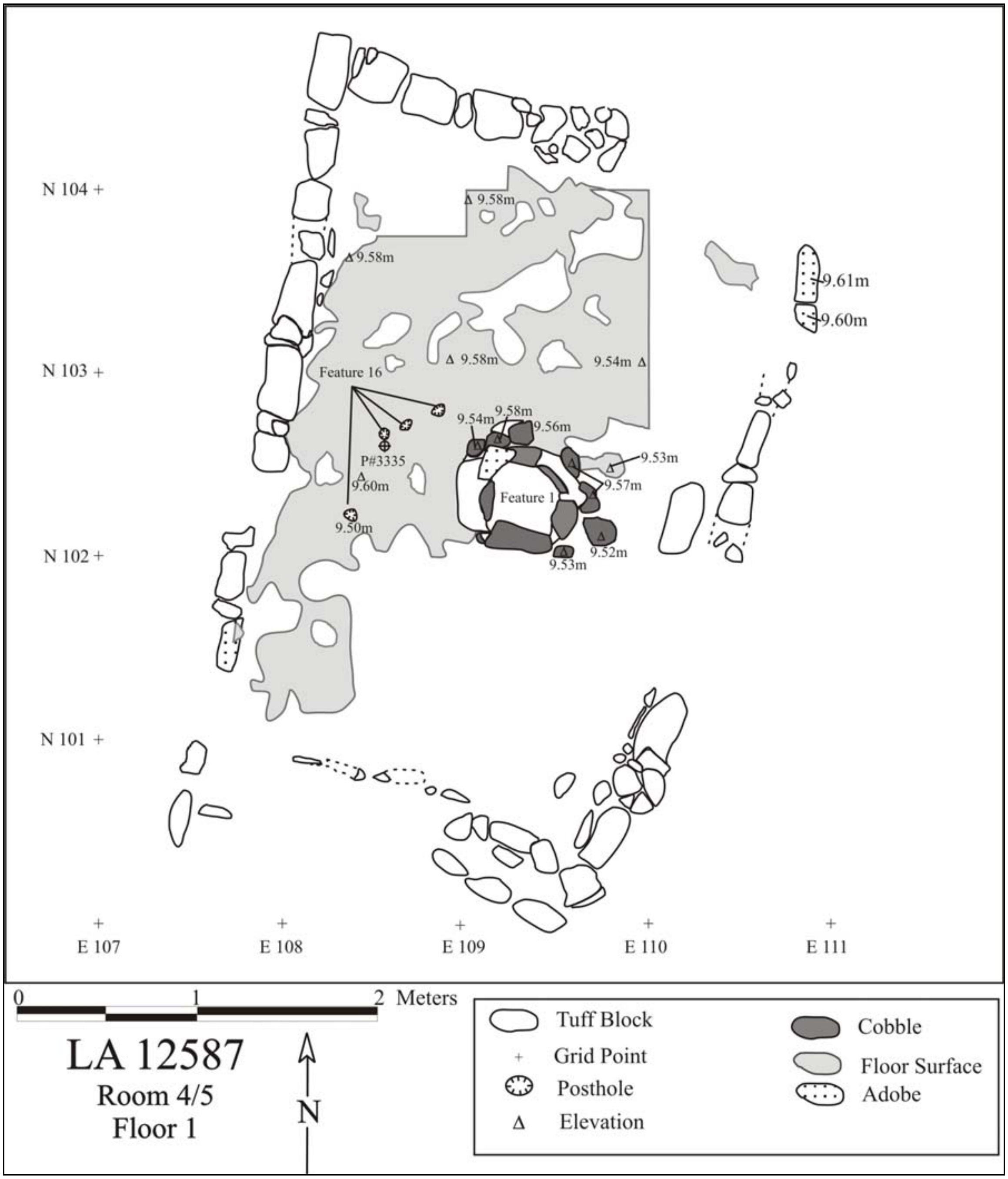

Figure 14.19. Room 4/5, Floor 1.

Eight artifacts were found on the floor surface and included a dacite abrading stone (FS 2395), a dacite two-hand mano fragment (FS 2396), a quartzite polishing stone (FS 2550), a Pedernal chert core fragment (FS 1061), a Pedernal chert flake fragment (FS 2363), two smeared-indented corrugated jar sherds (FS 1098 and 2736), and an obsidian nodule (FS 2580).

Wall Construction. The west wall was built first, followed by the north and south walls. Both of these walls abut the west wall. The east wall abuts the south wall. The relationship between the north wall and the east wall is undetermined, as that corner is missing. Table 14.14 gives the dimensions of the extant segments. The north wall is described in the Room 2 section. The only difference is that no plaster is present on the south face of the wall.

Table 14.14. Room 4/5 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	2.6	0.30	0.33
East	1.0, 0.90	0.34	0.26
South	0.40	0.35	0.41
West	3.75	0.33	0.21

The extant central fragment of the east wall is constructed of upright and semi-coursed unshaped tuff blocks. The southern fragment is constructed of irregular upright blocks and small stones placed at irregular intervals into a mass of mortar (Figure 14.20). Despite the fragmentary condition of the southeast corner, the south wall clearly abuts the east wall.

The extant portion of the south wall consists of two parallel rows of upright tabular tuff blocks (18 to 20 cm apart). The interior was probably filled with sediment and rubble. Remnants of adobe at the west end of the south wall indicate that the foundation is a bed of adobe into which the uprights were secured. An alignment of small, mostly upright stones was encountered at the base of the walls and set slightly into the room away from the surface of the wall. These small stones were probably placed to provide support for a fairly robust application of wall plaster.

The northern portion of the west wall is built of large upright tuff blocks placed into a bed of adobe. Where a second course is present, it consists of horizontally laid tuff blocks. The southern portion of the wall is built of semi-coursed irregular tuff blocks secured with copious amounts of mortar. A slightly raised remnant of adobe present near the south end of the wall may be an eroded sill indicating a connection between Room 4/5 and Room 6.

The basal course of an east-west-aligned wall was found in the middle of the room. The wall was built on top of the plastered floor surface and one masonry block had been placed in an upright position in the hearth (Feature 1). It could not be determined if this wall was ever built to full height.

Figure 14.20. Room 4/5 southeast corner.

Artifact and Samples. All the artifacts from units 102N/109E and 103N/109E were analyzed. All the macrobotanical material from unit 103N/109E was also analyzed. All the faunal remains and all the artifacts found on the floor were analyzed. Table 14.15 lists the samples analyzed from Room 4/5.

Table 14.15. Room 4/5 analyzed samples by stratum.

Stratum	Flotation	Pollen	Macrobotanical[1]
1	632	631	821
10	641, 656, 695, 708, 1064	642, 694, 707, 1063	667, 1089, 1193, 1225, 1275, 2685, 3055
14	2564	2563	None
70	956	1038	972
170	3368	None	985
250	2630, 2632	2631	None
251	2635, 4023	2634	None
252	3256	3217, 3258	3261
253	3299	None	None
255	3308	None	None
256	None	3334, 3335	None
305	None	4024	None
306	4049	None	None

1 In addition to the macrobotanical material from 103N/109E

Features

Feature 1 (Hearth). Feature 1 is a circular collared hearth located near the center of Room 4/5 (Figures 14.21 and 14.22). The exterior diameter of the hearth is 54 cm, the interior diameter is 36 cm, and it is 18 cm deep. Cobbles and ground stone artifacts formed the walls and base of the hearth, and these were mortared into place. The Floor 2 surface articulates with the hearth and covers the adobe collar. Parts of the hearth walls and base are also coated with plaster.

When Floor 2 was removed, an arc of cobbles on the north and east side of the hearth was exposed (Figure 14.23). On the north side of the hearth, Floor 1 extends a few centimeters down into a pit that was dug to accommodate this outer arc of cobbles. The removal of Floor 2 also revealed that Floor 1 abuts the south wall of the hearth. This arc of stones may represent the extent of the hearth when Floor 1 was in use. If this is the case, then the earlier hearth had an exterior diameter of approximately 72 cm and interior dimensions of 46 cm north-south by 58 cm east-west. Removal of the exterior arc of rocks revealed a 40-cm-long arc of deteriorated, oxidized, and very friable plaster northwest of the hearth. This plaster may be the remains of an even earlier floor or hearth.

Eight ground stone artifacts were part of the hearth walls, base, and outer arc. These included a vesicular basalt slab metate fragment (FS 4017), a dacite metate fragment (FS 4018), two andesite metate fragments (FS 4019 and FS 4022), a quartzite mano fragment (FS 4020), a dacite two-hand mano fragment (FS 4021), a rhyolite or rhyolitic tuff grinding slab fragment (FS 4045), a welded tuff slab metate fragment (FS 4046), and a dacite grinding slab (FS 4047).

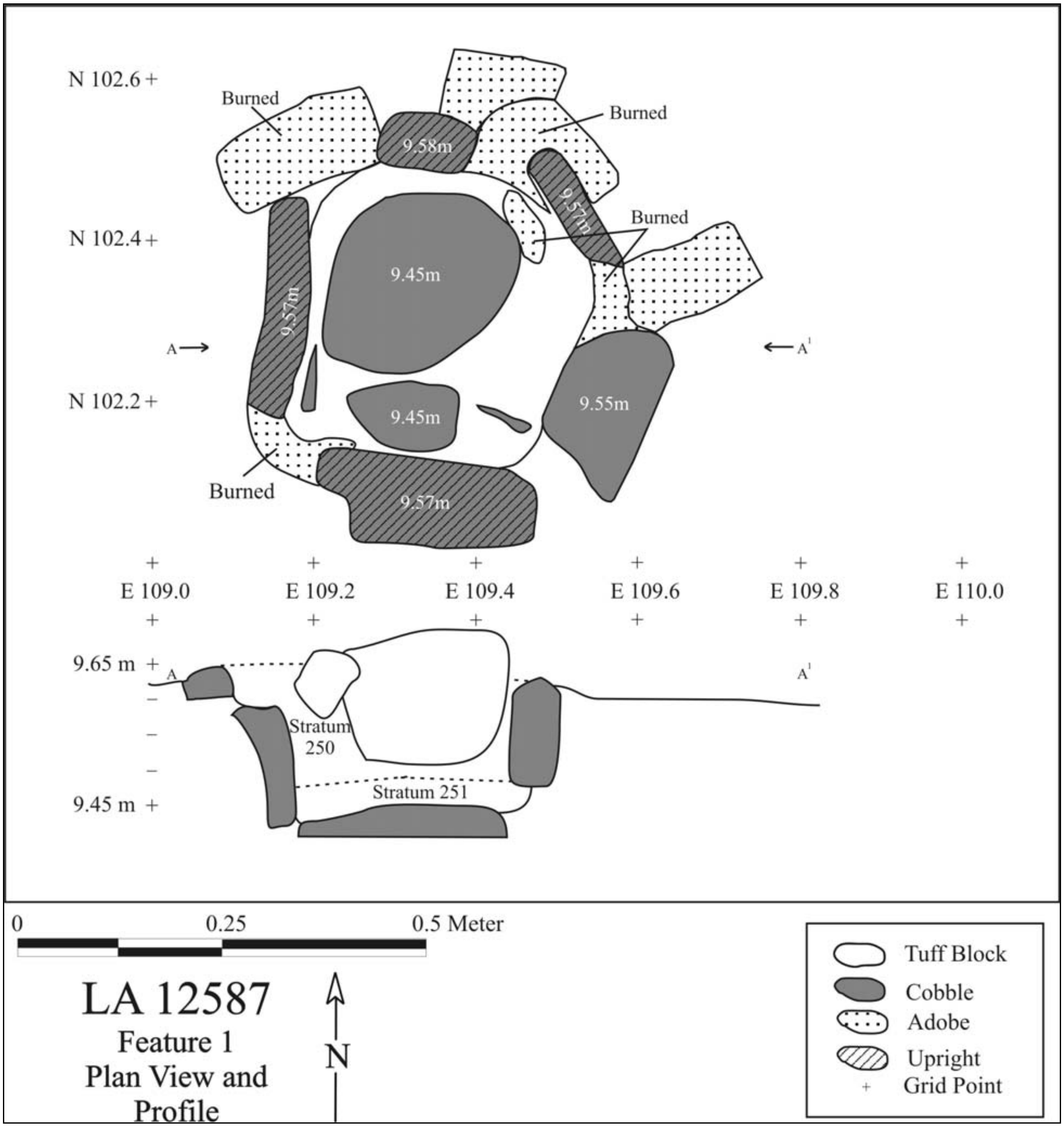

Figure 14.21. Feature 1 plan view and profile.

Figure 14.22. Feature 1.

A large rock that was part of the wall dividing Room 4/5 was placed in the hearth, filling most of its interior. Two strata were found beside and below the masonry block. Stratum 250 is the fill in the upper portion of the hearth and Stratum 251 is a thin ash- and charcoal-rich layer at the base of the hearth. Stratum 250 surrounds the masonry block and so post-dates, or is contemporaneous with it. Stratum 251 is associated with the use of Feature 1 although the thinness of this stratum (3 cm) suggests that the hearth was partially cleaned out before construction of the wall.

Five flotation samples were analyzed from Feature 1. Taxa identified in Stratum 250 (FS 2630 and FS 2632) included sagebrush, four-wing saltbush, saltbush/greasewood, unknown conifer, juniper, tobacco (*Nicotiana*), unidentified pine, piñon pine, ponderosa pine, oak, and maize. Charred wood from the following taxa were identified in the Stratum 251 flotation samples (FS 2635 and FS 4023): saltbush/greasewood, sunflower family, sunflower (*Helianthus*), bugseed, grass family, juniper, mint family, unidentified pine, piñon pine, ponderosa pine, and maize. The following charred material was found in a flotation sample of the plaster of Feature 1 (FS 4049): cheno-ams, beeweed, bugseed, grass family, juniper, unidentified pine, piñon pine, ponderosa pine, and maize. A pollen sample from Stratum 250 (FS 2631) produced the following taxa: maize, prickly pear, beeweed, cheno-ams, grass family, sunflower family, spurge family, unidentified pine, juniper, and sagebrush. Taxa identified in the pollen sample taken from Stratum 251 (FS 2634) included maize, prickly pear, beeweed, purslane, cheno-ams, grass family, mustard family, sunflower family, ragweed/bursage, piñon pine, and sagebrush.

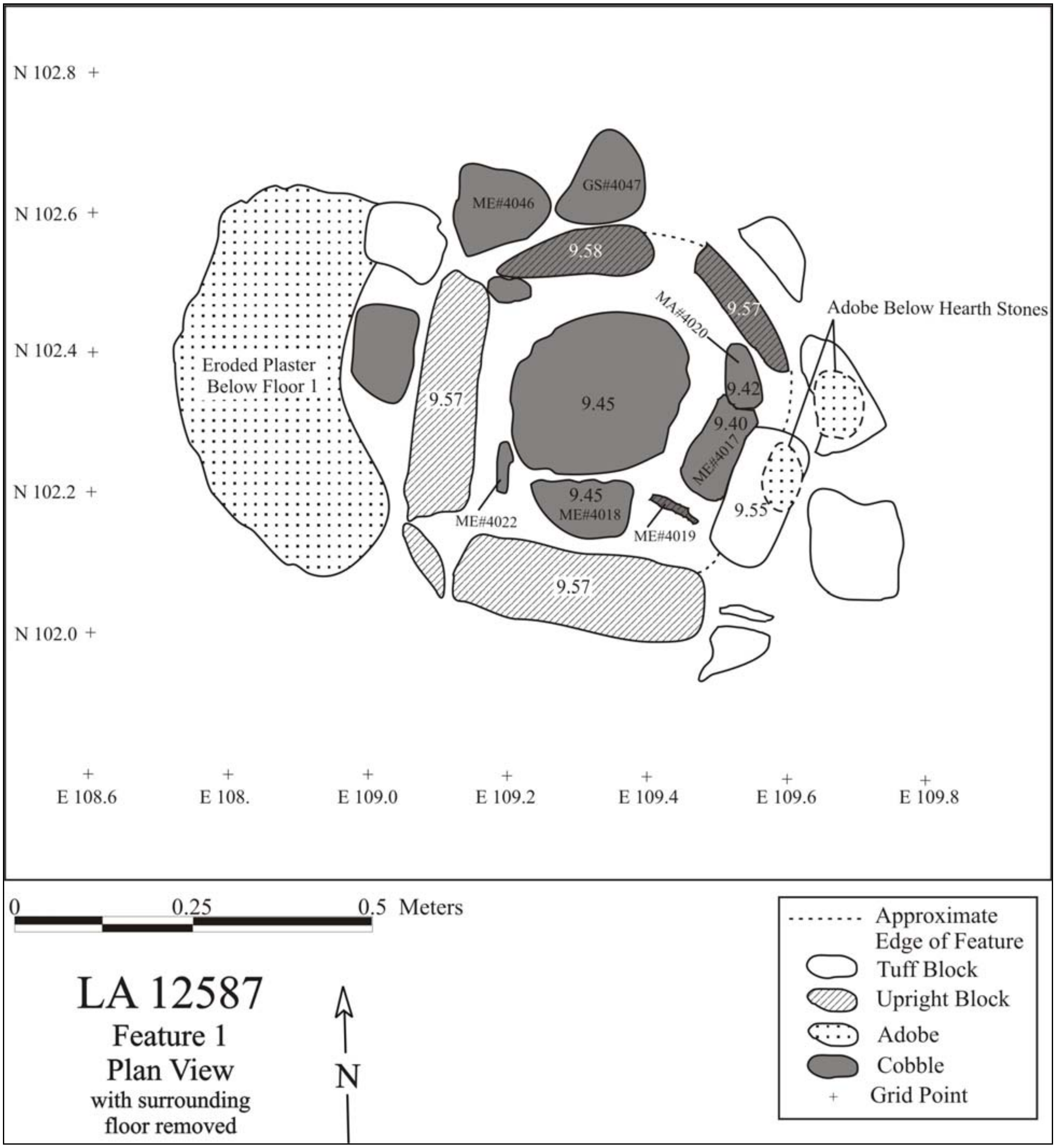

Figure 14.23. Feature 1 with surrounding floor removed.

A maize specimen (from FS 2632) from Feature 1 was subjected to AMS radiocarbon dating. The sample returned an age of 690±40 BP (Beta-183752) and a date of cal AD 1290 with a two-sigma date range of cal AD 1270–1320 and cal AD 1350–1390. An archaeomagnetic sample from the hearth (set 1209B) returned an imprecise date suggesting that the final burning of the hearth occurred sometime in the late 13th or early 14th century.

Feature 8 (Posthole). Feature 8 is an elliptical posthole in Floor 2 situated 1 m northwest of the hearth. Floor 1 forms the base of the posthole. Feature 8 measures 10 by 7.5 cm across and is 3 cm deep. The plaster from the floor does not appear to extend down the lip into the hole.

Feature 16 (Postholes). Feature 16 consists of four postholes in Floor 1. The holes form a rough arc west of the hearth (Feature 1) (Figure 14.24).

Figure 14.24. Feature 16.

Posthole 1 is 20 cm northwest of the hearth and measures 6 cm in diameter. It is 7 cm deep. Posthole 2 is 12 cm southwest of Posthole 1 and 32 cm northwest of the hearth. It is slightly triangular in shape and measures 6 by 5 cm. It is 8 cm deep. Posthole 3 is 6 cm further to the southwest. This hole is 5 cm in diameter and 7 cm deep. Posthole 4 lies 68 cm west of Feature 1 and it is 44 cm southwest of Posthole 3. It measures 6 cm in diameter and is 8 cm deep.

Room 6

Room 6 (Figure 14.25) is south of Room 1 and west of Room 4/5. The interior dimensions of the room are 2.2 m east-west and 3.6 m north-south. The interior area is 7.9 m^2. A shallow sub-floor pit (Feature 7) is present.

Stratigraphy. Table 14.16 summarizes the strata associated with Room 6. A portion of an anthill was located in the northeast corner of the room. Stratum 1 consists of loose, unconsolidated, fine-grained sandy loam. Stratum 10 contains a heterogeneous mix of sandy loam and adobe melt. In a few areas the adobe melt is up to 16 cm thick. In other areas large chunks of adobe are in a sandy loam matrix. In still other areas there are only isolated fragments of adobe. In spots, a thin layer of adobe melt was found just above the floor. The number of masonry blocks removed from Stratum 10 was not recorded. In the northwest corner of the room an 8- to 11-cm-thick deposit of loose, sandy loam (Stratum 70) is present below a thick deposit of adobe melt. This stratum is pre-room collapse fill. Stratum 175, the Pleistocene Btk horizon, underlies the floor in most places and is only a few centimeters deep. Stratum 175 is underlain by bedrock. Strata 126 and 290 are discussed below.

Table 14.16. Room 6 stratigraphy.

Stratum	Color	Texture	Thickness	Description
0	7.5-10YR 4-5/3	sandy loam	0	Surface
1	7.5YR 5/3, 10YR 4-5/3, 5/4	sandy loam	1–7	Unconsolidated surface soil
10	7.5YR 5/3, 10YR 4-5/3, 5/4	sandy loam and adobe melt	22–42	Wallfall and post-occupational fill
70	10YR 5/4	sandy loam	8–11	Fill below wallfall and above floor
126	10YR 7/1	silty clay	0	Floor, surface
175	7.5YR 4/5	sandy clay	2–7	Btk horizon
290	10YR 4/4	sandy loam	15	Feature 7, fill

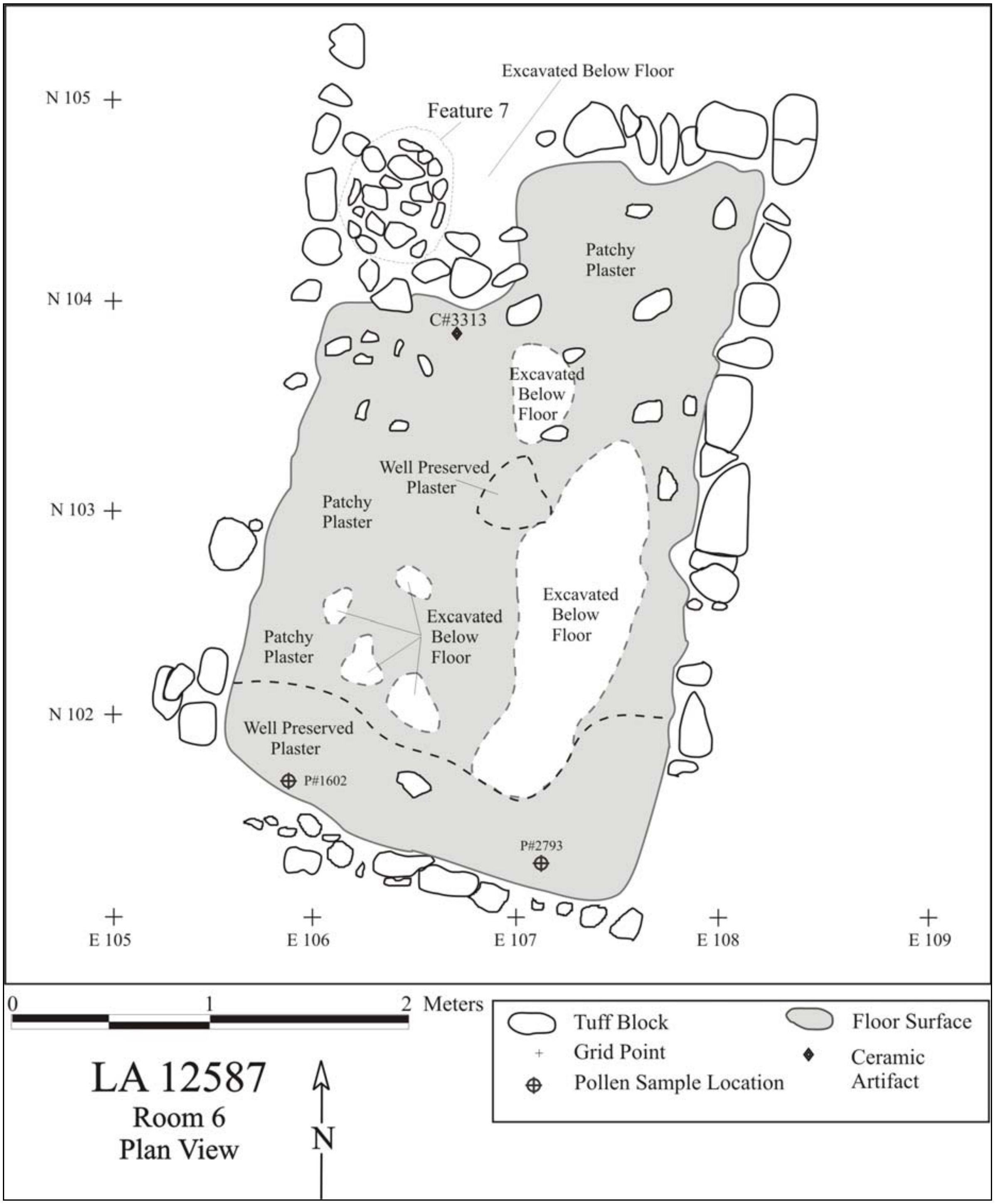

Figure 14.25. Room 6 plan view.

Table 14.17 shows the artifact counts by stratigraphic unit for Room 6. The 'Other' category consists of an adult human left distal humerus fragment (FS 1373), a freshwater shell fragment (FS 1358), an *Anodonta* sp. umbo fragment (FS 1462), two turquoise beads (FS 835 and FS

1375), a hematite fragment (FS 839), three reddish-brown micaceous shale fragments (FS 2223), and several miscellaneous samples.

Table 14.17. Artifact counts by stratum in Room 6.

Stratum	Chipped Stone	Ceramics	Ground Stone	Nonhuman Bone	Other	Total
0	13	26	0	0	0	39
1	117	295	1	1	4	418
10	463	1432	37	15	10	1957
70	5	18	0	0	0	23
126	0	1	0	0	0	1
175	1	3	1	0	0	5
290	0	0	0	0	0	0
Total	**599**	**1775**	**39**	**16**	**14**	**2443**

Floor. The plastered floor surface of Room 6 (Stratum 126) is well-preserved along the south wall; elsewhere it is either absent or greatly disturbed by root and rodent activity. In these areas it appears that some of the adobe floor foundation is present, but not the surficial plaster. Coping is present between the floor, the south wall, and the east wall and in the southwest corner. No evidence of multiple plastering episodes was found, although this may be due to the poor preservation of the floor. Tabular tuff cobbles are set into Stratum 175 in the northern third of the room in order to level the ground surface. A smeared-indented corrugated jar sherd (FS 3313) was the only artifact unambiguously associated with the floor surface of Room 6.

Wall Construction. The north wall abuts the east wall but no other corners are intact. This makes it difficult to determine the room construction sequence. However, based on the construction sequence of the other rooms, it seems likely that the east wall was built first and then the other walls were added. While shaped and unshaped tuff blocks were found in the fill of the room, the field notes give the impression that there was less masonry present here than in some other rooms (e.g., Rooms 2 and 7). As a great deal of adobe melt was found in the room, a significant portion of the Room 6 walls may have been made of adobe. Table 14.18 gives the dimensions of the extant wall segments. The north wall is described above as the south wall of Room 1 and the east wall is described above as the west wall of Room 4/5. Occasional upright tuff blocks and cobbles of the basal course are all that remain of the west wall. A small patch of plaster is present on the interior face of the wall near its north end. The south wall is poorly preserved. The remains of the basal course consist only of a tuff upright and several fist-sized tuff cobbles set in adobe. A horizontally laid tuff block is all that remains of the second course.

Table 14.18. Room 6 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	0.90	0.31	0.23
East	2.21	0.35	0.20
South	1.48	0.22	0.20
West	0.50, 1.48	0.32	0.20

Artifact and Samples. All the artifacts from units 104N/106E and 104N/107E were analyzed. All the macrobotanical material from unit 104N/107E was also analyzed. The single sherd from the floor and all the faunal remains were analyzed. Two shaped andesite slab fragments (FS 2203) were also analyzed. Table 14.19 lists the samples analyzed from Room 6.

Table 14.19. Room 6 analyzed samples by stratum.

Stratum	Flotation	Pollen	Macrobotanical[1]
10	881	880	1447
70	None	None	1007
126	None	1602, 2793	None
175	None	None	None
290	3309	3310	None

1 In addition to the macrobotanical material from 104N/107E

Features

Feature 7 (Pit). Feature 7 is a shallow sub-floor pit (63 cm north-south, 42 cm east-west, and 15 cm deep) that is located adjacent to the west wall in the northwest corner of Room 6 (Figure 14.26). A rough circle of upright tuff cobbles defines the perimeter of the feature; the base consists of fragmented bedrock. The fill of Feature 7 (Stratum 290) was indistinguishable from Stratum 10. The floor around Feature 7 was too disturbed to determine how the former articulated with the latter.

No artifacts were found in the feature and no evidence of burning was observed. One pollen and one flotation sample were recovered from the feature. The following charred taxa were found in the flotation sample (FS 3309): unknown conifer, juniper, and maize. Taxa identified in the pollen sample (FS 3310) included prickly pear, beeweed, cheno-ams, grass family, sunflower family, spurge family, spruce (*Picea*), unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

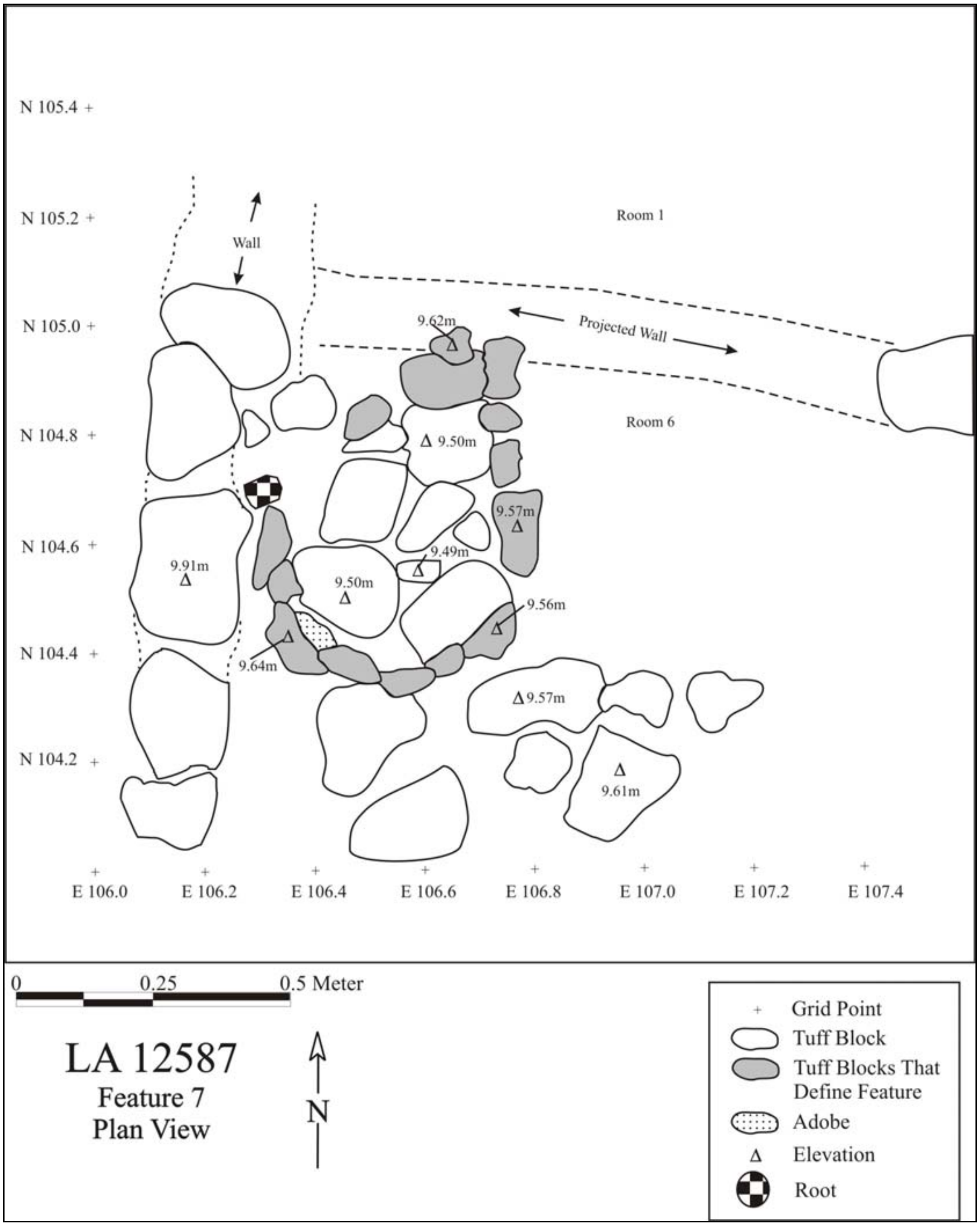

Figure 14.26. Feature 7 plan view.

Room 7

Room 7 is located in the southeast corner of Roomblock 1 (Figures 14.27 and 14.28). It is south of Room 4/5 and east of Room 8. Because the shape and extent of the east and south walls could not be defined, the room size cannot be precisely determined. If it is assumed that the room is rectangular in shape, then the floor area is about 12 m^2. Based on the extant floor, the room is shaped like a blocky, upside down "L" and has an area of about 9.9 m^2. A hearth and ash box complex (Feature 6) and four postholes (Feature 12) were identified in the room.

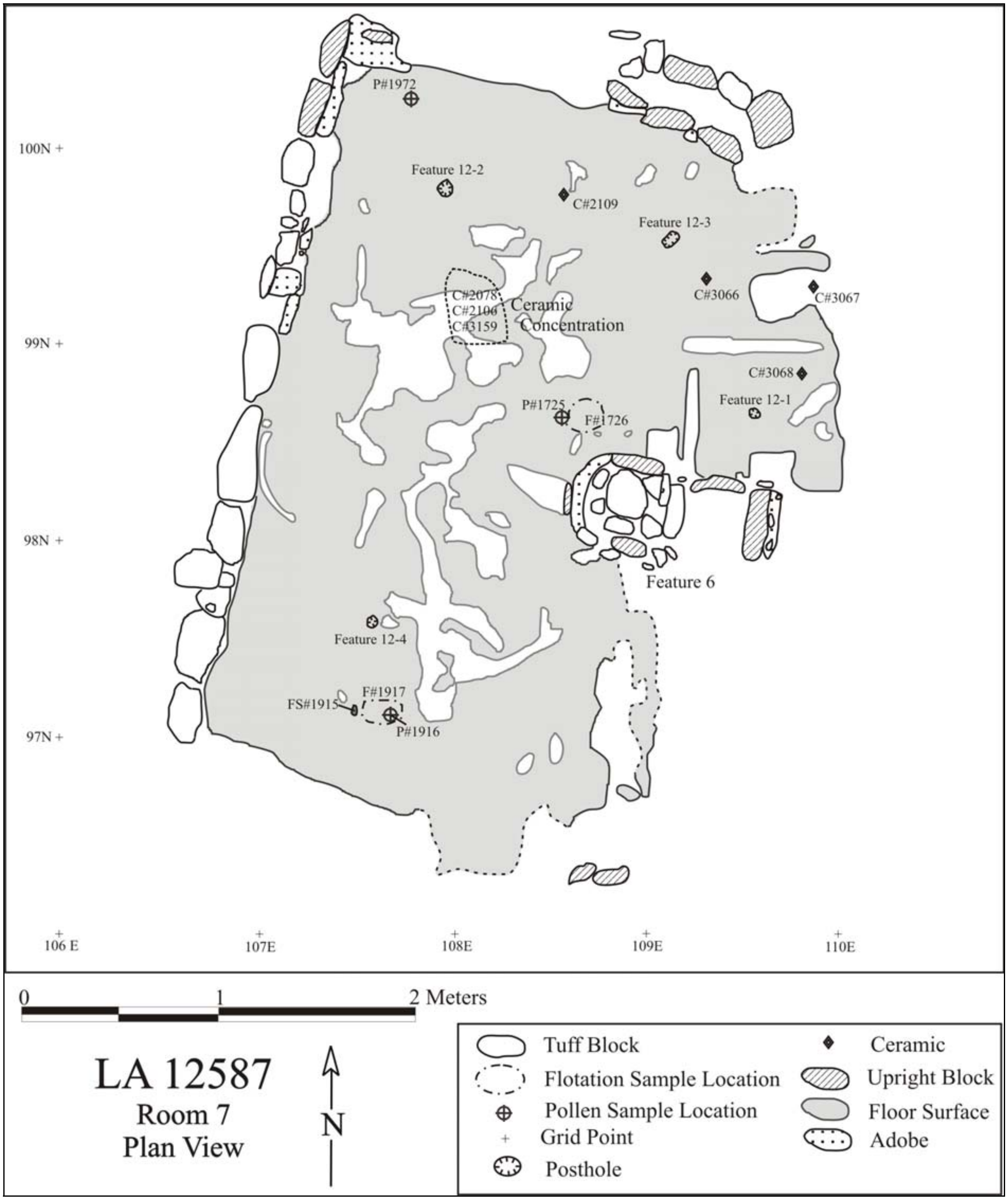

Figure 14.27. Room 7 plan view.

Figure 14.28. Room 7.

Stratigraphy. Table 14.20 summarizes the strata associated with Room 7. Several plants grew in and near Room 7 at the time of excavation, including several prickly pear cacti and one sagebrush. A piñon tree was located just off the southwest corner of the room. The ground surface in this area was covered with pine needles. Stratum 1 consisted of loose, unconsolidated, fine-grained sandy loam. Six tuff masonry blocks were found in this stratum. Stratum 10 consisted of moderately compact sandy loam with varying amounts of tuff gravel, wallfall, and occasional ashy stains. Wallfall includes approximately 160 shaped and unshaped tuff blocks, fist-sized tuff cobbles, adobe chunks, and adobe melt. No rooffall could be identified. The strata associated with the floors and features of Room 7 are discussed subsequently.

Table 14.20. Room 7 stratigraphy.

Stratum	Color	Texture	Thickness (cm)	Description
0	10YR 4-5/3, 10YR 4.5/4	sandy loam	0	Surface
1	10YR 5/3	sandy loam	1–7	Unconsolidated surface soil
10	10YR 4-5/3, 10YR 3-3.5/4-4.5	sandy loam	18–34	Wall fall and post-occupational fill
127	10YR 6.5/1	silty clay	0	Floor, surface
170	10YR 4/4	sandy loam	2–5	Sub-floor soil

Stratum	Color	Texture	Thickness (cm)	Description
175	7.5YR 4/6	sandy clay	2–5	Btk horizon
270	10YR 4.5/3	sandy loam	4–10	Feature 6, upper hearth fill
271	10YR 8/1	consolidated ash	7–10	Feature 6, lower hearth fill
272	10YR 5/3	sandy loam	5–7	Feature 12, fill
273	10YR 5/3	silty clay	0.5–4	Floor 2, matrix
300	N/A	plaster/adobe	N/A	Feature 6, later wall of hearth
301	10YR 4/4	sandy loam	11	Feature 6, material between earlier and later hearth walls
307	10YR 4/4	sandy loam	23	Feature 6, fill of ash box
308	7.5YR 4/6	ashy sandy loam	5	Ashy deposit below Feature 6 base
309	N/A	plaster/adobe	N/A	Feature 6, earlier wall of hearth

Table 14.21 shows the artifact counts by stratigraphic unit for Room 7. The 'Other' category consists of two freshwater shell fragments (FS 1850) and a plaster sample. The first total row in Table 14.21 includes only artifacts found in Room 7. This total is less than that from other rooms because artifacts found in Room 3 (which overlays Room 7 and covers 3.2 m^2) are not included. When artifacts from Room 3, many of which are probably associated with Room 7, are included, the total number of artifacts is similar to that of other rooms.

Table 14.21. Room 7 artifact counts by stratum.

Stratum	Chipped Stone	Ceramic	Ground Stone	Nonhuman Bone	Other	Total
0	0	2	0	0	0	2
1	33	100	0	0	0	133
10	518	1013	22	12	2	1567
127	0	15	1	0	0	16
170	0	0	0	0	0	0
175	0	0	0	0	0	0
270	3	11	0	22	0	36
271	3	1	0	61	0	65
272	0	0	0	0	0	0
273	0	0	0	0	0	0
300	1	2	5	0	0	8
301	1	1	0	0	0	2
307	1	2	0	0	0	3
308	1	3	0	1	0	5
309	0	0	4	0	1	5
Total	**561**	**1150**	**32**	**96**	**3**	**1842**
Total (incl. Rm 3)	**683**	**1508**	**39**	**98**	**6**	**2334**

Floor. The floor surface (Stratum 127) of Room 7 is fairly even with only slight undulations. In the corners the floor is well-preserved but there is a great deal of rodent and root disturbance in the center of the room. The edges of the floor are well defined along the north wall and in the southwest corner where they cope up to the walls or show evidence of coping where the walls are absent. Coping also occurs in spots along the west wall. More frequently the floor has broken away from the wall leaving a 5- to 10-cm gap between the wall and the floor. In the east and southeast of the room there is no clear edge of the floor. Instead, the floor grades into the sandy loam exterior fill (Stratum 200). Two episodes of floor plastering are evident but in many areas the two surfaces merge into one, making it impossible to determine which surface is being observed.

The floor assemblage consists of a partial ceramic vessel in 12 sherds (FS 2078, FS 2106, FS 2109, and FS 3159; several sherds from FS 2104 may also be part of this vessel), three sherds that are not part of the vessel and include a smeared-indented corrugated jar sherd (FS 3066), an indented corrugated jar sherd (FS 3067), and a Santa Fe Black-on-white bowl sherd (FS 3068), and a dacite ground stone fragment (FS 1915). In addition, two flotation and two pollen samples were collected from the floor. Taxa identified in the flotation samples include sagebrush, cheno-ams, saltbush/greasewood, plantain (*Plantago*), unknown conifer, juniper, groundcherry, piñon pine, ponderosa pine, prickly pear, and maize. Taxa identified in the pollen samples include maize, cholla, prickly pear, beeweed, cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush.

Wall Construction. No corners of the room were intact, so the construction sequence of the room was undetermined. Table 14.22 gives the dimensions of the extant wall segments. The west wall consists of a single row of coursed tuff blocks and chinking stones set in mortar (Figure 14.29). All of the masonry blocks are horizontally laid except for the two northernmost blocks; these are both uprights. Two courses are present at the center of the wall but only one course survives at the north and south ends. The masonry of the wall ranges in size from 20 by 17 by 5 cm to 45 by 18 by 18 cm. Although a few blocks exhibit some minor shaping, most of the masonry is unshaped. Two small tuff uprights near the southeast corner of the room may have been part of the south wall. Nothing else remains of the south wall. No evidence of an east wall was found, although, presumably, one was present. The north wall is described with Room 4/5.

Table 14.22. Room 7 dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	0.63, 0.97	0.25	0.38
East	n/a	n/a	n/a
South	0.48	0.10	0.15
West	3.66	0.35	0.33

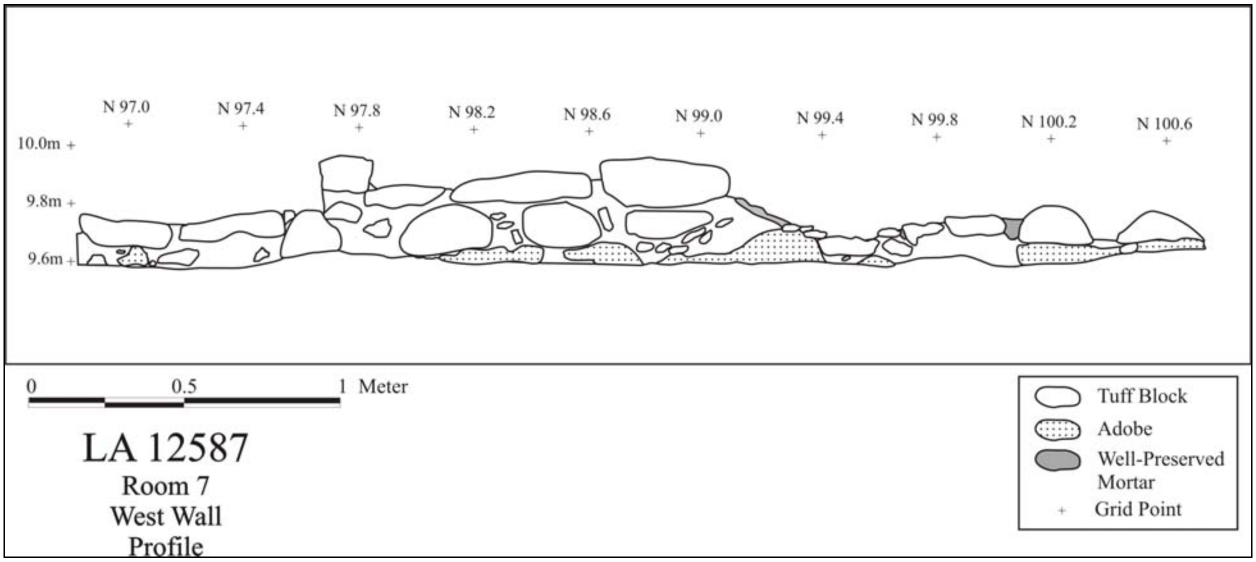

Figure 14.29. Room 7 west wall profile.

Artifacts and Samples. All the artifacts from units 98N/107E and 98N/108E were analyzed as were all the artifacts from below the base of the Room 3 walls in unit 99N/108E. All the macrobotanical material from unit 98N/107E was analyzed. All the artifacts found on the floor and all the faunal remains were analyzed. A Cerro Toledo obsidian side-notched Puebloan point was also analyzed (FS 2284). Table 14.23 lists the samples analyzed from Room 7.

Table 14.23. Room 7 analyzed samples by stratum.

Stratum	Flotation	Pollen	Macrobotanical[1]
1	None	None	1701
10	1886	1887	2133
127	1726, 1917	1725, 1916, 1972	None
270	3273, 3274, 3275, 3276, 3319, 3320, 3321	3358	None
271	3277, 3278, 3279, 3280, 3281, 3282, 3322, 3323, 3324	3360	None
272	None	3441, 3444	None
273	3471, 3472	3466, 3467	None
300	3983, 3984, 3985	3985	None
301	3990, 3991	None	None
307	4074, 4075	4073	None
308	4102	4100	None
309	4098	4098	None

1 In addition to the macrobotanical material from 98N/107E

Features

Feature 6 (Hearth and Ash Box). Feature 6 is a hearth and ash box complex. The hearth shows evidence of initial construction and a later remodeling. The initial construction of the hearth consisted of arranging a ring of dacite and tuff uprights in a pit in the floor (Figures 14.30 and 14.31). Three of these stones (A, B, and C in Figure 14.30) were clearly set into the earlier floor. The interior of the ring of uprights was plastered over. The interior diameter at the top of the hearth after the initial construction was approximately 50 cm.

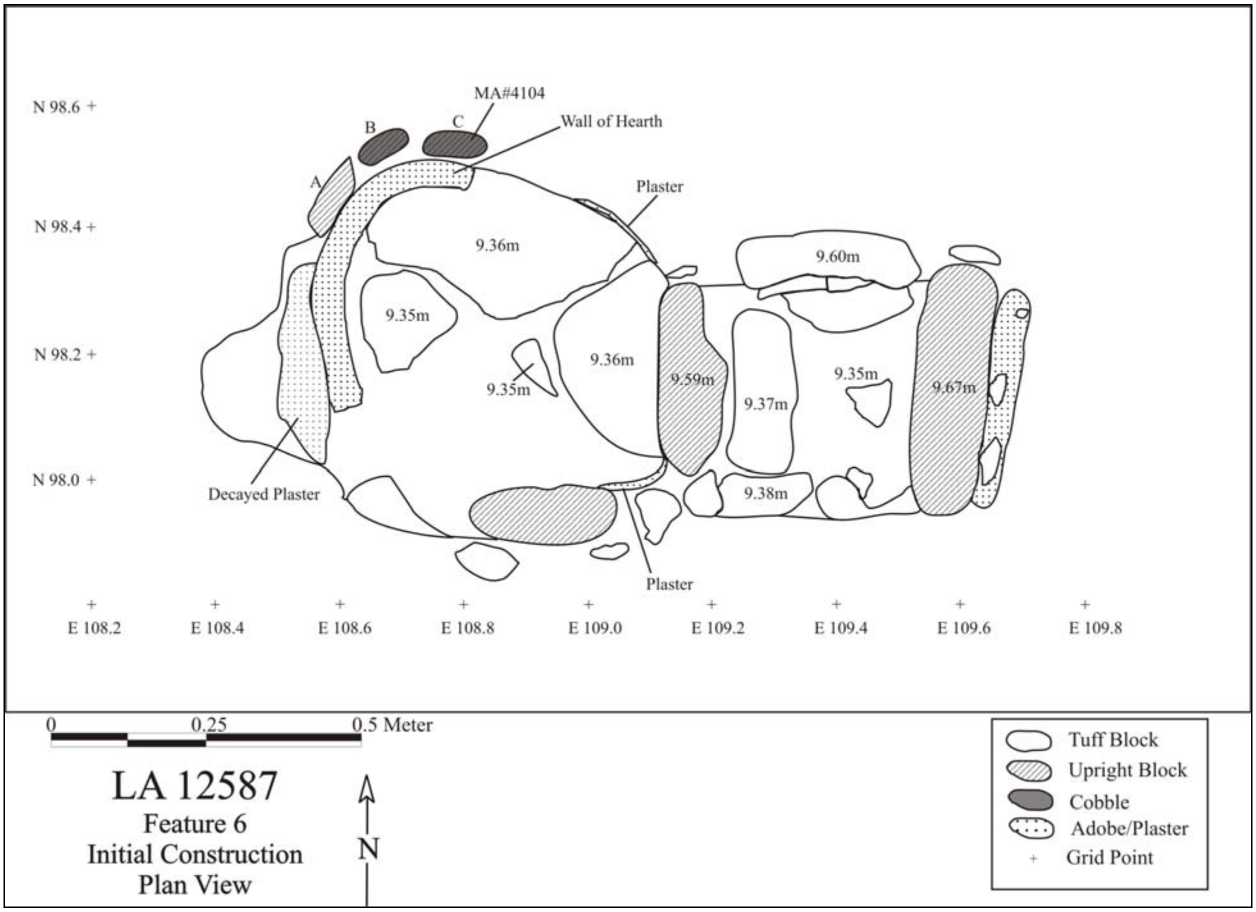

Figure 14.30. Feature 6 initial construction plan view.

Later, the hearth was remodeled (Figures 14.32 and 14.33). Stones A, B, and C were covered by floor plaster and a new layer of plaster was laid in the hearth interior. Dacite and tuff slabs were placed into this plaster to form the walls of the hearth. In some areas, the old interior was merely covered by 1 or 2 cm of plaster. Along the northwest arc of the hearth, several thin slabs were placed between the first and second interiors. The interior diameter at the top of the remodeled hearth is approximately 45 cm and 19 cm deep. In both hearth construction episodes several ground stone fragments were used to form the hearth walls. These include a dacite grinding slab (FS 3982), two vesicular basalt two-hand mano fragments (FS 3986 and FS 4104), an andesite slab metate fragment (FS 3987), a tuff milling stone (FS 3988), a basalt hoe (FS 3989), and a dacite two-hand mano (FS 4105).

Figure 14.31. Feature 6 initial construction.

Figure 14.32. Feature 6 remodeled hearth.

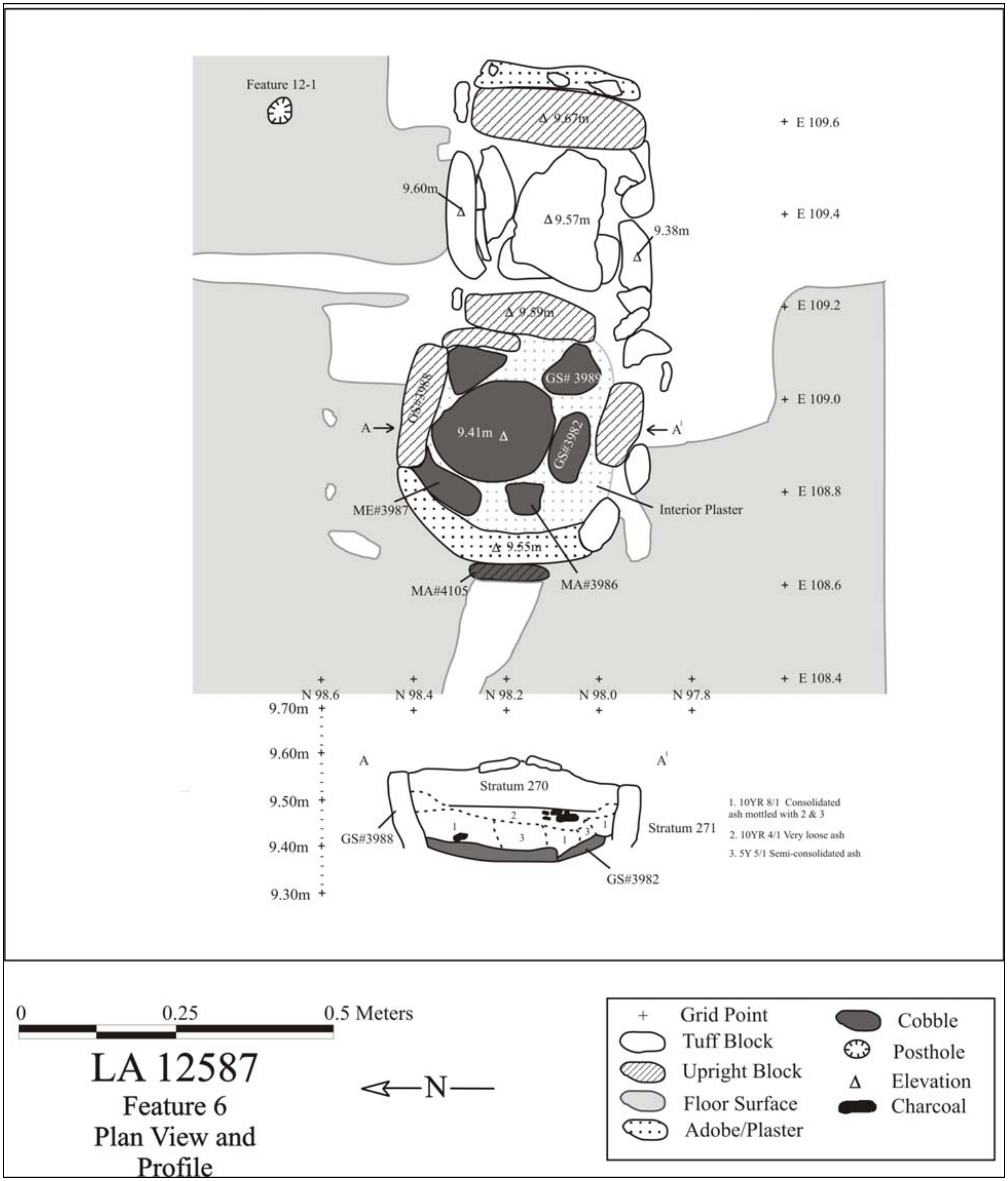

Figure 14.33. Feature 6 remodeled hearth plan view and profile.

The base of the hearth (34 by 24 cm after the remodeling) consists of a large, flat, dacite cobble. This cobble seems to be too small to have served as the base of the original hearth, suggesting that the hearth base may have been remodeled in addition to the walls. A small amount of ash was found below the dacite cobble.

The fill of the hearth consists of two strata. The upper stratum (Stratum 270) is generally 10 cm thick and consists of sandy loam. It is indistinguishable from Stratum 10. Below Stratum 270 there is a deposit of ash that is approximately 8 cm deep (Stratum 271). Other strata associated with the hearth are Stratum 300 (the interior plaster of the remodeled hearth), Stratum 301 (material between the first and second layers of interior plaster), Stratum 308 (the ashy material below the hearth base), and Stratum 309 (the original hearth plaster). Flotation and pollen samples were taken from each of these strata.

Charred taxa identified in the Stratum 270 flotation samples (FS 3273, FS 3274, FS 3275, FS 3276, FS 3319, FS 3320, and FS 3321) include sagebrush, pigweed, saltbush/greasewood, four-wing saltbush, bugseed, goosefoot, cheno-ams, grass family, unknown conifer, Desert olive, juniper, bean (*Phaseolus*), tobacco, unidentified pine, piñon pine, ponderosa pine, prickly pear, cottonwood/willow, purslane, Douglas fir, oak, and maize. Taxa identified in the Stratum 270 pollen sample (FS 3358) include maize, cholla, beeweed, cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, and sagebrush.

Taxa identified in the Stratum 271 flotation samples (FS 3277, FS 3278, FS 3279, FS 3280, FS 3281, FS 3282, FS 3322, FS 3323, and FS 3324) include saltbush/greasewood, goosefoot, bugseed, unknown conifer, juniper, tobacco, evening primrose, unidentified pine, piñon pine, bean, prickly pear, groundcherry, cottonwood/willow, purslane, ponderosa pine, Douglas fir, and maize. Taxa identified in the Stratum 271 pollen sample (FS 3360) include maize, cholla, prickly pear, beeweed, purslane, cheno-ams, grass family, spurge family, sunflower family, unidentified pine, piñon pine, juniper, and sagebrush.

Taxa identified in the Stratum 300 flotation samples (FS 3983, FS 3984, and FS 3985) include pigweed, sagebrush, saltbush/greasewood, goosefoot, cheno-ams, Desert olive, unknown conifer, juniper, groundcherry, unidentified pine, piñon pine, ponderosa pine, purslane, oak, and maize. Taxa identified in the pollen sample (FS 3985) from this stratum include maize, prickly pear, beeweed, cheno-ams, grass family, sunflower family, ragweed/bursage, unidentified pine, piñon pine, juniper, and sagebrush.

Taxa identified in the Stratum 301 flotation samples (FS 3990 and FS 3991) include sagebrush, saltbush/greasewood, goosefoot, Desert olive, unknown conifer, juniper, piñon pine, ponderosa pine, cottonwood/willow, and maize. No pollen samples were collected from this stratum.

Taxa identified in the Stratum 308 flotation sample (FS 4102) include saltbush/greasewood, goosefoot, unknown conifer, juniper, piñon pine, oak, and maize. A pollen sample (FS 4100) was collected from this stratum but it was not analyzed.

No charred material was recovered from the Stratum 309 flotation sample (FS 4098), although piñon pine needles were identified. Taxa identified in the single pollen sample taken from this stratum (FS 4098) include maize, prickly pear, cheno-ams, sunflower family, spurge family, unidentified pine, piñon pine, juniper, and sagebrush.

A maize specimen (from FS 3274 and FS 3319) from Feature 6 was submitted for AMS radiocarbon dating. The sample returned an age of 860±40 BP (Beta-183753) and a date of cal AD 1190 with a two-sigma date range of cal AD 1040–1260. A sample (UW 1032) of the earlier hearth plaster (Stratum 309) was submitted for thermoluminescence dating. The sample returned a date of AD 981 with a two-sigma date range of AD 803–1159.

An ash box was identified east of the hearth. An upright tuff block that was part of the eastern hearth wall formed the west wall of the ash box. The north wall was formed by a second tuff upright and two underlying tuff cobbles. The top of the west wall and north wall is 1 to 2 cm above the floor level. The east wall of ash box was formed by a larger, shaped tuff block, the top of which was 7 cm above the floor level. This block may have served as a deflector, or the base of a deflector. There is no obvious south wall. The ash box had no obvious floor but bedrock was encountered at 22 cm below the floor level, and a shaped tuff slab lying diagonally between the bedrock and the west fall formed a partial floor/wall. The interior dimensions of the ash box are 32.5 cm east-west and 35 cm north-south.

A large (24 by 21 by 12 cm), unshaped tuff block was found in the center of the ash box just below floor level. The rest of the fill (Stratum 307) was similar to Stratum 10. No ash and only a few flecks of charcoal were found. Two flotation samples were analyzed from Stratum 307 (FS 4074 and FS 4075) and the identified taxa included pigweed, sagebrush, saltbush/greasewood, goosefoot, squash/coyote gourd, spurge, Desert olive, unknown conifer, juniper, groundcherry, unidentified pine, piñon pine, prickly pear, cottonwood/willow, oak, purslane, buffalo burr, dropseed grass, and maize. One pollen sample (FS 4073) was collected from Stratum 307 and identified taxa included maize, cheno-ams, sunflower family, unidentified pine, piñon pine, and sagebrush.

Feature 12 (Postholes). Feature 12 consists of four postholes. Posthole 12-1, located 50 cm northwest of the hearth, is the smallest of the four postholes (5 cm in diameter) and has a smooth plaster interior but not a plaster bottom. Postholes 12-2, 12-3, and 12-4 may define three corners of a 2.3- by 1.4-m rectangular structure, although a posthole that would form the southeast corner was not found. Postholes 12-2 (7.5-cm diameter) and 12-4 (7.0-cm diameter) are well-preserved and both have smooth plaster interiors. Posthole 12-3 is slightly damaged and lacks a well-defined southwest arc, but was probably 8 cm in diameter. It appears to have had a smooth plaster interior.

Room 8

Room 8 (Figure 14.34) is one of the back rooms in Roomblock 1. Room 8 is south of Room 6, north of Room 9, and west of Room 7. The room interior measures 3.5 m north-south by 2.1 m east-west and has an interior floor area of 7.4 m^2. No interior features were identified during excavations.

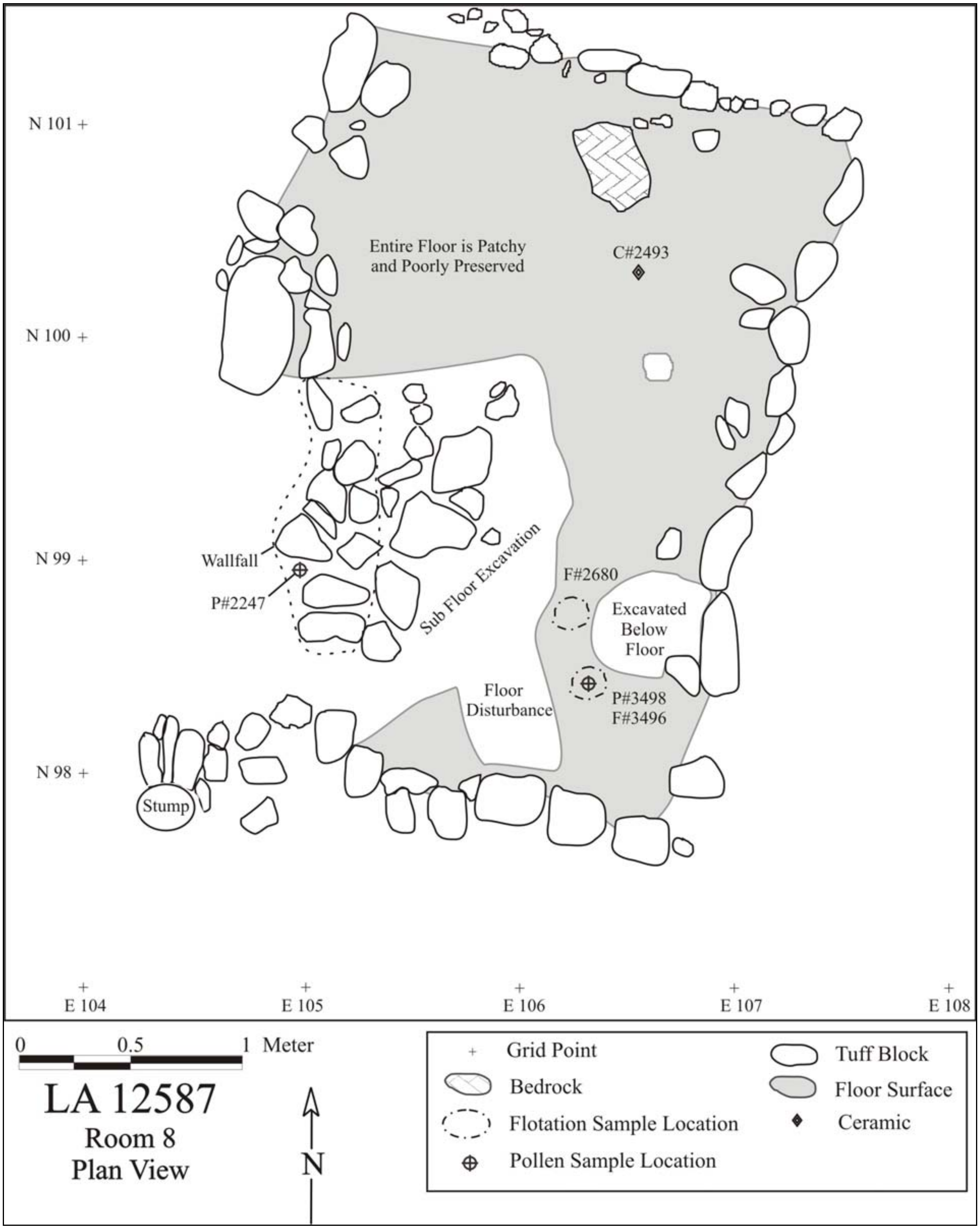

Figure 14.34. Room 8 plan view.

Stratigraphy. Table 14.24 summarizes the strata associated with Room 8. Much of the ground surface was covered by pine duff and twigs from a nearby piñon tree. Stratum 1 consists of loose, unconsolidated, sandy loam. Stratum 10 consists of compact sandy loam and areas of consolidated adobe melt. Many masonry blocks were found in this stratum. Strata associated with the floor and sub-floor are discussed in the subsequent section.

Table 14.24. Room 8 stratigraphy.

Stratigraphic Unit	Thickness (cm)	Color	Texture	Description
0	0	10YR 4/3	sandy loam	Surface
1	1–5	10YR 4/3	sandy loam	Unconsolidated surface soil
10	24–35	10YR 4/3	sandy loam	Wallfall and post-occupational fill
128	0	10YR 7/1	silty clay	Floor, surface
170	1–2	10 YR 4/3	sandy loam	Sub-floor soil

Table 14.25 shows the artifact counts by stratigraphic unit for Room 8. The 'Other' category consists of a freshwater shell fragment (FS 2426).

Table 14.25. Room 8 artifact counts by stratum.

Stratum	Chipped Stone	Ceramic	Ground Stone	Nonhuman Bone	Other	Total
0	0	0	0	0	0	0
1	40	65	0	0	0	105
10	187	778	6	8	1	980
128	0	1	0	0	0	1
170	0	0	0	0	0	0
Total	**227**	**844**	**6**	**8**	**1**	**1086**

Floors. The floor surface of Room 8 (Stratum 128) is patchy and poorly preserved. It has been greatly disturbed by roots (including the roots of a large piñon in the southwest corner of the room) and rodent activity. The floor foundation is 1 to 4 cm thick. In many areas, shaped and unshaped tuff blocks are set into the loose sandy loam sub-floor deposits (Stratum 170) to provide a level surface for the floor foundation. In other areas, the floor is built directly on bedrock. There is no evidence of multiple plastering events. In some areas there is coping between the floor and the walls. Coping is best preserved in the northeast and southeast corners of the room. A smeared-indented corrugated jar sherd was found on the floor. Two pollen (FS 2247 and FS 3498) and flotation (FS 2680 and FS 3496) samples were taken on the floor. Taxa identified in the pollen samples included maize, cholla, prickly pear, beeweed, cheno-ams, grass family, sunflower family, ragweed/bursage, chicory tribe (Liguliflorae), spurge family, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush. Taxa identified in the flotation samples included pigweed, goosefoot, cheno-ams, Desert olive, piñon pine, juniper, and maize. A pollen (FS 3499) and flotation (FS 3497) sample were collected from the sub-floor context. Taxa identified in the pollen sample included cholla, prickly pear, beeweed, cheno-ams, sunflower family, unidentified pine, piñon pine, and sagebrush. Taxa identified in the flotation sample included saltbush/greasewood, goosefoot, unknown conifer, juniper, piñon pine, ponderosa pine, and maize.

Wall Construction. The room corners are poorly preserved so the construction sequence of the room could not be determined. Table 14.26 gives the dimensions of the extant wall segments. The north wall is described above as the south wall of Room 6 and the east wall is described above as the west wall of Room 7. The south and the west wall are poorly preserved; all that could be determined about their construction was that the basal course was made of tuff blocks set into adobe mortar. On all walls, faint remnants of plaster were occasionally found.

Table 14.26. Room 8 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	1.48	0.20	0.20
East	3.66	0.33	0.22
South	1.75	0.22	0.20
West	1.80	0.22	0.40

Artifacts and Samples. All the artifacts from units 100N/105E and 100N/106E were analyzed. All the faunal remains from this room were analyzed. Table 14.27 lists the samples analyzed from Room 8.

Table 14.27. Room 8 analyzed samples by stratum.

Stratum	Flotation	Pollen	Macrobotanical
10	None	2679	2492
70	1699	1698	None
128	2680, 3496	2247, 3498	None
170	3497	3499	None

Room 9

Room 9 (Figure 14.35) is located at the southwest end of the Roomblock 1. The interior dimensions of the room are 4.9 m north-south and 1.9 m east-west. The interior area is 9.3 m^2. No interior features were identified in the room.

Stratigraphy. Table 14.28 summarizes the strata associated with Room 9. Stratum 1 consists of loose, unconsolidated, sandy loam. Stratum 10 consists of compact sandy to clayey loam, wallfall, adobe, and rooffall. Stratum 70, the fill below the wallfall but above the floor, consists of loose, unconsolidated, and relatively homogeneous sandy to silty loam. The strata associated with the floor and sub-floor are discussed below in the following section.

Table 14.28. Room 9 stratigraphy.

Stratigraphic Unit	Thickness (cm)	Color	Texture	Description
0	0	10YR 4/3	sandy loam	Surface
1	1–6	10YR 4/3	sandy loam	Unconsolidated surface soil
10	16–22	7.5 YR 4/4	sandy loam, clay loam	Wallfall and post-occupational fill
70	8–10	10YR 4/3	sandy to silty loam.	Fill below wallfall and above floor
129	0	10YR 6/3	silty clay	Floor, surface
170	4–20	10YR 4/3	sandy to silty loam	Sub-floor soil

Table 14.29 shows the artifact counts by stratigraphic unit for Room 9. The 'Other' category includes a small piece of turquoise (FS 2389), a fragment of hematite (FS 2955), and several miscellaneous samples.

Table 14.29. Room 9 artifact counts by stratum.

Stratum	Chipped Stone	Ceramic	Ground Stone	Nonhuman Bone	Other	Total
0	0	1	0	0	0	1
1	82	200	2	1	0	285
10	278	1028	9	3	2	1320
129	0	0	0	0	1	1
170	13	49	2	12	3	79
Total	**373**	**1278**	**13**	**16**	**6**	**1686**

Floor. Floor plaster was found only in the northern half of the room. Here the floor surface was patchy and poorly preserved. In the southern half of the room it was not possible to follow the floor and the entire area was excavated to 4 to 20 cm below floor level. Coping is visible between the floor and the walls, but only in the northeast corner of the room. Where the floor is present it appears to have been built directly on top of bedrock. In areas where the bedrock undulates, flattened, shaped tuff blocks were used to create a level surface. There is no evidence for multiple plastering episodes. No artifacts were found on the floor surface. Two pollen (FS 2570 and FS 3502) and two flotation samples (FS 2571 and FS 3500) were collected from the floor surface. Taxa identified in the pollen samples included maize, cholla, prickly pear, beeweed, cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, and sagebrush. Taxa identified in the flotation samples included saltbush/greasewood, juniper, piñon pine, cottonwood/willow, and maize. A flotation (FS 3501) and pollen (FS 3503) sample were collected from sub-floor contexts. Taxa identified in the pollen sample included maize, cholla, prickly pear, cheno-ams, sunflower family, ragweed/bursage, unidentified pine, piñon pine, and sagebrush. Taxa identified in the flotation sample included saltbush/greasewood, juniper, unidentified pine, piñon pine, rose family, cottonwood/willow, dropseed grass, and maize.

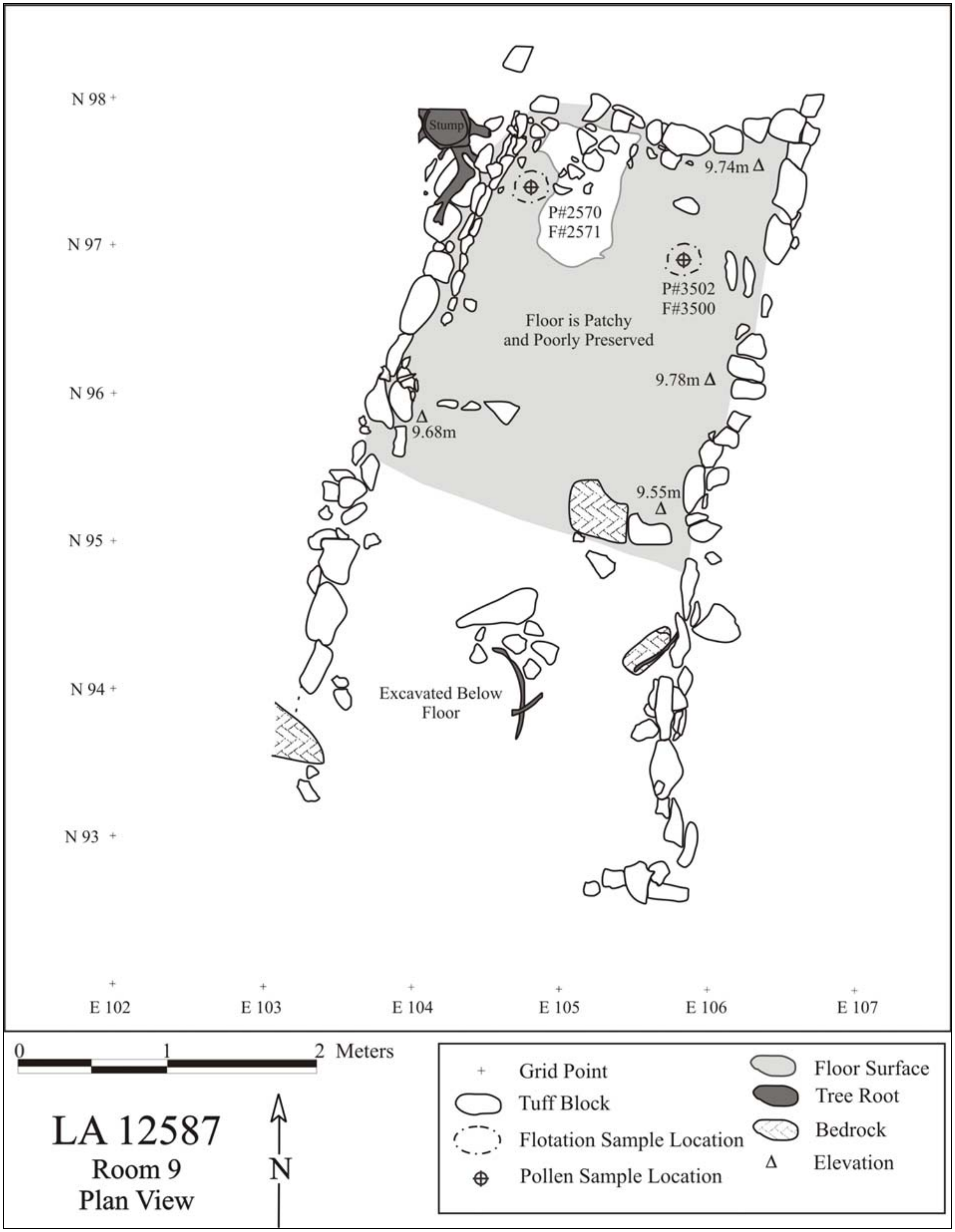

Figure 14.35. Room 9 plan view.

Wall Construction. The sequence of wall construction in this room is difficult to determine because all of the remaining corners are in poor condition. It is possible that the north and south walls are bonded with the east wall. Table 14.30 gives the dimensions of the extant wall segments.

Table 14.30. Room 9 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	1.75	0.30	0.20
East	4.80	0.18	0.20
South	0.70	0.35	0.29
West	4.33	0.23	0.38

The north wall of Room 9 is described in Room 8. Five tuff blocks in the southeast corner of the room are all that remain of the south wall. The basal course of the east and west walls consists of tuff uprights set into an adobe bed. Additional adobe mortar was applied to the sides and tops of the uprights. In places, the west wall is two uprights thick. A few segments of the second course of the west wall were preserved. These segments consist of horizontally laid flat tuff blocks.

Artifacts and Samples. All the artifacts from units 96N/104E and 97N/105E were analyzed. All the faunal remains from the room were analyzed. Table 14.31 lists the samples analyzed from Room 9.

Table 14.31. Room 9 analyzed samples by stratum.

Stratum	Flotation	Pollen	Macrobotanical
1	None	None	2567
10	2397	2229	2233
129	2571, 3500	2570, 3502	3404
170	3501	3503	3624

Roomblock 2 (Room 3)

During excavation it became apparent that a later structure overlay Roomblock 1 and this structure was originally designated Roomblock 2. Subsequently, Roomblock 2 was discovered to consist of only a single room (Room 3).

Room 3

Room 3 is situated over the northwest corner of Room 7 of Roomblock 1 and small portions of Rooms 8 and 4/5 (Figures 14.36 and 14.37). The room has an interior area of 3.2 m^2 (1.9 by 1.7 m). No internal features were identified during excavation. Room 3 is interpreted as a fieldhouse and may be contemporaneous with one or more agricultural features at the site (e.g., Features 17, 18, and 22).

Stratigraphy. Table 14.32 summarizes the strata associated with Room 3. Stratum 1 is loose, unconsolidated, fine-grained sandy loam. Ten tuff masonry blocks were recovered from this stratum. Stratum 20 consists of moderately compact sandy loam and a mix of approximately 40 shaped and unshaped tuff blocks, chinking stones, chunks of adobe, and adobe melt. Stratum 20 was generally less compact than Stratum 10; otherwise the two strata were indistinguishable. Fill above the base of the Room 3 walls was assigned to Stratum 20; fill below was assigned to Stratum 10. The fill in, and immediately below, the walls of Room 3 was designated as Stratum 21.

Table 14.32. Room 3 stratigraphy.

Stratum	Color	Texture	Thickness (cm)	Description
0	10YR 5/3	sandy loam	0	Surface
1	10YR 5/3	sandy loam	2–5	Unconsolidated surface soil
20	7.5YR 4/2, 10YR 4-5/3, 4/4	sandy loam	14–25	Wallfall and post-occupational fill
21	10YR 4/4	sandy loam	N/A	Wall fill

Figure 14.36. Room 3 after excavation.

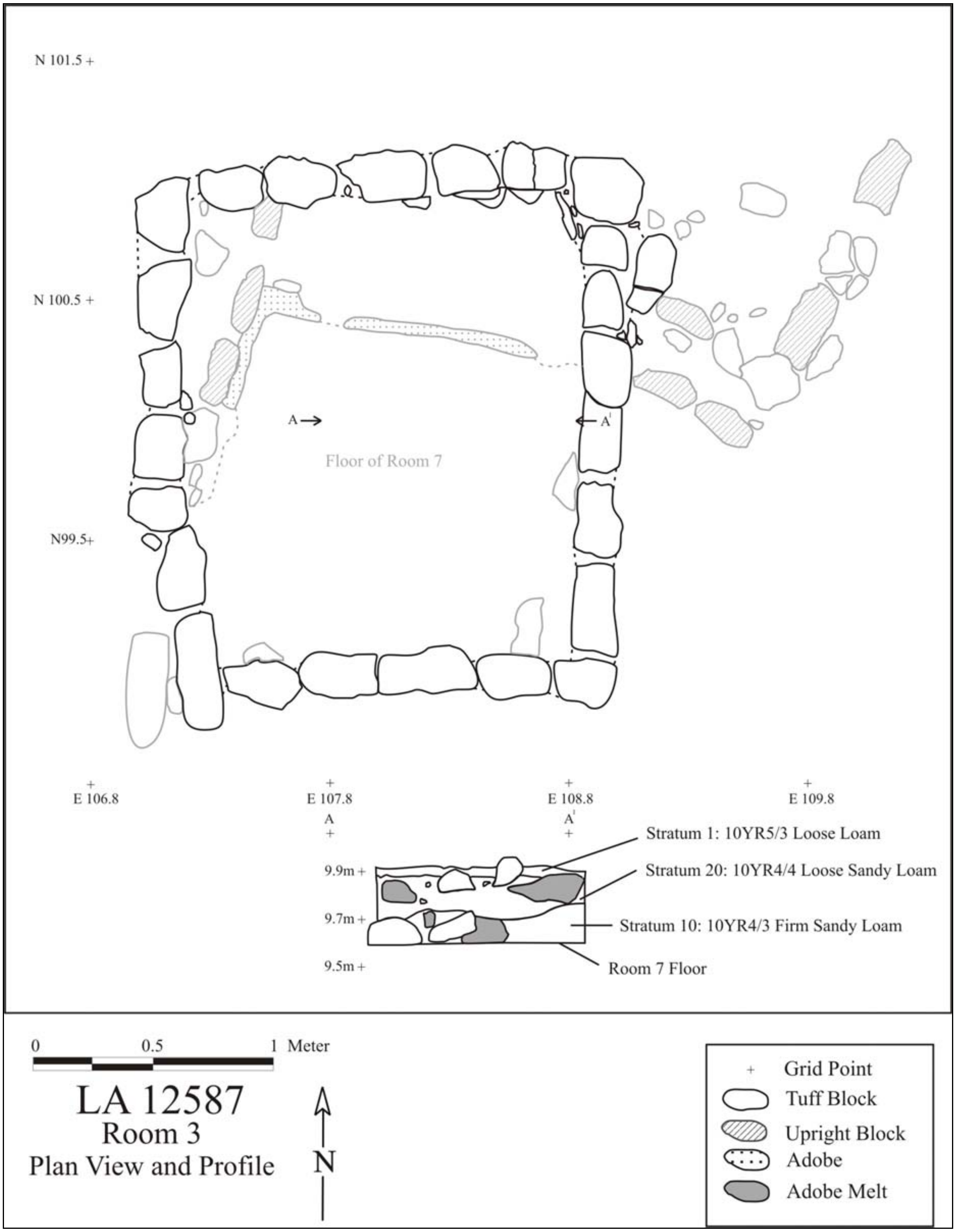

Figure 14.37. Room 3 plan view and profile.

Table 14.33 shows the artifact counts by stratigraphic unit for Room 3. The 'Other' category consists of a freshwater shell fragment (FS 1499) and several miscellaneous samples. Given the amount of bioturbation at the site and the difficulty distinguishing between Stratum 20 and Stratum 10, many of the artifacts in Table 14.33 are probably associated with Roomblock 1 not Room 3 (Roomblock 2).

Table 14.33. Room 3 artifact counts by stratum.

Stratum	Chipped Stone	Ceramic	Ground Stone	Bone	Other	Total
0	1	3	0	0	0	4
1	30	91	1	0	0	122
20	67	219	6	1	1	294
21	24	45	0	1	2	72
Total	**122**	**358**	**7**	**2**	**3**	**492**

Floor. No floor or use surface was found in Room 3.

Wall Construction. The walls of Room 3 (Table 14.34) were constructed of a single row of horizontally laid coursed tuff blocks held together by mortar. At the eastern end of the north wall, two courses are present; elsewhere only one course survives (Figure 14.38).

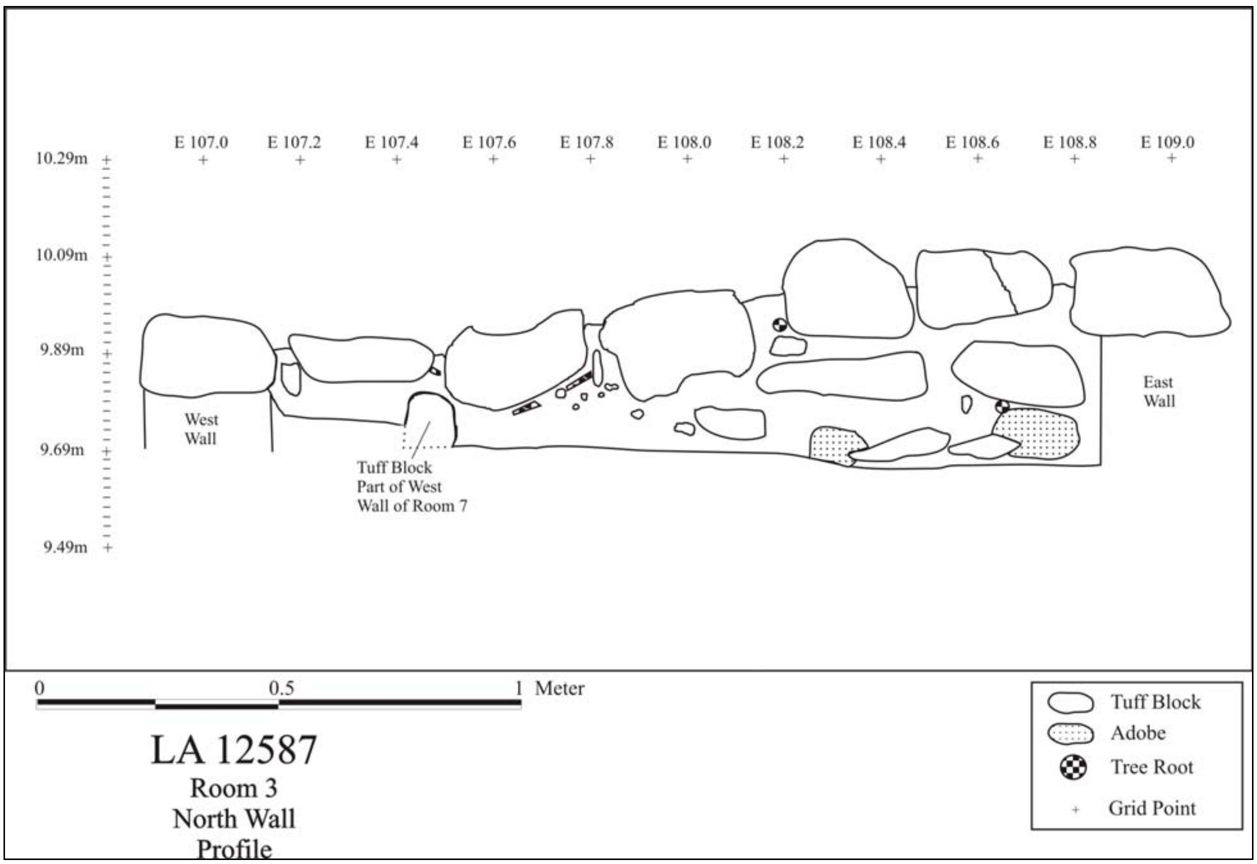

Figure 14.38. Room 3 north wall profile.

Most of the masonry measures approximately 30 by 20 by 12 cm. While three or four blocks show minor shaping, most of the blocks are unshaped. Two chinking stones are present in the north wall. The mortar between the masonry is decayed and nearly indistinguishable from the surrounding matrix, although a few less decayed patches are present. A thin (1 to 5 cm thick) layer of mortar is present below the basal course of the walls in some locations. Room 3 was built after Room 7 had collapsed and it is possible that the tops of some of the Roomblock 1 walls were incorporated into the Room 3 wall foundations. For example, the north wall of Room 3 was built almost directly on top of masonry from the west wall of Room 7.

Table 14.34. Room 3 wall dimensions.

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	1.73	0.33	0.24
East	1.90	0.14	0.21
South	1.50	0.17	0.20
West	1.94	0.20	0.24

Artifacts and Samples. All the artifacts recovered in Room 3 were analyzed. Table 14.35 lists the samples analyzed from Room 3.

Table 14.35. Room 3 analyzed samples by stratum.

Stratum	Flotation	Pollen	Macrobotanical
20	1593	1591	1491, 1500, 1592, 2044
20 (from base of stratum)	1493, 2040	1492, 1590	None
21	3000	3003, 3158	None

Roomblock 3

Roomblock 3 is a one-room-wide linear roomblock that is oriented about 8.5° east of north and is situated immediately west of Roomblock 1. Thirteen rooms (Rooms 10 through 22; Table 14.36) were identified in the 52-m-long roomblock. Ten of the rooms are contiguous (Rooms 10 through 18 and 22), while portions of the remaining three rooms (Room 19, 20, and 21) were exposed during excavation of the agricultural berms (Feature 22) in Area 2. The northern three rooms are aligned with the lower group of rooms and are assumed to be continuous with them even though the intervening three meters was not excavated.

It appears that Roomblock 3 was never completed. In Rooms 13, 17, and 18 and the southern portion of Room 11, the fill was nearly devoid of wallfall and only one to two standing courses were found. However, enough wallfall was present in the northern portion of Room 11 and in Rooms 10, 12, 14, and 16 to indicate that the walls of these rooms were at least several courses high. Too little of Rooms 15 and 19 through 22 was excavated to determine the amount of wallfall present. None of the rooms in Roomblock 3 had prepared or plastered floors and possible use surfaces were only found in Rooms 11 and 18.

Due to time constraints, the Roomblock 3 rooms were only partially excavated. The plan view maps for each room differentiate between excavated and unexcavated areas.

Table 14.36. Room dimension summary for Roomblock 3.

Room Number	Length (m)	Width (m)	Floor Area (m^2)
10	3.4	2.3	7.8
11	6.5	2.4	15.6
12	3.6	2.2	7.9
13	3.7	2.4	8.9
14	3.9	2.3	9.0
15	3.7	2.4	8.9
16	5.4	2.3	12.4
17	3.4	2.5	8.5
18	3.0	2.3	6.9
19	*3.3*	*2.2*	*7.3*
20	?	?	?
21	?	*2.4*	?
22	?	?	?

Numbers in italics are estimates for incomplete rooms. A "?" indicates that no estimate of that dimension could be made.

Architecture and Stratigraphy. All the rooms in Roomblock 3 were constructed with shaped tuff blocks of fairly uniform size. It appears that the only construction style employed was that of coursed masonry. No upright blocks or turtleback construction was evident. Facing stones are present on the interior and exterior of several walls. This architectural feature consists of a single row of closely spaced tabular tuff cobbles running parallel to the base of the walls. The facing stones may have functioned as an anchor for the wall plaster to adhere to the floor surface. Similar facing stones were infrequently used in Roomblock 1.

Wall foundations were simple. No prepared trenches were noted and many of the walls were constructed directly on top of the underlying bedrock. Others were built upon varying depths of cultural fill (presumably from Roomblock 1) or on the Btk horizon (Stratum 175).

It appears that the north-south-oriented walls were built first and then the cross walls were added. At several locations along the north-south walls, masonry blocks were placed such that their long axes were perpendicular to the walls. These tie-stones projected into the space between the walls. Where cross walls incorporate tie-stones, a bonded relationship is created between the north-south wall and the east-west wall.

Stratigraphic Relationship Between Roomblocks 1 and 3. The stratigraphic relationship between the two roomblocks is seen in the profile between Rooms 9 and 12 (Figure 14.39). Because of the importance of this profile, its stratigraphy was studied in detail by the project geomorphologists. As a result, the stratigraphy in Figure 14.39 is specific to the profile and is more fine-grained than the general excavation stratigraphy. Table 14.37 summarizes the Figure 14.39 stratigraphy and correlates it with the excavation strata.

Table 14.37. LA 12587 stratigraphic summary.

Profile Stratum	Excavation Stratum	Color	Texture	Description
I	1	N/A	N/A	Compact pine duff. Modern.
II	1/200/202	10YR 4/4	coarse sandy loam	Abrupt upper boundary, clear and wavy to irregular lower boundary. Massive structure, slightly hard. Abundant gravel inclusions. Covers Roomblock 1 wall remnant. Post-occupational natural deposit containing structural debris.
III	200/202	10YR 5/3	sandy clay loam	Sharp boundary with Strata V to VII, clear boundary with Strata IV and VIII, generally irregular. Massive and single-grained structure, slightly hard to soft. Contains charcoal and sparse gravel. Probably post-dates Roomblock 1.
IV	200/202	7.5YR 4/3	sandy clay loam	Clear horizontal boundary with Strata III, VII, VIII, and X, abrupt boundary with Stratum IX. Massive and single-grained structure (due to root disturbance), slightly hard. Contains charcoal. Probable root/rodent disturbance.
V	200/202	10YR 6/3	sandy clay	Sharp boundaries but very irregular from disturbances. Hard angular structure. Possible adobe melt from Roomblock 1.
VI	200/202	10YR 5/3	sandy clay loam	Slightly lighter brown than Stratum III. Clear boundaries. Massive structure, soft. May be part of Stratum III.
VII	200/202	10YR 6/2	sandy loam	Sharp boundaries. Massive coherent single grained structure, loose to soft. Appears to contain ash, and charcoal on margin may be associated. Possibly burned structural debris or Roomblock 1 trash.
VIII	170	10YR 5/3	coarse sandy loam	Abrupt boundary with Strata V and IX, clear boundary on all other contacts. Massive structure, soft. Very disturbed from abundant roots. Contains charcoal and tuff gravel inclusions. May represent native preoccupation topsoil.
IX	175	7.5YR 4/4	sandy clay	Abrupt boundaries. Contains degraded spalls of bedrock.
X	175?	7.5YR 4/5	coarse sandy clay	Sharp boundaries. Massive single-grain structure, very soft. Contains tuff gravel and a chert flake. May represent a deposit of Stratum IX material that was redeposited during

Profile Stratum	Excavation Stratum	Color	Texture	Description
				excavation of Room 9 foot trench.

Sub-floor and sub-wall observations of Roomblock 1 indicated that it was built on preoccupation topsoil (Stratum 170), remnant Pleistocene soil (Stratum 175), or occasionally on bedrock. Roomblock 3 was sometimes built on these deposits, but in some areas strata containing cultural debris were found to underlie the walls of this pueblo. Figure 14.39 depicts cultural deposits (Strata V and VII) that were probably derived from Roomblock 1 at depths that are below the east wall of Room 12. The east wall of Room 12 was built in Stratum III, a stratum that appears to post-date Roomblock 1. Based on these observations, it is inferred that the construction of Roomblock 3 post-dates the abandonment of Roomblock 1.

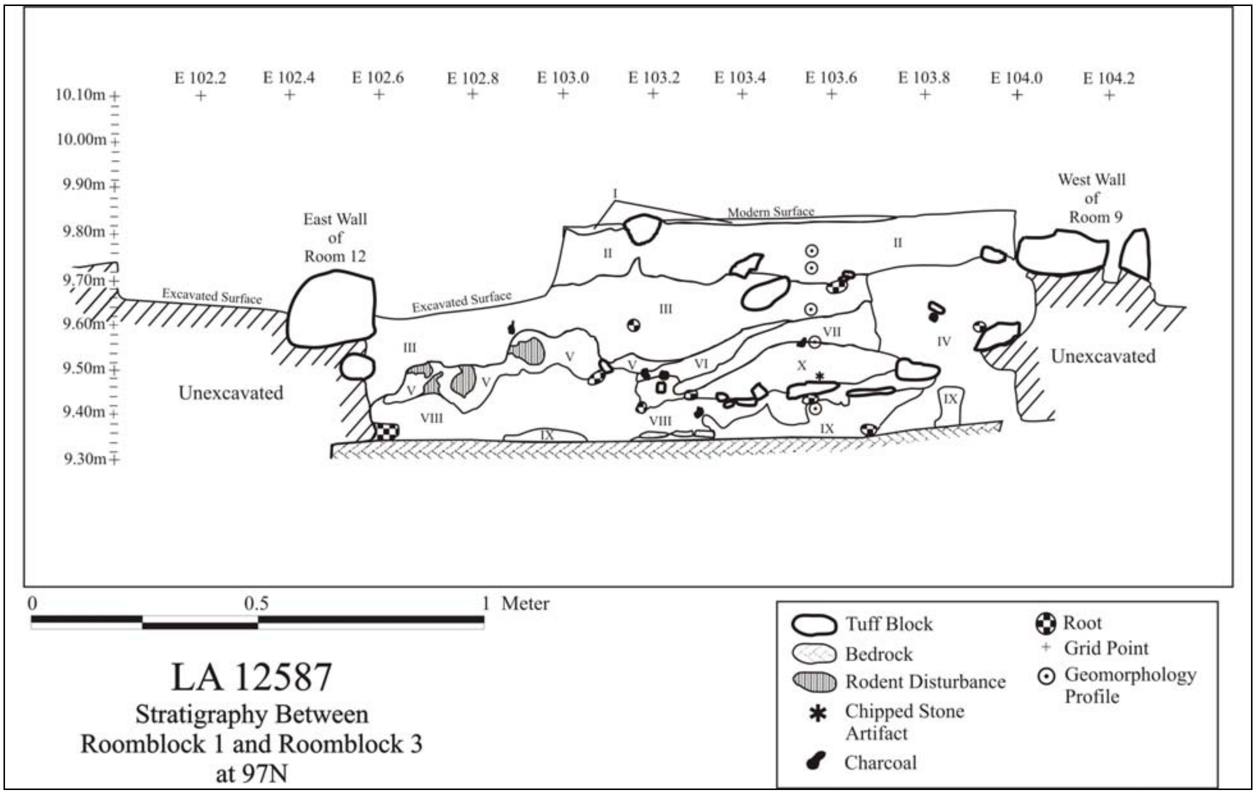

Figure 14.39. Stratigraphic relationship between Roomblocks 1 and 3.

Room 10

Room 10 (Figure 14.40) is located near the center of Roomblock 3 between Rooms 11 and 12. The interior dimensions of the room are 3.4 m north-south by 2.3 m east west, and it has an interior area of 7.8 m^2.

Stratigraphy. Five strata are associated with Room 10 and are summarized in Table 14.38. At the time of excavation a juniper tree was growing inside the room near the southwest corner. Stratum 1 consists of loose, unconsolidated, and fine-grained sandy loam.

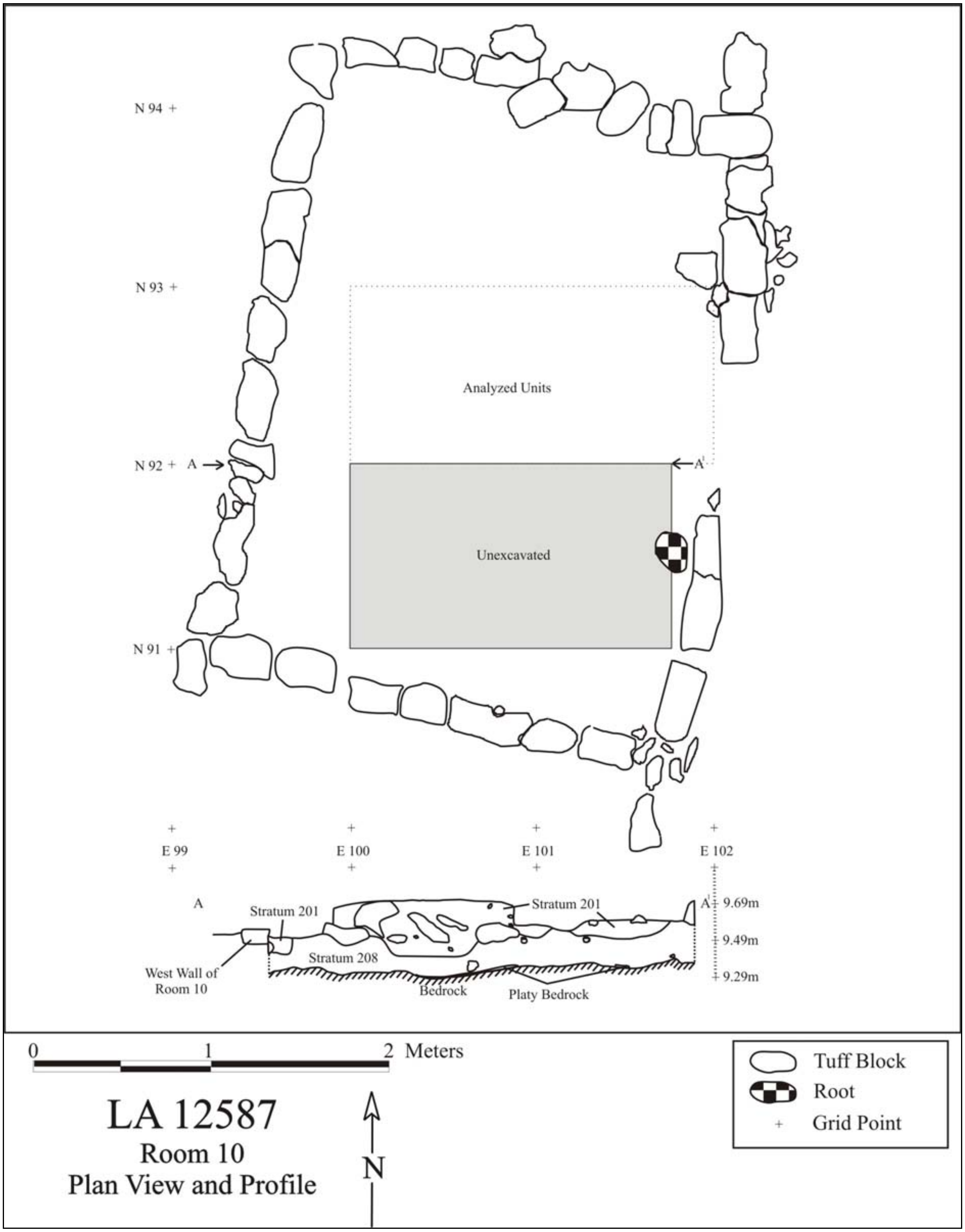

Figure 14.40. Room 10 plan view and profile.

Stratum 201 is composed of two sub-strata. The uppermost sub-stratum consists of sandy loam that grades into sandy clay loam as depth increases. A good deal of wallfall was found in this sub-stratum. The upper sub-stratum is 20 to 30 cm thick and ends 4 to 12 cm above the base of the walls. The lower sub-stratum is a layer of sandy clay loam that is largely free of masonry blocks and tuff cobbles, but contains many artifacts. This sub-stratum extends to, and in some areas to slightly below, the base of the walls.

Stratum 208 consists of sandy clay loam and an intermittently occurring layer of tuff cobbles. Where the cobbles are present there are about 20 per square meter. Some cobbles are in contact with the bedrock, although most are 0.5 cm or more above it. These cobbles may have been placed as a foundation for the living surface/intended floor of Room 10.

In the southwest corner of the room (in unit 91N/99E), a possible use surface (Stratum 203) of clay loam was found below Stratum 208 and just above bedrock. Given its depth beneath the wallfall (approximately 25 cm) and its depth below the base of the walls (5 cm below the west wall, 16 cm below the south wall), it is unlikely that this surface is associated with the habitation of Room 10. It may be associated with the occupation of Roomblock 1, or an even earlier component. No artifacts were found in association with this surface.

The bedrock below this room was smooth, compact, and lightly undulating with a few deep (circa 10 cm) crevices that had been cut by roots or water. A light layer of carbonate covered the bedrock, giving it a white color. Three- to five-centimeter-thick patches of thinly layered and easily separated decaying tuff bedrock overlay the more compact material below.

Table 14.38. Room 10 stratigraphy.

Stratum	Color	Texture	Thickness (cm)	Description
0	10YR 3/3	sandy loam	0	Surface
1	10YR 3/3	sandy loam	2–18	Unconsolidated surface soil
201	10YR 3/3	sandy loam to sandy clay loam	18–35	Fill to base of walls
208	10YR 3/3	sandy clay loam	4–16	Soil below base of walls to bedrock
203	5YR 4/3	clay loam	0.1–2	Possible use surface

Table 14.39 shows the artifact counts by stratum for Room 10. Since the walls of the room were not visible on the surface, Strata 1 and 201 from units that straddle the walls incorporate some artifacts that came from outside the room. Additionally, portions of Room 10 were excavated to bedrock before Stratum 208 was introduced to designate fill below the level of the base of the walls. Therefore, the artifact tallies for Strata 1 and 201 are somewhat inflated, while those for Stratum 208 are somewhat deflated. The ‘Other’ category consists of a fragment of malachite (FS 2577), a quartzite manuport (FS 3713), and several other miscellaneous samples.

Table 14.39. Room 10 artifact counts by stratum.

Stratum	Chipped Stone	Ceramic	Ground Stone	Bone	Other	Total
0	0	0	0	0	0	0
1	12	51	0	0	0	63
201	193	1008	11	2	5	1219
203	0	0	0	0	0	0
208	30	256	1	0	0	287
Total	**235**	**1315**	**12**	**2**	**5**	**1569**

Floors. No floors or living surfaces were associated with Room 10 except for Stratum 203, which predates the room. A pollen (FS 2746) and flotation (FS 2745) sample were collected from this stratum. Taxa identified in the pollen sample include maize, cholla, prickly pear, beeweed, cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, and sagebrush. Taxa identified in the flotation sample include sagebrush, saltbush/greasewood, juniper, and maize.

Some tuff cobbles in Stratum 208 may have been placed as a floor foundation. A pollen (FS 3541), flotation (FS 3544), and two macrobotanical (FS 3612 and FS 3721) samples were collected from Stratum 208. Taxa identified in the pollen sample include maize, beeweed, cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, and sagebrush. Taxa identified in the flotation sample from Stratum 208 include Desert olive, juniper, and oak. Taxa identified in the macrobotanical samples include saltbush/greasewood, cottonwood/willow, piñon pine, ponderosa pine, unknown conifer, and unidentified pine.

Wall Construction. The north wall is bonded with the east wall; all other walls abut. Table 14.40 gives the dimensions of the extant wall segments. The walls are constructed of a single row of coursed and mortared horizontally laid masonry of shaped and unshaped tuff blocks. Near the west end of the south wall, an adobe mass with embedded tuff cobbles takes the place of one or two tuff blocks. A few chinking stones are present between masonry blocks. Along the interior base of the east, west, and south walls, a row of facing stones are intermittently present.

Two courses of masonry are present on the east half of the north wall, the northern half of the east wall, and the entire south wall. Elsewhere the walls are one course high except for a 1.25-m gap at the center of the east wall. There are several facing stones in the gap, indicating a missing masonry block.

Table 14.40. Room 10 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	2.69	0.32	0.24
East	1.38, 1.31	0.32	0.24
South	2.69	0.35	0.23
West	3.38	0.14	0.22

Artifacts and Samples. All the artifacts from units 92N/100E and 92N/101E were analyzed. All the macrobotanical material from unit 92N/100E was also analyzed. Table 14.41 lists the samples analyzed from Room 10.

Table 14.41. Room 10 analyzed samples by stratum.

Stratum	Pollen	Flotation	Macrobotanical[1]
1	2674	2673	None
201	3710	3709	3720
203	2746	2745	None
208	3541	3544	3612, 3721

1 In addition to the macrobotanical material from 92N/100E

Room 11

Room 11 (Figure 14.41) is located in the southern half of Roomblock 3 between Rooms 10 and 13. It is the largest room in the roomblock with internal dimensions of 6.5 m north-south by 2.4 m east-west and an internal area of 15.6 m^2.

Stratigraphy. Seven strata are associated with Room 11 (Table 14.42). At the time of excavation, three piñon trees were growing inside the room. Stratum 1 consists of loose, unconsolidated, and fine-grained sandy loam. It contains a few tuff blocks and chinking stones.

The stratigraphy in the northern half of the room is more complex than in the southern half of the room. Here, the upper part of Stratum 201 consists of 10 to 20 cm of silty to sandy loam. A considerable amount of wallfall is present, including a four- to five-course-tall section of the east wall that fell into the room intact. The lower part of Stratum 201 is a 10-cm-thick sub-stratum of masonry-free sandy clay loam that contains many artifacts. Below the wallfall in unit 90N/100E, there is a 9- to 12-cm-thick stratum (Stratum 205) of sandy clay loam and clay loam mixed with charcoal and ash. Stratum 205 is also present in 90N/99E; however, this unit was excavated before the deposit was recognized as a distinct stratum. Just above the bedrock in units 90N/99E and 90N/100E there is a thin, patchy layer of sandy clay loam that may have been a use surface (Stratum 204). In unit 89N/100E, there is a thin layer of adobe melt covering the bedrock. In other areas a thin deposit of Stratum 175 is present. There is no Stratum 208 in the northern part of the room as the base of the walls is only 1 to 3 cm above bedrock.

Table 14.42. Room 11 stratigraphy.

Stratum	Color	Texture	Thickness (cm)	Description
0	10YR 3/3	sandy loam	0	Surface
1	10YR 3/3	sandy loam	1–13	Unconsolidated surface soil
175	10YR 4/4	sandy clay	1–3	Btk horizon
201	10YR 3/3	sandy/silt loam to sandy clay loam	13–27	Fill to base of walls
204	10YR 3/3	sandy clay loam	0.1–1	Possible use surface

Stratum	Color	Texture	Thickness (cm)	Description
205	8.75 YR 3/3.5	sandy clay loam and clay loam	9–12	Ashy lenses
208	10YR 3/3	sandy clay loam	10–27	Soil below base of walls to bedrock

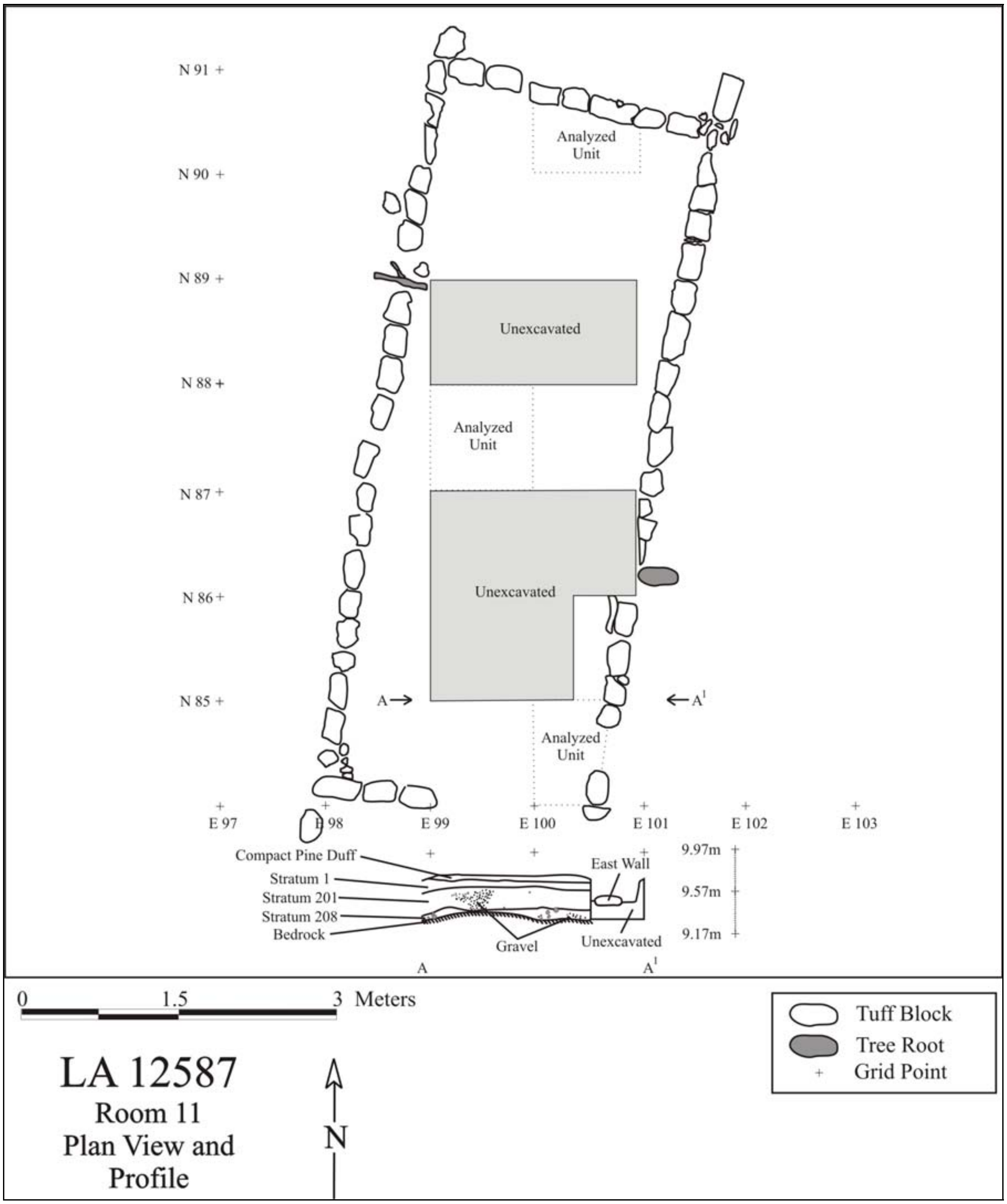

Figure 14.41. Room 11 plan view and profile.

The stratigraphy is less complex in the central and southern portions of the room. There is very little wallfall in Stratum 201 and most of what is present is in the central part of the room. Stratum 201 is fairly uniform throughout and overlays Stratum 208 (a sandy clay loam), except in the southwest corner. Here, the walls are built directly on an elevated section of bedrock. Stratum 175 is present in the central portion of the room, but not in the southern portion. Strata 204 and 205 are both absent.

Table 14.43 shows the artifact counts by stratum for Room 11. Since the walls of the room were not visible on the surface, Strata 1 and 201 from units that straddle the walls incorporate some artifacts that came from outside the room. Stratum 208 was not always excavated separately from Stratum 201. In most cases, the lowest "stratum" of a unit can only be identified as Stratum 201/208. As noted above, in unit 90N/99E, Stratum 205 was excavated as Stratum 201 before it was recognized as a distinct stratum.

Table 14.43. Room 11 artifact counts by stratum.

Stratum	Chipped Stone	Ceramic	Ground Stone	Bone	Other	Total
0	0	0	0	0	0	0
1	9	33	0	0	1	43
175	0	0	0	0	0	0
201	313	1358	4	3	0	1678
201/208	30	195	0	2	0	227
204	0	3	0	0	0	3
205	10	43	0	0	0	53
Total	**362**	**1632**	**4**	**5**	**1**	**2004**

Floors. A possible living surface (Stratum 204), which was identified as a clear, flat break between Stratum 201 and a thin, sterile sandy clay loam deposit, was encountered in the northern part of the room. Three smeared-indented corrugated jar sherds (FS 2907 and FS 2964) were found in contact with the possible living surface. Two pollen samples (FS 2906 and FS 2963) were analyzed. Identified taxa included maize, prickly pear, cholla, beeweed, cheno-ams, grass family, mustard family, sunflower family, spurge family, evening primrose, fir, unidentified pine, piñon pine, juniper, oak, and sagebrush. Two flotation samples (FS 2905 and FS 2962) were collected from the floor and the charred identified taxa included saltbush/greasewood, goosefoot, cheno-ams, grass family, juniper, groundcherry, unidentified pine, piñon pine, and maize.

Wall Construction. The north wall abuts the east and west walls, the west wall and the south wall are bonded, and the southeast corner does not exist. Table 14.44 gives the dimensions of the extant wall segments. The walls are constructed of a single row of coursed, horizontally laid masonry of shaped and unshaped tuff blocks held together with mortar. Chinking stones are often present in horizontal rows between masonry courses. A section of the east wall fell into the room but otherwise remained intact. This section shows that for four courses above the base course, the wall was built with the same coursed masonry style that the basal courses display. Facing stones are only present along the interior and exterior of the east wall. The base of the north wall, the northern portions of the east and west walls, and the southwest corner were all built on or within 1 to 3 cm of bedrock. Elsewhere the walls were built on Strata 175 and 208.

All the extant walls are one course high except for the west end of the north wall, which is two courses high (Figure 14.42). A single masonry block from the second course of the west wall is also present. Occasionally there are gaps in the walls where masonry was displaced by roots.

Table 14.44. Room 11 wall dimensions (extant wall segments).

Wall	Length (m)	Height (m)	Thickness (m)
North	2.69	0.33	0.20
East	1.21, 4.02	0.14	0.20
South	1.19	0.10	0.21
West	1.81, 4.50	0.21	0.22

Figure 14.42. Room 11 north wall.

Artifacts and Samples. All the artifacts from units 84N/100E, 87N/99E, and 90N/100E were analyzed. All the faunal remains were analyzed. A Cerro Toledo obsidian biface fragment (FS 3701) was also analyzed. Table 14.45 lists the samples analyzed from Room 11.

Table 14.45. Room 11 analyzed samples by stratum.

Stratum	Pollen	Flotation	Macrobotanical
1	4122	None	None

Stratum	Pollen	Flotation	Macrobotanical
201	4123	4245	2904
208	None	3761	3759
204	2906, 2963	2905, 2962	None

Room 12

Room 12 is located near the center of Roomblock 3 between Rooms 10 and 14 (Figure 14.43). The interior dimensions of the room are 3.6 m north-south by 2.2 m east-west, and the interior area is 7.9 m^2.

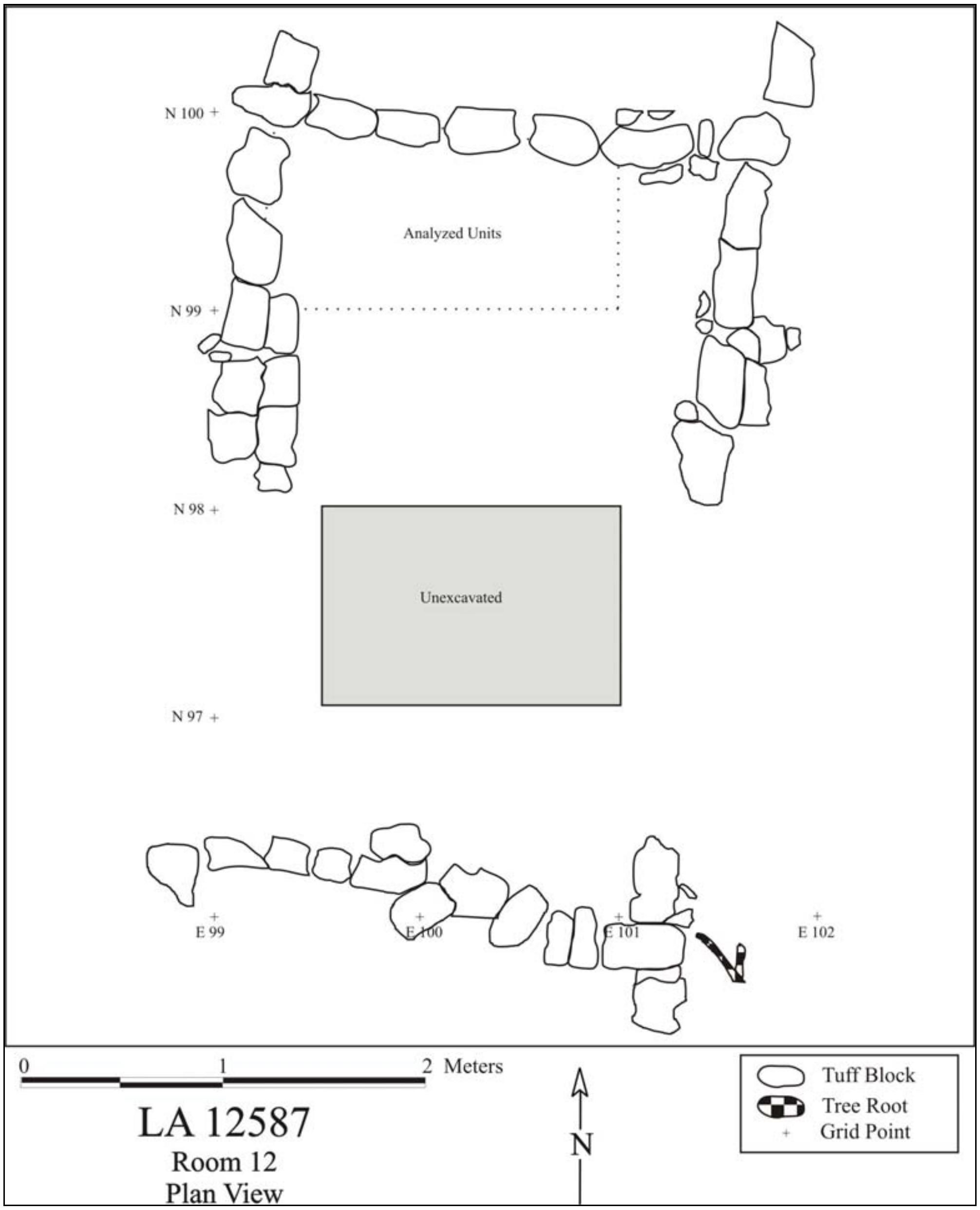

Figure 14.43. Room 12 plan view.

Stratigraphy. The four strata associated with Room 12 are summarized in Table 14.46. Stratum 1 consists of loose sandy loam. It contains a few masonry blocks and melted adobe. Stratum 201 consists of moderately compact sandy loam. In the northern half of the room, approximately 20 masonry blocks were found in Stratum 201. Stratum 208 was similar to Stratum 201 although it graded to sandy clay loam near bedrock. The only masonry in Stratum 208 consisted of a few tuff blocks along and under the east wall. This material is probably wallfall from Roomblock 1. Small patches of Stratum 175 are present just above the bedrock.

Table 14.46. Room 12 stratigraphy.

Stratum	Color	Texture	Thickness (cm)	Description
0	10YR 4/3	sandy loam	0	Surface
1	10YR 4/3	sandy loam	2–10	Unconsolidated surface soil
201	7.5YR 4/3	sandy loam	27–38	Fill to base of walls
208	7.5YR 4/3-4/4	sandy loam to sandy clay loam	3-18 (up to 25 cm deep along east wall)	Soil below base of walls to Stratum 175
175	7.5YR 4/4	sandy clay	1–3	Btk horizon

Table 14.47 shows the artifact counts by stratum for Room 12. Since the walls of the room were not visible on the surface—and in some areas are non-existent—Strata 1, 201, and 208 from units that straddle the walls incorporate artifacts that came from outside the room.

Table 14.47. Room 12 artifact counts by stratum.

Stratum	Chipped Stone	Ceramics	Ground Stone	Bone	Other	Total
0	1	3	0	0	0	4
1	48	249	0	0	0	297
201	223	1444	8	2	1	1678
208	88	383	1	9	1	482
175	3	15	0	0	0	18
Total	**363**	**2094**	**9**	**11**	**2**	**2479**

Floors. No floors or living surfaces were found in Room 12.

Wall Construction. The north wall of the room is bonded with the east and west walls, and the south wall is bonded with the east wall. Not enough masonry is left in the southwest corner to tell if the corner is bonded or abutted. Table 14.48 gives the dimensions of the extant wall segments. The walls are constructed of a single row of coursed, horizontally laid masonry of shaped and unshaped tuff blocks held together with mortar. A few chinking stones are present in each wall. Facing stones are present in the northeast corner of the room and at the west end of the south wall. Most of the walls are only one course high, although two courses are present in the northwest corner at the east end of the south wall and near the north end of the west wall. The southern half of both the east and west walls is absent.

Table 14.48. Room 12 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	2.75	0.15	0.25
East	1.98	0.15	0.20
South	2.69	0.32	0.26
West	1.82	0.17	0.25

Artifacts and Samples. All the artifacts from units 97N/100E and 97N/101E were analyzed, as were all the macrobotanical material from 96N/101E. All the faunal remains were analyzed. A Valle Grande obsidian projectile point (FS 2584) was also analyzed. One pollen sample (FS 3650) from Stratum 208 was analyzed. No flotation samples were analyzed.

Room 13

Room 13 (Figure 14.44) is located in the southern half of Roomblock 3 between Rooms 11 and 15. The interior dimensions of the room are 3.7 m north-south by 2.4 m east west, and it has an interior area of 8.9 m^2.

Stratigraphy. The three strata associated with Room 13 are summarized in Table 14.49. A backhoe scraped away several centimeters of Stratum 1 along the western and southern edges of this room. This accounts for the shallowness of the stratum. Stratum 201 consists of moderately compact sandy loam and contained almost no wallfall. Excavation ended when the sterile Stratum 175 was reached, which was several centimeters below the base of the walls.

Table 14.49. Room 13 stratigraphy.

Stratum	Color	Texture	Thickness (cm)	Description
0	7.5YR 4/4	sandy loam	0	Surface
1	7.5YR 4/4	sandy loam	1–3+	Unconsolidated surface soil
201	7.5YR 4/4, 10YR 3/3	sandy loam	10–31	Fill to base of walls

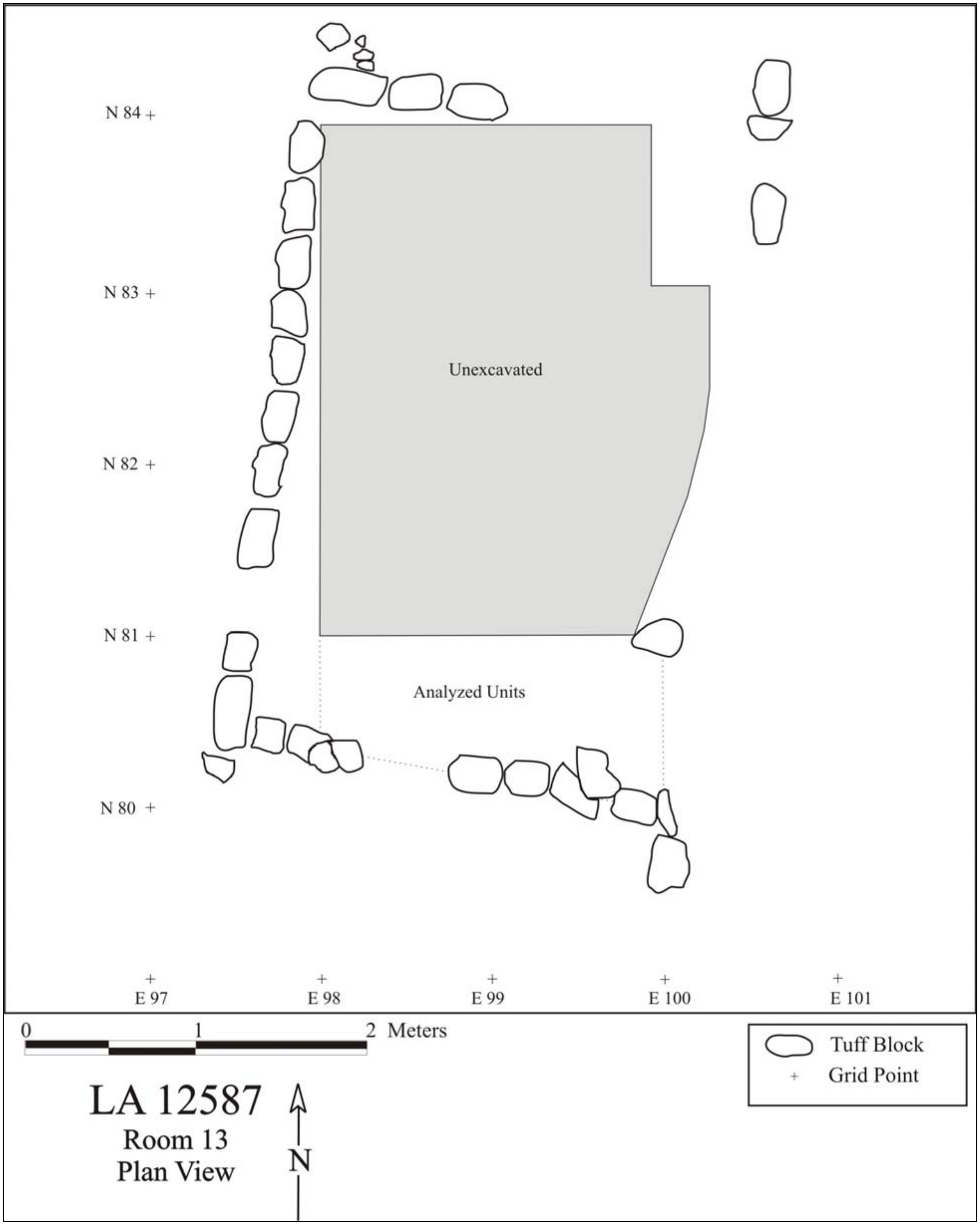

Figure 14.44. Room 13 plan view.

As most of the excavated units of Room 13 straddled the walls, the artifact counts (Table 14.50) for this room are somewhat inflated. It is not clear if artifacts from the exterior and interior of Room 13 were always kept separate. Additionally, small areas of 80N/97E and 80N/98E lie in Room 15, but were not excavated separately. Artifacts from these units have been designated as being from Room 13, as the largest areas of these units are in that room.

Table 14.50. Room 13 artifact counts by stratum.

Stratum	Chipped Stone	Ceramics	Ground Stone	Nonhuman Bone	Other	Total
0	0	0	0	0	0	0
1	3	9	0	0	0	12
201	60	274	4	0	0	338
Total	**63**	**283**	**4**	**0**	**0**	**350**

Floors. No floors or living surfaces were found in Room 13.

Wall Construction. The north wall is bonded with the west wall, and the south wall abuts the east and west walls. Not enough masonry remains in the northeast corner of the room to determine the relationship between the north and east walls. Table 14.51 gives the dimensions of the extant wall segments. The walls are constructed of a single row of coursed, horizontally laid masonry of shaped and unshaped tuff blocks held together with mortar. Facing stones were not observed. All the walls are one course high except for the south wall, where two separate masonry blocks of the second course are still in place. The east wall of Room 13 is almost non-existent. About half a dozen scattered masonry blocks were found where the wall should have been. It is unclear if this wall ever existed. There is a 50-cm-wide gap in the south wall. It is not clear if this gap was intentionally left in the wall or if there was masonry here that was subsequently lost. A similar 40-cm-wide gap is present in the west wall.

Table 14.51. Room 13 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	1.19	0.12	0.21
East	n/a	0.10	0.18
South	0.88, 1.28	0.20	0.21
West	0.63, 2.81	0.12	0.20

Artifacts and Samples. All the artifacts from 80N/98E and 80N/99E were analyzed. Ceramics from FS 3550 were also analyzed. One flotation sample (FS 3730) from Stratum 201 was analyzed. Taxa identified included juniper and piñon pine. No pollen samples were analyzed.

Room 14

Room 14 is located in the central portion of the roomblock between Rooms 12 and 16 (Figure 14.45). The interior dimensions of the room are 3.9 m north-south by 2.3 m east west, and it has an interior area of 9.0 m^2. A small internal rock feature (Feature 19) is present.

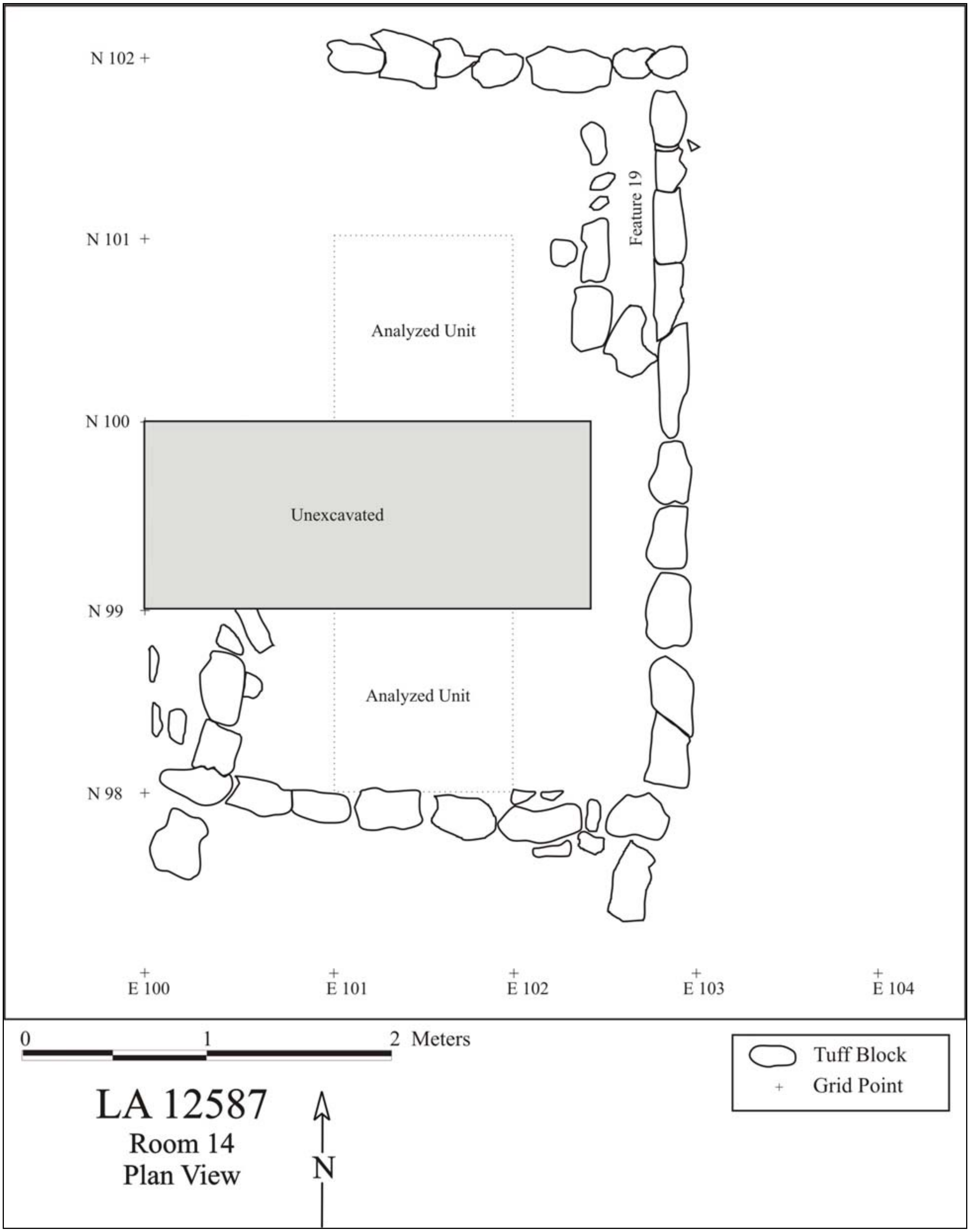

Figure 14.45. Room 14 plan view.

Stratigraphy. The four strata associated with Room 14 are summarized in Table 14.52. Stratum 1 consists of loose unconsolidated fill. A backhoe scraped away several centimeters of this stratum. Stratum 201 consists of moderately compact sandy loam. It contains burned daub, a few pieces of fire-cracked rock, many shaped and unshaped tuff blocks, and chinking stones. Stratum 208 is indistinguishable from Stratum 201 (save that no burned daub or fire-cracked rock was present). Near the base of Stratum 208, shallow patches of the reddish brown clay were observed (probably Stratum 175), but were not given a separate stratum number.

Table 14.52. Room 14 stratigraphy.

Stratum	Thickness (cm)	Color	Texture	Description
0	0	7.5YR 4/3	sandy loam	Surface
1	1	7.5YR 4/3	sandy loam	Unconsolidated surface soil
201	19–29	7.5YR 4/3-4	sandy loam	Fill to base of walls
208	13–24	7.5YR 4/3-4	sandy loam	Soil below walls to bedrock

Table 14.53 shows the artifact counts by stratigraphic unit for Room 14. The ‘Other’ category includes a freshwater shell fragment (FS 3620), a possible *Anodonta* sp. fragment (FS 3839), a land gastropod shell (FS 3839), a manuport of unidentified material (FS 3906), and a miscellaneous sample.

Table 14.53. Room 14 artifact counts by stratum.

Stratum #	Chipped Stone	Ceramics	Ground Stone	Nonhuman Bone	Other	Total
0	7	18	0	0	0	25
1	1	8	0	0	0	9
201	226	1341	11	4	4	1586
208	123	607	6	2	1	739
Total	**357**	**1974**	**17**	**6**	**5**	**2359**

Floors. No floors or living surfaces were found in Room 14.

Wall Construction. The south wall is bonded with the east and west walls, the north wall was bonded with the east wall, and the northwest corner is missing. Table 14.54 gives the dimensions of the extant wall segments. The walls are constructed of a single row of coursed and mortared horizontally laid masonry of shaped tuff blocks. All the extant walls are a single course high.

Table 14.54. Room 14 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness
North	2.0	0.14	0.23
East	3.8	0.10	0.22
South	2.75	0.15	0.25
West	0.78	0.15	0.27

Artifacts and Samples. All the artifacts from units 98N 101E and 100N 101E were analyzed, as were the macrobotanical materials from unit 98N 100E. All the faunal remains were analyzed. Other analyzed artifacts include a tuff vent plug (FS 3693), a tested cobble of quartzite (FS 3694), an andesite polishing stone (FS 3694), and a basalt hoe (FS 3735). Table 14.55 lists the samples analyzed from Room 14.

Table 14.55. Room 14 analyzed samples by stratum.

Stratum	Flotation	Pollen	Macrobotanical[1]
201	3769	3692	3691
208	3873	3872	3738

1 In addition to the macrobotanical material from 98N/100E

Features

Feature 19 (Rock Alignment). Feature 19 is located in the northeast corner of Room 14. It consists of a north-south alignment of four rocks; a fifth rock at the southern end of the feature lies between the alignment and the east wall of the room. The north end is open. The interior of Feature 19 is 32 cm wide by 88 cm long. The exterior dimensions are 46 cm wide and 97 cm long. The feature is 16 cm tall. The function of Feature 19 is unknown.

Room 15

Room 15 (Figure 14.46) is located in the southern half of Roomblock 3 between Rooms 13 and 17. The interior dimensions of the room are 3.7 m north-south and 2.3 m east-west and it has an interior area of 8.9 m^2.

Stratigraphy. The three strata associated with Room 15 are summarized in Table 14.56. This room was excavated almost entirely as Stratum 201: 79N/97E was the only unit in which Stratum 1 was dug separately, and in no unit was Stratum 208 distinguished from Stratum 201. Six masonry blocks were found in Stratum 201.

Table 14.56. Room 15 stratigraphy.

Stratum	Color	Texture	Thickness (cm)	Description
0	7.5YR 4/4	sandy loam	0	Surface
1	7.5YR 4/4	sandy loam	2–4	Unconsolidated surface soil
201	7.5YR 4/4, 10YR 3/3	sandy loam	31–41	Fill to base of walls

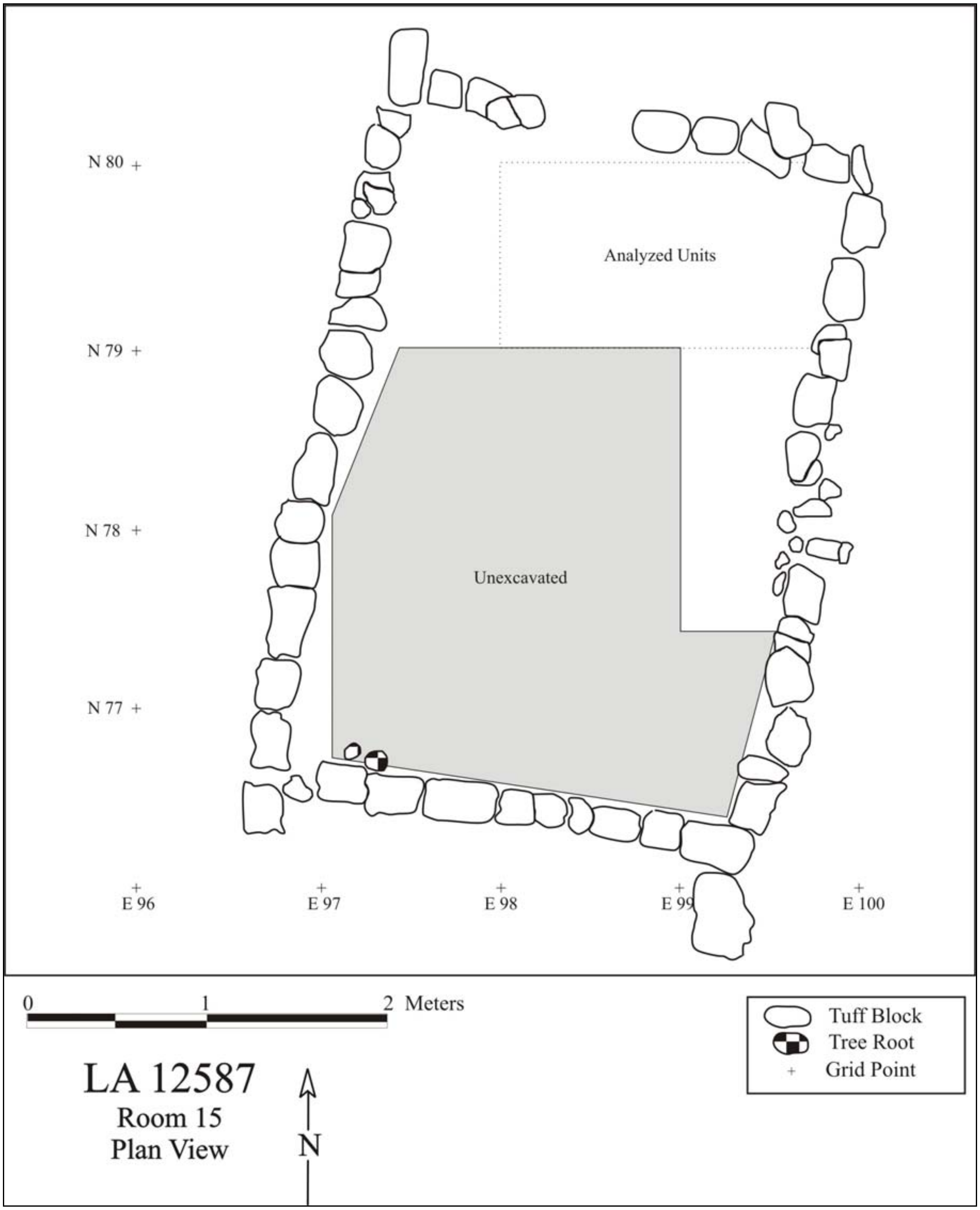

Figure 14.46. Room 15 plan view.

The artifact counts for Room 15 (Table 14.57) are low, since material from units 80N/97E and 80N/98E were designated as belonging to Room 13 (see the Room 13 discussion). Conversely, some material from 79N/97E may have come from outside the room walls.

Table 14.57. Room 15 artifact counts by stratum.

Stratum	Chipped Stone	Ceramics	Ground Stone	Nonhuman Bone	Other	Total
0	0	0	0	0	0	0
1	3	6	0	0	0	9
201	46	237	4	0	0	287
Total	**49**	**243**	**4**	**0**	**0**	**296**

Floors. No floors or living surfaces were found in Room 15.

Wall Construction. All the corners of this room are abutted except for the southeast corner. In the southeast corner, the south wall is bonded with the east wall. Table 14.58 gives the dimensions of the extant wall segments. The walls are constructed of a single row of coursed, horizontally laid masonry of shaped and unshaped tuff blocks held together with mortar. In a few places on the north, east, and west walls, isolated masonry blocks of the second course are present. A single masonry block of the third course is present on the east wall. Several of these multiple courses were placed to compensate for the uneven terrain the walls are built on (i.e., even though the number of courses varies along the length of a wall, the top of the wall is level along its length). A 40-cm-long row of facing stones is present on the interior of the east wall; another 40-cm-long row of facing stones is present on the exterior of the west wall. There is a 50-cm-long gap in the north wall. It is not clear if this gap was intentionally left in the wall, or if there was masonry here that was subsequently lost. A smaller (20 cm long) gap is present at the west end of the wall. This gap was probably not part of the original wall construction.

Table 14.58. Room 15 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	0.88, 1.28	0.20	0.21
East	3.96	0.30	0.24
South	2.81	0.10	0.19
West	4.03	0.20	0.25

Artifacts and Samples. All the artifacts from units 79N/98E and 79N/99E were analyzed. One flotation sample (FS 4000) from Stratum 201 was analyzed. Identified charred taxa included unknown conifer, juniper, and maize. No pollen samples were analyzed.

Room 16

Room 16 (Figure 14.47) is located in the central portion of Roomblock 3 between Rooms 14 and 22. The interior dimensions of the room are 5.4 m north-south by 2.3 m east-west, and it has an interior area of 12.4 m^2.

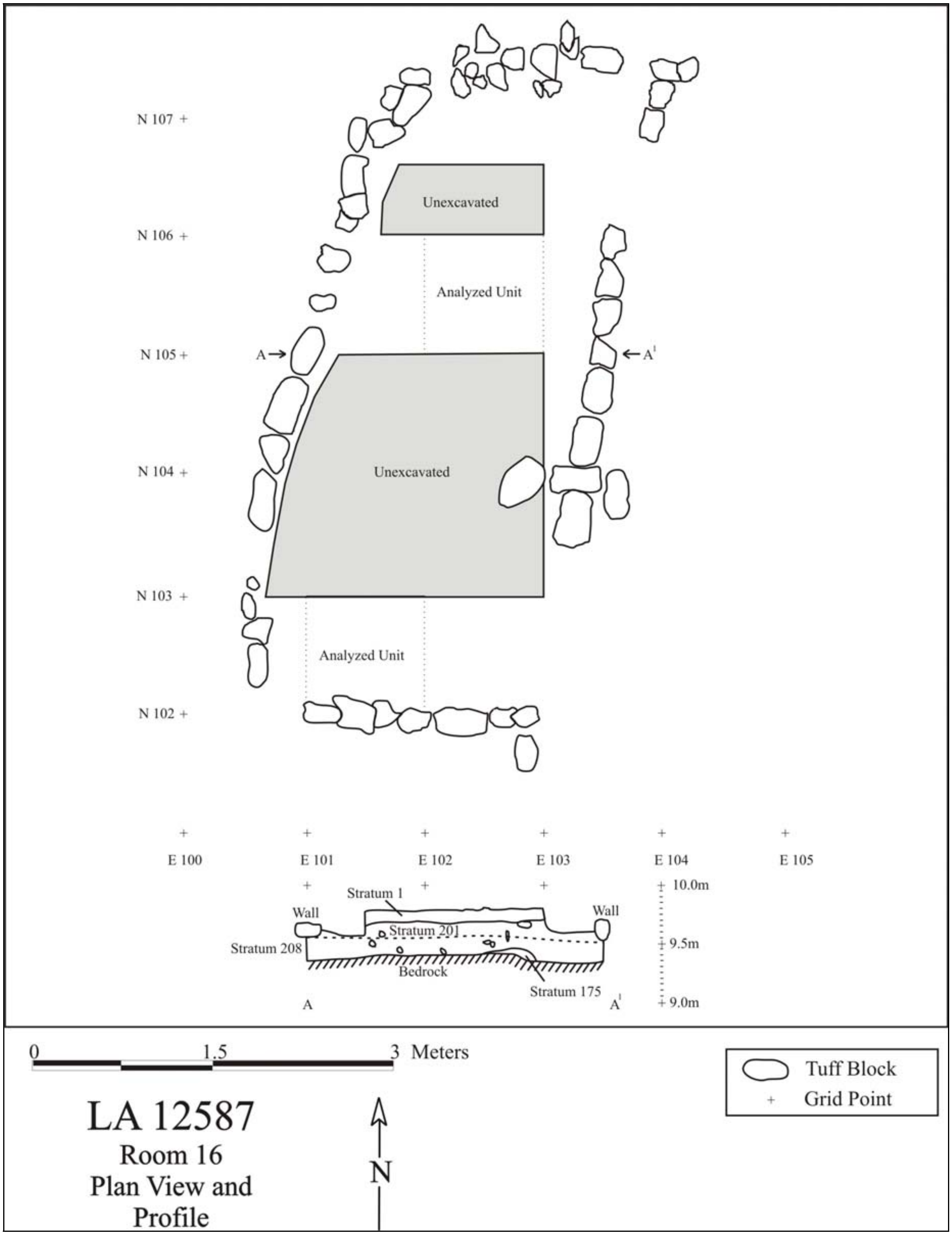

Figure 14.47. Room 16 plan view and profile.

Stratigraphy. The four strata associated with Room 16 are summarized in Table 14.59. At the time of excavation a piñon tree was growing in the northwest corner of the room. Stratum 1 consists of loose, unconsolidated, and fine-grained sandy loam. Stratum 201 consists of sandy loam. Many masonry blocks and chinking stones were recovered from this stratum. Stratum 208 is similar to Stratum 201, although it is slightly less consolidated and contains less wallfall. Bedrock and infrequent patches of Stratum 175 underlay Stratum 208. Table 14.60 gives the artifact counts by stratum for Room 16.

Table 14.59. Room 16 stratigraphy.

Stratum	Thickness (cm)	Color	Texture	Description
0	0	7.5YR 4/3	sandy loam	Surface
1	3–6	7.5YR 4/4	sandy loam	Unconsolidated surface soil
201	11–29	7.5-10YR 4/4	sandy loam	Fill to base of walls
208	13–35	7.5-10YR 4/4	sandy loam	Soil below walls to bedrock

Table 14.60. Room 16 artifact counts by stratum.

Stratum	Chipped Stone	Ceramics	Ground Stone	Nonhuman Bone	Other	Total
0	8	15	1	0	0	24
1	34	43	0	0	0	77
201	271	1323	13	2	0	1609
208	158	630	7	20	1	816
Total	**471**	**2011**	**21**	**22**	**1**	**2526**

Floors. No floors or living surfaces were found in Room 16.

Wall Construction. The northeast and southeast corners of the room are in poor condition, although it appears that the south walls are bonded to the east wall. The other corners are not intact. Table 14.61 gives the dimensions of the extant walls segments. The walls are constructed of a single row of coursed, horizontally laid masonry of shaped and unshaped tuff blocks. The north wall was in poor condition due to considerable disturbance from tree roots. The rest of the walls are a single course high, although rubble found inside the room suggests that they were several courses higher at some point. The southern end of the east wall is missing as are several stones from the north end. The basal course of the west wall is mostly intact, although occasional gaps are present. The north end of this wall is distorted by tree roots.

A possible tie stone is present at 103.9N/103.2E in the east wall. It is possible that this is the remains of a south wall or of some other internal division. However, lacking other evidence for a wall at this location, the north wall of Room 14 is assumed to be the south wall of Room 16.

Table 14.61. Room 16 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness
North	--	--	--
East	0.56, 2.56	0.27	0.24
South	2.0	0.17	0.24

Wall Orientation	Length (m)	Height (m)	Thickness
West	5.54	0.25	0.25

Artifacts and Samples. All the artifacts from units 102N/101E and 105N/102E were analyzed, as were all the macrobotanical materials from unit 102N/102E. All the faunal remains were analyzed. Other analyzed artifacts include a dacite palette (FS 3683) and a welded tuff maul (FS 3706). Table 14.62 lists the samples analyzed from Room 16.

Table 14.62. Room 16 analyzed samples by stratum.

Stratum	Flotation	Pollen	Macrobotanical
201	3888	3820	3874
208	4010	4009	4011

Room 17

Room 17 (Figure 14.48) is located near the south end of Roomblock 3 between Rooms 15 and 18. The interior dimensions of the room are 3.4 m north-south by 2.5 m east-west and it has an interior area of 8.5 m^2.

Stratigraphy. The four strata associated with Room 17 are summarized in Table 14.63. At the time of excavation, a large piñon tree and two small juniper trees were present in the center of the room. Stratum 1 consists of loose, unconsolidated, and fine-grained sandy loam. Stratum 201 consists of sandy loam grading to clay loam and contains very little wallfall. Stratum 208 is similar to Stratum 201 although it is mostly clay loam. Infrequent patches of Stratum 175 were found just above bedrock. Table 14.64 summarizes the artifacts from Room 17 by stratum.

Table 14.63. Room 17 stratigraphy.

Stratum	Thickness (cm)	Color	Texture	Description
0	0	10YR 4/3	sandy loam	Surface
1	1–5	10YR 4/3	sandy loam	Unconsolidated surface soil
201	5–45	10YR 4/4	sandy/clay loam	Fill to base of walls
208	6–30	10YR 4/4	clay loam	Soil below walls to bedrock

Table 14.64. Room 17 artifact counts by stratum.

Stratum	Chipped Stone	Ceramic	Ground Stone	Nonhuman Bone	Other	Total
0	1	0	1	0	0	2
1	3	0	0	0	0	3
201	4	16	1	0	0	21
208	4	18	0	0	0	22
Total	**12**	**34**	**2**	**0**	**0**	**48**

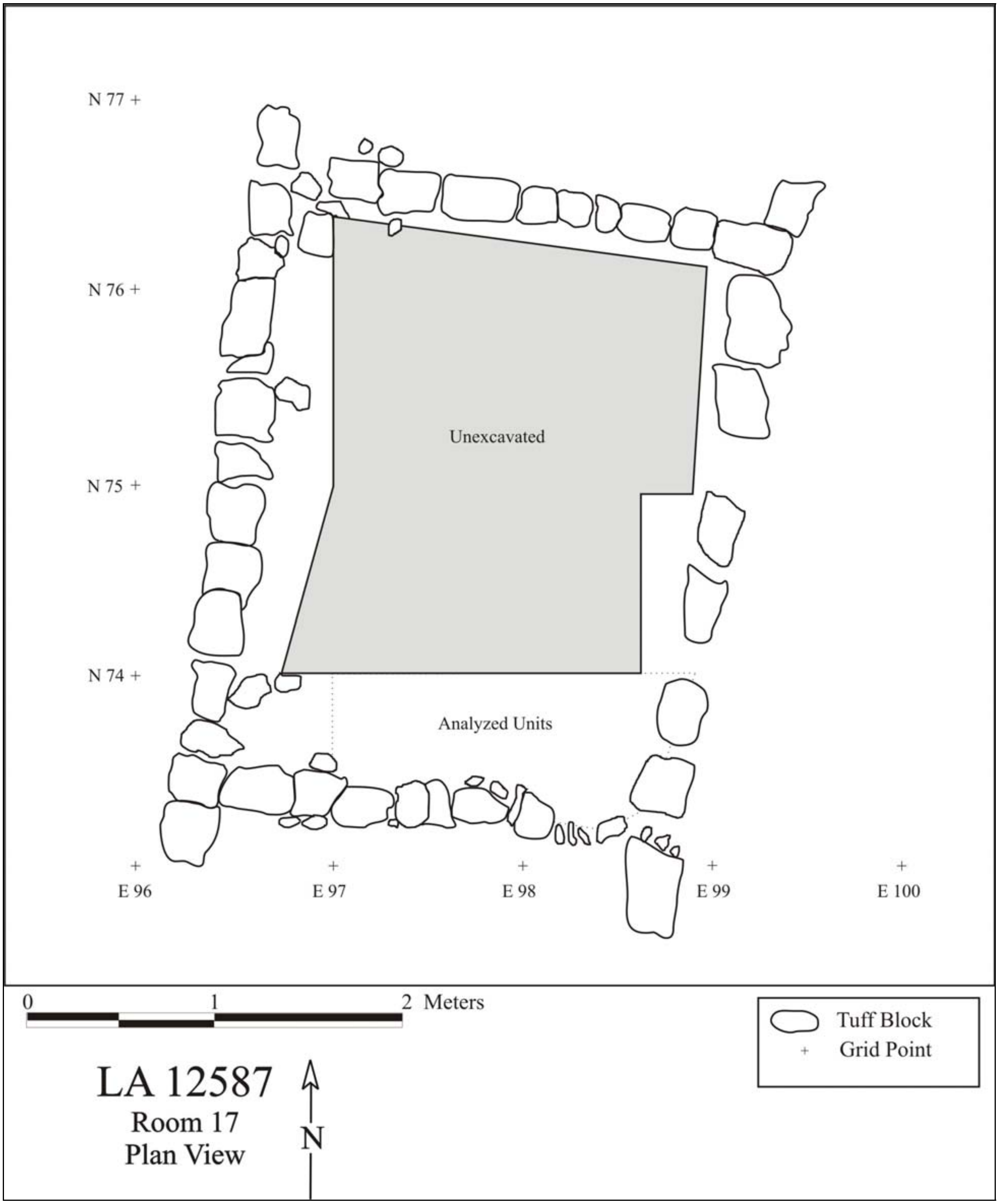

Figure 14.48. Room 17 plan view.

Floors. No floors or living surfaces were found in Room 17.

Wall Construction. The north wall is bonded with the east wall. All other corners abut. Table 14.65 gives the dimensions of the extant wall segments. The walls are constructed of a single row of coursed, horizontally laid masonry of shaped and unshaped tuff blocks held together with mortar. The basal courses of all the walls are intact except for the east wall, which has a few gaps. The west wall is two courses tall near the northwest corner of the room; otherwise the walls are only one course high.

Table 14.65. Room 17 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	2.70	0.11	0.22
East	2.30	0.23	0.28
South	3.38	0.23	0.26
West	3.45	0.10	0.25

Artifacts and Samples. All the artifacts from units 73N/97E and 73N/98E were analyzed. Table 14.66 lists the samples analyzed from Room 17.

Table 14.66. Room 17 analyzed samples by stratum.

Stratum	Pollen	Flotation	Macrobotanical
1	4128	None	None
201	3860, 4129, 4130	4036, 4037, 4131, 4132	3853, 3857

Room 18

Room 18 (Figure 14.49) is the southernmost room of Roomblock 3. It is south of Room 17. The interior dimensions are 3.0 m north-south by 2.3 m east west, and it has an interior area of 6.9 m^2. Excavation ended at a possible living surface that was level with, to a few centimeters below, the top of the walls. The dirt access road for the power line lies about 1 m south of Room 18.

Stratigraphy. The four strata associated with Room 18 are summarized in Table 14.67. Stratum 1 consists of loose, unconsolidated, and fine-grained sandy loam. The stratum is 1 to 2 cm thick in the south portion of the room. It is deeper in the north where it averaged 5 to 7 cm in thickness, although the maximum thickness was 14 cm. Stratum 201 consists of loose, medium-grained sandy loam. The stratum is not present in the southern portion of Room 18 and it is shallow in the center of the room (1 to 5 cm). At the north end of the room, Stratum 201 is up to 17 cm deep. Both Stratum 1 and Stratum 201 contained very little wallfall. Stratum 310 is discussed below in the ‘Floor’ section. Table 14.68 gives the artifact counts by stratum for Room 18.

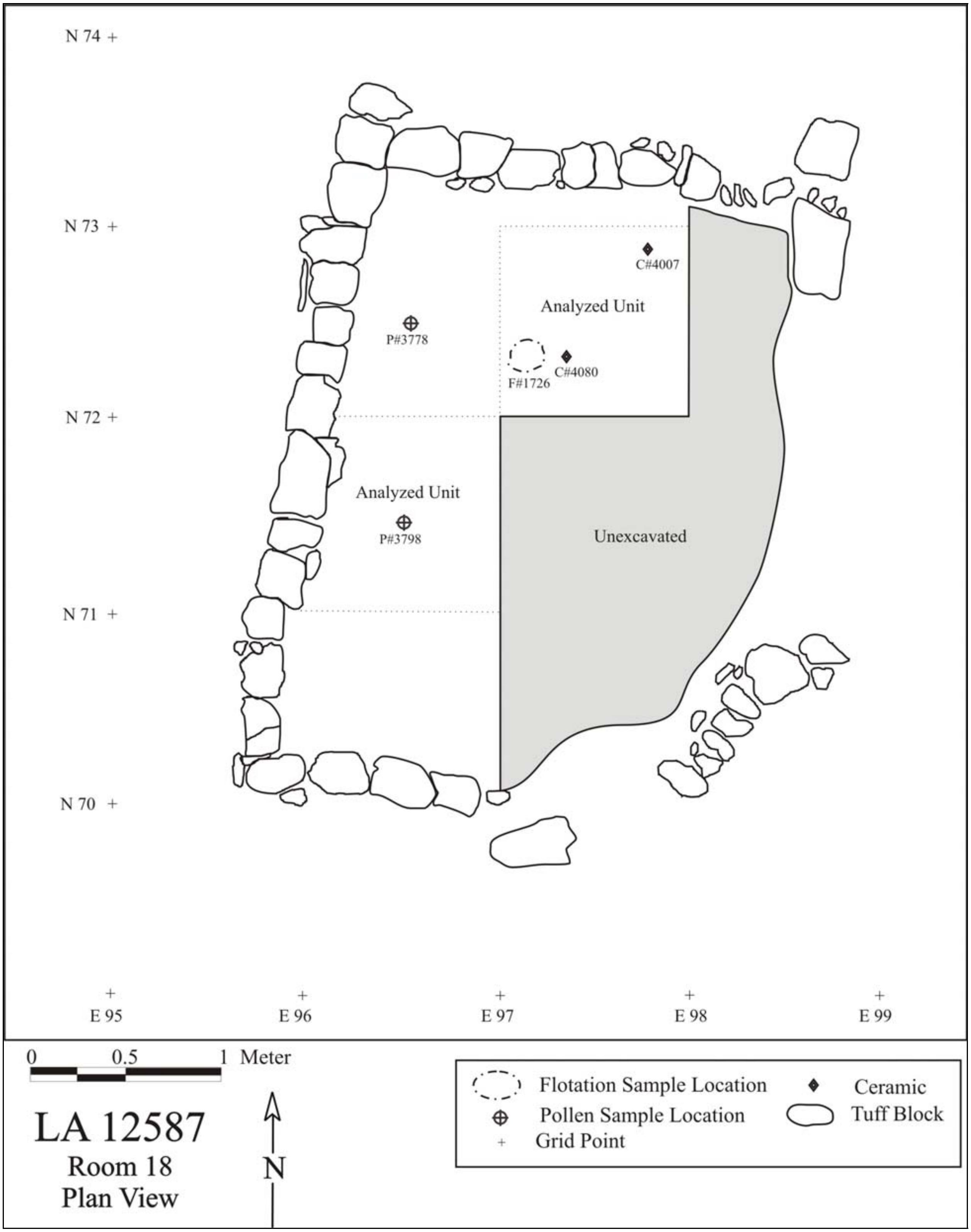

Figure 14.49. Room 18 plan view.

Table 14.67. Room 18 stratigraphy.

Stratum	Color	Texture	Thickness (cm)	Description
0	7.5YR 4/4	sandy loam	0	Surface
1	7.5-10YR 4/4	sandy loam	1–14	Unconsolidated surface soil
201	7.5-10YR 4/4	sandy loam	1–17	Fill to Stratum 310
310	7.5YR 5/3	sandy loam	0	Possible use surface

Table 14.68. Room 18 artifact counts by stratum.

Stratum	Chipped Stone	Ceramics	Ground Stone	Nonhuman Bone	Other	Total
0	0	0	0	0	0	0
1	17	27	5	0	0	49
201	27	32	0	1	0	60
310	0	2	0	0	0	2
wall trenches grab sample	1	11	0	0	0	12
Total	**45**	**72**	**5**	**1**	**0**	**123**

Floors. Stratum 310, a possible use surface (Figure 14.50), underlies Stratum 1 in the south half of the room, and Stratum 201 in the north half of the room. It is underlain by an unexcavated Bw2 horizon. Stratum 310 consists of a compact and even surface that was level with, and articulated with, the top of the west and south walls. The top of Stratum 310 is a few centimeters below the top of the north wall. Several tuff cobbles were embedded in Stratum 310 and rise above its surface, indicating the Stratum 310 may not actually be a use surface. Two smeared-indented corrugated jar sherds (FS 4007 and FS 4080) were found on the surface of Stratum 310.

Wall Construction. The north wall abuts the west wall and probably abutted the east wall, but the relationship between the west wall and the south wall is unclear. The southeast corner does not exist. Table 14.69 gives the dimensions of the extant wall segments. The walls are constructed of a single row of horizontally laid masonry of shaped and unshaped tuff blocks held together with mortar. Facing stones are occasionally present on both the interior and exterior of the walls. All the walls are one course tall. The lack of wallfall in the fill suggests that the walls were never built up beyond their present height. The basal courses of the north and west wall are both intact, save for a 30-cm-long gap at the east end of the north wall. Only the west half of the south wall is present and the east wall is non-existent except for one masonry block in the northeast corner.

Table 14.69. Room 18 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	2.14	0.15	0.25
East	0.44	0.11	0.27
South	1.43	0.12	0.21
West	3.56	0.10	0.25

Figure 14.50. Room 18, Stratum 310.

Artifacts and Samples. All the artifacts from units 71N/96E and 72N/97E were analyzed. Analyzed samples consist of one flotation sample (FS 4079) and two pollen samples (FS 3778 and FS 3798) taken from just above Stratum 310. Only juniper remains were identified in the flotation sample. Taxa identified in the pollen samples include maize, beeweed, buckwheat, cheno-ams, grass family, mustard family, sunflower family, ragweed/bursage, globemallow (*Sphaeralcea*), spurge family, Douglas fir, fir, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush.

Features. At the southeast corner of the room there is a detached, meter long, southwest-northeast-oriented alignment of unshaped and unmortared tuff blocks. It seems unlikely that this alignment is associated with the Room 18 walls. The tuff blocks are smaller than the masonry blocks of the room walls, the alignment of the blocks is different from that of the wall (their long axes are perpendicular, not parallel, to the alignment of the feature), and the top of the alignment is about 15 cm below the top of the walls. The function/origin of this alignment is unknown.

Room 19

Room 19 (Figure 14.51) is located near the north end of Roomblock 3 between Rooms 20 and 21. Room 19 is stratigraphically below Feature 22 (Figure 14.52).

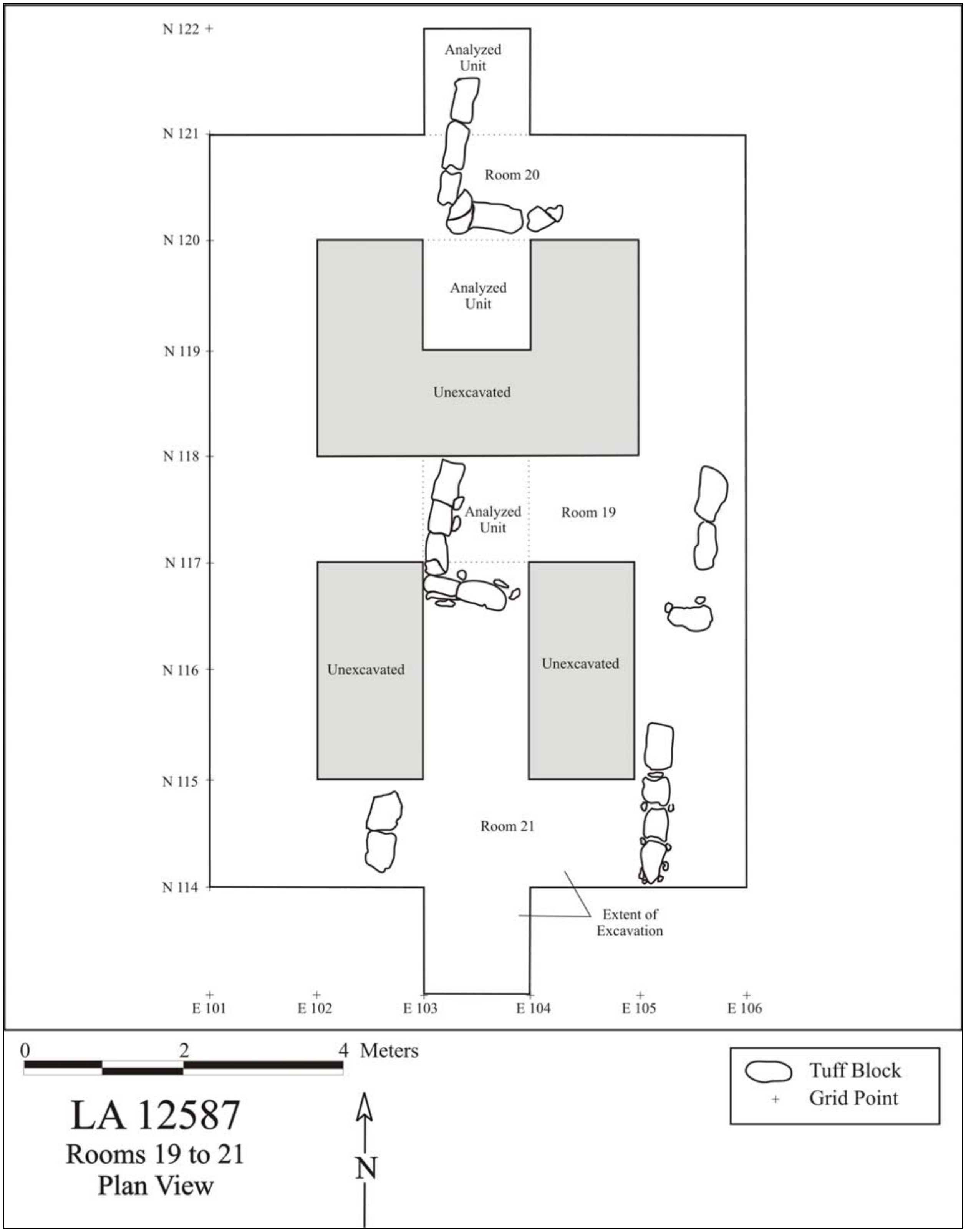

Figure 14.51. Rooms 19 to 21 plan view.

Figure 14.52. Room 19 underlies Feature 22.

Only one course of the southwest corner, fragments of the southeast corner, and a small part of the north wall were exposed. The room probably had internal dimensions of 3.3 m north-south by 2.2 m east-west and an area of 7.3 m^2. Only the basal course of the wall fragments survived and it is not clear if this was the extent of the Room 19 construction or if much of the room was destroyed by the construction of Feature 22.

Stratigraphy. The fill above the room walls is described in the discussion of Feature 22 below. Only the lower levels of Stratum 280 in three units (117N/103E, Level 4; 119N/103E, Levels 3 and 4; and 120N/103E, Level 4) were assigned to Room 19. Stratum 280 consists of 7.5YR 3/3 sandy loam and is 6 to 20 cm deep. It begins at the top of the Room 19 walls and ends slightly below the walls at the sandy clay of Stratum 175. Table 14.70 gives a count of the artifacts found in this stratum.

Table 14.70. Room 19 artifact counts by stratum.

Stratum	Chipped Stone	Ceramic	Ground Stone	Nonhuman Bone	Other	Total
280	25	80	3	0	1	109

Floors. No floors or living surfaces were found in Room 19.

Wall Construction. Very little of the Room 19 walls remain (Table 14.71). The southwest corner is defined by three masonry blocks of the west wall and by two masonry blocks of the south wall. The southeast corner is defined by two masonry blocks of the east wall and by one masonry block of the south wall. The three westernmost blocks of the north wall are also present. Facing stones are present on both the interior and exterior of the southwest corner and on the interior of the southeast corner. The base of the walls is approximately 12 cm above bedrock. All the masonry blocks are shaped.

Table 14.71. Room 19 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	1.06	0.10	0.27
East	0.94	nd	nd
South	0.78	0.10	0.20
West	1.28	0.17	0.22

nd = no data recorded

Artifacts and Samples. All the artifacts from units 117N/103E and 119N/103E were analyzed. Three pollen samples (FS 4059, FS 4061, and FS 4063) were also analyzed. Taxa identified in the pollen samples included maize, cholla, beeweed, buckwheat, cheno-ams, grass family, sunflower family, spurge family, Douglas fir, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

Room 20

Room 20 (see Figures 14.51 and 14.52) is the northernmost room of Roomblock 3. Feature 22 overlies Room 20. Because only the southwest corner of the room was exposed, the room dimensions could not be determined. The only excavated units associated with Room 20 are 120N/103E and 121N/103E.

Stratigraphy. The fill above the room walls is described in the discussion of Feature 22 below. Only the lower levels of Stratum 280 in units 120N/103E and 121N/103E were assigned to Room 20. Stratum 280 begins at the top of the walls and ends below the base of the walls at Stratum 175. It consists of 10 to 19 cm of 7.5YR 3/3 to 10YR 4/4 medium-grained sandy loam. Two masonry blocks were found in Stratum 280. Table 14.72 gives a count of the artifacts found in this stratum.

Table 14.72. Room 20 artifact counts by stratum.

Stratum	Chipped Stone	Ceramic	Ground Stone	Nonhuman Bone	Other	Total
280	4	41	1	0	0	46

Floors. No floors or living surfaces were found in Room 20.

Wall Construction. A single course of three shaped tuff blocks makes up the west wall, and a single course of three shaped tuff blocks makes up the south wall (Table 14.73). The masonry ranges in size from 26 by 20 by 8 cm to 40 by 28 by 11 cm. It is possible that the foundation of the southwest corner was all that was built of Room 20 as there is no evidence for additional segments of the south and west walls.

Table 14.73. Room 20 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	n/a	n/a	n/a
East	n/a	n/a	n/a
South	1.06	0.10	0.27
West	1.10	0.10	0.18

Artifacts and Samples. All the artifacts from unit 121N/103E were analyzed. Three pollen samples (FS 4065, FS 4066, and FS 4067) were also analyzed. Taxa identified in these samples included maize, cholla, prickly pear, beeweed, purslane, cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, evening primrose, Douglas fir, unidentified pine, piñon pine, juniper, rose family, and sagebrush.

Room 21

Room 21 (see Figure 14.51) is located near the north end of Roomblock 3 between Rooms 19 and 22. Feature 22 overlays Room 21. Only portions of the basal courses of the north, east, and west walls were found. It is not clear if this was the extent of the Room 22 construction or if much of the room was destroyed by the construction of Feature 22. The east-west width of the room is 2.4 m, and since no south wall was found, the north-south dimension is unknown.

Stratigraphy. Due to the minimal remains of Room 21, all the strata and artifacts encountered in this area were assigned to Feature 22.

Floors. No floors or living surfaces were found in Room 21.

Wall Construction. Very little of the walls remain (Table 14.74). The easternmost block and the two westernmost blocks of the north wall are present. Four contiguous blocks of the east wall survive, as do two contiguous blocks of the west wall. All the masonry blocks are shaped and range in size from 33 by 23 by 10 cm to 40 by 20 by 10 cm. Facing stones are present on both the interior and exterior of the north and east walls. Along the east wall most of the facing stones are placed at the joints between the masonry blocks. The base of the walls is a few centimeters above bedrock.

Table 14.74. Room 21 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	0.78	0.10	0.20
East	1.50	0.10	0.21

Wall Orientation	Length (m)	Height (m)	Thickness (m)
South	n/a	n/a	n/a
West	0.67	0.1	0.25

Artifacts and Samples. Two pollen (FS 4056 and FS 4057) samples from Room 21 were analyzed. Taxa identified in the pollen samples included maize, cholla, prickly pear, beeweed, purslane, cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

Room 22

Room 22 is located in the northern portion of Roomblock 3 between Rooms 21 and 16. Only the area around the south wall and the south half of the east wall was excavated. The north and west walls could not be located. Because so little of the room was unexcavated, no dimensional data are available.

Stratigraphy. Because only a small area of the room was excavated, a stratigraphic description is also unavailable. Since most of the fill excavated from Room 22 was not screened, only four chipped stone artifacts are associated with the room.

Floors. No floors or living surfaces were found in Room 22.

Wall Construction. Two segments of the east wall remain (Table 14.75, Figure 14.53). The southern segment consists of three shaped tuff blocks that extend north for 60 cm from the north wall of Room 16. The northern segment lies 1.75 m further north and consists of two parallel rows of small upright tuff cobbles and four masonry blocks. The south wall is described above as the north wall of Room 16.

Table 14.75. Room 22 wall dimensions (extant wall segments).

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	n/a	n/a	n/a
East	0.60, 1.05	0.12	0.19
South	n/a	n/a	n/a
West	n/a	n/a	n/a

Artifacts and Samples. No artifacts or samples were analyzed from Room 22.

Figure 14.53. Room 22 east wall.

Area 1 Exterior Features

Four external features were identified in Area 1. Feature 3 is an ash stain located about 5 m east of Room 7. Feature 5, a possible storage cist, was constructed against the exterior of the east wall of Room 2. It was included in the Room 2 description. Feature 13 is a set of bedrock grinding slicks located 1 m west of Room 6. A northern extension of the center wall of Roomblock 1 and an associated floor surface and charcoal stain were identified as Feature 21.

Feature 3 (Ash Stain). During mechanical scraping to the east and southeast of Roomblock 1, a 3.3- by 1.9-m scatter of tuff blocks was encountered. An ashy stain was located near the center of the scatter. The stain measures 64 by 38 cm and is 5 to 8 cm deep (Figure 14.54).

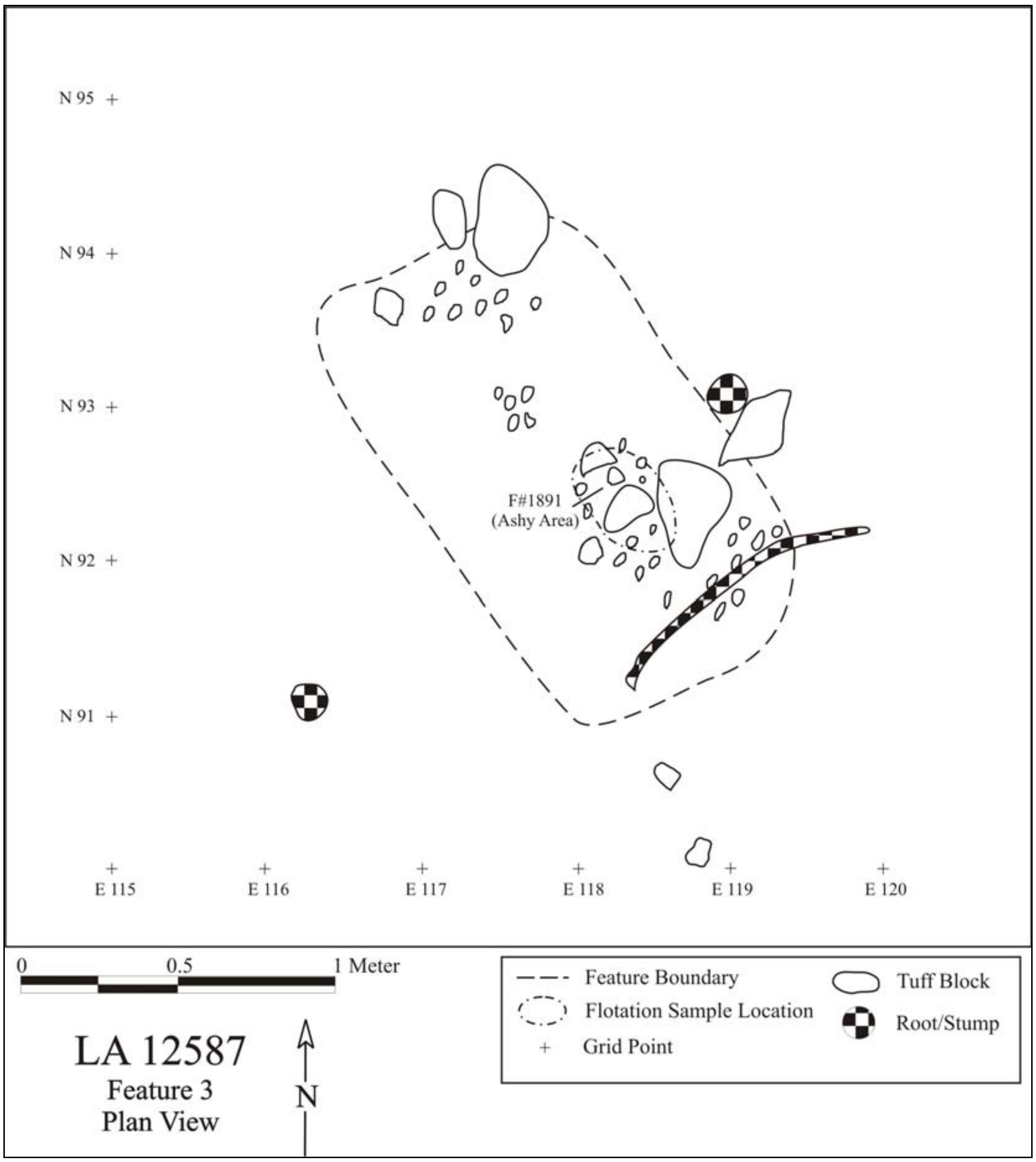

Figure 14.54. Feature 3 plan view.

The ashy deposit was collected as a flotation sample (FS 1891) and the charred taxa included unknown conifer, juniper, piñon pine, unidentified pine, saltbush/greasewood, and maize. Seven smeared-indented corrugated jar sherds (FS 1888), one plain body jar sherd (FS 1888), and one basalt core flake (FS 1889) were recovered from the feature. Feature 3 may be the remains of an informal hearth.

Feature 13 (Grinding Slicks). Feature 13 consists of six grinding slicks in the tuff bedrock, which were identified approximately 35 cm below surface. The slicks varied in depth from 2 to 6 cm and were 15 to 28 cm long and 10 to 14.5 cm wide. Five were oriented northwest-southeast (Slicks 1 through 5), and the sixth was oriented north-south (Figures 14.55 and 14.56).

Figure 14.55. Feature 13.

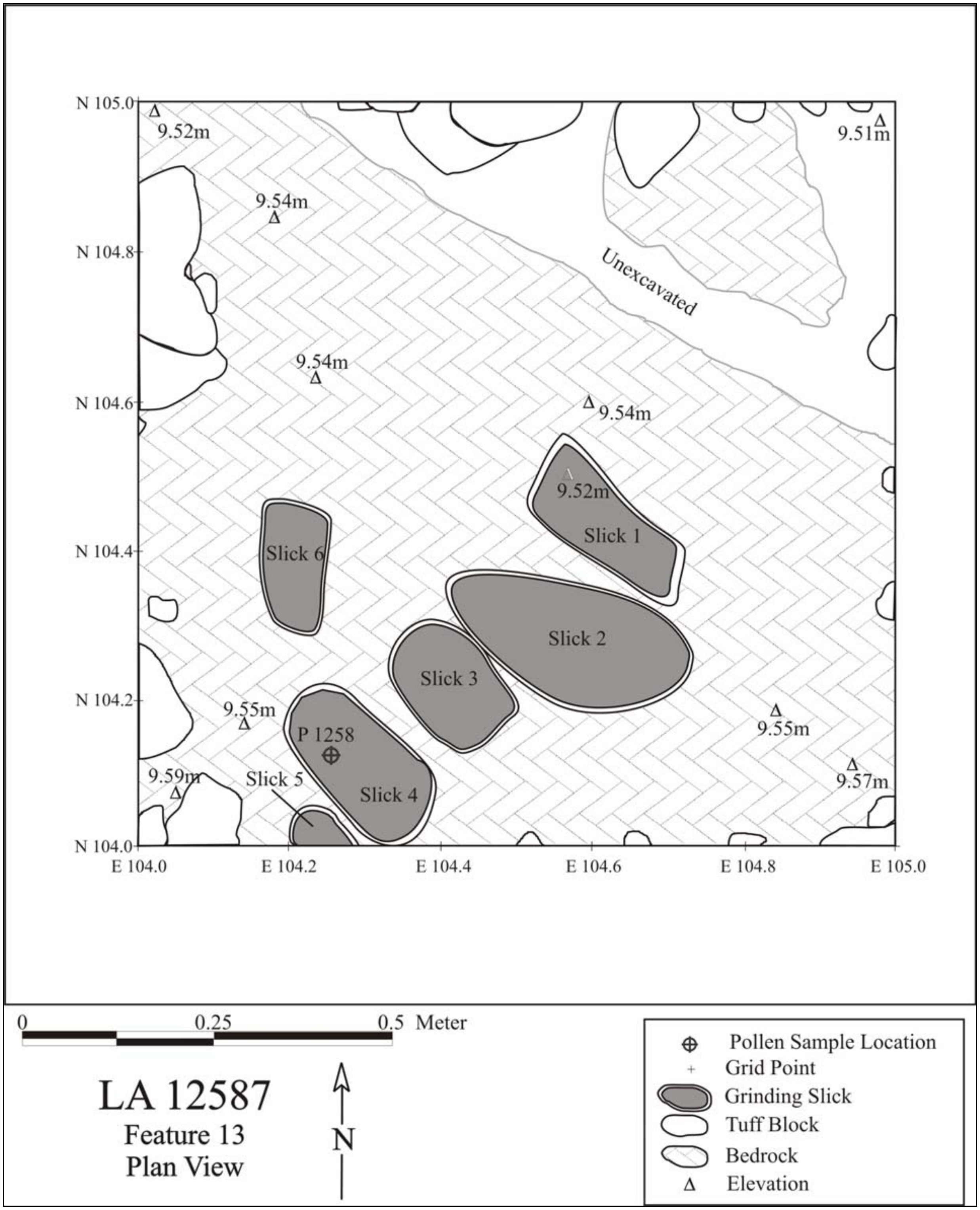

Figure 14.56. Feature 13 plan view.

Slick 1 is 25 cm long, 10 cm wide, and 2.5 cm deep. The width is uniform. The north side is nearly vertical, angling out slightly at the top. In contrast, the south side slopes evenly up to the bedrock surface. Both ends slope up evenly to the bedrock surface. Striations are present at the base of the slick and are parallel with the long axis.

Slick 2 varies in width from 11 cm at the ends to 16 cm in the center. It is 28 cm long and up to 6 cm deep. The ends and sides slope uniformly up to the bedrock surface. Striations are present at the base of the slick and are parallel with the long axis.

Slick 3 shares a common edge with Slick 2. This slick is 22 cm long, 12.5 cm wide at the northwest end, 10 cm wide at the southeast end, and 11 cm wide at the center. It is 3 cm deep. A hole, 3 cm in diameter and 2.5 cm deep was pecked into the northwest end of the slick. Striations are present at the base of the slick and are parallel with the long axis. The grinding surface of Slick 3 overlaps the south edge of Slick 2 suggesting that Slick 3 is younger.

Slick 4 is 22 cm long, 10 to 10.5 cm wide, and 5.5 cm deep. Its sides are relatively vertical, angling out slightly at the top. Both ends feather out. A small hole at the southeast end, which was 1 cm in diameter, may have been produced by pecking. A pollen sample (FS 1258) collected from just above this slick was analyzed. Taxa identified in the sample included prickly pear, cheno-ams, grass family, sunflower family, spurge family, fir, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

Slick 5 is shallow and less distinct than the others. It is 15 cm long, 10 cm wide, and not more than 1 cm deep. Striations are not evident. A conical hole that is 3 cm in diameter and 1 cm deep is located immediately southwest of the slick. It may have been produced by pecking.

Slick 6 is 16.5 cm long, 11.5 cm wide at the center, and 2 cm deep. Its sides are relatively vertical. Striations are present at the base of the slick and are parallel with the long axis.

Feature 13 is either associated with the Archaic component (Area 8) of the site or with Roomblock 1. The stratigraphic relationship between Roomblock 1 and later components indicates that Feature 13 was buried after the abandonment of Roomblock 1.

Feature 21 (Alignment). Feature 21 consists of an 80-cm-long extension of the middle wall of Roomblock 1 north of Rooms 1 and 2. Remnants of wall mortar were noted on the east side of the wall extension. Directly east of the wall extension there was a fragment of plastered floor surface. The north wall of Room 2 forms the south side of the feature. No northern and eastern boundaries were found. An ash and charcoal stain was exposed in the southwest corner of the feature. A flotation sample (FS 4211) was collected from the stain and the taxa identified included squash/coyote gourd, unknown conifer, juniper, unidentified pine, purslane, oak, and maize. The function/origin of this feature is unknown.

Area 2

Area 2 was defined by the presence of three parallel tuff rock alignments (Feature 22) and scattered rubble. Two other features (Feature 17 and Feature 18) were excavated in Area 2.

Feature 17 is a surficial rock cluster situated immediately southeast of Feature 22. Feature 18 is a similar rock cluster situated about 1 m south of Feature 17. Additional rubble and alignments lie north of Feature 22. These were not investigated, but likely represent additional agricultural features. Features 17, 18, and 22 are all situated in the A horizon at a shallow depth, indicating that they are at least roughly contemporaneous.

Feature 17 (Rock Cluster). Feature 17 is located immediately southeast of Feature 22. It is a circular rock cluster of unshaped tuff rocks. The feature is approximately 1 m in diameter and 15 cm high. In profile it is clear that Feature 17 is situated in the A horizon. The function of the feature is not evident. It may be an agricultural feature, possibly where seeds were planted to take advantage of the moisture and heat-retention qualities of the rock. Or it may be the result of rock clearing and stockpiling that possibly occurred during the preparation of Feature 22. A pollen sample was taken from beneath a large tuff block in the cluster (FS 4097). Taxa identified in this sample included maize, cholla, prickly pear, cheno-ams, grass family, spurge family, sunflower family, ragweed/bursage, Douglas fir, unidentified pine, piñon pine, juniper, oak, cottonwood/willow, and sagebrush.

Feature 18 (Rock Cluster). Feature 18 is situated approximately 1 m south of Feature 17. It is a circular rock cluster that consists of 24 unshaped tuff blocks in a 1.72- by 1.70-m area (Figures 14.57 and 14.58).

Figure 14.57. Feature 18.

The feature is slightly mounded with a maximum height of 8 cm. The rocks are irregular in shape and range in size from 23 by 18 cm to 8 by 6 cm. Many of the cobbles are lichen-covered. In profile it is clear that Feature 18 is situated in the A horizon (Figure 14.58). The function of the feature is not evident. It may be an agricultural feature, possibly where seeds were planted to take advantage of the moisture and heat-retention qualities of the rock. Or it may be the result of rock clearing and stockpiling, possibly during preparation of Feature 22. A pollen sample (FS 4154) was collected from within the feature and a second pollen sample (FS 4155) was collected from below it. Taxa identified in FS 4154 include maize, prickly pear, cheno-ams, grass family, sunflower family, spurge family, evening primrose, Douglas fir, piñon pine, unidentified pine, juniper, and sagebrush. Taxa identified in FS 4155 include maize, prickly pear, beeweed, cheno-ams, grass family, sunflower family, ragweed/bursage, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

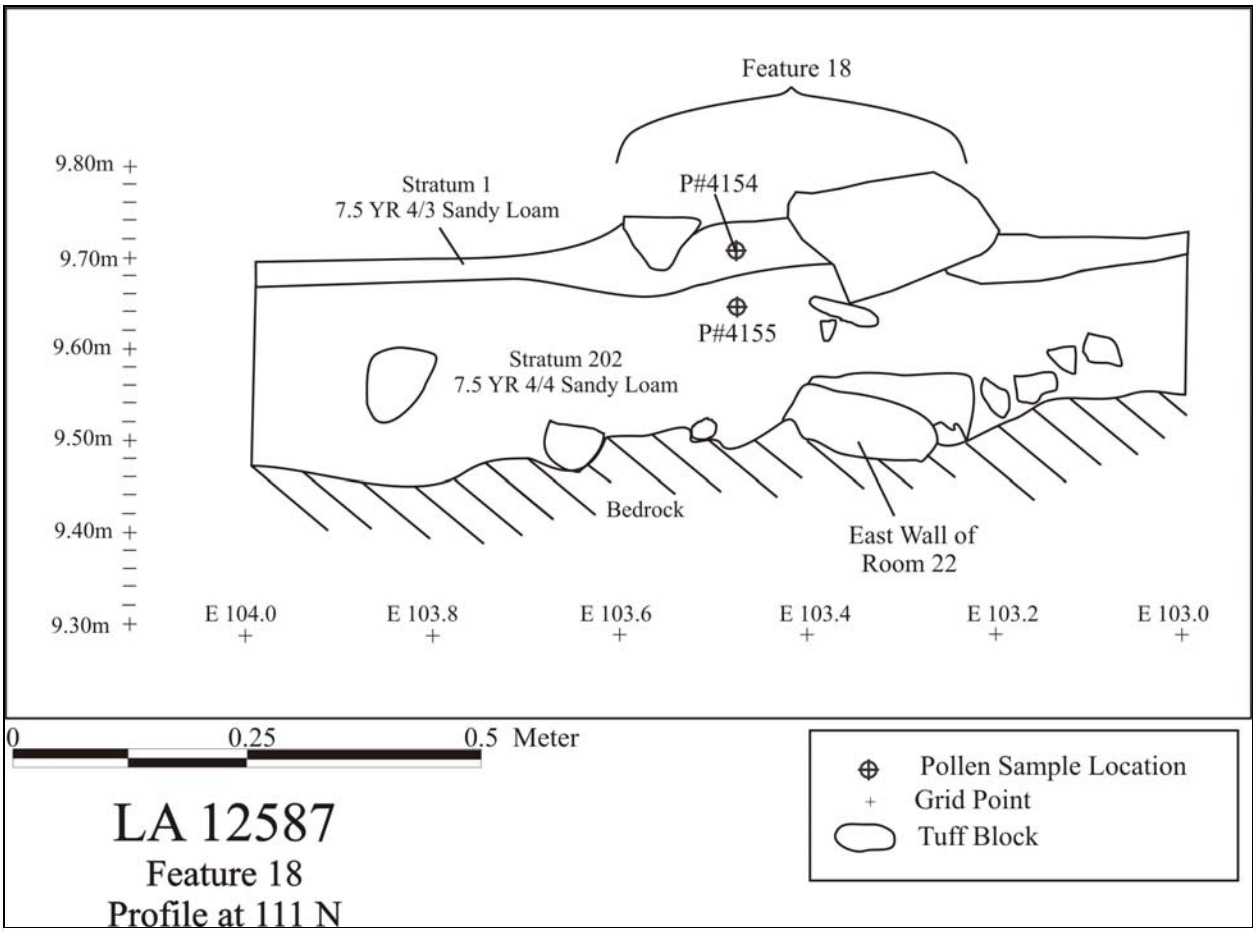

Figure 14.58. Feature 18 profile.

Feature 22 (Berms). Feature 22 is located near the north end of the site and consists of three east-west-running berms of unshaped tuff cobbles. The berms are 4 to 5 m long, 0.5 to 1.0 m wide, and 0.15 to 0.20 m high (Figures 14.59, 14.60, and 14.61). A few rocks on the west side of the feature create a rough boundary. The cobbles making up the feature are loosely placed together and stacked no more than three high. They are partially buried by A horizon soil

(Stratum 1) and rest on or just in the Bw horizon (Stratum 280). The A horizon is somewhat deeper inside the feature than outside, suggesting that dirt was intentionally placed inside the berms (see Drakos and Reneau, Volume 3). Isolated wall segments of Rooms 19 to 21 immediately underlie Feature 22. Feature 22 is interpreted as an agricultural feature.

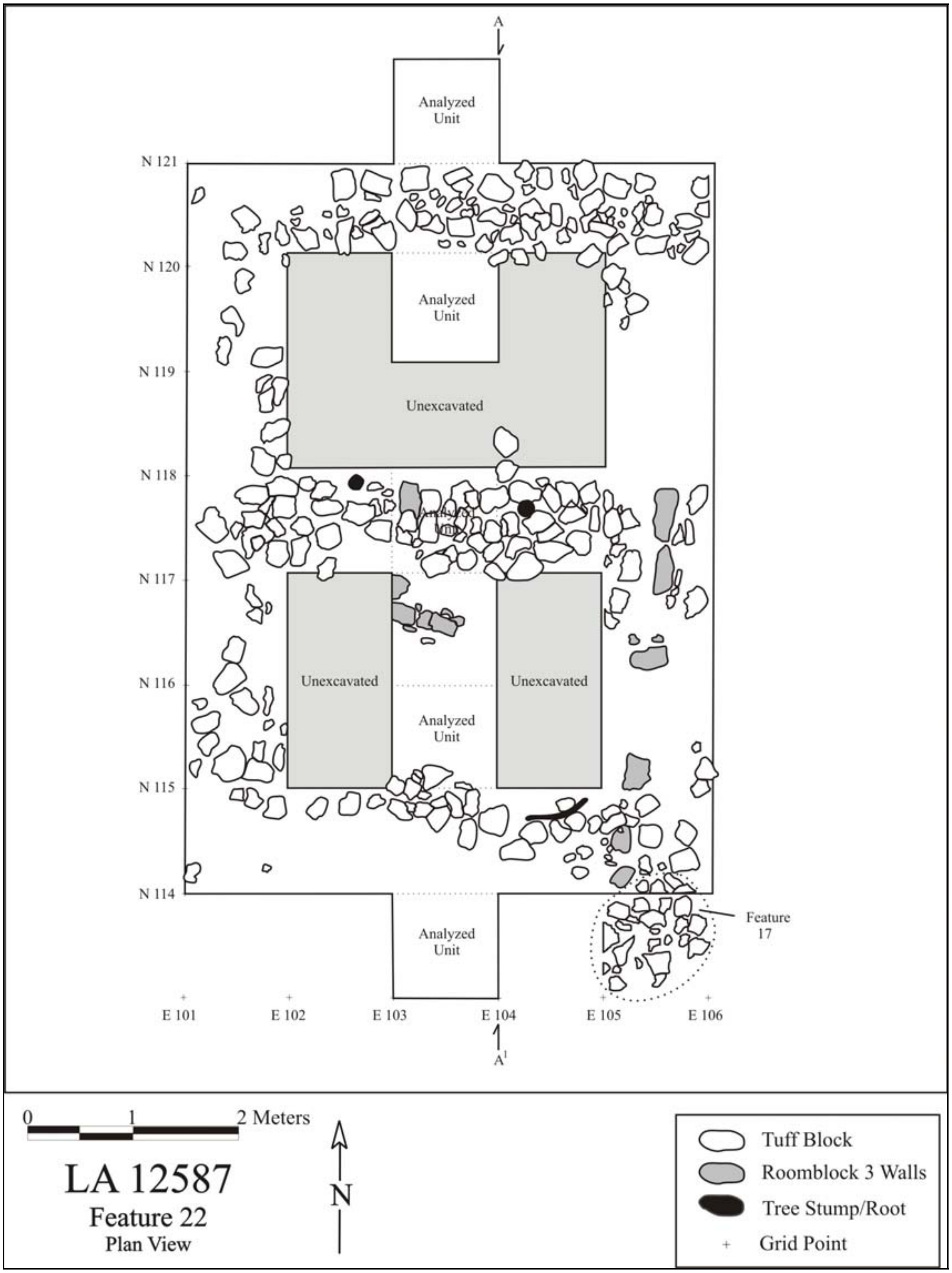

Figure 14.59. Feature 22 plan view.

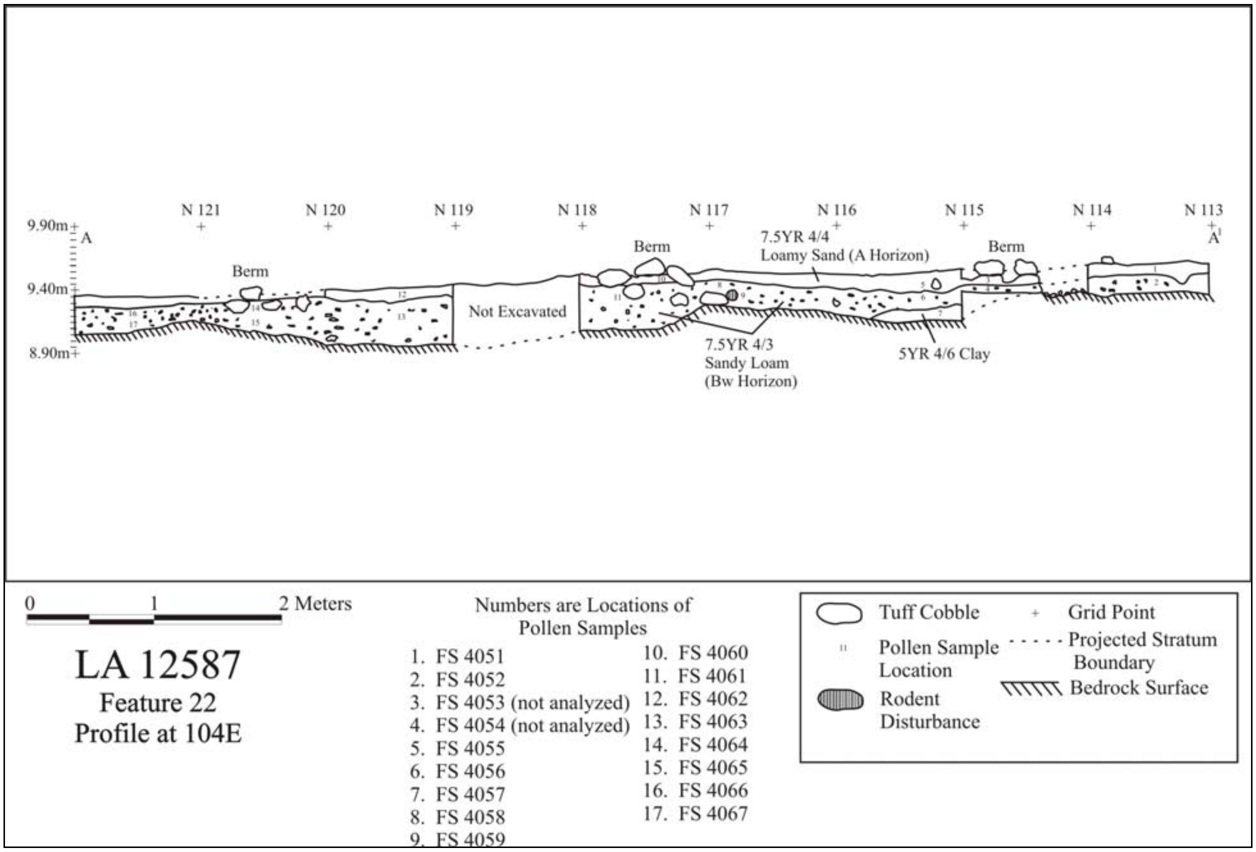

Figure 14.60. Feature 22 profile.

Artifacts from every other grid along the 103E line (starting at 113N and ending at 121N, inclusive) were analyzed. Fifteen pollen samples were analyzed from Feature 22 (FS 4051, FS 4052, FS 4055, FS 4056, FS 4057, FS 4058, FS 4059, FS 4060, FS 4061, FS 4062, FS 4063, FS 4064, FS 4065, FS 4066, and FS 4067). Taxa identified in these pollen samples included cotton (*Gossypium*), maize, prickly pear, cholla, beeweed, mint family, purslane, buckwheat, cheno-ams, grass family, mustard family, sunflower family, ragweed/bursage, spurge family, evening primrose, Douglas fir, unidentified fir, unidentified pine, piñon pine, juniper, oak, rose family, Mormon tea, and sagebrush. Table 14.76 gives a count of the number of artifacts per stratum from Feature 22. The 'Other' category consists of a turquoise fragment (FS 3340) and several miscellaneous samples.

Table 14.76. Feature 22 artifact counts by stratum.

Stratum	Chipped Stone	Ceramic	Ground Stone	Nonhuman Bone	Other	Total
0	59	189	3	0	0	251
1	152	318	2	0	1	473
280	436	1449	10	3	5	1903
Total	**647**	**1956**	**15**	**3**	**6**	**2627**

Figure 14.61. Feature 22.

Area 3

Area 3 is east of Area 2 (see Figure 14.2). It includes rock alignments and concentrations that are likely the remains of agricultural features. Due to time constraints, data recovery efforts were not conducted in this area.

Area 4

Area 4 is south of Area 1 (see Figure 14.2). It is the designation given to the southern surface collection area. Surface collection was conducted here before setting up tripod screens for screening fill from excavation. No surface features were identified, and no excavation was conducted. The artifacts collected from the surface are part of the Roomblock 1 midden and may include some material associated with the Archaic period artifact scatter (Area 8).

Area 6

Area 6 is west of Areas 1 and 2 (see Figure 14.2). This area includes various rock concentrations and alignments. The end of an isolated room or grid garden was identified at 116N/97E and a rock concentration resembling Features 17 and 18 was identified at 93.5N/95.0E. Between these two features additional rock alignments and concentrations were identified. These are probably the remains of structures and/or agricultural features. Data recovery efforts were not conducted in this area.

Area 7

Area 7 includes most of the midden associated with Roomblock 1 (see Figure 14.2). Investigations in Area 7 focused on areas with the highest artifact density. In-field inspection indicated that in areas east of 130E and south of 90N artifact densities declined significantly.

Stratigraphy. The midden strata are summarized in Table 14.77. Stratum 1 consists of soft, medium-grained, sandy loam. Stratum 60 incorporates the A, Bw, and Btk horizons. This stratum contains most of the midden deposits. The considerable variation in the depth of Stratum 60 is attributed to the undulating surface of the bedrock (Figure 14.62).

Table 14.77. Midden stratigraphy.

Stratum	Color	Texture	Thickness (cm)	Description
0	10YR 4/4	sandy loam	0	Surface
1	10YR 4/4	sandy loam	2–10	Unconsolidated surface soil
60	10YR 4/4	sandy loam	10–44	Midden fill
175[1]	7.5YR 4/6	sandy clay	1–15	Btk horizon

1. Stratum 175 was not differentiated from Stratum 60 during excavation.

Table 14.78 gives the artifact counts by stratum for the midden. These counts are complied from excavation units 116N/127E, 110N/122E, 110N/123E, 106N/129E, 106N/130E, 105N/122E, 101N/122E, 101N/123E, 101N/124E, and 95N/126E). The 'Other' category consists of a human adult right first pedal phalanx (FS 2523), a small fragment of turquoise (FS 2414), and eight pieces of fire-cracked rock (FS 3224, FS 3232, FS 3238, and FS 3242).

Table 14.78. Midden artifact counts by stratum.

Stratum	Chipped Stone	Ceramics	Ground Stone	Nonhuman Bone	Other	Total
0	14	49	0	0	0	63
1	101	469	0	1	1	572
60	598	2922	39	21	9	3589
Total	**713**	**3440**	**39**	**22**	**10**	**4224**

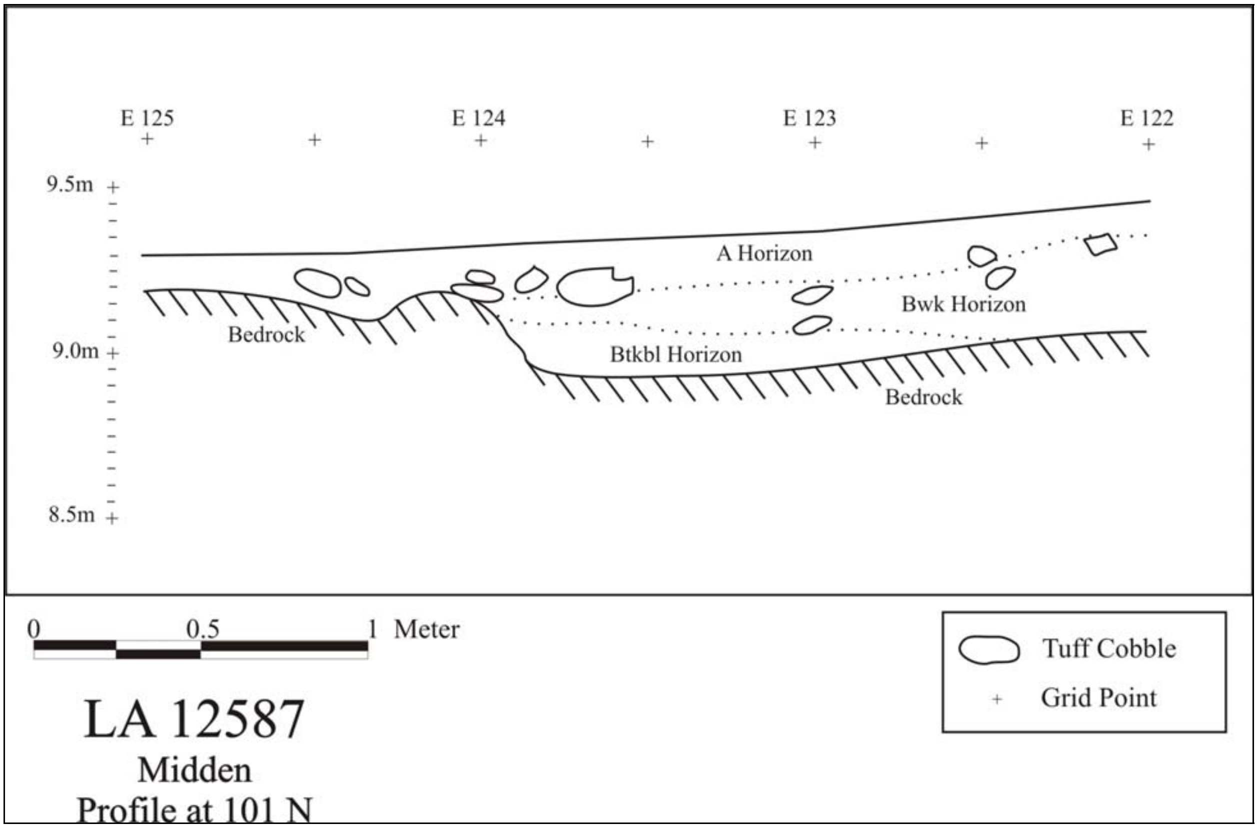

Figure 14.62. Midden profile at 101N/122 to 125E.

Artifacts and Samples. All the artifacts are from units 116N/127E, 110N/122E, 106N/129E, 106N/130E, 105N/122E, 101N/122E, 101N/123E, and 95N/126E. Artifacts from unit 92N/118E were also analyzed. All the faunal remains were analyzed. Other analyzed artifacts include a Cerro Toledo obsidian biface fragment (FS 3227), a Valle Grande obsidian biface fragment (FS 3234), and a tuff mortar (FS 3907). Table 14.79 lists the samples analyzed from the midden.

Table 14.79. Midden analyzed samples by excavation unit.

Grid Unit	Pollen FS	Flotation FS	Macrobotanical FS
95N/126E	3080 and 3083	3081	3079 and 3087
101N/123E	2923	2924	None
116N/127E	3050	3049	None

Taxa identified in the pollen samples from 95N/126E included maize, prickly pear, beeweed, cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, and sagebrush. Taxa identified in the flotation sample from this unit included pigweed, sagebrush, saltbush/greasewood, goosefoot, cheno-ams, unknown conifer, juniper, groundcherry, piñon pine, purslane, and maize. Taxa identified in the macrobotanical samples included juniper, mountain mahogany, unidentified pine, and piñon pine.

Taxa identified in the pollen sample from 101N/123E included maize, prickly pear, beeweed, cheno-ams, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, and rose family. Taxa identified in the flotation sample included saltbush/greasewood, unknown conifer, juniper, and maize.

Taxa identified in the pollen sample from 116N/127E included cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush. Taxa identified in the flotation sample from this unit included goosefoot, juniper, piñon pine, and maize.

Human Burials. Three human burials were found during trenching activities in the midden. The excavation, provenience, and associated artifacts of the burials are discussed below (see Schillaci, Volume 3 for details). Since all three burials were found in the midden, many artifacts were recovered during their excavation. Only artifacts identified as funerary objects, sacred objects, and/or objects of cultural patrimony (Native American Graves Protection and Repatriation Act [NAGPRA] artifacts) by the Tribal Monitor are included in the burial descriptions.

Burial 1 (Feature 9)

Burial 1 was disturbed by backhoe operations. Skeletal remains of a 30+ year old Native American female were found in units 100N/124E, 99N/123E, 99N/124E, 99N/125E, 98N/124E, and 98N/125E. The skeleton was disarticulated and many elements were missing, including the head, pelvis, and lower limbs. Most of the remains were found between 8.95 and 8.88 m (38 to 45 cm below ground surface). Due to the disturbed nature of the burial, no skeletal orientation or internment data were gathered. Tables 14.80 to 14.82 summarize the artifacts associated with Burial 1.

Table 14.80. Burial 1 NAGPRA ceramic artifacts.

Type	Bowl	Jar	Olla	Indeterminate	Total
Santa Fe Black-on-white	64	2	0	0	66
Wiyo Black-on-white	2	0	0	0	2
Galisteo Black-on-white	3	0	0	0	3
Smeared-indented corrugated	0	1	0	0	1
Plain body	0	1	0	1	2
Mud ware	0	1	0	0	1
Unpainted undifferentiated	9	0	1	0	10
Total	**78**	**5**	**1**	**1**	**85**

Table 14.81. Burial 1 NAGPRA lithic artifacts.

Artifact Type	Basalt	Chalcedony	Obsidian	Silicified Wood	Andesite	Dacite	Quartzite	Tuff	Total
Core	0	2	0	0	0	0	0	0	2
Hammerstone	0	0	0	0	0	1	0	0	1
Core flake	1	1	0	0	0	0	0	0	2
Retouched piece	0	0	1	0	1	0	0	0	2
Biface	0	3	7	1	0	0	0	0	11
Projectile point	0	1	6	0	0	0	0	0	7
Uniface	0	0	1	0	0	0	0	0	1
Drill	0	0	2	0	0	0	0	0	2
One-hand mano	0	0	0	0	0	0	1	0	1
Grinding slab	0	0	0	0	0	1	0	0	1
Polishing stone	0	0	0	0	0	1	0	0	1
Abrading stone	0	0	0	0	0	0	0	1	1
Unidentified ground stone fragment	0	0	0	0	0	1	0	0	1
Shaped slab	0	0	0	0	0	1	0	0	1
Manuport	0	0	0	0	0	1	0	0	1
Total	**1**	**7**	**17**	**1**	**1**	**6**	**1**	**1**	**35**

Table 14.82. Burial 1 NAGPRA other artifacts.

Artifact	Total
Siltstone ornament	1
Hematite fragment	2
Turquoise fragment	1
Quartzite pebble	1
Freshwater shell fragment	9
Worked shell fragment	1
Shell bead	1
Total	**16**

Burial 2 (Feature 14)

Burial 2 was located in unit 92N/118E. Initial identification of the burial occurred when bones were unearthed during the excavation of Trench 6. Most of the skeletal remains were disturbed by the backhoe although the skull, upper torso, and upper right arm remained in situ. These elements were semi-articulated and were the remains of a 45- to 59-year-old Native American female.

The in situ remains were found between 9.13 and 8.88 m (10 to 35 cm below ground surface). The individual was placed in a natural niche in the bedrock on her back (with her upper back and head slightly elevated), with her head oriented to the southwest and facing northeast. This burial may have been covered with a tuff slab. Tables 14.83 and 14.84 summarize the artifacts associated with Burial 2.

Table 14.83. Burial 2 NAGPRA ceramic artifacts.

Type	Bowl	Jar	Total
Santa Fe Black-on-white	34	0	34
Smeared-indented corrugated	0	1	1
Unpainted undifferentiated	2	0	2
Total	**36**	**1**	**37**

Table 14.84. Burial 2 NAGPRA lithic artifacts.

Artifact Type	Chalcedony	Obsidian	Dacite	Quartzite	Total
Projectile point	1	0	0	0	1
Drill	0	1	0	0	1
Graver	0	1	0	0	1
Unidentified ground stone fragment	0	0	2	2	4
Total	**1**	**2**	**2**	**2**	**7**

One pollen sample (FS 5123), one flotation sample (FS 5127), and two macrobotanical samples (FS 5129 and FS 5141) from this burial were analyzed. Taxa identified in the pollen sample included maize, cholla, prickly pear, beeweed, cheno-ams, grass family, sunflower family, spurge family, ragweed/bursage, unidentified pine, piñon pine, and sagebrush. Taxa identified in the flotation sample included saltbush/greasewood, goosefoot, cheno-ams, hedgehog cactus, unknown conifer, juniper, piñon pine, purslane, and maize. Taxa identified in the macrobotanical samples included saltbush/greasewood, Desert olive, sagebrush, maize, unknown conifer, piñon pine, and juniper.

Burial 3 (Feature 15)

Burial 3 was situated in units 94N/124E and 94N/125E. Initial identification of the burial occurred when two arm bones were unearthed during trenching activities. The burial was in poor condition and many elements were missing, including the vertebrae and lower limbs. The remaining elements were quite fragmented and articulation was poor. The skeleton was identified as a 20- to 30-year-old Native American female.

Most of the skeletal remains were found between 8.88 and 8.79 m (30 to 40 cm below ground surface). The lower end of this elevation range was only a few centimeters above bedrock. About one dozen unshaped tuff cobbles (8 by 8 cm to 28 by 18 cm) were found immediately above the remains and were probably deliberately placed to cover the burial. The individual was interred laying on her right side with her head oriented to the east and facing north. Her right arm was fully extended. Tables 14.85 and 14.86 list the artifacts associated with Burial 3.

Table 14.85. Burial 3 NAGPRA ceramic artifacts.

Artifact Type	Bowl	Jar	Dipper	Total
Santa Fe Black-on-white	36	5	2	43
Plain body	0	2	0	2
Unpainted undifferentiated	8	1	0	9
Total	**44**	**8**	**2**	**54**

Table 14.86. Burial 3 NAGPRA lithic artifacts.

Artifact Type	Chalcedony	Obsidian	Andesite	Dacite	Sand-stone	Total
Projectile point	0	1	0	0	0	1
One-hand mano	0	0	0	1	0	1
Polishing stone	0	0	1	1	0	2
Pestle	0	0	0	1	0	1
Abrading stone	0	0	0	1	0	1
Unidentified ground stone fragment	0	0	0	1	1	2
Manuport	1	1	0	0	0	2
Fire-cracked rock	0	0	0	2	0	2
Total	**1**	**2**	**1**	**7**	**1**	**12**

SITE CHRONOLOGY AND ASSEMBLAGE

Sampling Strategy

Approximately 88,500 artifacts and samples were recovered from LA 12587. Since all of these artifacts and samples could not be analyzed, an analysis sample was selected as described below. All the artifacts in at least two 1- by 1-m units from Rooms 1 through 18 were analyzed. In general, units that contained the most artifacts were selected. When rooms contained many macrobotanical samples, a 1- by 1-m unit was selected and all macrobotanical samples from the unit were analyzed (Table 14.87). When available, at least one pollen sample, flotation sample, and macrobotanical sample was analyzed from each stratum in each room. Several samples of each type (when available) from each interior feature were analyzed. Additionally, all artifacts found on a floor surface were analyzed.

Outside of the roomblocks, artifacts from Feature 22 in every other 1- by 1-m unit along the 103E line were analyzed. Some artifacts from these units were assigned to Rooms 19 and 20 based on stratigraphy. Artifacts from nine 1- by 1-m units in the midden were analyzed (Table 14.87). Fifteen pollen samples were analyzed from Feature 22 and several samples of various types were analyzed from the other exterior features and midden contexts.

Because of their relatively small numbers, all the human remains, NAGPRA artifacts, faunal remains, and shell artifacts recovered from the site were analyzed. Several noteworthy artifacts not falling into any of the 1- by 1-m units or the categories already mentioned were also analyzed. In all, approximately 14,150 artifacts and samples were analyzed.

Table 14.87. Systematic sample of ceramic and lithic artifacts and macrobotanical samples.

Provenience	Artifact Columns	Macrobotanical Column
Room1	106N/107E, 107N/107E	106N/107E
Room 2	105N/111E, 106N/111E	105N/111E
Room 3	99N/107E, 99N/108E, 100N/107E, 100N/108E	99N/107E, 99N/108E, 100N/107E, 100N/108E
Room 4/5	102N/109E, 103N/109E	103N/109E
Room 6	104N/106E, 104N/107E	104N/107E
Room 7	98N/107E, 98N/108E, 99N/108E	98N/107E
Room 8	100N/105E, 100N/106E	None
Room 9	96N/104E, 97N/105E	None
Room 10	92N/100E, 92N/101E	92N/100E
Room 11	84N/100E, 87N/99E, 90N/100E	None
Room 12	97N/100E, 97N/101E	96N/101E
Room 13	80N/98E, 80N/99E	None
Room 14	98N/101E, 100N/101E	98N/100E
Room 15	79N/98E, 79N/99E	None
Room 16	102N/101E, 105N/102E	102N/102E
Room 17	73N/97E, 73N/98E	None
Room 18	71N/96E, 72N/97E	None
Room 19	117N/103E, 119N/103E	None
Room 20	121N/103E	None
Feat. 22	113N/103E, 115N/103E, 117N/103E, 119N/103E, 121N/103E	None
Area 7 (Midden)	92N/118E, 95N/126E, 101N/122E, 101N/123E, 105N/122E, 106E/129N, 106E/130N, 110N/122E, 116N/127E	None

Chronology

Radiocarbon Dating

Seven radiocarbon samples (all *Zea mays*) were submitted for analysis (Table 14.88) and the returned results are all consistent with a Late Coalition period occupation. The relatively late radiocarbon date from maize (FS 4138) found in Feature 20 (archaeomagnetically dated to circa AD 1200) is not surprising given the amount of disturbance in and around the feature. FS 4138 is probably intrusive from the fill of Room 2.

Table 14.88. LA 12587 radiocarbon dating results.

FS	Context	Laboratory (Beta)#	Conventional radiocarbon age	Intercept of radiocarbon age	2-sigma calibrated result
2644	Room 2, Feature 4	183747	870±70 BP	AD 1180	AD 1020–1280
4138	Room 2, Feature 20	183748	650±40 BP	AD 1300	AD 1280–1400
2725	Room 2, Stratum 10	183749	680±60 BP	AD 1290	AD 1250–1410
2888C	Room 2, Stratum 10	183750	760±40 BP	AD 1270	AD 1210–1290
2888K	Room 2, Stratum 10	183751	690±40 BP	AD 1290	AD 1270–1320 AD 1350–1390
2632	Room 4/5, Feature 1	183752	690±40 BP	AD 1290	AD 1270–1320 AD 1350–1390
3274, 3319	Room 7, Feature 6	183753	860±40 BP	AD 1190	AD 1040–1260

Archaeomagnetic Dating

Burned sediments were collected from the hearths in Rooms 2, 4/5, and 7 (Table 14.89). Feature 20 from Room 2 appears to be the earliest in the sequence, separated from Room 2, Feature 4 by a significant remodeling event that relocated the hearth. Feature 6 in Room 7 was significantly remodeled through its use-life through the addition of linings that reduced the interior capacity of the hearth. Only one (from the earliest hearth plaster) of the three lining samples taken produced a sufficiently precise result for date estimation. Feature 1 in Room 4/5 represents a single, apparently late, hearth in the sequence of site occupation. In sum, the final burning of Feature 20 probably occurred circa AD 1200; the final burning of the other features probably occurred in the late 13th or early 14th century AD (see Blinman and Cox, Volume 3).

Table 14.89. LA 12587 archaeomagnetic dating results.

Sample Number	Feature	VGP Curves and Date Estimates (AD)		
		Wolfman	SWCV2000	DuBois
1209a	Room 4/5, Feature 1 Lining and tuff block	Dates disregarded		
1209b	Room 4/5, Feature 1 Lining only	1015–1130 1160–1275 1335–1410	1005–1375	
1209c	Room 4/5, Feature 1 Tuff block only	Not culturally relevant		
1210	Room 2, Feature 4	925–1015 1245–1310 1315–1355	925–1015 1370–1510 1550–1700	1200– 1320 1265–

Sample Number	Feature	VGP Curves and Date Estimates (AD)		
		Wolfman	SWCV2000	DuBois
				1325
1211	Room 7, Feature 6 Upper west inner lining	Too imprecise for date range estimation		
1212	Room 7, Feature 6 Upper north inner lining	930–1025 1235–1305 1315–1360	925–1015 1260–1465	
1213	Room 7, Feature 6 Lower west inner lining	Too imprecise for date range estimation		
1214	Room 2, Feature 20 west wall	1185–1205	1145–1170	
1215	Room 2, Feature 20 Base lining	1175–1220	1125–1185	

Note: When date ranges are expressed in parentheses, the closest points on the curve segment was outside of the error ellipse when the result was originally plotted. VGP is virtual geomagnetic pole.

Thermoluminescence Dating

Two burned plaster samples and two sherds were submitted for thermoluminescence dating (Table 14.90). Except for FS 1274, all the dates were earlier than expected. The thermoluminescence results are discussed further in Volume 3 (see Feathers, Chapter 67).

Table 14.90. LA 12587 thermoluminescence dating results.

FS#	Lab #	Context	Burial depth (cm)	Years BP	Percent error	Years AD
1274	UW1030	Sherd from Room 2 floor	43	777±68	8.7	1226±68
2078	UW1031	Sherd from Room 7 floor	32	916±77	8.5	1087±78
4098	UW1032	Room 7, Feature 6	35	1022±89	8.7	981±89
4209	UW1033	Room 2, Feature 20	63	881±80	9.1	1122±80

Obsidian Hydration

Sixteen artifacts were submitted for obsidian hydration dating. Due to analytical problems, four of the artifacts (FS 2284, FS 3655, FS 3780-1, and FS 5094) could not be dated. Table 14.91 summarizes the results for the 12 dateable artifacts. Most of the obsidian hydration dates are much younger than expected. For additional discussion of the obsidian hydration dates see Stevenson (Volume 3).

Table 14.91. LA 12587 obsidian hydration dating results.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
1183	2003-15	Cerro Toledo	3.92	-4597	338
1498	2003-16	Cerro Toledo	3.55	1428	30
2010-1	2003-17	Cerro Toledo	4.06	-1009	148

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
2094	2003-18	Cerro Toledo	5.77	-4903	240
2584	2003-20	Valle Grande	3.78	567	74
2628	2003-21	Valle Grande	3.65	823	63
3229	2003-22	Cerro Toledo	4.21	-406	113
3234-1	2003-23	Valle Grande	3.34	1146	49
3701	2003-25	Cerro Toledo	3.98	808	58
3780-3	2003-27	Cerro Toledo	2.64	351	123
3844	2003-28	not XRF'ed	2.91	914	72
4172	2003-29	El Rechuelos	2.21	967	91

Summary of Dating Results

Figure 14.63 shows a summary of the dating results (only one obsidian hydration date, FS 3234, is included). The figure shows that radiocarbon and archaeomagnetic dates are generally in agreement and indicate the use of Roomblock 1 in the late 13th and/or early 14th century AD (ca. AD 1275-1325). The two archaeomagnetic dates from Feature 20 indicate use of the site as early as circa AD 1200. The radiocarbon dates from Feature 4 and Feature 6 appear to correspond well to the AD 1200 date. However, the context from which these samples were derived suggests that they are associated with the final occupation of Roomblock 1. Similarly, the thermoluminescence dates are derived from contexts most likely associated with the final occupation of Roomblock 1 (save for the thermoluminescence date from Feature 20).

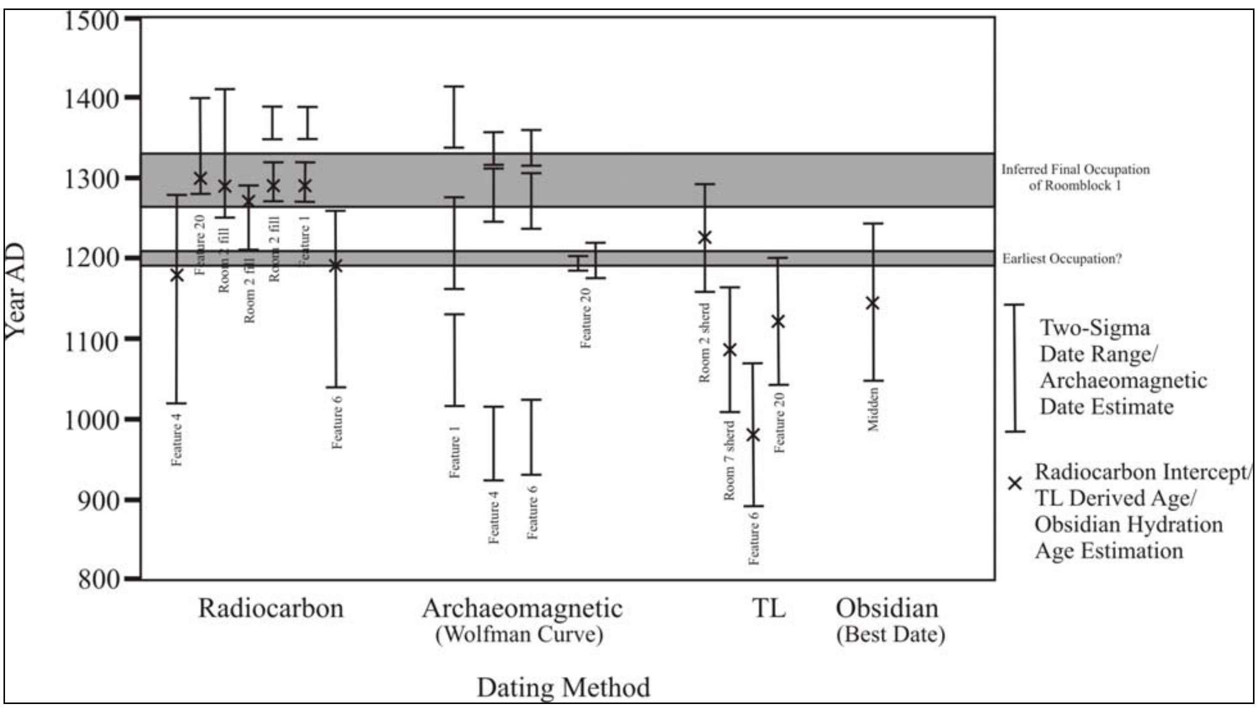

Figure 14.63. Summary of dating results.

The ceramic data (see Wilson, Volume 3) indicate that most of the Coalition period occupation at LA 12587 occurred during the early and middle 13th century and probably continued into the late 13th or early 14th century. Some samples of dated materials exhibit date ranges in the early to middle 13th century. Dated material indicates that there definitely was occupation in the late 13th or early 14th century. See Harmon and Vierra (Volume 3) for an evaluation of the different dating techniques

Ceramic Artifacts (Dean Wilson)

A total of 10,363 sherds were examined from the Late Coalition period contexts at LA 12587 (Tables 14.92 and 14.93). Ceramics from the Late Archaic component (Area 8) were also analyzed and are discussed in Chapter 15 of this volume. The LA 12587 assemblage indicates an occupation dating primarily to the Coalition period (Table 14.92). The majority (just more than 80%) of pottery is represented by gray utilityware types (Table 14.93). The majority of whiteware pottery was derived from Santa Fe Black-on-white vessels, and the majority of utilitywares are represented by corrugated and smeared-indented corrugated types tempered with anthill sand. Kwahe'e Black-on-white, Wiyo Black-on-white, and White Mountain Redwares are present in extremely low frequencies. A small number of sherds from LA 12587 reflect a probable Classic period contamination. Identified types are biscuitwares and Sankawi Black-on-cream. Low frequencies of glazewares include Glaze-on-red, Glaze-on-yellow, and Agua Fria Red-on-glaze. Santa Fe Black-on-white is the dominant decorated type at the site with just over 12 percent. The majority of pottery is represented by gray utilitywares (Table 14.93) exhibiting a combination of plain, corrugated, and smeared-indented corrugated textures (Table 14.93).

Table 14.92. Distribution of ceramic types at LA 12587.

Northern Rio Grande Whiteware	Count	Percent
Unpainted undifferentiated whiteware	1	0.0
Unpainted undifferentiated	426	4.1
Mineral paint undifferentiated	1	0.0
Kwahe'e Black-on-white solid designs	1	0.0
Indeterminate organic paint	42	0.4
Indeterminate organic Coalition	3	0.0
Santa Fe Black-on-white	1267	12.2
Wiyo Black-on-white	40	0.4
Galisteo Black-on-white	22	0.2
Unpainted Galisteo paste	1	0.0
Jemez/Santa Fe/Vallecitos	1	0.0
Gallina Black-on-white	1	0.0
Biscuitware painted unspecified	1	0.0
Unpainted Biscuitware slipped one side	2	0.0
Biscuit A (Abiquiu Black-on-white)	10	0.1
Biscuit B (Bandelier Black-on-white)	7	0.1

Sankawi Black-on-cream	1	0.0
Northern Rio Grande Utilityware		
Plain gray rim	31	0.3
Unknown gray rim	202	1.9
Plain body	525	5.1
Basket impressed gray	2	0.0
Indented corrugated	481	4.6
Incised corrugated	2	0.0
Plain corrugated	37	0.4
Smeared plain corrugated	1032	10.0
Alternating corrugated	1	0.0
Smeared-indented corrugated	6174	59.6
Polished gray	4	0.0
Plain incised	1	0.0
Mudware	5	0.0
Unpolished mica slip	1	0.0
Local brownware	8	0.1
Polished gray	1	0.0
Cibola Whiteware		
Tularosa Black-on-white	2	0.0
White Mountain Redware		
White Mountain Red painted undifferentiated	2	0.0
St. Johns Black-on-red	1	0.0
White Mountain Red unpainted undifferentiated	5	0.0
Middle Rio Grande Glazeware		
Glaze Yellow body unpainted	3	0.0
Glaze Red body undifferentiated	1	0.0
Agua Fria Glaze-on-red	1	0.0
San Juan Whiteware		
Unpainted whiteware undifferentiated	2	0.0
Mesa Verde Black-on-white	3	0.0
Indeterminate organic San Juan whiteware	1	0.0
Northern Mogollon Whiteware		
Chupadero Black-on-white indeterminate design	1	0.0
Mogollon Brownware		
Reserve smudged	3	0.0
Total	**10,363**	**100.0**

Table 14.93. Distribution of ceramic wares at LA 12587.

Ware	Count	Percent
Gray	8500	82.0

Ware	Count	Percent
White	1839	17.7
Red	8	0.1
Brown	11	0.1
Glaze	5	0.0
Total	**10,363**	**100.0**

Stylistic analysis of a sample of Santa Fe black-on-white rim sherds indicated a similar range of decorations and manipulations from LA 12587 (Tables 14.94 through 14.98). The majority of rim sherds are unpainted and tapered, and most of the bowl sherds were decorated only on the interior side. The majority of the rim sherds exhibit a single framing line close to the top of the rim.

Table 14.94. Distribution of Santa Fe Black-on-white rim orientation.

Rim Orientation	Count	Percent
Single thin framing line	14	29.2
Single thick framing line	10	20.8
Multiple thin framing lines	--	--
Multiple size framing lines lg top	--	--
Incorporated framing line	16	33.3
Thin top, incorporated lower	4	8.3
Solid	3	6.3
No framing lines	1	2.1
Total	**48**	**100.0**

Table 14.95. Distribution of Santa Fe Black-on-white rim shape.

Rim Shape	Count	Percent
Rounded	5	10.2
Flat	2	4.1
Tapered	36	73.5
Angled	4	8.2
Flared	2	4.1
Total	**49**	**100.0**

Table 14.96. Distribution of Santa Fe Black-on-white rim decoration.

Rim Decoration	Count	Percent
None	43	87.8
Solid	2	4.1
Ticked w/ dots & squares	4	8.2
Total	**49**	**100.0**

Table 14.97. Distribution of Santa Fe Black-on-white primary rim designs.

Primary Designs	Count	Percent
Solid indeterminate	7	14.3
Solid triangle	4	8.1
Solid and lined	--	--
Thin parallel lines	--	--
Thick parallel lines	3	6.1
Hachure	20	40.8
Hachured ribbon	2	4.1
Ticked lines	1	2.0
Chevron parallel lines	1	2.0
Checkerboard	1	2.0
Solid triangle	4	8.2
Hachured triangle	1	2.0
Checkerboard triangle	1	2.0
Thick and thin parallel lines	--	--
Intersecting lines	--	--
Dotted lines	2	4.1
Straight line hachure	2	4.1
Total	**49**	**100.0**

Table 14.98. Distribution of Santa Fe Black-on-white number of design motifs.

Number of Motifs	Count	Percent
0	1	2.0
1	35	71.4
2	12	24.5
3	1	2.0
Total	**49**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 2,493 artifacts were analyzed from LA 12587. The assemblage consists of 20 cores, 2,296 pieces of debitage, 61 retouched tools, 110 ground stone artifacts, one hammerstone, and five pieces of fire-cracked rock, which represents a 16 percent sample of the 15,430 total lithic artifacts recovered during the site excavations. Table 14.99 presents the data on lithic artifact type by material type. The majority of the cores, debitage, and retouched tools are made of chalcedony, with lesser amounts of obsidian, Pedernal chert, and basalt. The presence of cortex on 12.1 percent of the debitage indicates that these materials were collected from waterworn

(87.0%) and nodular (12.9%) sources. The chalcedony and Pedernal chert are available from local Rio Grande Valley gravel sources, the basalt from gravels and bedrock outcrops, and the obsidian from primary sources in the Jemez Mountains. The ground stone artifacts are primarily made from igneous materials, which are available both as bedrock outcrops and in stream gravels that cross-cut the Pajarito Plateau. Quartzite is, however, only available from the nearby Rio Grande Valley gravels. The source of the sandstone is difficult to determine, but it could be derived from gravel formations near Totavi or from more distant sources in the Santa Fe or Abiquiu areas.

Fourteen pieces of debitage and 18 retouched tools were submitted for X-ray fluorescence analysis. Most of these projectile points were not included in the sample analysis from the site. Nonetheless, the majority of the artifacts were from the Cerro Toledo source, with less from the Valle Grande and El Rechuelos sources (Table 14.100). The Cerro Toledo (Rabbit Mountain/Obsidian Ridge) and Valle Grande (Cerro del Medio) source areas are located about 17 km (11 miles) and 22 km (14 miles) as the “crow flies” to the southwest and west of the site, whereas, the El Rechuelos (Polvadera Peak) source area is situated about 30 km (19 miles) to the northwest. Most of the debitage is made of Cerro Toledo obsidian, while the retouched tools were manufactured on a variety of materials. All but one of the El Rechuelos artifacts are retouched tools.

Table 14.99. Lithic artifact type by material type.

Artifact Type		Basalt	Vesicular basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Silicified wood	Quartzite	Other	Total
Cores	Core	1	0	0	0	0	0	1	12	0	5	0	0	0	19
	Tested cobble	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	1	0	0	0	0	0	1	13	0	5	0	0	0	20
Debitage	Angular debris	6	0	0	1	0	0	14	237	2	28	1	5	0	294
	Core flake	84	0	3	9	3	0	130	854	17	88	15	22	9	1224
	Blade	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Biface flake	11	0	0	0	0	0	68	0	2	2	0	0	0	125
	Piece esquilleé	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Core trimming flake	0	0	0	0	0	0	0	3	0	2	0	0	0	5
	Opposing core flake	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Outrepasse	2	0	0	0	0	0	4	1	0	0	0	0	0	7
	Pot lid	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Microdebitage	33	0	0	0	0	0	163	341	5	22	1	5	0	570
	Undetermined flake	5	0	0	0	0	0	16	29	2	6	0	0	0	58
	Hammerstone flake	0	0	0	1	0	0	0	0	0	0	0	2	0	3
	Ground stone flake	2	0	0	0	0	0	0	0	0	0	0	0	0	2
	Subtotal	143	0	3	11	7	0	389	1505	28	150	17	34	9	2296
Retouched Tools	Retouched piece	5	0	1	0	0	0	2	17	0	0	0	0	0	25
	Notch	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Biface	1	0	0	0	0	0	5	5	1	0	0	0	0	12
	Projectile point	0	0	0	0	0	0	3	1	1	0	0	0	0	5
	Uniface	0	0	0	0	0	0	2	3	0	1	0	0	0	6
	Endscraper	0	0	0	0	0	0	0	1	0	0	0	0	0	1

Artifact Type		**Basalt**	**Vesicular basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Silicified wood**	**Quartzite**	**Other**	**Total**
	Drill	0	0	0	0	0	0	2	4	0	0	0	0	0	6
	Perforator	0	0	0	0	0	0	0	3	0	0	0	0	0	3
	Graver	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Perforator/notch	0	0	0	0	0	0	0	2	0	0	0	0	0	2
	Subtotal	6	0	0	0	0	0	14	38	2	1	0	0	0	61
Ground Stone	One-hand mano	0	1	0	2	5	1	0	0	0	0	0	3	1	13
	Two-hand mano	1	5	0	2	3	0	0	0	0	0	0	1	0	12
	Undetermined mano fragment	0	0	0	2	3	1	0	0	0	0	0	6	1	13
	Millingstone	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Slab metate	0	1	0	1	1	1	0	0	0	0	0	0	0	4
	Grinding slab	0	0	1	3	6	2	0	0	0	0	0	0	0	12
	Undetermined metate fragment	0	0	0	3	5	2	0	0	0	0	0	0	1	11
	Polishing stone	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Abrading stone	0	0	0	1	3	0	0	0	0	0	0	0	0	4
	Axe	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Maul	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	Hoe	1	0	0	1	0	0	0	0	0	0	0	0	0	2
	Ornament	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Stone ceramic lid	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Shaped slab	0	0	0	5	2	0	0	0	0	0	0	0	0	7
	Undetermined ground stone	2	0	2	11	8	1	0	0	0	0	0	3	0	27
	Subtotal	5	7	3	31	36	9	0	0	0	0	0	14	4	110

Artifact Type		**Basalt**	**Vesicular basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Silicified wood**	**Quartzite**	**Other**	**Total**
Other	Hammerstone	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Fire-cracked rock	0	0	0	0	4	0	0	0	0	0	0	1	0	5
	Subtotal	0	0	0	0	4	0	0	0	0	1	0	1	0	6
Total		**155**	**7**	**6**	**42**	**47**	**9**	**404**	**1556**	**30**	**157**	**17**	**49**	**14**	**2493**

Table 14.100. Obsidian source samples.

FS #	Artifact	Color	Source
1148	Tool	Translucent	Cerro Toledo rhyolite
1183	Tool	Black opaque	Cerro Toledo rhyolite
1430-1	Debitage	Green	Cerro Toledo rhyolite
1430-2	Debitage	Green	Valle Grande rhyolite
1437-1	Debitage	Black opaque	Cerro Toledo rhyolite
1437-2	Debitage	Black opaque	Cerro Toledo rhyolite
1437-3	Debitage	Black dusty	El Rechuelos
1437-3	Debitage	Black opaque	Cerro Toledo rhyolite
1498	Tool	Translucent	Cerro Toledo rhyolite
1705	Tool	Black opaque	Cerro Toledo rhyolite
2010-1	Debitage	Black opaque	Cerro Toledo rhyolite
2010-2	Tool	Translucent	Cerro Toledo rhyolite
2094	Projectile point	Gray	Cerro Toledo rhyolite
2140	Projectile point	Black dusty	El Rechuelos
2264	Projectile point	Black opaque	Cerro Toledo rhyolite
2284	Projectile point	Black opaque	Cerro Toledo rhyolite
2340	Projectile point	Black dusty	El Rechuelos
2584	Projectile point	Translucent	Valle Grande rhyolite
2628	Projectile point	Translucent	Valle Grande rhyolite
3227	Tool	Black opaque	Cerro Toledo rhyolite
3229	Debitage	Translucent	Cerro Toledo rhyolite
3234-1	Tool	Translucent	Valle Grande rhyolite
3234-2	Debitage	Translucent	Valle Grande rhyolite
3701	Tool	Black opaque	Cerro Toledo rhyolite
3712	Tool	Translucent	Cerro Toledo rhyolite
3780-1	Debitage	Translucent	Cerro Toledo rhyolite
3780-2	Debitage	Translucent	Cerro Toledo rhyolite
3780-3	Debitage	Translucent	Cerro Toledo rhyolite
3780-4	Debitage	Translucent	Cerro Toledo rhyolite
3830	Debitage	Black opaque	Cerro Toledo rhyolite
4172	Projectile point	Black dusty	El Rechuelos
4199	Projectile point	Black dusty	El Rechuelos
5094	Projectile point	Translucent	Valle Grande rhyolite

Lithic Reduction

The cores consist of five single-directional, eight bi-directional, five multi-directional, and one flake core. The single-directional cores are single (n = 3) and multi-faces (n = 2), while the bidirectional cores are change-of-orientation (n = 2), bifacial (n = 1), opposed-different-face (n = 4) and ninety-degrees (n = 1). Lastly, the multi-directional cores are all globular-shaped and the flake core is a change-of-orientation. None of the cores exhibit any obvious evidence of platform preparation. Most of the cores were discarded due to material flaw fractures (n = 7) and exhaustion (*n* = 7), with fewer due to a culturally induced fracture (*n* = 2) or extensive hinging/stepping (*n* = 1). Otherwise, only three cores were classified as still useable. One of the single-directional cores was burned. Table 14.101 presents the metric information on the whole cores. A single tested chalcedony cobble was identified. It weighs 172.1 g and exhibits numerous fracture planes and flaws.

Table 14.101. Core type dimensions (mm) and weight (gm).

Core Type	Length	Width	Thickness	Weight
Single-directional	27	30	18	16.1
Single-directional	57	73	45	207.7
Single-directional	31	46	41	64.4
Single-directional	46	25	18	26.5
Bi-directional	47	45	18	40.9
Bi-directional	49	37	25	50.1
Bi-directional	41	27	18	27.6
Bi-directional	39	34	24	38.0
Bi-directional	52	38	27	56.6
Bi-directional	41	36	28	46.8
Bi-directional	27	17	14	6.0
Bi-directional	31	28	23	14.2
Multi-directional	31	30	22	17.7
Multi-directional	33	24	21	18.9
Multi-directional	49	37	32	57.7
Multi-directional	34	25	22	26.3
Multi-directional	31	26	24	21.5
Flake	38.0	27.0	14.0	16.2

The debitage assemblage consists mainly of core flakes (53.3%) with lesser amounts of microdebitage (24.8%), angular debris (12.8%), and biface flakes (5.4%). Table 14.102 summarizes the various stages of reduction represented by the whole core and biface (tertiary) flakes. The debitage assemblage is composed primarily of secondary non-cortical, with lesser amounts of secondary cortical, tertiary, and primary flakes. The overall cortical:non-cortical ratio of 0.42 reflects this emphasis on the later stages of core reduction.

Table 14.102. Debitage reduction stages.

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Basalt	0	4	9	0	0.44
Obsidian	0	4	10	5	0.26
Chalcedony	3	55	126	7	0.43
Pedernal Chert	0	5	11	0	0.45
Silicified Wood	0	0	6	0	---
Quartzite	1	2	0	0	---

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Total	4	70	162	12	0.42
Percentage	1.6	28.2	65.3	4.8	

The majority of the flakes exhibit single-faceted platforms (51.7%; *n* = 269), with lesser amounts of cortical (*n* = 92), crushed (*n* = 75), collapsed (*n* = 63), multifaceted (*n* = 11), and dihedral (*n* = 10) platforms. Sixty-seven (12.8%) of the flake platforms exhibit evidence of preparation; most of these were abraded/crushed (*n* = 56), with fewer retouched (*n* = 8), and abraded/ground (*n* = 3) platforms. The paucity of retouched platforms is in part due to the large number of crushed and collapsed platforms on obsidian biface flakes. The majority of the core flakes consist of distal fragments (*n* = 563; 45.9%), with fewer whole (*n* = 262), proximal (*n* = 200), midsection (*n* = 174), lateral (*n* = 12), and undetermined fragments (*n* = 13). Most of the biface flakes are also distal fragments (*n* = 48; 38.4%), with fewer whole (*n* = 12), proximal (*n* = 37), and midsection fragments (*n* = 28). The whole core flakes have a mean length of 21.0 mm (*std* = 9.3), whereas the whole biface flakes exhibit a mean length of 18.5 mm (*std* = 7.8). Lastly, angular debris have a mean weight of 2.4 g (*std* = 4.8).

The retouched tools consist of a mix of expedient flakes tools such as retouched pieces, perforators, a notch, a graver, and perforator/notches. The formal tools consist of bifaces, projectile points, and drills. The retouched pieces exhibit marginal retouch along a single edge (*n* = 16), with lesser amounts of retouch along two edges (*n* = 9). Table 14.103 presents the information on retouch type by edge outline.

Table 14.103. Retouched pieces.

Retouch Type	Edge Outline						
	Straight	Concave	Convex	Straight/ concave	Straight/ convex	Concave/ convex	Projection
Unidentified ventral	4	1	0	0	0	0	0
Unidentified dorsal	7	3	3	1	2	0	3
Bidirectional	4	0	0	0	0	0	1
Alternating	0	0	0	1	0	0	0
Alternate	0	0	0	0	0	0	1
Total	**15**	**4**	**3**	**2**	**2**	**0**	**5**

Most of the edges are characterized by a straight outline with retouch along the dorsal surface. The edge angles range from 40 to 75 degrees with a mean of 59.5 degrees (*std* = 10.2); indeed, as Figure 14.64 illustrates, there is a modal distribution with a peak at 55 degrees. This presumably reflects an emphasis on cutting activities at the site. The perforators exhibit unidirectional dorsal and alternate retouch that was used to accentuate the pointed end of a flake with edge angles of about 75 degrees. The notch is a core flake with a single notch retouched onto the ventral surface of the flake along its distal and lateral edges. The graver is a core flake with a unidirectional dorsal retouched projection with a blunt end. The drills consist of four distal and two midsection fragments that exhibit bidirectional retouch with edge angles ranging from 40 to 70 degrees. The unifaces are roughly worked flakes with unidirectional dorsal retouch and edge angles ranging from 60 to 70 degrees. In contrast, a single formal endscraper fragment was also identified, consisting of a distal fragment with an edge angle of 70 degrees. Figure 14.65 illustrates some of the retouched tools.

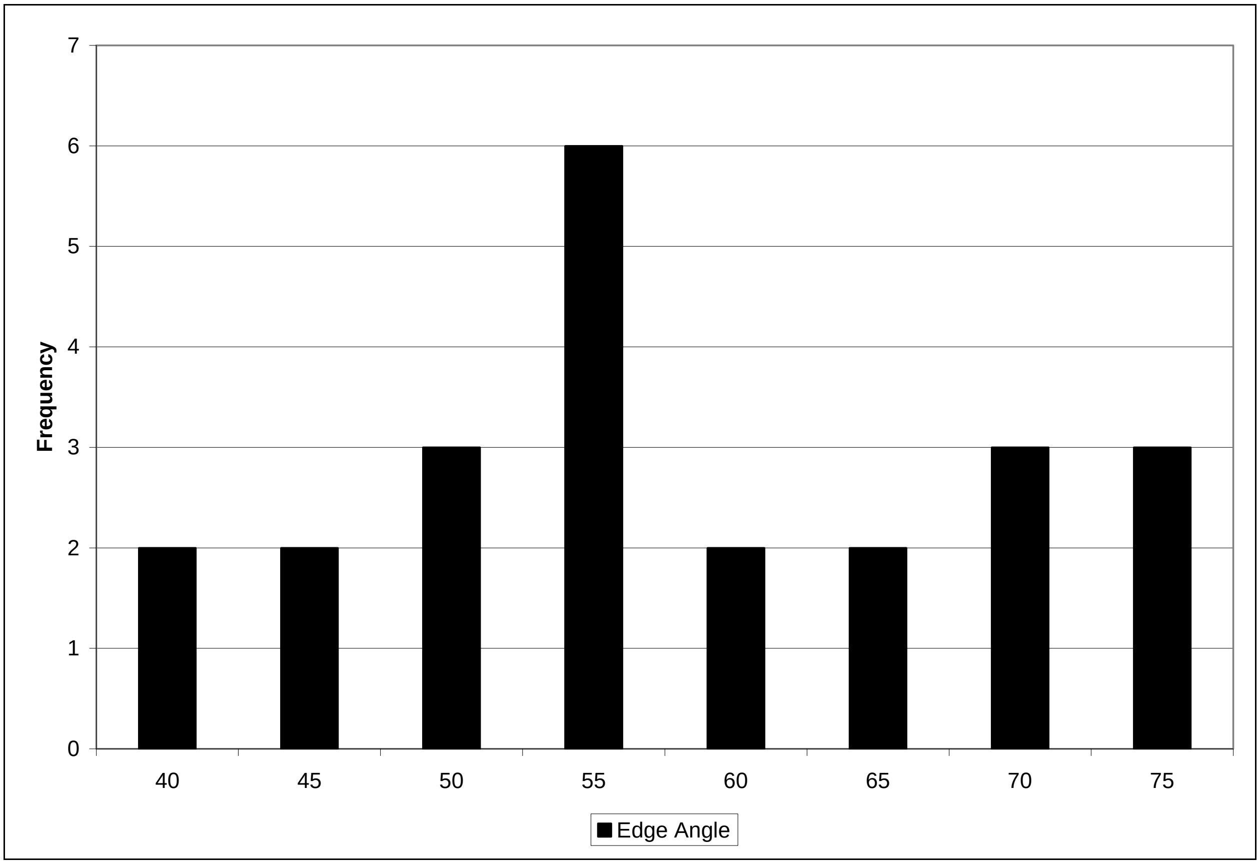

Figure 14.64. Edge angle distribution for retouched pieces.

Only two stages of biface production were identified during the analysis. No early-stage bifaces are present. The middle-stage bifaces (*n* = 4) are 8 to 12 mm thick and exhibit edge angles ranging from 50 to 60 degrees, while the late-stage bifaces (*n* = 7) are 2 to 4 mm thick and exhibit edge angles ranging from 25 to 35 degrees (preforms). One of the middle-stage bifaces was manufactured on a flake blank and the platform was present at the proximal end. It is made of chert and appears to have been heat-treated. Most of the bifaces are ovoid-shaped, with a single lanceolate-shaped late-stage biface (Figure 14.66).

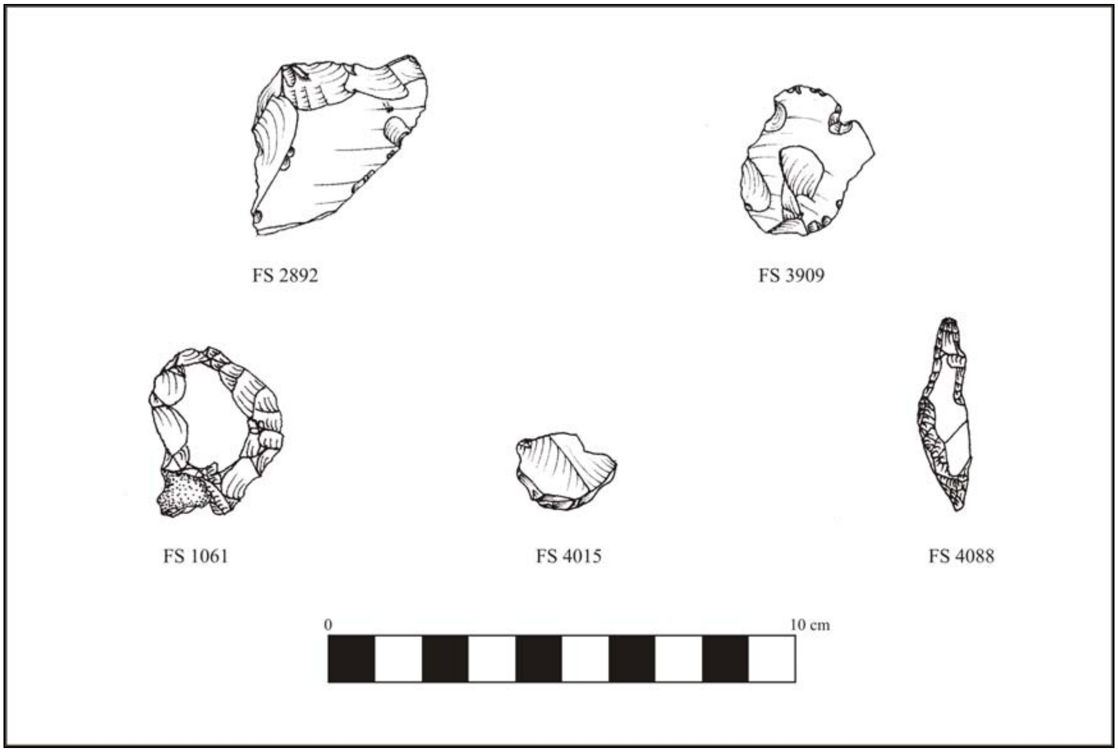

Figure 14.65. Retouched flake, notch, uniface, endscraper, and drill.

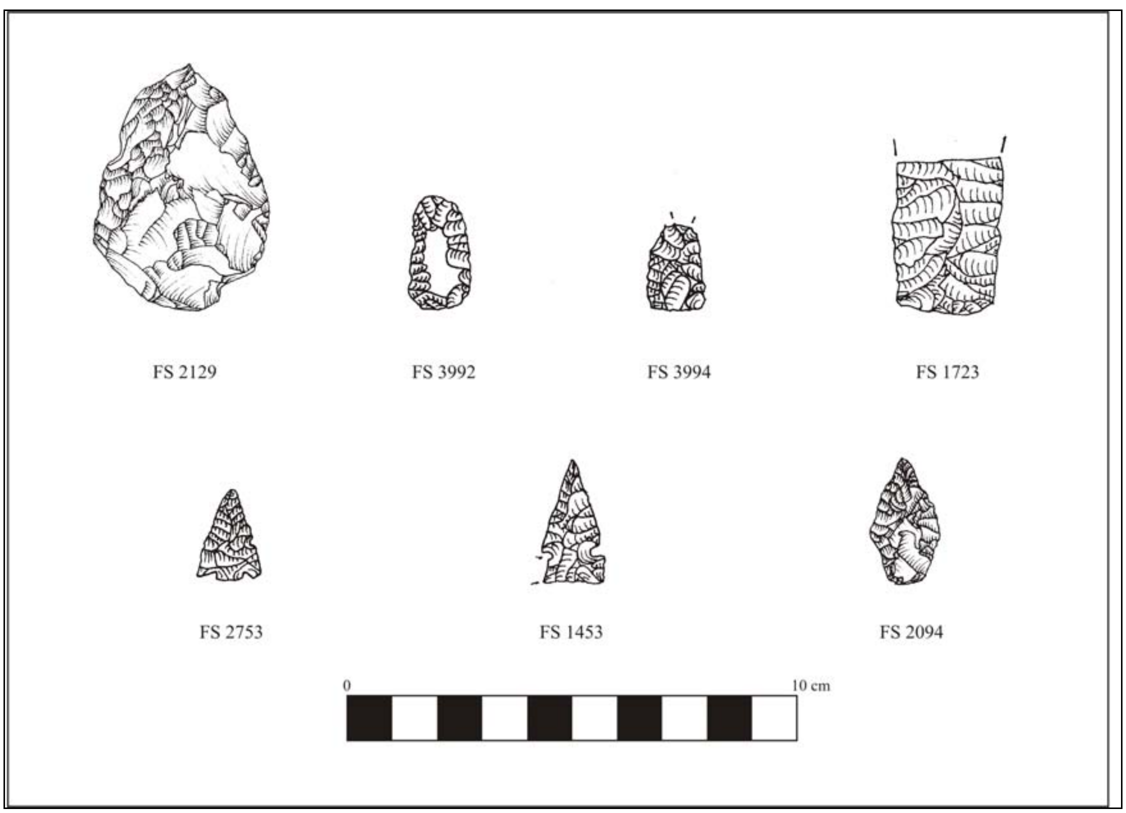

Figure 14.66. Bifaces and projectile points.

Metrical and descriptive information on the projectile points is presented in Table 14.104. The five projectile points exhibit some variation, with two corner-notched, a side-notched, a contracting stem, and an undetermined fragment (see Figure 14.66). Three of these represent arrow points with neck widths ranging from 5 to 8 mm, and one a lance/dart point with a neck width of 13 mm. Only two of the points are whole, with the other three being midsection or distal fragments.

Table 14.104. Projectile point metrical (mm) and descriptive data.

FS #	Material	Condition	Overall Length	Blade Length	Neck Width	Stem Length	Stem Width	Thickness	Weight (gm)	Haft Type	Blade Shape	Base Shape
1146	Obsidian	Mid-section	--	--	8	--	--	1	0.2	Corner-notched	Straight	Und.
1453	Chert	Whole	26	19	8	7	--	4	1.1	Side-notched	Straight	Und.
2094	Obsidian	Whole	28	20	13	8	8	4	1.8	Contracting	Straight	Strt.
2753	Chalce-dony	Distal	--	18	5	--	--	5	0.8	Corner-notched	Straight	Und.
3971	Obsidian	Mid-section	--	--	--	--	--	3	1.2	Und.	Und.	Und.

Tool Use

Only 15 flakes (0.1%) exhibit evidence of damage that could be attributed to use-wear. The edge damage is evenly distributed between the lateral edge of the flake (*n* = 8) and the end of the flake (*n* = 7). Most of the edge outlines are straight (*n* = 13), with a single concave-shaped outline for both the lateral and end of two flakes. Edge angles range from 35 to 70 degrees, with a mean of 53 degrees (*std* = 10.8). This is similar to the pattern exhibited by the retouched flakes.

In contrast to the debitage, 32 of the retouched tools (52.4%) exhibit evidence of use-wear. This consists of 16 retouched pieces, a notch, a biface, a projectile point, three unifaces, four drills, three perforators, the graver, and one perforator/notch. The biface is a middle stage biface that exhibits polishing and rounding along a lateral edge. The projectile point is a midsection fragment with impact fracture.

One hundred and ten ground stone artifacts were identified during the analysis. Identified artifacts included manos, metates, polishing stones, abrading stones, and other ground stone items (Figure 14.67). The manos are nearly evenly distributed between one- and two-hand varieties. Most of the one-hand manos exhibit one (*n* = 9) or two (*n* = 4) grinding surfaces. In contrast, most of the two-hand manos have two (*n* = 10) grinding surfaces. Only two of the two-hand manos have two grinding surfaces. This divergent pattern is also reflected in mano cross-section. The one-hand manos exhibit mostly plano/flat cross-sections (*n* = 7) as compared to wedge-shaped cross-sections for the two-hand manos (*n* = 7). Undetermined mano fragments appear to reflect both one- and two-hand varieties with one and two grinding surfaces, but mostly have plano/flat cross-sections.

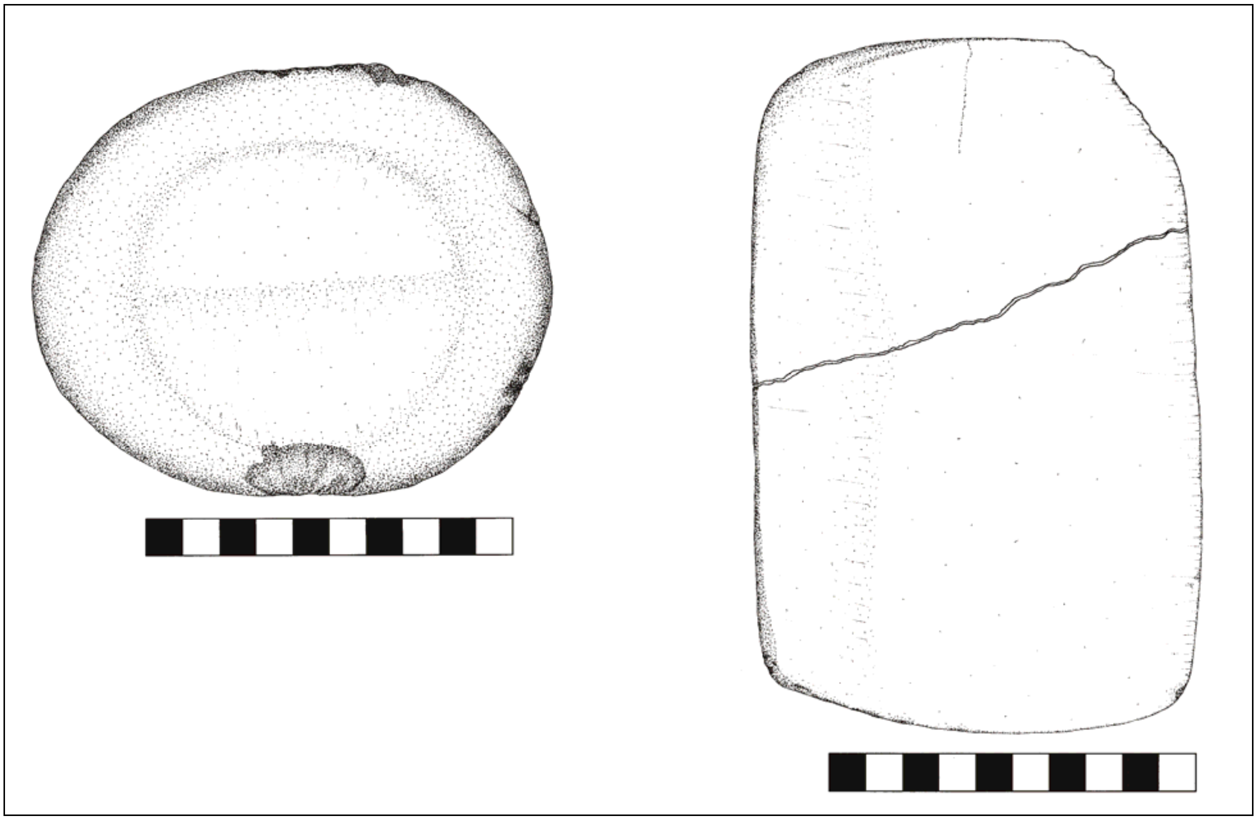

Figure 14.67. One- and two-hand manos.

A single generalized millingstone and four formal slab metates were identified. The formal slab metates are all broken fragments, with shaped perimeters and large, mostly flat, well-worn grinding surfaces. The formal slab metates are made of a variety of materials, including tuff, dacite, andesite, and vesicular basalt. About half of the two-hand manos are also made of vesicular basalt, reflecting the importance of milling maize at the site. The polishing stone is a chalcedony pebble with a finely ground surface, whereas the abrading stones are dacite and andesite pebbles with irregularly ground surfaces.

The axe is a quartzite cobble with flaked and heavily crushed edges. The artifact broke in half along the hafting area. The maul is a vesicular basalt cobble that is heavily battered on both ends and has a ground full-groove. The hoes were made on a thin piece of tabular basalt and a thick piece of tabular andesite; both had several flakes removed from their bit that also exhibited rounding. The andesite hoe also exhibits hafting notches and some polish along the middle portion of the artifact. The ornament is a shale bead that may have been part of a tube that was broken into individual beads.

Faunal Remains (Kari Schmidt)

In general, the overall preservation of the bones from LA 12587 is good. For the most part, bones tended to be in large fragments, and a number of complete elements were identified. Weathering on the faunal remains was present, although the frequency and severity was generally low (n = 18), suggesting the remains may not have been exposed to the elements for a long period of time before burial. The bones show minimal evidence of root-etching, and no evidence of rodent gnawing, carnivore gnawing, or carnivore digestion. Modifications resulting from burning were present on 183 pieces of bone, constituting some 28 percent of the total assemblage. Pathologies were identified on two specimens: a pocket gopher femur and pubis. Thirty-two specimens recovered from LA 12587 were worked.

Of the 649 faunal remains recovered from the excavations at LA 12587, 33 percent (n = 217) were identified to at least the level of class. The 217 identified remains were recovered from a variety of contexts. Table 14.105 shows all the identified taxa that were recovered from the site. Because the most abundant taxa represented in the assemblage were intrusive pocket gopher remains (*Thomomys* sp.), Table 14.106 presents the same data with this taxon removed. Pocket gopher burrows were extensive in the immediate site area, and the visual appearance of their bones was quite distinct from the majority of the other bones recovered from the site.

Table 14.105. Identified faunal remains from all contexts at LA 12587.

TAXON	TOTAL			BURNED		
	NISP*	MNI	Percent	NISP	Percent	Percent of Taxon
Freshwater catfishes (Ictaluridae)	1	1	0.5	0	0	0
Bullfrog (*Rana catesbeiana*)	1	1	0.5	0	0	0
cf. Woodhouse's Toad (*Bufo woodhousii*)	1	1	0.5	0	0	0
Piñon jay (*Gymnorhinus cyanocephalus*)	1	1	0.5	0	0	0
Turkey (*Meleagris gallopavo*)	32	2	14.0	4	16.0	12.5
Golden eagle (*Aquila chrysaetos*)	2	1	1.0	0	0	0
Large bird	11	1	5.0	3	12.0	27.2
Pocket mice (*Perognathus* sp.)	9	3	4.0	0	0	0
Kangaroo rats (*Dipodomys* sp.)	4	3	2.0	0	0	0
Pocket gophers (*Thomomys* sp.)	81	8	37.0	1	4.0	0.1
Rock squirrels (*Spermophilus variegatus*)	7	2	3.0	0	0	0
Black-tailed jackrabbit (*Lepus californicus*)	10	1	5.0	4	16.0	40.0
cf. Desert cottontail (*Sylvilagus audubonii*)	19	2	9.0	3	12.0	16.0
Coyote (*Canis latrans*)	2	1	1.0	0	0	0
Domestic dog (*Canis familiaris*)	1	1	0.5	0	0	0

TAXON	TOTAL			BURNED		
	NISP*	MNI	Percent	NISP	Percent	Percent of Taxon
Coyote/dog (*Canis latrans/familiaris*)	1	1	0.5	0	0	0
Gray fox (*Urocyon cinereoargenteus*)	1	1	0.5	0	0	0
Artiodactyls (Artiodactyla)	1	1	0.5	0	0	0
Mule deer (*Odocoileus hemionus*)	16	1	7.0	4	16.0	29.0
Sm/med mammals	5	1	2.5	1	4.0	20.0
Medium mammals	1	1	0.5	1	4.0	100.0
Med/lg mammals	10	1	5.0	4	16.0	44.0
IDENTIFIED TOTAL	217	--	100.0	25	100.0	--
UNIDENTIFIED TOTAL	432	--	--	154	--	--
SITE TOTAL	**649**	**--**	**--**	**179**	**--**	**--**

NISP is number of identified specimens; MNI is minimum number of individuals

Table 14.106. Identified faunal remains, minus probable intrusive rodents, from LA 12587.

TAXON	TOTAL			BURNED		
	NISP	MNI	Percent	NISP	Percent	Percent of Taxon
Freshwater catfishes (Ictaluridae)	1	1	1.0	0	0	0
Bullfrog (*Rana catesbeiana*)	1	1	1.0	0	0	0
cf. Woodhouse's Toad (*Bufo woodhousii*)	1	1	1.0	0	0	0
Piñon jay (*Gymnorhinus cyanocephalus*)	1	1	1.0	0	0	0
Turkey (*Meleagris gallopavo*)	32	2	25.0	4	17.0	12.5
Golden eagle (*Aquila chrysaetos*)	2	1	1.5	0	0	0
Large bird	11	1	9.0	3	12.5	27.0
Kangaroo rats (*Dipodomys* sp.)	4	3	3.0	0	0	0
Rock squirrels (*Spermophilus variegatus*)	7	2	5.5	0	0	0
Black-tailed jackrabbit (*Lepus californicus*)	10	1	7.5	4	17.0	40.0
cf. Desert cottontail (*Sylvilagus audubonii*)	19	2	15.0	3	12.5	16.0
Coyote (*Canis latrans*)	2	1	1.5	0	0	0
Domestic dog (*Canis familiaris*)	1	1	1.0	0	0	0
Coyote/dog (*Canis latrans/familiaris*)	1	1	1.0	0	0	0
Gray fox (*Urocyon cinereoargenteus*)	1	1	1.0	0	0	0
Artiodactyls (Artiodactyla)	1	1	1.0	0	0	0
Mule deer (*Odocoileus hemionus*)	16	1	12.0	4	17.0	28.0

TAXON	TOTAL			BURNED		
	NISP	MNI	Percent	NISP	Percent	Percent of Taxon
Sm/med mammals	5	1	4.0	1	3.5	20.0
Medium mammals	1	1	1.0	1	3.5	100.0
Med/lg mammals	10	1	7.5	4	17.0	44.0
IDENTIFIED TOTAL	127	--	100.0	24	100.0	--
UNIDENTIFIED TOTAL	432	--	--	153	--	--
SITE TOTAL	**559**	**--**	**--**	**177**	**--**	**--**

Table 14.106 shows that the majority of the identified fauna (25%) at LA 12587 is turkey (*Meleagris gallopavo*), followed by cottontail (*Sylvilagus* sp.), mule deer (*Odocoileus hemionus*), indeterminate large bird, jackrabbit (*Lepus californicus*), and indeterminate medium/large mammal remains. The remainder of the assemblage consists of a wide variety of taxa, including fish, amphibians, small and large birds, rodents, and carnivores. The variation present in the assemblage attests to its location near a number of distinct biomes.

Archaeobotanical Remains (Pamela J. McBride)

Flotation Remains

The Coalition period at LA 12587 is characterized by the predominance of maize, with a few instances of possible squash and beans to round out the traditional triad of domesticated plants (Table 14.107). Annual seeds were the next most common plant remains, easily procured in cultivated fields and other disturbed areas. Annual taxa included bugseed, goosefoot (the most common annual taxon, which was found in 24% of samples), pigweed, and purslane. Pitseed goosefoot, sunflower, and tobacco were less common annual taxa, found in less than 5 percent of samples. Perennial taxa were primarily those associated with firewood use like conifer needles, bark, and twigs, but cactus seeds and piñon nutshell indicate cactus fruits and piñon nuts were gathered and eaten. Four-wing saltbush fruits could be firewood debris or evidence for their use as food or for their salty flavor. Grass taxa diversity and abundance is low with grass family and dropseed grass occurring in less than 4 percent of samples and ricegrass occurring in 12 percent of samples.

Table 14.107. Ubiquity of flotation sample carbonized plant remains from LA 12587.

Common Name/Plant Part	Count*	%**
Bean cotyledon	2	2
Bugseed seed	6	5
Cheno-am seed	20	18
Dropseed grass caryopsis	13	12
Four-wing saltbush fruit	4	4
Goosefoot seed	27	24
Grass family caryopsis	5	4
Grass family culm	2	2

Common Name/Plant Part	Count*	%**
Groundcherry seed	11	10
Hedgehog cactus seed	3	3
Juniper seed	1	1
Juniper twig	2	2
Maize cob	3	3
Maize cupule	106	95
Maize cupule segment	11	10
Maize embryo	16	14
Maize glume	4	4
Maize kernel	58	52
Mint family seed	2	2
Monocot stem	1	1
Pigweed seed	16	14
Pine bark scale	3	3
Pine cone scale	1	1
Piñon needle	15	13
Piñon nutshell	3	3
Ponderosa pine needle	3	3
Prickly pear cactus embryo	1	1
Prickly pear cactus seed	1	1
Purslane seed	18	16
Ricegrass caryopsis	2	2
Squash/coyote gourd rind	4	4
Sunflower achene	1	1
Tobacco seed	4	4
Unidentifiable embryo	1	1
Unidentifiable seed	3	3
Unidentifiable plant part	8	7
Unknown # 1 embryo	1	1
Unknown # 1 plant part	1	1
Unknown # 3 plant part	1	1

*Number of samples with common name/plant part present; **Number of samples with common name/plant part divided by total number of flotation samples with charred remains (112) × 100.

Wood from flotation and vegetal samples was dominated by juniper and unknown conifer (Table 14.108). Other conifers included Douglas fir, piñon, and ponderosa pine. Although non-conifers were diverse, saltbush/greasewood was the only one that was present in significant quantities. New Mexico locust, cottonwood/willow, desert olive, mountain mahogany, oak, rabbitbrush, rose family, sagebrush, and sumac complete the list of non-conifer taxa identified at the site. There were no remarkable differences in wood taxa from back rooms versus front rooms and wood from both thermal and non-thermal contexts was primarily juniper and unknown conifer.

Table 14.108. Ubiquity of flotation sample wood charcoal taxa from LA 12587.

Common Name	Count*	%**
Cottonwood/willow	20	18
Desert olive	9	8
Douglas fir	12	11
Juniper	92	82
Mountain mahogany	3	3
Oak	23	21
Pine	44	39
Piñon	41	37
Ponderosa pine	26	23
Rabbitbrush	1	1
Rose family	7	6
Sagebrush	30	27
Saltbush/greasewood	64	57
Sumac	1	1
Unknown conifer	75	67
Unknown non-conifer	18	16

*Number of samples with wood taxon present; **Number of samples with wood taxon present divided by total number of flotation samples with wood charcoal (112) × 100.

Roomblock 1

The majority of samples were collected from Roomblock 1 (Rooms 1 to 9; only 15% were from Roomblock 3) and focused on the hearths in the front Rooms 2, 4/5, and 7. Based on the macrobotanical remains recovered, it appears as though Rooms 4/5 and 7 may have been primarily used for food preparation, while Room 2 served as a location for both food preparation and storage. Fused masses of kernels that were found in Room 2 indicate that stacks of cobs were stored on the floor or on top of the roof. Most of the cobs holding the kernels were burned to ash, leaving kernels still fused in alignment. Several thousand loose kernels were also recovered in Room 2, primarily from post-occupational fill and rooffall (1,563 kernel fragments, 2,771 whole), but from floor, fill above the floor, and hearth contexts as well.

There were two hearths in Room 2; Feature 4 was a plastered, collared hearth associated with the Late Coalition occupation of the site, and Feature 20 was the oldest feature at the site and dating to the Early Coalition (AD 1200). Maize is the most common taxon in both hearths; weedy annual seeds and dropseed grass were recovered from both features. Possible squash/coyote gourd rind was identified in the older hearth, while groundcherry, mint family, and hedgehog seeds were restricted to Feature 4. This indicates that the diets of earlier and later site occupants were probably not considerably different, especially when sample bias is taken into account (4 samples were analyzed from Feature 20 versus 10 from Feature 4). The possible extramural storage cist constructed on the east wall of Room 2 contained annual seeds, maize, and piñon needles along with at least five wood taxa, indicating a trashy fill signature, and thus obfuscating any clues about the contents of the cist.

The recovery of three of four tobacco seeds from the site in the lower and general hearth fill of Room 7, as well as the presence of a deflector and ash box that do not occur in other rooms, indicates the room might have had a ceremonial function. A bean cotyledon and three cotyledon fragments were also recovered from the Room 7 hearth.

Diversity of taxa from back Rooms 1, 6, and 8 is very low, and evidence of their use as storage rooms is not apparent in the macrobotanical assemblage. Taxonomic diversity was also low in Room 9, the largest of the back rooms. The back rooms could have been cleaned out before abandonment or the macrobotanical assemblage may be biased by sample size differences, as 15 flotation samples were analyzed from back rooms compared to 76 from front rooms. The heavy focus on front room sampling is a function of the paucity of features in backrooms, extensive rodent disturbance, and a lack of the concentrated deposits of plant material (i.e., piles of maize) found in the front rooms.

Room 3

The probable fieldhouse (Room 3) flotation and vegetal samples were taken from post-occupational fill and wallfall. Macrobotanical remains consisted of maize embryo and kernel fragments, as well as cupules, and piñon needles. Cottonwood/willow, juniper, mountain mahogany, oak, piñon, ponderosa, sagebrush, saltbush/greasewood, unknown conifer, unknown non-conifer, and wolfberry wood were also identified. Piñon needles may be part of firewood debris and maize parts probably represent a combination of cooking accidents and the use of cobs for fuel.

Roomblock 3

Roomblock 3 was only partially excavated and in most cases only a basal course of masonry existed to define room outlines. A lack of wallfall in many of the 13 rooms indicates that construction of rooms may never have been completed. Carbonized plant material consisted of cheno-am, goosefoot, groundcherry, and grass seeds, grass stems, maize cupules and kernels, conifer cone scales, twigs, and needles, four coniferous woods, and nine non-conifers. Uncharred plant material was abundant and included Russian olive seeds, an obvious intrusive species. Occupants of this roomblock utilized disturbance-loving plants and grasses, grew maize, and collected local wood species for fuel and construction material.

Extramural Features

Flotation samples from a midden to the east of Roomblock 1 contained annual seeds, maize cupules, cupule segments, and kernels, groundcherry seeds, piñon nutshell and needles, along with juniper, piñon, sagebrush, saltbush/greasewood, and unknown conifer wood. The fill around Burial 2 that was found in the midden contained similar plant material, indicating that although the individual was placed in a natural niche in the bedrock and may have been covered with a tuff slab, plant material from the sample derives from midden deposits.

Maize and juniper, piñon, and saltbush/greasewood wood were recovered from an ashy area east and southeast of Roomblock 1 (Feature 3). This feature may be a deflated hearth, representing an extramural area where maize may have been prepared. Another ash/charcoal stain (Feature 21) in an extension of the middle wall of Roomblock 1 with an associated floor surface produced maize, possible squash, and purslane seeds along with juniper, pine, and oak wood and could represent cooking accidents from additional extramural activities.

Vegetal Samples

Ubiquity of wood from the vegetal samples is close to that of flotation charcoal with the exception of ponderosa and cottonwood/willow (Table 14.109). In the flotation samples, ubiquity of cottonwood/willow was 18 percent and ponderosa pine was 23 percent. In the vegetal samples, the percent presence of cottonwood/willow (43%) and ponderosa pine (46%) is double that found in the flotation samples. This appears to be an example of a bias toward larger diameter specimens when collecting vegetal samples in the field. Box elder, New Mexico locust, and wolfberry wood were identified in the vegetal samples but not in the flotation samples. Two beam fragments from Room 2 were identified as juniper.

Table 14.109. Ubiquity of vegetal sample wood charcoal from LA 12587.

Common Name/Plant Part	Count*	%**
Box elder wood	2	2
Cottonwood/willow wood	42	43
Desert olive wood	15	15
Douglas fir wood	9	9
Juniper wood	78	80
Mountain mahogany wood	11	11
New Mexico locust wood	2	2
Oak wood	25	26
Pine wood	47	48
Piñon wood	52	53
Ponderosa pine wood	45	46
Rabbitbrush wood	1	1
Rose family wood	3	3
Sagebrush wood	28	29
Saltbush/greasewood wood	40	41
Unknown conifer wood	60	61
Unknown non-conifer wood	23	23
Wolfberry wood	5	5

*Number of samples with common name/wood present; **Number of samples with common name/wood divided by total number of vegetal samples with wood charcoal (98) × 100.

Six percent (330) of the incredibly large number of whole kernels (n = 5264) recovered in flotation and vegetal samples was measured (Appendix V). The average height of the sub-sampled kernels was 7.3 mm, the average width was 6.6 mm, and the average thickness was 4.0 mm. Four kernels from LA 4624, an Early Coalition period pueblo also on Mesita del Buey (McBride and Smith 2002) and 122 kernels from LA 135290, a Middle Coalition roomblock on the Los Alamos Town Site Mesa (Chapter 25, this volume), will be compared with those from LA 12587 later in the discussion section.

The average row number of 20 maize cobs from LA 12587 was 10 and rows were straight in appearance (Table 14.110). The average rachis segment length was 3.4 mm, the average cob diameter was 10.3 mm, and the average cupule width was 5.2 mm. Environmental stress such as high temperatures and water or nutrient deficiencies during various early developmental stages of a maize plant can lead to ears that are partially or completely barren (Muenchrath and Salvador 1995:316). Only one cob with an undeveloped row may have been a product of this kind of environmental stress. Five cobs from LA 86534 (Chapter 24, this volume), two from LA 4624 (McBride and Smith 2002), and 17 from LA 135290 (Chapter 25, this volume) will also be compared to cobs from LA 12587 in the discussion section later.

Table 14.110. *Zea mays* cob morphometrics (in mm) from LA 12587.

FS No.	Row #	Type	Length	Rachis Segment Length	Cob Diameter	Cupule Width
965	12	ST	27.7	2.9	14.2	6.4
1094	12	ST, U	18.4	3.4	11.6	5.8
1306	8	ST	12.8	2.9	5.6	4.1
1401	8	ST	12.9	2.6	6.9	4.4
1567	12	ST	26.0	3.9	13.5	5.3
1939	10	ST	18.9	2.5	7.5	3.7
2555	10	ST	19.7	3.8	14.3	7.0
2555	12	ST, T	22.9	3.1	10.5	4.0
2639	8	ST	14.5	4.0	12.1	7.0
2639	8	ST	17.7	3.4	9.1	6.9
2831	8*	ST	19.5	4.0	8.6	7.5
2831	12	ST	13.8	3.4	9.1	4.1
2831	12	ST	10.8	3.5	8.7	3.7
2831	10	ST	21.1	3.8	10.7	5.8
2831	12	ST	22.5	4.2	12.6	5.2
2832	12	ST	16.6	3.1	10.2	3.9
2832	10	ST	41.9	3.6	14.7	6.6
2888	12	ST	13.1	3.1	9.5	4.0
2888	8	ST	14.5	3.4	7.3	3.8
5141	10	ST	20.2	2.8	10.0	5.5
Averages	10	All straight	19.3	3.4	10.3	5.2

*2 rows of cob have kernels; T = tip, U = undeveloped row present.

Other charred non-wood plant parts were limited to pine bark scales and cone umbos. These are probably part of the record as a result of firewood use. An uncharred grape seed was recovered in FS 1029 from Room 1 (Stratum 1) that is described as a loose surface deposit with some artifacts and vegetal material. The context and the uncharred state of the seed suggest it is non-cultural or modern in origin.

Pollen Remains (Susan J. Smith)

A total of 122 pollen samples were analyzed from LA 12587. Table 14.111 lists the frequency of identified pollen types. Cultigens identified in the assemblage included cotton and squash in low numbers, with higher amounts of maize, maize aggregate pollen, and cholla. Economic resources identified in the pollen assemblage included prickly pear and prickly pear aggregates, cactus family and cactus family aggregates, beeweed, sunflower type, lily family (which includes yucca, wild onion, and sego lily), nightshade family, parsley family, cattail, sedge, mint family, and purslane. A number of other potential economic resources were identified in the assemblage (Table 14.111), and these are described in detail in Smith's chapter in Volume 3 (Chapter 63).

Table 14.111. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 12587 (*n* = 122)
Cultigens	*Gossypium*	Cotton	2
	Cucurbita	Squash	1
	Zea mays	Maize	65
	Zea Aggregates	Maize Aggregates	16
	Opuntia (Cylindro)	Cholla	34
Economic Resources	*Opuntia* (Platy)	Prickly Pear	60
		Prickly Pear Aggregates	4
	Cactaceae	Cactus Family	1
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	57
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	1
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	1
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	2
	Portulaca	Purslane	4
Other Potential Economic Resources	Rosaceae	Rose Family	7
	Eriogonum	Buckwheat	4
	Brassicaceae	Mustard Family	9
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 12587 (*n* = 122)
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	2
	Polygala type	Milkwort	0
	Poaceae	Grass Family	72
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	2
Riparian Types	*Populus*	Cottonwood, Aspen	1
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs and Possible Subsistence Resources	Cheno-Am	Cheno-Am	99
		Cheno-Am Aggregates	39
	Fabaceae	Pea Family	2
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	98
		Sunflower Family Aggregates	2
	Ambrosia	Ragweed, Bursage	35
		Ragweed/Bursage Aggregates	1
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	2
	Sphaeralcea	Globemallow	2
		Globemallow Aggregates	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 12587 (*n* = 122)
	Euphorbiaceae	Spurge Family	70
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	12
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	1
	Convolvulaceae	Morning Glory Family	2
Regional to Extralocal Native Trees and Shrubs and Potential Subsistence Resources	*Pseudotsuga*	Douglas Fir	7
	Picea	Spruce	5
	Abies	Fir	18
	Pinus	Pine	95
		Pine Aggregates	2
	Pinus edulis type	Piñon	95
	Juniperus	Juniper	79
		Juniper Aggregates	0
	Quercus	Oak	16
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	22
	Artemisia	Sagebrush	92
		Sagebrush Aggregates	2
	Unknown Small *Artemisia*	Unknown Small Sagebrush	20
		Small Sagebrush Aggregates	1
	Sarcobatus	Greasewood	1
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SITE OCCUPATIONAL HISTORY

The earliest component at LA 12587 is an Archaic lithic scatter (Chapter 15, this volume). The first evidence for post-Archaic period use of the site comes from two early archaeomagnetic dates from one of the Room 2 hearths (Feature 20) and the presence of a small amount of early 13th century ceramics. These indicate that there was a Puebloan occupation of LA 12587 at circa

AD 1200. However, no other features or architectural elements can be linked with this occupation. Given the buried context of Feature 20 and the lack of early dates associated with other Roomblock 1 features, it is possible that the present pueblo was built over (or incorporated into) an earlier structure, perhaps one that had been uninhabited for some time. Based on his analysis of the ceramic artifacts, Wilson (Volume 3) argues that most of the Coalition period occupation at LA 12587 occurred during the early and middle 13^{th} century. Some samples of dated materials exhibit date ranges in the early to middle 13^{th} century. A cluster of radiocarbon and archaeomagnetic dates indicates that the final occupation of Roomblock 1 occurred in the late 13^{th} or early 14^{th} century. Unfortunately, it is unclear if Roomblock 1 was continually inhabited from circa AD 1200 to the late 13^{th}/early 14^{th} century of if there were multiple episodes of habitation.

After Roomblock 1 was abandoned, construction of Roomblock 3 began. This roomblock was never finished and was probably never inhabited. No firm dates can be assigned to Roomblock 3, but based on its stratigraphic relationship to other components, it dates to the Late Coalition or Early Classic period.

The last component at LA 12587 consists of an isolated room (Room 3) and several rock features (Features 17, 18, and 22). Room 3 was built on top of Roomblock 1 wallfall and so post-dates the pueblo. The temporal relationship between Room 3 and Roomblock 3 is less clear. One line of tenuous evidence indicating a younger age for Room 3 is that, before excavation, some wall tops of Room 3 were visible on the surface whereas most of Roomblock 3 was buried. While unlikely, it is *possible* that Room 3 pre-dates, or is contemporaneous with, Roomblock 3. Features 17, 18, and 22 overlay parts of Roomblock 3. All three features are situated in the A horizon indicating that they are at least roughly contemporaneous. It is possible that some or all of the rock features in Areas 3 and 6 are also part of this final component. While it cannot be demonstrated that Room 3 and Features 17, 18, and 22 are all contemporaneous, all four of these elements do appear to represent an agricultural use of the site. The presence of several biscuitware and glazeware sherds may indicate an Early to Middle Classic period date for these features.

SUMMARY OF SITE EXCAVATIONS

LA 12587 is a multi-component Puebloan and Archaic site. The earliest occupation is represented by a lithic artifact scatter dating to the Late Archaic period (Chapter 15, this volume). The components discussed in this chapter consist of a seven-room pueblo and associated midden dating to the Late Coalition period (an early hearth in this roomblock indicates there may also have been an Early and/or Middle Coalition period occupation), a partially completed 13-room pueblo dating to the Late Coalition or Early Classic period, and multiple agricultural features including a grid garden and a one-room structure that probably date to the Early or Middle Classic period.

LA 12587 does resemble other excavated Coalition period sites on the Pajarito Plateau, containing front habitation rooms with hearths and smaller rear storage rooms. A range of botanical remains were identified from flotation samples recovered from the hearths, including maize, beans, cheno-ams, dropseed grass, and tobacco. In addition, squash rind, piñon nuts, groundcherry and sunflower were also represented at the site. The faunal remains also include a variety of species like jackrabbit, cottontail, rock squirrel, mule deer, turkey, and red-tailed hawk.

The ceramic assemblage primarily consists of Santa Fe Black-on-white and smeared-indented corrugated ceramics. The dominance of these ceramics types, coupled with the paucity of Kwahe'e and the presence of Wiyo, Galisteo, and Mesa Verde Black-on-white, reflects a Late Coalition period of occupation. The AMS and archaeomagnetic dates overlap and cover a similar two-sigma range from AD 1275 to 1325.

The stone tool technology reflects an emphasis on core reduction of materials like chalcedony, Pedernal chert, and obsidian. Most of the obsidian appears to have been obtained from nearby sources in the Valles Caldera. The retouched tool assemblage includes a mix of expedient flake tools like retouched pieces and perforators and formal tools like bifaces, projectile points, and unifaces. The manos are represented by both one- and two-hand varieties. The metates consist of undetermined fragments, which could represent millingstones or slab types. In addition, the presence of polishing stones, abrading stones, and an axe indicates that a variety of domestic activities were occurring at the site.

CHAPTER 15
WHITE ROCK TRACT (A-19): LA 12587 (AREA 8)

Kari M. Schmidt

INTRODUCTION AND SITE SETTING

LA 12587 is a multi-component site that includes the remains of a Late Coalition period roomblock (see Chapter 14, this volume) and a Late Archaic period lithic scatter (Area 8). Area 8 is situated on a knoll at the southern end of Mesita del Buey and lies at the confluence of Cañada del Buey and Pajarito Canyon. The area is covered with piñon and juniper trees and sits at an elevation of 1979 m (6500 ft). The roomblock portion of the site is located on a small knoll and is located slightly upslope and to the north of the lithic scatter. To demarcate the lithic scatter from the roomblock portion of the site, the scatter was given a separate area number (Area 8) during excavation activities at the site. Area 8 consists of a Late Archaic period lithic scatter at the southern end of LA 12587, as well as the continuation of the midden associated with the roomblock at LA 12587.

Area 8 is located south of a two-track road that runs northeast to southwest along the ridge on which LA 12587 sits (see Figure 14.3). The two-track road is used by Los Alamos County to aid in the servicing of an existing Los Alamos County power line. From the two-track, the artifact scatter extends southeast to the edge of the hilltop where a distinct line of outcropping bedrock marks the hilltop edge. From this point southward and eastward, the land slopes steadily downward until the valley bottom flattens out some 50 m distant. There is a fairly heavy cover of piñon and juniper across the surface of the scatter with small but contiguous patches of outcropping bedrock.

SITE DESCRIPTION

Area 8 consisted of two concentrations of artifacts: a Late Archaic occupation in the southern portion of the area and the continuation of the midden associated with the roomblock at LA 12587 in the northern portion. In-field analyses conducted during the original assessment of the site sampled two dogleashes and a linear transect. The dogleash samples were 1 and 2 m samples, respectively, and the transect was 5 by 27 m. Both of the dogleash samples were located within the boundaries of the Coalition period roomblock, while the sample transect was located in Area 8, the Late Archaic period lithic scatter.

Obsidian comprised over 96 percent of the chipped stone debitage identified within the sample transect; other identified materials included Pedernal chert, other chert, and basalt. Excluding over 100 pieces of obsidian microdebitage located on an anthill in the transect, the chipped stone in this area was fairly evenly split between core flakes (32%), biface flakes (29%), and microdebitage (26%). The remaining pieces of debitage were either unidentified flakes (12%) or angular debris (1%). The base of a Late Archaic obsidian projectile point and a one-handed rhyolite mano were identified in this area of the site. Based on the high percentage of obsidian debitage and the Late Archaic projectile point in the area south of the roomblock, it was determined that there were multiple components at LA 12587, including both Archaic and Coalition periods.

FIELD METHODS

Fieldwork began with the initial assessment of the Area 8 site area. The crew walked over the site, delineated the boundaries, and identified the presence of artifact concentrations and features. A 1- by 1-m grid system that was laid out during the initial ground-penetrating radar survey of the roomblock at LA 12587 was also used during the excavations of Area 8. The central site datum (100N/100E) was established near the center of the roomblock, with controlled surface collections being made across the entire site area.

After the grid was laid out and before the collection of any artifacts, the crew walked around the site area and pin-flagged surface artifacts. Based on the visual demarcation of artifact density displayed by the distribution of pin-flags, surface artifacts were collected in a 5200-m^2 area. This area included both the Late Archaic lithic scatter and the midden associated with the roomblock.

During the surface collection, all artifacts were collected according to their unit designation. Artifacts were bagged separately according to material type (except when the total number of artifacts from the grid was less than five), and each bag was given a separate field specimen (FS) number. While chipped stone debitage and ceramics were collected within the general 1- by 1-m grid they were located in, the location of formal chipped stone tools and ground stone items were point-provenienced. A total of 1842 pieces of chipped stone, 1802 ceramics, and 96 pieces of ground stone were collected from the surface in Area 8. Figure 15.1 shows personnel conducting the surface collection in Area 8.

Figure 15.1. Surface collection of Area 8.

Subsequent to the field season, all artifacts collected from the individual grids were entered into Surfer, version 7. From these data, maps of surface artifact distribution were generated. Figures 15.2 through 15.4 show the distribution of ceramics, chipped stone, and ground stone and fire-cracked rock (FCR), respectively. These maps show a distributional pattern commensurate with the multi-component nature of the site: ceramics dominate to the north and follow a general arc curving around the southern portion of the roomblock while the chipped stone materials dominate in the southern portion of the area where the Late Archaic use of the site occurred.

Many of the artifacts collected during the surface collection were submitted for analysis. Utilitywares formed the bulk of the ceramic assemblage comprising almost 80 percent. Decorated wares were dominated by Santa Fe Black-on-white (13%), with smaller percentages of Wiyo Black-on-white, Biscuit A (Abiquiu Black-on-gray), and San Juan whiteware (all less than 1%).

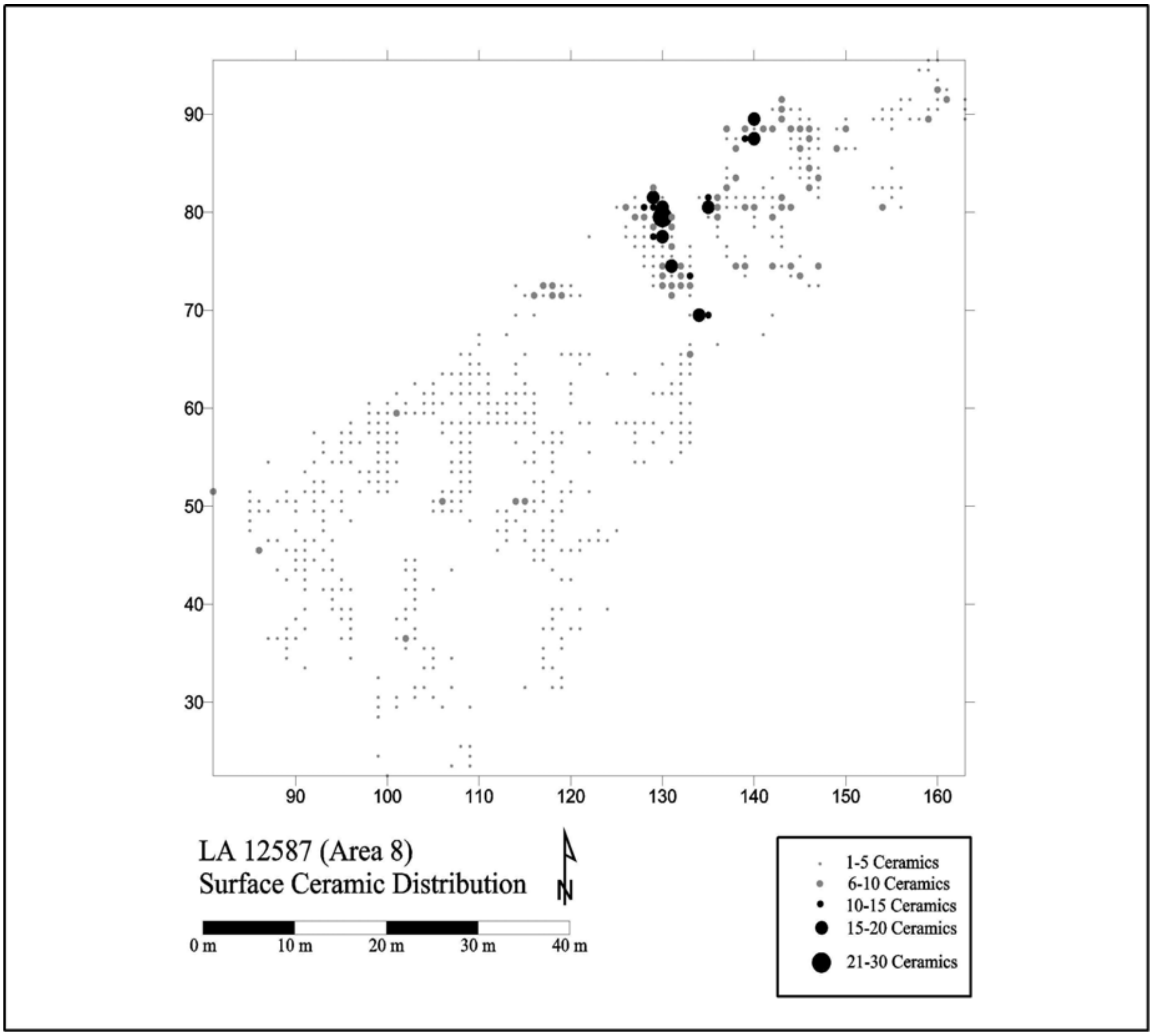

Figure 15.2. Distribution of ceramics on the surface of the site.

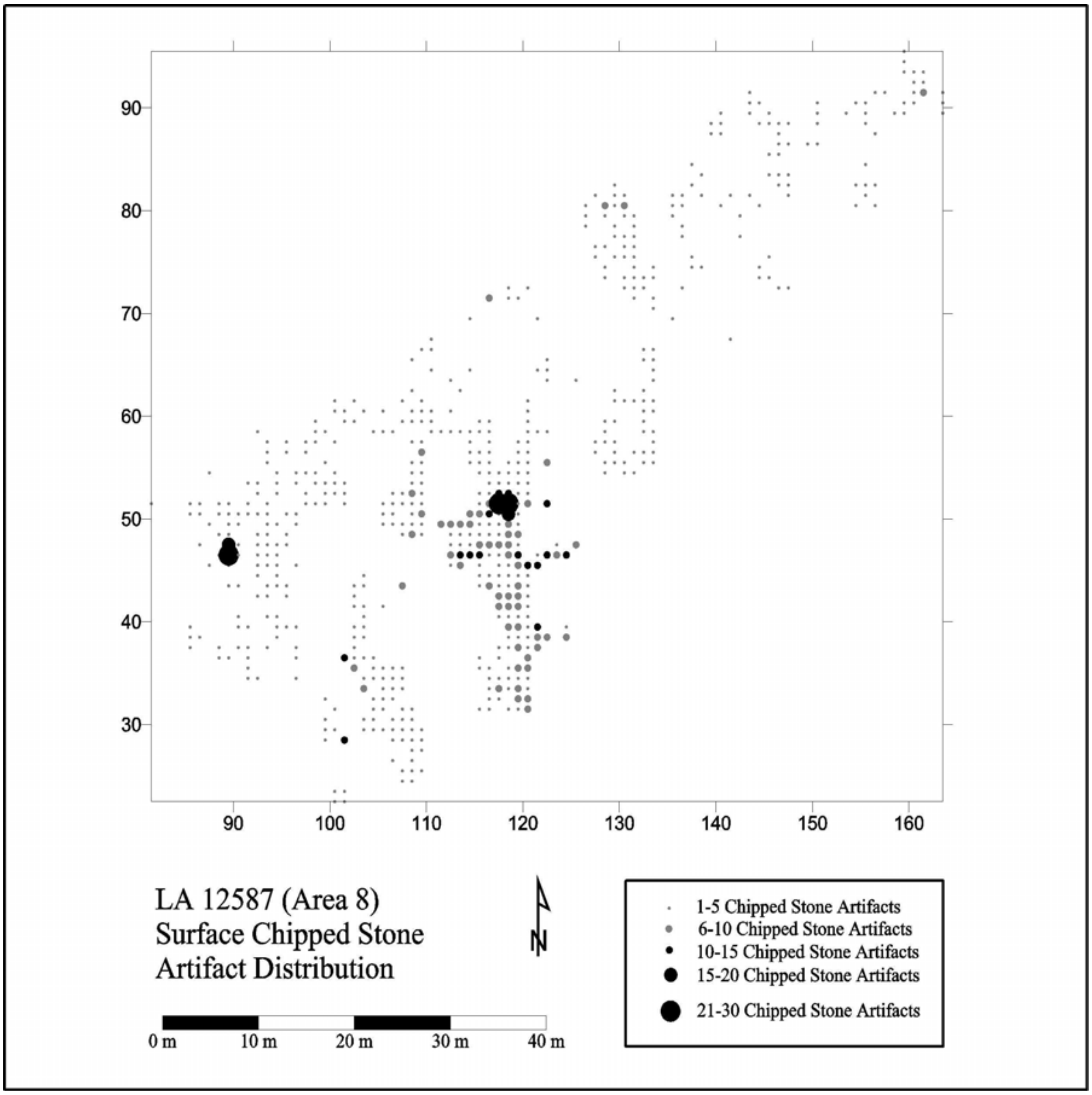

Figure 15.3. Distribution of chipped stone materials on the surface of the site.

Chipped stone material was also collected from the surface of Area 8. The most abundant type of material recovered from the analyzed surface sample was obsidian (*n* = 440, 91%), followed by chalcedony (*n* = 17, 4%), Pedernal chert (*n* = 6, 1%), and negligible amounts of rhyolite, basalt, and quartzite. Microdebitage comprised the majority of the debitage assemblage at nearly 53 percent. Biface and core flakes were the second most abundant type of debitage, making up 26 percent and 15 percent of the assemblage, respectively. Angular debris and unidentified flake fragments each comprised about 3 percent of the debitage assemblage. One chalcedony core was recovered. An obsidian biface and projectile point were each recovered from the surface of Area 8. No other retouched tools were identified.

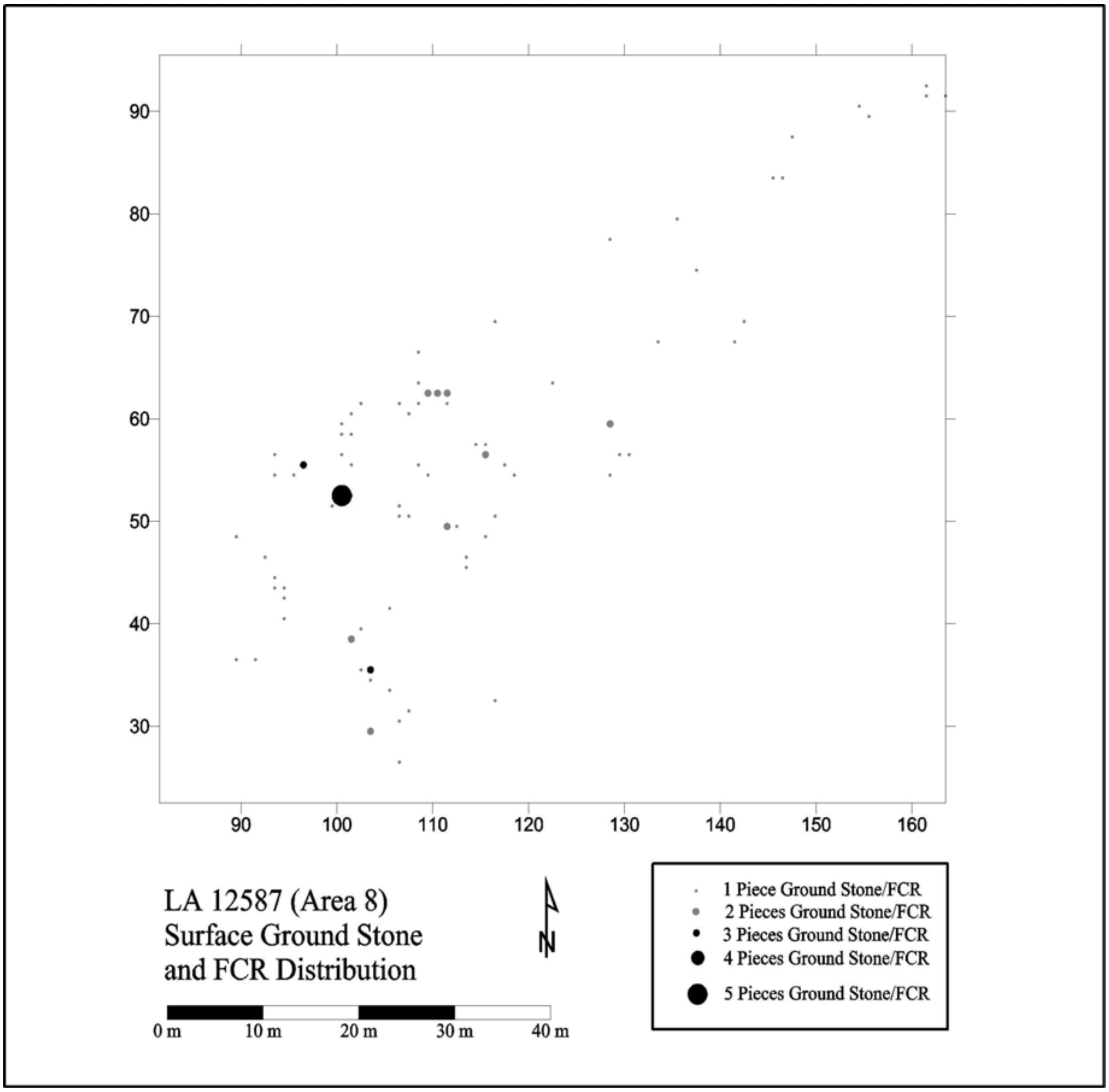

Figure 15.4. Distribution of ground stone and FCR across the surface of the site.

Eleven pieces of ground stone were analyzed from selected areas of Area 8. Just over half of these were made from dacite cobbles (*n* = 6), followed by andesite (*n* = 3) and quartzite and vesicular basalt (*n* = 1). Three of the dacite cobbles were mano fragments, while the other three were unidentified ground stone fragments. Andesite materials consisted of an unidentified metate fragment, an abrading stone, and an unidentified ground stone fragment. One quartzite polishing stone was identified, as was an unidentified vesicular basalt ground stone fragment.

Areas selected for excavation were placed in areas of high artifact density and/or in areas where it was suspected that greater soil depth might increase the chances of locating any subsurface features. Four 1- by 1-m units were selected for excavation. In all four of the excavation units, digging continued until bedrock was reached (see section on site excavation for more details).

STRATIGRAPHY (Paul Drakos and Steve Reneau)

The Late Archaic period lithic scatter is located in an area of thin soils over tuff bedrock that appears to have experienced significant erosion, and the lithic scatter may in part represent a lag left following erosion of an unknown thickness of mesatop soils (Drakos and Reneau, Volume 3). Excavations into relatively thick pockets of soil (up to 28 cm thick) inside the main artifact scatter revealed the presence of both ceramics and obsidian flakes to the base of a weakly developed soil (Table 15.1; see Appendix K for key). An excavation completed outside the main artifact scatter revealed a young colluvial deposit of similar thickness (20 cm) and a weakly developed soil (Table 15.2). Soils in the vicinity of the lithic scatter lack the Bw horizons typically observed in older post-Puebloan soils, and instead exhibit A-BC or A-C horizons. This weak soil development is consistent with a post-Puebloan age, possibly less than 500 years old. This observation is consistent with the interpretation that this is an actively eroding surface with minimal potential for preserving an intact archaeological record. Four 1- by 1-m units were excavated in Area 8, but soil profiles were only conducted in two units. Excavation units were placed in areas of greater soil development in an attempt to locate subsurface features. Stratigraphic sequences are described in the following pages and in Table 15.3.

Table 15.1. Geomorphologic analysis of test pits in Area 8, Test Pit Number 4, 51N/118E; inside main artifact scatter.

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
A	0-9	20-30	10YR4/4	10YR4/3	sl	1 msbk-m	so-lo	so, po	n.o.	e-	cs		Post-Puebloan; possibly < several 100 yrs.	gravel nodules, angular, basalt
BC	9-28	10-20	10YR4/4	10YR4/3	scl	1 msbk	so	ss, ps	n.o.	es	ai			young colluvium w/ ceramics + lithics to base
R	28+												-	tuff

Table 15.2. LA 12587 (Area 8), White Rock Land Transfer Parcel, Test Pit # 2, 36N/103E; outside main artifact scatter.

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
A	0-2	30	10YR4/3	10YR3/3	scl	1-2 mpl	so	ss, ps	n.o.	es	cs		Post-Puebloan; possibly < several 100 yrs.	young colluvium
C	2-20	30	10YR4/3	10YR3/3	sl	m	lo	so, po	n.o.	es	aw			young colluvium
R	20+													tuff

Table 15.3. Stratigraphic sequence used during excavation at Area 8.

LA 12587 (Area 8) Stratigraphic Summary							
Strat #	Provenience	Max. Thickness	Min. Thickness	Elevation	Color	Texture	Comments
1	35N/90E 36N/103E 47N/118E	0.02	0.01	0 – 2 cm bgs	10YR5/4	Silty sand	Very thin stratum of silty sand. Also a lot of duff and other vegetal matter.
2	35N/90E 36N/103E 47N/118E	0.28	0.20	2 – 30 cm bgs*	10YR5/4	Sandy loam	Sandy loam with slightly more inclusions than Stratum 1, including pebbles and artifacts. No mottles. Lower boundary is bedrock.

* = centimeters below ground surface

51N/118E

Unit 51N/118E, which is located inside the Late Archaic lithic scatter, had several discrete stratigraphic units. The A horizon in this unit extended from the surface to 9 cm below the surface and contained 20 percent to 30 percent gravels. It was dark yellowish-brown in color and was identified as a sandy loam. This horizon had a weak subangular blocky to massive structure, was soft to loose in consistency, contained no observed argillans, and was slightly effervescent. The lower bounder of this horizon was identified as clear and smooth. Soils in this horizon were associated with the post-Puebloan period.

The BC horizon in this unit extended from 9 to 28 cm below surface and contained 10 percent to 20 percent gravels. The sediments were dark yellowish-brown in color, sandy clay loam in composition, and medium subangular blocky in structure. The horizon had a soft consistency with no observed argillans and was strongly effervescent. The lower boundary was abrupt and irregular and was thought to be post-Puebloan in age. The R (bedrock) horizon began at 28 cm below surface. Figure 15.5 shows this unit at the completion of excavation.

Figure 15.5. Unit 51N/118E at the end of excavation.

36N/103E

Unit 36N/103E, which was located outside the Late Archaic lithic scatter, also contained several stratigraphic units. The A horizon in this unit extended from 0 to 2 cm below the surface and contained 30 percent gravels. It was a brown, sandy clay loam with a weak to moderate medium platy structure. This horizon had a soft consistency, with no observed argillans, and was strongly effervescent. Its lower boundary was clear and smooth, and was likely post-Puebloan in age.

The C horizon extended between 2 and 20 cm below the surface and also contained approximately 30 percent gravels. Like the overlying A horizon, the C horizon was also brown in color, but had a sandy loam composition and a medium structure. It had a loose consistency with no observed argillans, was strongly effervescent, and had a clear, smooth lower boundary. Similar to the A horizon, this horizon is only several hundred years old and is likely post-Puebloan in age. The R horizon (bedrock) in this unit began about 20 cm below the surface. Figure 15.6 shows this unit after it was excavated.

Figure 15.6. Unit 36N/103E at the end of excavation.

SITE EXCAVATION

Excavations at LA 12587 (Area 8) were conducted in November and December of 2002. The crew consisted of Kari Schmidt (crew chief), Mia Jonsson, Mike Kennedy, Timothy Martinez, Bruce Masse, and Marjorie Wright. These personnel excavated four 1- by 1-m units in Area 8. Two were located in the western half of the scatter and two were located in the eastern half.

These units were excavated in arbitrary stratigraphic levels, until natural strata became clear enough to be used for excavation.

35N/90E (Test Pit 1)

The fill in this unit was a brown sandy loam soil down to bedrock, which was shallow in this unit and was encountered at about 12 to 15 cm below the surface. The majority of the unit was excavated to this depth, although a deep fissure ran through the center of the grid extending to 30 cm in depth. Lying atop the bedrock was a layer of matted roots that covered virtually the whole bedrock surface in the grid. The only cultural remains that were recovered in this unit were four small obsidian flakes, four smeared-indented corrugated ceramics, and a piece of piñon pine (*Pinus edulis*). A single flotation sample taken from excavations in this unit produced the following taxa: goosefoot (*Chenopodium*), unknown conifer (Gymnospermae), juniper (*Juniperus*), unidentified pine (*Pinus* sp.), and piñon pine.

36N/103E (Test Pit 2)

The soil in this unit was also brown and a sandy loam down to the top of bedrock. The bedrock was encountered about 12 cm below the surface in the northwest corner of the unit and sloped down generally toward the southeast to a depth of 30 cm. The upper 10 cm of fill contained large, fragmented chunks of unconsolidated bedrock, while closer to bedrock the soil was more consolidated. In the upper 10 cm of fill, 15 pieces of chipped stone (obsidian and Pedernal chert) and three plainware body and a smeared-indented corrugated sherd were recovered. In the sediments deeper than 10 cm below the surface, eight pieces of chipped stone (obsidian and chert) were found.

47N/118E (Test Pit 3)

In the upper 10 cm of this unit the soil was sandy loam, and between 10 and 25 cm below the surface it became a sandy clay loam. In the lower part of this level, just above the bedrock, there were fragmented pieces of bedrock mixed with the soil. From 0 to 10 cm there were 47 obsidian flakes, one chert flake, and two smeared-indented corrugated ceramics recovered from the fill. Between 10 and 25 cm below surface, 43 obsidian flakes, a Santa Fe Black-on-white sherd, a smeared-indented corrugated sherd, and a ground stone fragment were found. Additionally, a piece of piñon pine was identified in a macrobotanical sample and juniper remains were identified in a flotation sample.

51N/118E (Test Pit 4)

The soil in this unit was a brown, sandy loam from the surface down to bedrock, which presented itself as a somewhat discontinuous layer at approximately 30 cm below the surface. In the upper 10 cm there were 107 pieces of obsidian and a whiteware, plainware body and smeared-indented corrugated sherds. From 10 to 20 cm below the surface, 30 more obsidian flakes were found, and a flotation sample was collected from the fill. Identified taxa from this sample include unknown conifer and juniper. In the 20- to 30-cm level, seven pieces of obsidian and a single smeared-indented corrugated sherd were recovered.

SITE CHRONOLOGY AND ASSEMBLAGE

Some 4100 total artifacts were recovered from excavations in Area 8 at LA 12587. Analyses of the ceramics, lithics (chipped and ground stone), and archaeobotanical materials were conducted. Ceramic samples were taken from two transects in the northern portion (southern portion of the LA 12587 midden) of Area 8, while chipped stone materials were collected from two transects in the western section (Late Archaic focus) of Area 8. No faunal remains were recovered in the deposits, and taxa were identified in the single pollen sample from the site. No materials were submitted for radiocarbon analyses due to a lack of suitable material in the excavation units. However, obsidian artifacts were submitted for hydration dating. Results of the analyses that were conducted are presented in the following sections.

Obsidian Hydration

Ten obsidian artifacts from Area 8 at LA 12587 were submitted for age determination using the obsidian hydration method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rind, was measured. Second, the high temperature hydration rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site was estimated in order that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 15.4).

Table 15.4. Obsidian hydration dates for Area 8 at LA 12587.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
8363-1	2003-31	Cerro Toledo	2.14	1355	57
8373	2003-32	Cerro Toledo	3.44	-3049	295
8376	2003-33	Cerro Toledo	2.55	1041	73
8414	2003-34	Cerro Toledo	2.60	1668	22
8489	2003-35	Cerro Toledo	2.34	1537	36
8492-1	2003-36	Cerro Toledo	3.27	1456	31
8874-1	2003-37	Cerro Toledo	2.55	-176	170
8875	2003-38	El Rechuelos	3.85	-646	137
8883	2003-39	Cerro Toledo	4.24	-1607	170
S#2	2003-40	Cerro Toledo	2.73	482	110

The obsidian hydration dates provide a wide range from 3049 BC to AD 1668. On the other hand, a Late Archaic point was dated to AD 482, which seems to be in the appropriate range.

Later dates could reflect the reuse of the site, although the AD 1668 date seems quite late, and the three earliest dates seem too early.

Ceramics (Dean Wilson)

The majority of the ceramics analyzed from Area 8 are Santa Fe Black-on-white, smeared-indented corrugated wares, and plainwares suggesting a Coalition period occupation of the northern portion of the area. The percentages of pottery types, as well as the types of wares are very similar to the roomblock at LA 12587, suggesting the northern portion of Area 8 is likely a continuation of the arc-shaped midden forming the eastern and southeastern boundary of the site. Very few biscuitwares were identified, and no glazewares were identified. Tables 15.5 and 15.6 show the distribution of pottery types and temper types identified in ceramic samples collected and analyzed from Area 8.

Table 15.5. Distribution of ceramic types from Area 8 of LA 12587.

Ceramic Type	Frequency	Percent
Unpainted undifferentiated	2	1.4
Indeterminate organic paint	1	0.7
Santa Fe Black-on-white	17	12.0
Wiyo Black-on-white	1	0.7
Biscuit A (Abiquiu Black-on-gray)	1	0.7
Unpainted Santa Fe paste	7	4.9
Jemez/Santa Fe/Vallecitos	1	0.7
Plain rim	4	2.8
Plain body	27	19.0
Smeared-indented corrugated	79	55.6
Unpainted whiteware undifferentiated	1	0.7
Indented San Juan whiteware	1	0.7
Total	**140**	**100.0**

Table 15.6. Temper by ware for ceramics from Area 8 of LA 12587.

Ware	Temper				
	Granitic schist mica, quartz & feldspar	Fine tuff or ash	Fine tuff & sand	Andesite or Diorite & sherd	Ant-hill
Unpainted undifferentiated	--	1	1	--	--
Indeterminate organic paint	--	1	--	--	--
Santa Fe Black-on-white	--	6	11	--	--
Unpainted Santa Fe paste	--	4	3	--	--
Jemez/SF/Vallecitos	--	1	--	--	--
Plain rim	--	--	--	--	4

Ware	Temper				
	Granitic schist mica, quartz & feldspar	Fine tuff or ash	Fine tuff & sand	Andesite or Diorite & sherd	Ant-hill
Plain body	1	--	--	--	26
Smeared-indented corrugated	--	--	--	--	79
Unpainted whiteware undifferentiated	--	--	--	1	--
Indented San Juan whiteware	--	--	--	1	--
Total	**1**	**13**	**15**	**2**	**109**

Chipped and Ground Stone (Bradley Vierra and Michael Dilley)

Material Selection

A total of 485 artifacts were analyzed from two transects in the western portion (Late Archaic focus) of Area 8 at LA 12587, consisting of one core, 465 pieces of debitage, two retouched tools, and 11 ground stone items. This total represents a 22 percent sample of the 2196 total lithic artifacts recovered during the site excavations. Table 15.7 presents the data on lithic artifact type by material type. The majority of the debitage consists of obsidian, with a few items made from other materials. The presence of cortex on 4.0 percent of the debitage indicates that the materials were collected from both primary nodular (63.1%) and secondary waterworn sources. The obsidian and rhyolite are present at nearby sources in the Jemez Mountains, but obsidian flakes also exhibit waterworn cortex. In contrast, chalcedony, Pedernal chert, and quartzite are available from local Rio Grande Valley gravel sources.

Table 15.7. Lithic artifact type by material type from Area 8 at LA 12587.

Artifact Type		Material Type										
		Basalt	Vesicular Basalt	Rhyolite	Andesite	Dacite	Obsidian	Chalcedony	Chert	Pedernal	Quartzite	Total
Cores	Core	0	0	0	0	0	0	1	0	0	0	1
	Subtotal	0	0	0	0	0	0	1	0	0	0	1
Debitage	Angular Debris	0	0	0	0	0	12	1	0	2	0	15
	Core flake	1	0	1	0	0	55	9	1	4	0	71
	Biface flake	0	0	0	0	0	121	1	0	0	0	122
	Microdebitage	1	0	0	0	0	239	5	0	0	1	246

Artifact Type		Material Type										
		Basalt	Vesicular Basalt	Rhyolite	Andesite	Dacite	Obsidian	Chalcedony	Chert	Pedernal	Quartzite	Total
	Undetermined flake	0	0	0	0	0	11	0	0	0	0	11
	Subtotal	2	0	1	0	0	438	16	1	6	1	**465**
Retouched Tools	Biface	0	0	0	0	0	1	0	0	0	0	**1**
	Projectile point	0	0	0	0	0	1	0	0	0	0	**2**
	Subtotal	0	0	0	0	0	2	0	0	0	0	**2**
Ground Stone	Undetermined mano fragment	0	0	0	0	3	0	0	0	0	0	**3**
	Undetermined metate fragment	0	0	0	1	0	0	0	0	0	0	**1**
	Polishing stone	0	0	0	0	0	0	0	0	0	1	**1**
	Abrading stone	0	0	0	1	0	0	0	0	0	0	**1**
	Undetermined ground stone	0	1	0	1	3	0	0	0	0	0	**5**
	Subtotal	0	1	0	3	6	0	0	0	0	1	**11**
Other	Fire-cracked rock	0	0	0	0	6	0	0	0	0	0	**6**
	Subtotal	0	0	0	0	6	0	0	0	0	0	**6**
Total		**2**	**1**	**1**	**3**	**12**	**440**	**17**	**1**	**6**	**2**	**485**

Twenty-three pieces of debitage and two retouched tools were submitted for X-ray fluorescence analysis (Shackley, Volume 3). The majority of the artifacts were obtained from the Cerro Toledo source, with a single piece from the Valle Grande and El Rechuelos source areas (Table 15.8). The Cerro Toledo (Rabbit Mountain/Obsidian Ridge) and Valle Grande (Cerro del Medio) source areas are located about 15 km (10 miles) as the "crow flies" to the southwest and west of the site, while the El Rechuelos (Polvadera Peak) source area is situated about 30 km (19 miles) to the northwest.

Table 15.8. Obsidian source samples.

FS #	Artifact	Color	Source
S#2	Projectile point	Black opaque	Cerro Toledo rhyolite
8363-1	Debitage	Translucent	Cerro Toledo rhyolite
8363-2	Debitage	Translucent	Cerro Toledo rhyolite
8370-1	Debitage	Gray	Cerro Toledo rhyolite
8370-2	Debitage	Black 0paque	Cerro Toledo rhyolite
8373	Debitage	Brown	Cerro Toledo rhyolite
8376	Debitage	Translucent	Cerro Toledo rhyolite

FS #	Artifact	Color	Source
8414	Debitage	Gray	Cerro Toledo rhyolite
8489	Debitage	Black opaque	Cerro Toledo rhyolite
8492-1	Debitage	Black dusty	Cerro Toledo rhyolite
8492-2	Debitage	Black opaque	Cerro Toledo rhyolite
8492-3	Tool	Translucent	Cerro Toledo rhyolite
8496-1	Debitage	Green	Cerro Toledo rhyolite
8496-2	Debitage	Translucent	Cerro Toledo rhyolite
8499	Debitage	Green	Cerro Toledo rhyolite
8500-1	Debitage	Green	Cerro Toledo rhyolite
8500-2	Debitage	Translucent	Cerro Toledo rhyolite
8504	Debitage	Translucent	Valle Grande rhyolite
8510	Debitage	Green	Cerro Toledo rhyolite
8874-1	Debitage	Black opaque	Cerro Toledo rhyolite
8874-2	Debitage	Black opaque	Cerro Toledo rhyolite
8874-3	Debitage	Translucent	Cerro Toledo rhyolite
8875	Debitage	Black dusty	El Rechuelos
8883	Debitage	Green	Cerro Toledo rhyolite

Lithic Reduction

The single core was reduced using a bidirectional, opposed-different-face technique and was classified as being exhausted when discarded. Table 15.9 presents the metric information on this core.

Table 15.9. Core type dimensions (mm) and weight (gm).

Core Type	Length	Width	Thickness	Weight
Bi-directional	35	25	17	13.3

The debitage consists primarily of microdebitage (52.9%) and biface flakes (26.2%), with some core flakes (15.2%), and other items. The majority of the flakes exhibit single platforms (45.4%; *n* = 1 5), with dihedral (*n* = 1), multi-faceted (*n* = 4), collapsed (*n* = 3), and crushed (*n* = 10) platforms. Nineteen (57.5%) of the flake platforms exhibit evidence of preparation, with most of these being abraded/crushed and only four retouched/abraded platforms.

The majority of the core flakes consist of distal fragments (*n* = 37; 52.1%), with fewer whole (*n* = 1), proximal (*n* = 4), midsection (*n* = 27), lateral flake (*n* = 1), and undetermined flake (*n* = 1) fragments. Most of the biface flakes are also midsection fragments (*n* = 53; 43.4%), with fewer whole (*n* = 1), proximal (*n* = 25), and distal (*n* = 42) fragments. The single whole core flake has a length of 21.0 mm and the two whole biface flakes exhibit a mean length of 22.5 mm (*std* = 16.2). Lastly, angular debris have a mean weight of 0.7 g (*std* = 0.6).

The retouched tools consist solely of formal tools such as bifaces and projectile points. No retouched pieces were identified.

The biface is a distal fragment that was probably broken during manufacturing. It does exhibit an edge angle of 45 degrees, indicating that it could have been broken during the middle- to late-stage reduction process. Both projectile points are base fragments that are quite similar in form. The points contract towards the neck and contain a straight base that could reflect Late Archaic corner-notched base fragments.

Tool Use

Only three flakes (0.06%) exhibit evidence of damage that could be attributed to use-wear**.** Two have straight lateral edges with angles of 35 and 60 degrees, while the third was utilized on an edge with a straight outline and angle of 45 degrees. Three undetermined mano fragments, an undetermined metate fragment, a polishing stone, and five pieces of undetermined ground stone were identified during the analysis. The mano fragments probably represent broken one-hand cobble manos. The metate fragment is a burned piece of andesite with a single ground surface. The polishing stone is a quartzite pebble with some polish on one surface. Lastly, the undetermined ground stone consists of small fragments that exhibit a ground surface. Some of these fragments are burned.

Archaeobotanical Remains (Pamela McBride)

Goosefoot and pitseed goosefoot seeds comprised the only carbonized floral remains from excavations in Area 8 (Table 15.10). Non-cultural material consisted primarily of conifer duff along with goosefoot, spurge, and prickly pear cactus seeds. Fragments of juniper and unknown conifer charcoal were recovered in flotation samples. Vegetal samples from Units 1 and 3 yielded five specimens of piñon wood. The meager botanical information indicates that some weedy annual seeds may have been used for food, whereas, locally available conifers could have provided a source for firewood.

Table 15.10. Flotation sample plant remains from Area 8 at LA 12587.

FS No.	8876	8877	8888
Feature	**Test Pit 3**	**Test Pit 4**	**Test Pit 1**
Cultural Annuals			
Goosefoot	3(3)	3(3)	
Pitseed goosefoot	1(1)	1(1)	
Non-Cultural Annuals			
Goosefoot	+		
Spurge		+	+
Perennials			
Juniper		twig +	+, twig +
Pine			umbo +
Piñon			needle +
Prickly pear cactus		+	

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter.

SUMMARY

Area 8 at LA 12587 contains a large, fairly dense scatter of artifacts. While there was a general scatter of debitage over the entire area, there were distinct concentrations identified during mitigation. Of the total assemblage, 52 percent was chipped stone, 45 percent was ceramics, and less than 1 percent was ground stone. Most of the ceramics were located in the northeastern third of the site and were associated with the midden at the roomblock portion of LA 12587. Ceramic analyses confirm a Coalition period occupation. In contrast, the majority of chipped and ground stone artifacts were found in the southwestern half of the site, in the area thought to represent an Archaic occupation.

The chipped stone assemblage consisted primarily of small obsidian biface-thinning flakes, with a biface and possible Late Archaic dart points; whereas, the ground stone artifacts included possible one-hand cobble mano fragments and metate fragments. The different artifact classes and wide range of obsidian hydration dates recovered within Area 8 support multiple uses of the area, corroborating the initial assertion that LA 12587 was a multi-component site. A Late Archaic point was dated to AD 482±110, which lies within the defined temporal range of the point style. The few botanical items recovered from the test pits indicate that weedy annuals could have been used as food items at the site, although the context is poorly defined.

CHAPTER 16
WHITE ROCK TRACT (A-19): LA 86637

Kari M. Schmidt and Michael D. Kennedy

INTRODUCTION AND SITE SETTING

LA 86637 was identified during the initial pedestrian survey of the White Rock Tract as a fieldhouse surrounded by a dispersed ceramic and lithic artifact scatter. The fieldhouse is located on a small rise above an ephemeral drainage at the mouth of Cañada del Buey, and dominant vegetation in the area includes piñon and juniper trees, with an understory comprised of saltweed, snakeweed, yucca, and various other native grasses, shrubs, and forbs. The site is situated at an elevation of 1973 m (6475 ft). The fieldhouse is located on property owned by San Ildefonso and was not excavated as part of this project. A small portion of the artifact scatter was located just across the San Ildefonso/Los Alamos National Laboratory (LANL) boundary and several test pits were placed on properties that were being transferred from LANL to Los Alamos County. A fairly prominent arroyo that runs east-west is located approximately 5 m south of the artifact scatter. This arroyo joins the larger one that is just north of LA 128803, the grid garden (see Chapter 19, this volume). Large basalt outcrops are located immediately south of the artifact scatter.

SITE DESCRIPTION

The site is comprised of a small one- to two-room fieldhouse situated within a much larger lithic and ceramic artifact scatter. The fieldhouse was not excavated because it was on property owned by San Ildefonso Pueblo. A large percentage of the artifact scatter was also on San Ildefonso property and, as a result, artifacts from only a small portion of the site were collected and test excavations were limited to the most southern portion of the site. Much of the material associated with the fieldhouse appeared to be part of a background scatter that reflected a long period of use over a 45- by 90-m area. The fieldhouse is a small rubble mound measuring 2.5 by 3.7 m in size that was constructed from shaped tuff blocks. The largest of these blocks measures about 80 by 45 cm. The structure itself appears to be in good condition, but has been impacted on the east and west sides by active erosion associated with two small arroyos.

During the initial survey, an in-field analysis was conducted in a 10-m catchment area around the structure. This sample produced a total of 46 artifacts, including a Biscuit B (Bandelier Black-on-gray) sherd, a single obliterated corrugated sherd, and several pieces of Pedernal debitage. Additionally, artifacts were collected from a 10- by 20-m transect. Artifacts in this transect included a few Santa Fe Black-on-white sherds, Wiyo Black-on-white sherds, biscuitwares, a Sankawi Black-on-cream sherd, several Tewa Polychrome sherds, and utilitywares (n = 15). Most of the chipped stone artifacts in the artifact cluster were Pedernal chert and obsidian core flakes, with a few other debitage types. Other materials included two cores, a retouched flake, two projectile points, a one-hand mano, two unmodified quartzite river cobbles, and three quartzite one-hand manos. The projectile points were both made of obsidian and appeared to be Late Archaic in age.

Only the portion of the site containing the lithic and ceramic scatter was transferred to Los Alamos County, the remainder of this chapter deals only with that area. The portion of the lithic and ceramic scatter of concern to this project is located about 50 m downslope of the fieldhouse. Figure 16.1 shows the plan view of the site and shows which portions were subject to collection.

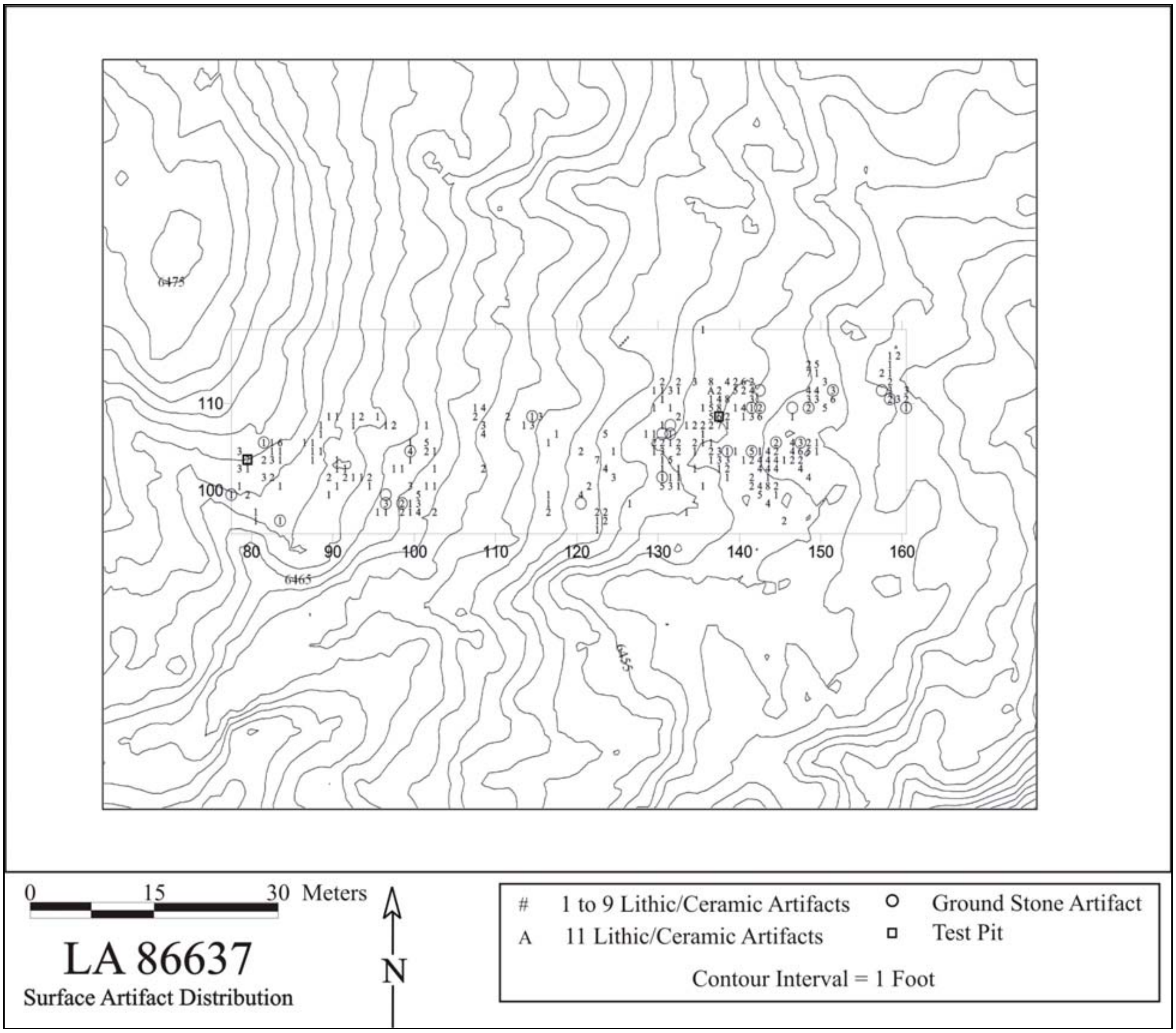

Figure 16.1. Surface artifact distribution at LA 86637.

FIELD METHODS

Fieldwork began at LA 86637 in December of 2002 and continued for just over two weeks. Work began with an initial assessment of the site. The crew walked over the site area, delineating the site boundaries and identifying the presence of artifact concentrations and features (Figure 16.2). Additionally, with the aid of a GPS unit, the San Ildefonso boundary was delineated and demarcated and no collections were made on the San Ildefonso side of the line. Mitigation of LA 86637 was limited to that portion of the site that lay south of the boundary between San Ildefonso and Los Alamos County. This included an area that was roughly 80 m east-west by 10 to 15 m north-south. The artifacts were located during a pedestrian survey and their locations were marked with pin flags. Once the extent of surface debitage and site limits were delineated, the site was gridded out in 1- by 1-m units. Individual grid units were designated by the horizontal coordinates at their southwest corner. The site datum was established near the center of the artifact scatter at 100N/100E for horizontal control.

Figure 16.2. North-south view of LA 86637.

Surface artifacts from Los Alamos County land were collected, bagged, and provenienced by the square meter. Figure 16.1 shows the distribution of surface artifacts that were collected. A total of 468 lithics, 118 ceramics, and 28 ground stone artifacts were collected. No bone or charcoal samples were recovered. The lithic assemblage included a reworked Late Archaic projectile point, but interestingly, the ceramics included historic Tewa polychrome sherds. In the ground stone assemblage there were several mano and metate fragments that also appeared to be Archaic in form.

Two 1- by 1-m test units were excavated. These units were located in different areas of the scatter with one in the southern portion of the site, where surface rock indicated the possibility of buried deposits, and one near the northern end of the site in an area where an Archaic point was noted during the original survey. All artifacts from the excavations were collected and recorded and the soils were sampled for flotation and/or pollen from appropriate stratigraphic levels. All fill was screened through 1/8-in. mesh.

STRATIGRAPHY (Paul Drakos and Steve Reneau)

The portion of LA 86637 of concern here contains a lithic and ceramic scatter that probably represents material transported down a colluvial slope from a Classic period fieldhouse. As already mentioned, the fieldhouse lies on San Ildefonso property and is therefore outside the scope of the current undertaking. Because of the extensive erosion in this area, and because the site lies between two channels incised into the colluvial slope, in situ deposits are unlikely. This is confirmed by stratigraphic assessments presented and discussed in the following pages (Table 16.1).

Table 16.1. Stratigraphic sequence used in the field at LA 86637.

LA 86637 STRATIGRAPHIC SUMMARY							
Stratum #	Provenience	Maximum Thickness	Minimum Thickness	Elevation	Color	Texture	Comments
1	Test pits 1 and 2	0.10	0.04	0 to 10 cm bgs*	10YR5/3	Loamy sand	Ac Horizon. Loose and massive. Five percent to 10% gravels, no argillans.
2	Test pits 1 and 2	0.21	0.10	10 to 31 cm bgs	7.5YR5/3	Sandy loam	Soft to slightly hard, lots of carbonates, 10% to 20% gravels, BkB horizon, no argillans, discontinuous, effervescent.
3	Test pits 1 and 2	0.15	0.07	31 to 46	7.5YR4/3	Sandy loam	Soft to slightly hard, cicada burrows, 10% to 20% gravels, plastic, effervescent, Bk-B_2 horizon. Boundary is clear and irregular.
4	Test pits 1 and 2	--	0.05	46+	7.5YR6/4	Sandy loam	Small nodules, slightly hard, Bk-B_2 horizon, slightly plastic, less than 10% gravels. Found to bottom of test pit, but stratum may have gone deeper.

*centimeters below ground surface

103N/79E

The soil profile from this unit shows that the test unit has an AC-Bw1b1-Bw2b1-Btkb2 horizon sequence that represents very young colluvium from 0 to 6 cm that overlies post-Coalition period colluvium that was observed to a depth of 43 cm (Table 16.2; see Appendix K for key). The young colluvium overlies a Pleistocene colluvial soil. Artifacts (lithics and ceramics) scattered throughout the AC, Bw1b1, and Bw2b1 horizons are interpreted to be part of the young colluvial package and therefore are not in archaeological context.

The AC horizon falls between 0 and 10 cm and contained 5 percent to 10 percent gravels. The sediments were a brown loamy sand with a loose consistency. They were strongly effervescent with a clear, but smooth, lower horizon boundary. The Bk1b1 horizon was located between 10 and 31 cm and contained 10 to 20 percent gravels. It was a brown sandy loam, had soft to slightly hard consistency, was strongly to violently effervescent, and had a gradual, smooth lower horizon boundary. The Bk2b1 horizon was located between 31 and 46 cm. It had 10 percent to 20 percent gravels, was a brown sandy loam, had soft to slightly hard consistency, was strongly to violently effervescent, and had a clear, irregular lower horizon boundary. The Bkb2 horizon fell between 46 and 50 cm below the surface. It contained less than 10 percent gravels, was a light brown sandy loam, had a slightly hard consistency, and was violently effervescent.

108N/137E

The soil profile of 108N/137E had an AC-Bwk1b1-Bwk2b1-Bkb2 horizon sequence interpreted to represent deposition of young colluvium from 0 to 10 cm. This layer overlaid 2 to 4 ka colluvium with Stage I carbonate from 10 to 46 cm (Table 16.3; see Appendix K for key). The age estimate for the Bwk horizons with Stage I carbonate was based on comparison with the Fence Canyon borrow pit description, which exhibited a Stage I carbonate with a surface age of approximately 4 ka and an 8 ka age at depth (Reneau and McDonald 1996). The Holocene colluvium overlies a Pleistocene colluvial soil. Ceramics and lithics observed in the upper 10 cm are part of the young colluvial package and are not in archaeological context. Lithics were only observed in the Bwk1b1 horizon and were interpreted to be part of an older (mid- to late-Holocene) colluvial package. The lithics in the Bwk1b1 horizon were apparently reworked from an Archaic site upslope and are therefore likely not in archaeological context at this location.

The AC horizon is between 0 and 6 cm. It contains about 10 percent gravels, is a pale brown loamy sand, has a soft consistency, is strongly to violently effervescent, and has a clear, smooth lower horizon boundary. This stratum is less than 100 years old. The Bw1b1 horizon is between 6 and 15 cm and contains 10 percent gravels. This stratum is a brown sandy loam, has a loose to soft consistency, is strongly to violently effervescent, and has a gradual smooth lower horizon boundary. This stratum is said to be less than 800 years old. The Bw2b1 horizon is found between 15 and 43 cm and has 20 percent gravels. It is a light brown sandy loam, has a soft and slightly plastic consistency, and is strongly effervescent. This stratum has an abrupt, irregular lower horizon boundary and is also thought to be less than 800 years old. The Btkb2 horizon falls between 43 and 50 cm and has 10 percent gravels. It is light reddish brown and is a sandy clay loam. It has a soft to slightly hard consistency, and is strongly effervescent.

Table 16.2. Stratigraphy in unit 103N/79E.

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
AC	0-10	5-10	10YR5/3	10YR4/3	ls	m	lo	so,po	n.o.	es-ev	-	cs	<100 yrs	
Bk1b1 (Bwklb1)	10-31	10-20	7.5YR5/3	7.5YR4/3	sl	1msbk	so-sh	ss,ps	n.o.	es-ev	I-	gs	<4 ka (2-4 ka?)	cicada burrows, sh-h w/ discontinuous $CaCO_3$ coatings
Bk2b1 (Bwk2b1)	31-46	10-20	7.5YR5/3	7.5YR4/3	sl	1-2msbk	so-sh	so,po	n.o.	es-ev	I-	ci		cicada burrows, discontinuous $CaCO_3$ coatings on burrows & gravel
Bkb2	46-50	<10	7.5YR6/4	7.5YR6/4	sl	2msbk	sh	so,po	n.o.	ev	II	-	late Pleistocene	$CaCO_3$ filaments, small nodules

Table 16.3. Stratigraphy of 108N/137E.

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
AC	0-6	10	10YR6/3	10YR4/3	ls	1m pl	so	so,po	n.o.	es-ev	-	cs	<100 yrs	young colluvium, post-lab?
Bw1b1	6-15	10	8.5YR5/3	10YR4/3	sl	1msbk	so-lo	so,po	n.o.	es-ev	-	gs	<800 yrs	ceramics and lithics scattered throughout AC, Bw1b1, and Bw2b1 horizons
Bw2b1	15-43	20	7.5YR6/3	7.5YR4/3	sl	1msbk	so-lo	so,ps	n.o.	es	-	ai		contains small chunks of older soil
Btkb2	43-50+	10	5YR6/4	5YR4/4	scl	2-3msbk	so-sh	ss,ps	1-2nbrpo	es	I+	-	middle to late Pleistocene	abundant filaments; 100-200k soil

SITE EXCAVATION

Excavations at LA 86637 were conducted in December of 2002. The crew consisted of Kari Schmidt (crew chief), Mia Jonsson, Mike Kennedy, Timothy Martinez, and Marjorie Wright. In addition to surface collection, personnel excavated two 1- by 1-m units, one each located in the eastern and western portions of the site. These units were excavated in arbitrary stratigraphic levels. The excavation units were placed about 50 m apart in areas with the highest density of surface artifacts. Therefore, no central site datum was used, rather vertical measurements were taken as centimeters below ground surface at each of the two test units.

103N/79E

103N/79E was located in the western portion of the artifact scatter in an area where an Archaic projectile point was identified during the original survey of the site. The unit was located above a shallow arroyo running through the site, about 5 m south of the San Ildefonso property boundary. From the surface down to about 30 cm below ground surface, the soil was silty sand, with gravels being at about 5 percent to 10 percent in the top 10 cm of fill and increasing to about 10 percent to 20 percent, with a few specks of $CaCO_3$ appearing by 30 cmbgs. From 30 to 40 cm below ground surface the amount of silt and $CaCO_3$ increased. In the top 10 cm of fill, there were six pieces of debitage and two ceramics recovered, mostly from the upper half of the level. Five pieces of debitage were found from 10 to 20 cm below ground surface, six pieces of debitage from 20 to 30 cm below ground surface, and three pieces of debitage from 30 to 40 cm below ground surface. The debitage were mostly obsidian, with some chalcedony or Pedernal chert, and the ceramics were dominated by biscuitwares and utilitywares (see Table 16.4).

Two pollen samples (Field Specimen [FS] 274 and FS 275) and flotation samples (FS 272 and FS 273) were collected. Taxa identified in the pollen samples include prickly pear (*Opuntia*), buckwheat (*Eriogonum*), sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), spurge family (Euphorbiaceae), unidentified pine (*Pinus*), piñon pine (*Pinus edulis*), juniper (*Juniperus*), rose family (Rosaceae), sagebrush (*Artemisia*), cheno-ams, and unidentified grasses (Poaceae). Taxa identified in the flotation samples were all uncharred and included juniper, unidentified pine, and piñon pine. No macrobotanical samples were identified during the excavations. Figure 16.3 shows 103N/79E looking north along the boundary of Los Alamos County and San Ildefonso properties.

Figure 16.3. 103N/79E, looking north.

108N/137E

This unit was located in the southeastern portion of the site where it was thought a possible buried feature was located. The top few centimeters of this unit were covered by pine duff and loose sand. The tuff rocks originally thought to be of possible cultural origin turned out to be merely sitting atop the surface, with no underlying structure. The top 20 to 25 cm of fill was a clayey-sandy loam with about 20 percent pea gravels. Below this and down to about 50 cm the silt was more of a silty, sandy loam with about 10 percent pea gravels and some broken tuff that appeared to be from bedrock. Artifacts recovered from this test unit included four pieces of debitage from the top 4 cm of fill and 23 pieces of debitage from 4 to 50 cm. The debitage were mostly obsidian, with some chalcedony, Pedernal chert, and basalt.

Two pollen samples (FS 276 and FS 277) and flotation samples (FS 270 and FS 271) were collected. Taxa identified in the pollen samples include the following: maize (*Zea mays*), beeweed (*Cleome*), sunflower family, ragweed/bursage, spurge family, evening primrose (Onagraceae), unidentified pine, juniper, oak (*Quercus*), rose family, sagebrush, cheno-ams, and unidentified grasses. Identified taxa in the flotation samples were all uncharred and included juniper, unidentified pine, piñon pine, and ponderosa pine (*Pinus ponderosa*). Figure 16.4 shows both of the excavated units in profile. The stratigraphy depicted in this figure is based on what excavators described during excavation; it does not depict the more complicated nature of the sediments described by Drakos and Reneau in the previous section.

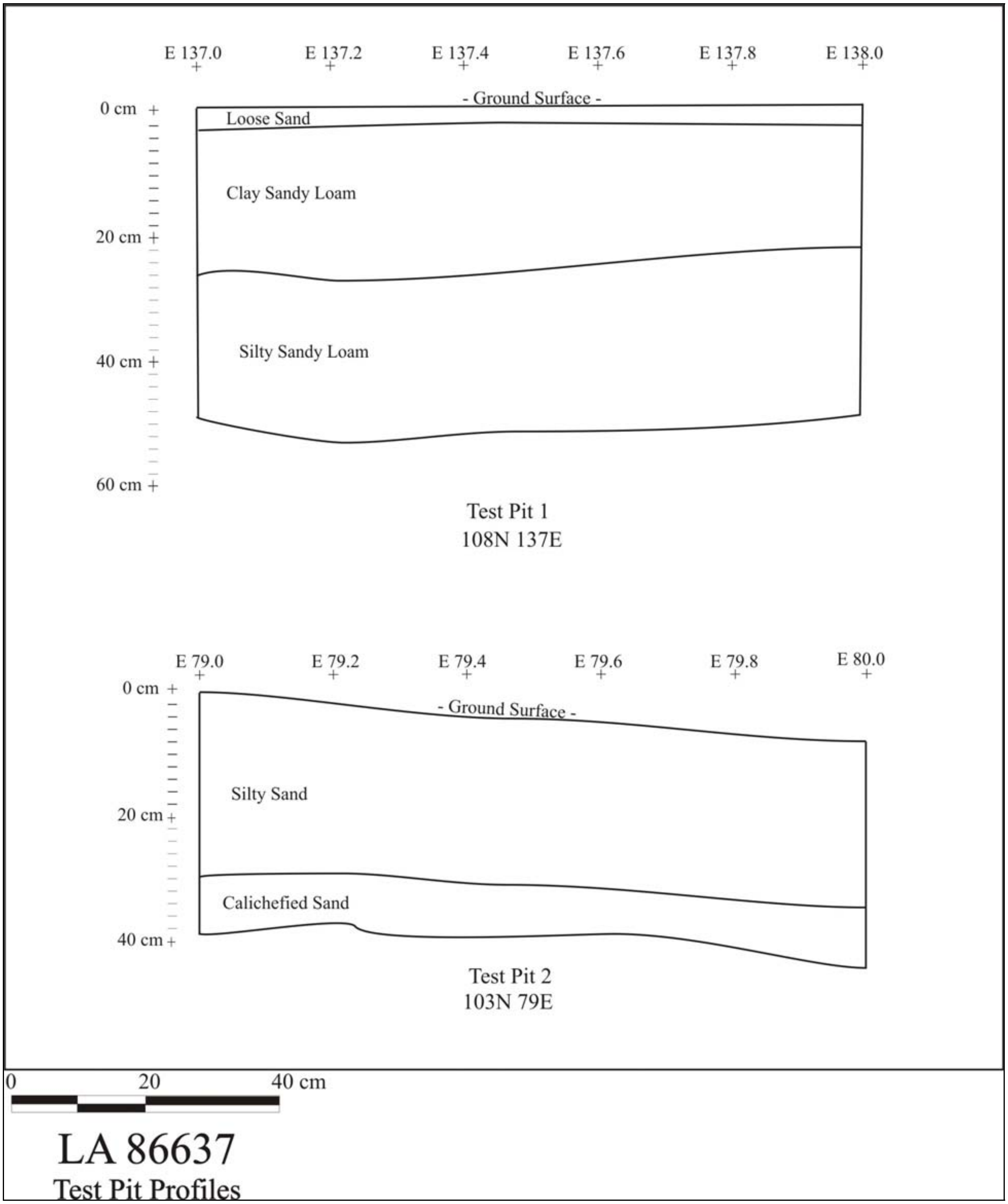

Figure 16.4. Soil profiles from LA 86637.

SITE CHRONOLOGY AND ASSEMBLAGE

Some 650 total artifacts were recovered from excavations at LA 86637 and all recovered artifacts were analyzed. Analyses of the ceramics, lithics (chipped and ground stone), archaeobotanical, and palynological materials were conducted. No faunal remains or vegetal remains were recovered during excavations, and no radiocarbon dates were submitted due to a lack of organic materials; however, obsidian artifacts were submitted for hydration dating. Results of analyses are presented in the following sections.

Obsidian Hydration

Ten obsidian artifacts from LA 86637 were submitted to Diffusion Laboratory for age determination using the obsidian hydration method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rind, was measured. Second, the high temperature hydration rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site was estimated in order that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 16.4).

Table 16.4. Obsidian hydration dates for LA 86637.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
2	2003-100	Cerro Toledo	3.91	-2215	216
11-2	2003-101	Valle Grande	3.79	-2015	212
11-1	2003-102	Cerro Toledo	4.74	-3996	254
18	2003-103	Valle Grande	3.63	-1710	205
86-1	2003-104	Cerro Toledo	3.24	-880	177
86-2	2003-105	Valle Grande	4.07	-2726	233
181	2003-106	Cerro Toledo	N/A		
230	2003-107	El Rechuelos	3.05	-699	177
245	2003-108	Cerro Toledo	4.68	-3991	257
S#3	2003-109	Cerro Toledo	3.67	-1567	194

The obsidian hydration dates provide a wide range from 3996 to 699 BC. On the other hand, a possible Late Archaic point was dated to 1567 BC. It is heavily reworked with a concave base and could reflect an Armijo (or San Jose) style point. Nonetheless, the dates appear to reflect both Middle and Late Archaic occupations.

Ceramics (Dean Wilson)

The distributions of ceramic types documented during the analysis of 110 sherds from the fieldhouse and artifact scatter at LA 86637 indicate a Late Coalition and Early Classic period assemblage (Table 16.5).

Table 16.5. Ceramic types from LA 86637.

Ceramic Type	Frequency	Percent
Unpainted undifferentiated	17	18.5
Indeterminate organic paint	1	1.1
Santa Fe Black-on-white	5	6.4
Biscuitware painted unspecified	22	23.9
Unpainted Biscuitware (slipped one side)	2	2.2
Biscuit A (Abiquiu Black-on-gray)	3	3.3
Biscuit B (Bandelier Black-on-gray)	2	2.2
Biscuit B/C	2	2.2
Unknown gray rim	2	2.2
Plain gray body	11	12.0
Indented corrugated	5	5.4
Plain corrugated	1	1.1
Smeared plain corrugated	3	3.3
Smeared-indented corrugated	7	7.6
Glaze red body unpainted	2	2.2
Los Padillas glaze polychrome	1	1.1
Total	**110**	**100.0**

A fairly late date is reflected by distributions of decorated whiteware types that make up 70.9 percent of the pottery from this site. All the whitewares exhibit tuff temper, pastes, and styles indicative of Rio Grande (or Tewa) tradition types (Tables 16.6 and 16.7). The majority of whitewares consist of jar forms (Table 16.8), and this dominance of whiteware jars may partly reflect the influence of only a few vessels. Decorated whiteware assemblages from all major contexts are dominated by Biscuitware types with Biscuit B (Bandelier Black-on-gray), Biscuit A (Abiquiu Black-on-gray), and some Santa Fe Black-on-white sherds.

Table 16.6. Tradition by ware for ceramics from all contexts.

Tradition	Ware			Total
	Gray	White	Glaze	
Northern Rio Grande (Prehistoric)	29	78	--	107
Middle Rio Grande	--	--	3	3
Total	**29**	**78**	**3**	**110**

Table 16.7. Temper by ware for all contexts.

Temper	Ware						Total	
	Gray		White		Glaze			
Indeterminate	1	3.4	--	--	--	--	1	0.9
Granitic (mica, quartz, and feldspar)	12	41.4	1	1.3	--	--	13	11.8
Fine tuff or ash	--	--	68	87.2	--	--	68	61.8
Gray crystalline basalt	--	--	--	--	3	100.0	3	2.7
"Anthill" sand	16	55.2	--	--	--	--	16	14.5
Mica and tuff	--	--	2	2.6	--	--	2	1.8
Tuff and phenocrysts ("anthill" sand)	--	--	7	9.0	--	--	7	6.4
Total	**29**	**100.0**	**78**	**100.0**	**3**	**100.0**	**110**	**100.0**

An Early Classic period association is also supported by the presence of glazewares, which represent 2.7 percent of the pottery from this site. Glazeware types noted include red slipped body and Los Padillos Polychrome that dates to the 14th century. All of these sherds are tempered with basalt (Table 16.7) commonly found in pottery produced in areas of the Middle Rio Grande to the south.

Gray utilityware types consist of 26.4 percent of the pottery from this site and indicate similar trends. The graywares show a fairly even mix of anthill sand and micaceous granite temper (Table 16.7). Surface manipulations are about equally divided between plain and smeared corrugated forms.

Table 16.8. Form by ware for LA 86637 ceramics.

Vessel Form	Ware						Total	
	Gray		White		Glaze			
Indeterminate	2	6.9	6	7.7	--	--	8	7.3
Bowl rim	--	--	4	5.1	--	--	4	3.6
Bowl body	--	--	15	19.2	1	33.3	16	14.5
Jar neck	3	10.3	19	24.4	--	--	22	20.0
Jar rim	2	6.9	2	2.6	--	--	4	3.6
Jar body	22	75.9	32	41.0	--	--	54	49.1
Body sherd polished int-ext	--	--	--	--	2	66.7	2	1.8
Total	**29**	**100.0**	**78**	**100.0**	**3**	**100.0**	**110**	**100.0**

The combination of decorated and utilityware pottery from LA 86637 is consistent with a component dating to the Early Classic period, spanning from circa AD 1300 to 1400. The five Santa Fe Black-on-white sherds are consistent with a Late Coalition period component.

Chipped and Ground Stone (Bradley Vierra and Michael Dilley)

Material Selection

A total of 533 lithic artifacts were analyzed from LA 86637, consisting of five cores, 244 pieces of debitage, five retouched tools, and 26 ground stone items. This represents a 100 percent sample of the lithic artifacts recovered during the site excavations. Table 16.9 presents the data on lithic artifact type by material type. The majority of the debitage is made of obsidian, with some chalcedony, basalt, and Pedernal chert materials. The presence of cortex on 10.9 percent of the debitage indicates that the materials were collected from both secondary waterworn (52.8%) and primary nodule sources. The obsidian is present at nearby sources in the Jemez Mountains, whereas, the chalcedony and Pedernal chert are available from local Rio Grande Valley gravel sources and the basalt from local bedrock outcrops. Otherwise, the ground stone artifacts are made of local igneous materials, with quartzite and sandstone. The source of the sandstone is difficult to determine, but it could have been derived from gravel formations near Totavi or more distant sources in the Santa Fe or Abiquiu areas.

Table 16.9. LA 86637 lithic artifact type by material type.

Artifact Type		Material Type												
		Basalt	Vesicular Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Pedernal	Quartzite	Sandstone	Other	Total
Cores	Core	0	0	0	0	0	0	2	5	0	0	0	0	7
	Subtotal	0	0	0	0	0	0	2	5	0	0	0	0	7
Debitage	Angular debris	2	0	1	0	0	0	18	32	3	0	0	0	56
	Core flake	27	0	0	2	0	0	104	78	14	0	0	1	226
	Biface flake	6	0	1	0	0	0	111	10	1	0	0	0	129
	Core trimming flake	0	0	0	0	0	0	0	3	0	0	0	0	3
	Op. core flake	0	0	0	0	0	0	1	0	0	0	0	0	1
	Outrepasse	0	0	0	0	0	0	3	0	0	0	0	0	3
	Hammerstone flake	0	0	0	0	0	0	0	0	0	1	0	0	1
	Microdebitage	1	0	0	0	0	0	39	5	1	0	0	0	45
	Undetermined flake	1	0	0	0	0	0	14	2	1	0	0	1	19
	Subtotal	37	0	2	2	0	0	290	130	20	1	0	1	483
Re-touched Tools	Retouched piece	0	0	0	0	0	0	1	3	0	0	0	0	4
	Biface	0	0	0	0	0	0	1	0	0	0	0	0	1
	Projectile point	0	0	0	0	0	0	3	0	0	0	0	0	3
	Uniface	0	0	0	0	0	0	0	0	1	0	0	1	2
	Composite Tool	0	0	0	0	0	0	1	1	0	0	0	0	2
	Subtotal	0	0	0	0	0	0	6	4	1	0	0	1	12

Artifact Type		Material Type												
		Basalt	Vesicular Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Pedernal	Quartzite	Sandstone	Other	Total
Ground Stone	One-hand mano	0	1	0	0	1	1	0	0	0	4	1	0	8
	Undetermined mano fragment	0	1	0	0	0	0	0	0	0	0	0	0	1
	Grinding slab	0	0	0	0	0	0	0	0	0	0	1	0	1
	Undetermined metate fragment	1	2	0	0	0	2	0	0	0	0	1	0	6
	Undetermined ground stone	1	0	0	1	3	0	0	0	0	4	1	0	10
	Subtotal	2	4	0	1	4	3	0	0	0	8	4	0	26
Other	Manuport	0	0	0	0	0	0	1	0	0	0	0	1	2
	Fire-cracked rock	0	0	0	0	0	0	0	0	0	2	0	0	2
	Subtotal	0	0	0	0	0	0	1	0	0	2	0	1	4
Total		**39**	**4**	**2**	**3**	**4**	**3**	**299**	**139**	**21**	**11**	**4**	**3**	**533**

Seventeen pieces of debitage, one core, and two projectile points were submitted for X-ray fluorescence analysis (Table 16.10). Analyses show that the majority of the artifacts were obtained from the Cerro Toledo source, with three from the Valle Grande and four from the El Rechuelos source areas (see Shackley, Volume 3). The Cerro Toledo (Rabbit Mountain/Obsidian Ridge) and Valle Grande (Cerro del Medio) source areas are located about 15 km (10 miles) as the "crow flies" to the southwest and west of the site, while the El Rechuelos (Polvadera Peak) source area is situated about 30 km (19 miles) to the northwest.

Table 16.10. Obsidian source samples from LA 86637.

FS #	Artifact	Color	Source
S#3	Projectile point	Translucent	Cerro Toledo rhyolite
2	Projectile point	Translucent	Cerro Toledo rhyolite
7	Debitage	Black dusty	El Rechuelos
8-1	Debitage	Translucent	Cerro Toledo rhyolite
8-2	Debitage	Translucent	Cerro Toledo rhyolite
9	Debitage	Black dusty	El Rechuelos
11-1	Debitage	Gray	Cerro Toledo rhyolite
11-2	Core	Translucent	Cerro Toledo rhyolite
17	Debitage	Translucent	Cerro Toledo rhyolite
18	Debitage	Gray	Cerro Toledo rhyolite
73	Debitage	Black opaque	Cerro Toledo rhyolite
82	Debitage	Black dusty	El Rechuelos
84-1	Debitage	Gray	Cerro Toledo rhyolite

FS #	Artifact	Color	Source
84-2	Debitage	Translucent	Cerro Toledo rhyolite
86-1	Debitage	Black opaque	Cerro Toledo rhyolite
86-2	Projectile Point	Translucent	Valle Grande rhyolite
88	Debitage	Black dusty	El Rechuelos
97-1	Debitage	Black opaque	Cerro Toledo rhyolite
97-2	Debitage	Translucent	Cerro Toledo rhyolite
138	Debitage	Black opaque	Cerro Toledo rhyolite
181	Debitage	Translucent	Valle Grande rhyolite
230	Debitage	Black dusty	El Rechuelos
245	Debitage	Black opaque	Cerro Toledo rhyolite
248	Debitage	Translucent	Cerro Toledo rhyolite

Lithic Reduction

The cores were reduced using single-directional/single-face, bidirectional/opposed-different-face, and multi-directional/globular technique. Figure 16.5 illustrates the multi-directional core. Two cores were produced on large flake blanks and another was identified as a core fragment. Three of the cores were broken due to material flaws, two were exhausted, one was considered still useable and reason for discard was undetermined for the core fragment. Table 16.11 presents the metric information on these cores.

Table 16.11. Core type dimensions (mm) and weight (gm).

Core Type	Length	Width	Thickness	Weight
Single-directional	28	37	38	38.8
Bi-directional	52	90	45	227.6
Multi-directional	67	55	50	201.5
Multi-directional	27	26	17	8.3
Flake core	35	45	18	24.6
Flake core	23	63	47	73.2

The debitage mainly consists of core flakes (46.7%) and biface flakes (26.7%), with some angular debris, microdebitage, and other items. Table 16.12 summarizes the various stages of reduction represented by the whole core and biface (tertiary) flakes. An overall cortical:noncortical ratio of 0.22 reflects an emphasis on the later stages of core reduction.

Table 16.12. Debitage reduction stages.

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Basalt	0	0	7	1	---
Obsidian	0	1	2	5	0.14
Chalcedony	0	4	9	2	0.36
Pedernal chert	0	1	1	0	0.50

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Total	0	6	19	8	0.22
Percentage	0	18.1	0.50	21.0	---

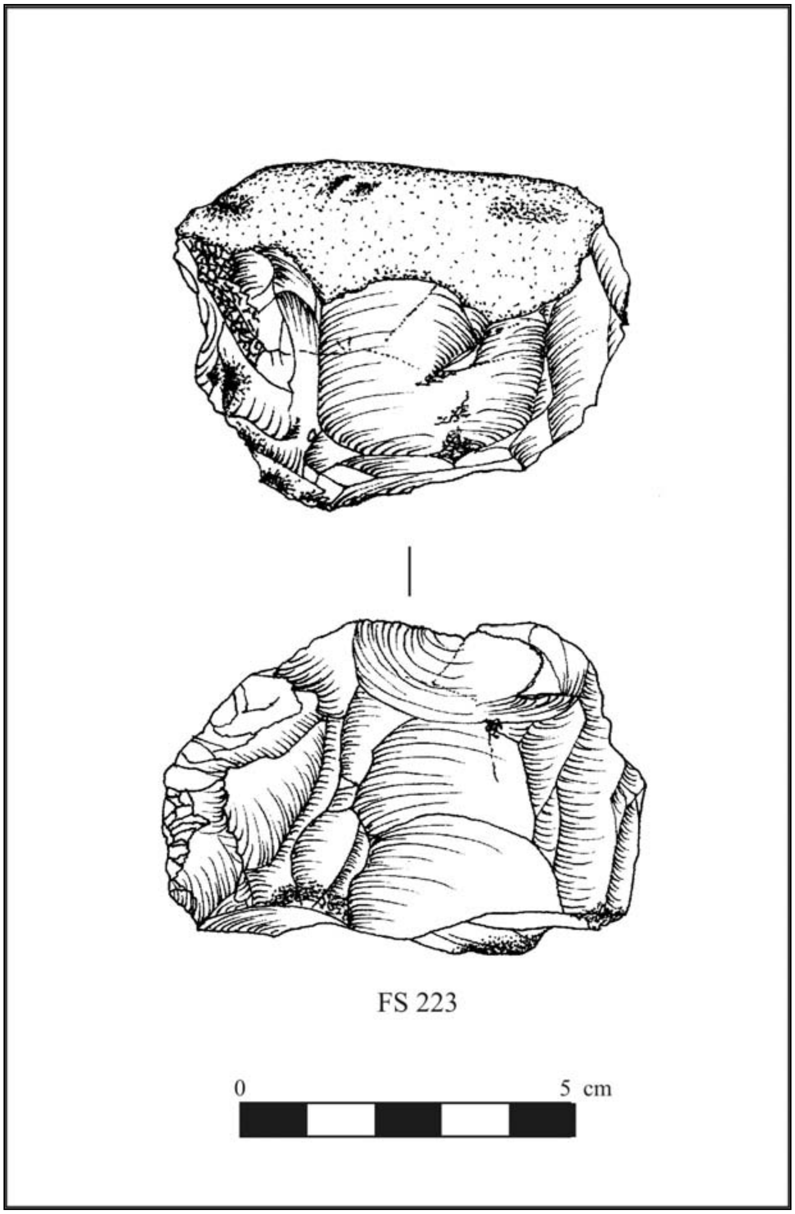

Figure 16.5. Multi-directional core (top and side).

The majority of the flakes exhibit single platforms (48.4%; *n* = 38), with cortical (*n* = 9), dihedral (*n* = 3), multi-faceted (*n* = 6), collapsed (*n* = 15), and crushed (*n* = 18) platforms as well. Thirty six (36.6%) of the flake platforms exhibit evidence of preparation, with most of these being abraded/crushed, retouched/abraded (*n* = 7), and ground (*n* = 1).

The majority of the core flakes consist of distal fragments (*n* = 125; 55.3%), with fewer whole (*n* = 30), proximal (*n* = 27), midsection (*n* = 42), lateral (*n* = 1), and undetermined flake (*n* = 1) fragments. Most of the biface flakes are also midsection fragments (*n* = 43; 41.0%), with fewer whole (*n* = 9), proximal (*n* = 33), and distal (*n* = 44) fragments. The whole core flakes have a mean length of 27.0 mm (*std* = 8.9), whereas, the whole biface flakes exhibit a mean length of 21.7 mm (*std* = 8.5). Lastly, angular debris have a mean weight of 6.2 g (*std* = 8.8).

The retouched tools mostly consist of formal tools like bifaces, projectile points, and unifaces, with some expedient tools like retouched pieces. The retouched pieces primarily exhibit marginal retouch along a single edge, with one having two retouched edges. Table 16.13 presents the information on retouch type by edge outline. Two other expedient tools were also identified. One is a retouched piece/perforator and the other is a notch or denticulate.

Table 16.13. Retouched pieces from LA 86637.

Retouch Type	Edge Outline						
	Straight	Concave	Convex	Straight/ concave	Straight/ convex	Concave/ convex	Projection
Unidentified ventral	1	0	0	0	0	0	0
Unidentified dorsal	0	0	1	2	0	0	0
Bidirectional	1	0	0	0	0	0	0
Total	**2**	**0**	**1**	**2**	**0**	**0**	**0**

The biface is whole and irregularly shaped. It has a thickness of 7 mm and edge angle of 55 degrees, indicating that it was discarded at the early to middle stage of the reduction process. The projectile points appear to be Late Archaic dart points with neck widths of 9 to 17 mm. Two are corner-notched and one is a stemmed point. One of the corner-notched points has a broken tip and the other two points have heavily resharpened blades. Metrical and descriptive information on the projectile points is presented in Table 16.14 and illustrated in Table 16.13 and Figure 16.6.

Table 16.14. Projectile point metrical (mm) and descriptive data.

FS	Material	Condition	Overall Length	Blade Length	Neck Width	Stem Length	Stem Width	Thickness	Weight (gm)	Haft Type	Blade Shape	Base Shape
S3	Obsidian	Whole	20	13	17	7	22	5	2.1	Stemmed	Straight	Concave
2	Obsidian	Whole	18	13	9	5	14	3	0.9	Corner-notched	Straight	Straight

FS	Material	Condition	Overall Length	Blade Length	Neck Width	Stem Length	Stem Width	Thickness	Weight (gm)	Haft Type	Blade Shape	Base Shape
86	Obsidian	Proximal	--	--	13	8	17	4	2.7	Corner-notched	Straight	Straight

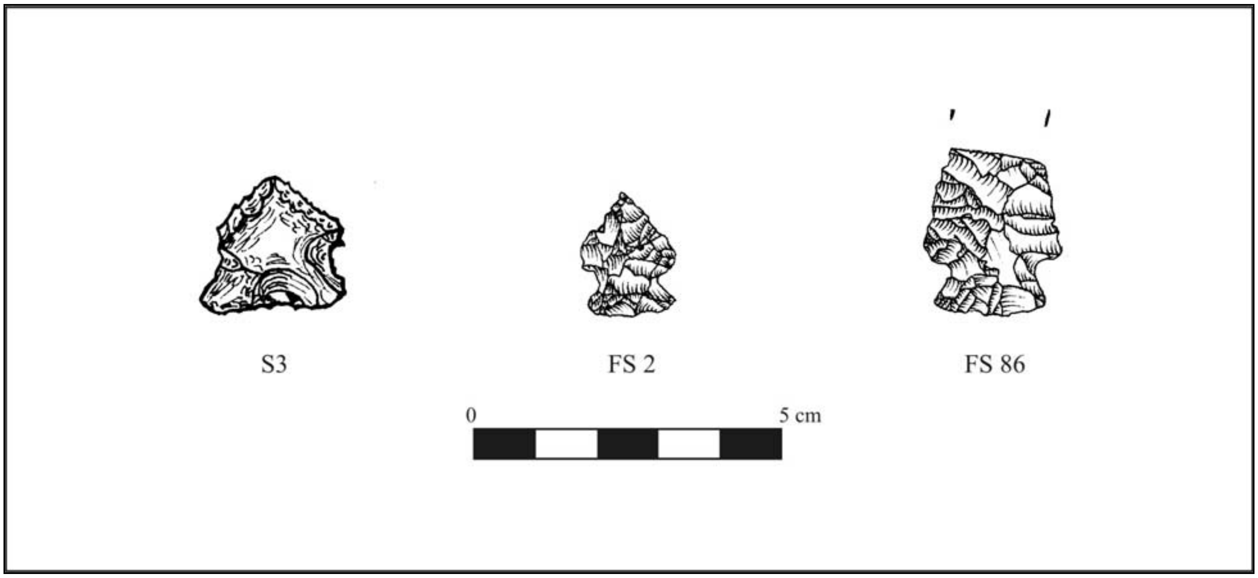

Figure 16.6. Projectile points.

Tool Use

Only six flakes (1.2%) exhibit evidence of damage that could be attributed to use-wear**.** Three have straight and one has a convex lateral edge with angles ranging from 20 and 70 degrees, whereas, the fifth was utilized on an end with a straight outline and angle of 25 degrees. The sixth flake exhibits a utilized projection.

Three of the retouched pieces exhibit rounding/scarring use-wear and the proximal projectile point fragment may have an impact fracture.

A large number of ground stone items were present in this assemblage. The one-hand manos are all cobbles with one or two grinding surfaces. The grinding slab is a tabular piece of sandstone that is ground on both surfaces, which may actually represent a millingstone fragment. The undetermined metate fragments mostly consist of burned tabular pieces of possible millingstones, whereas, the undetermined ground stone fragments are small pieces of tabular or cobble materials. Many of these also exhibit evidence of burning.

Archaeobotanical Remains (Pamela McBride)

One unidentifiable plant part fragment was the sole cultural plant remains recovered from LA 86637 (Table 16.15). The balance of the floral assemblage was unburned conifer duff, including twigs, needles, cones, and bark. This artifact scatter appeared to contain components dating from the Late Archaic, Coalition, and Classic periods and was also associated with a Classic period fieldhouse. The paucity of cultural plant remains is not surprising given the secondary nature of the deposits.

Table 16.15. Flotation sample plant remains from Test Pits 1 and 2.

Feature	Test Pit 1 108N/137E		Test Pit 2 103N/79E	
	stratum 2, level 2	stratum 3, level 2	stratum 1, level 1	stratum 2, level 4
Cultural Other				
Unidentifiable		pp 1(0)		
Non-Cultural Perennials				
Juniper	twig +	twig +	♀ cone +, twig +	twig +
Pine	♂ cone +	bs +	♂ cone +	
Piñon	needle +	needle +	needle +	needle +
Ponderosa pine	needle +			

Cultural plant remains are charred, non-cultural plant remains are uncharred.
+ 1-10/liter, bs barkscale, cf. compares favorably.

Pollen Remains (Susan J. Smith)

Three pollen samples were analyzed from LA 86637. Table 16.16 lists the frequency of identified pollen types. No cultigens were identified in the assemblage. Economic resources identified in the pollen assemblage included only prickly pear. A number of other potential economic resources were identified in the assemblage (Table 16.16), and these are described in detail in Smith's chapter in Volume 3 (Chapter 63).

Table 16.16. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86637 (*n* = 3)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	0
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 86637 (*n* = 3)**
Economic Resources	*Opuntia* (Platy)	Prickly Pear	1
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	1
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	2
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds,	Cheno-Am	Cheno-Am	3

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 86637 (*n* = 3)**
Herbs, Shrubs		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	2
		Sunflower Family Aggregates	1
	Ambrosia	Ragweed, Bursage	2
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	1
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	1
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	1
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Potential Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	0
	Abies	Fir	0
	Pinus	Pine	1
		Pine Aggregates	0
	Pinus edulis type	Piñon	2
	Juniperus	Juniper	3
		Juniper Aggregates	0
	Quercus	Oak	0
	Rhus type	Squawbush type	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86637 (*n* = 3)
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	0
	Artemisia	Sagebrush	3
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	2
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

The artifact assemblage at LA 86637 appears to represent a multi-component site. The projectile points and obsidian hydration dates indicate a possible Middle to Late Archaic component. In contrast, the ceramic assemblage may in part be associated with a nearby Early Classic period fieldhouse (Biscuitwares), with some sherds dating to the Late Coalition period. However, since both the surface as well as the subsurface artifacts appear to be located in a secondary context, it is probable that the majority of the assemblage originated from upslope and was subsequently deposited across the colluvial fan.

CHAPTER 17
WHITE ROCK TRACT (A-19): LA 127625

Kari M. Schmidt

INTRODUCTION AND SITE SETTING

LA 127625 (K-170) is a dispersed artifact scatter situated in a low-lying, flat area just east of the mouth of Cañada del Buey. Some 40 m west of the scatter, the flat lowland gives way to the talus slope of the adjacent mesa. The local vegetation includes juniper, ponderosa pine, prickly pear, sage, and various grasses. The site is situated at an elevation of 1951 m (6400 ft) and is immediately below an electrical substation. Figure 17.1 shows the general site layout.

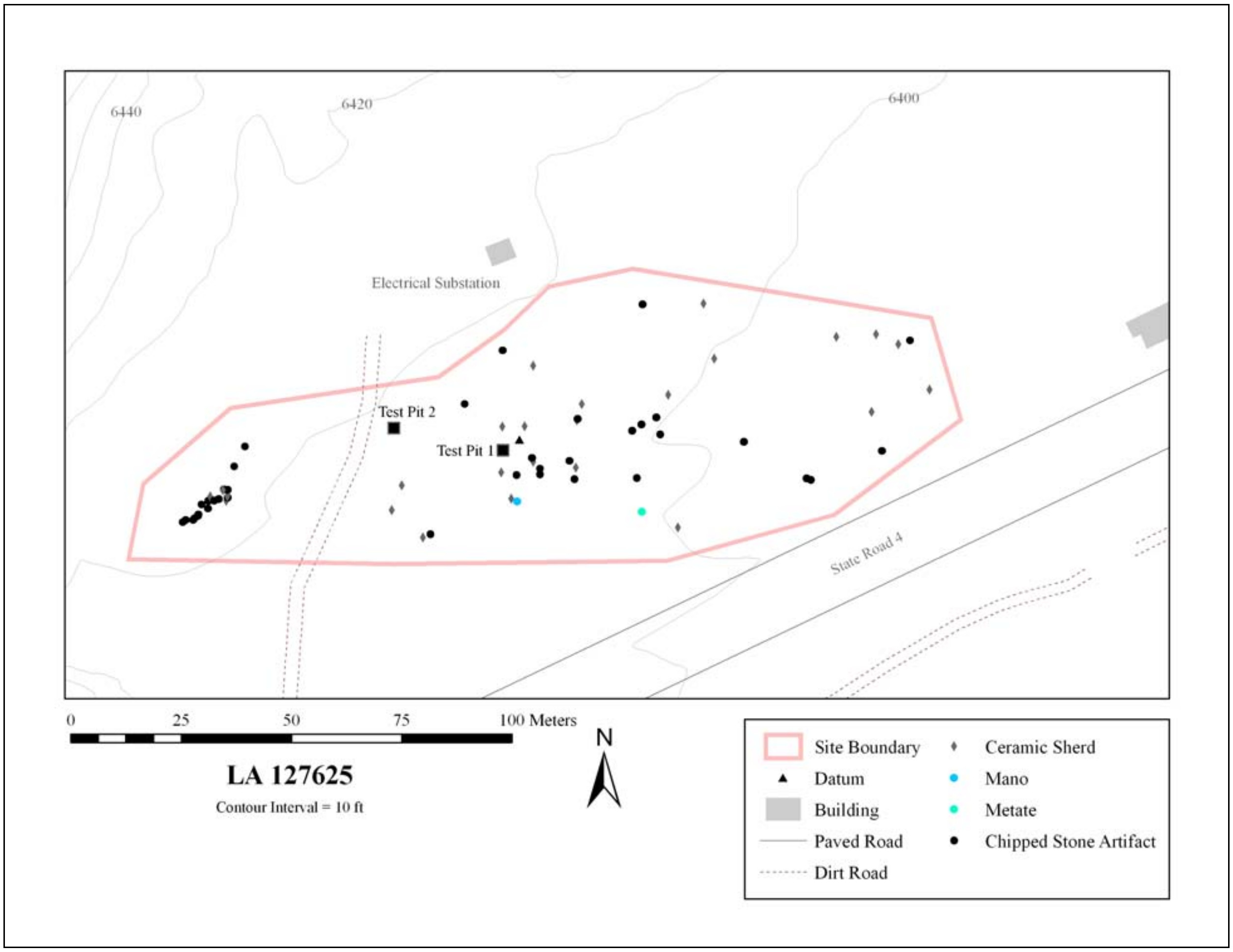

Figure 17.1. General overview of LA 127625.

SITE DESCRIPTION

The artifact scatter is distributed over a 190-m east-west by 65-m north-south area. An in-field analysis was conducted during the initial recording of the site. During this analysis, information was collected on approximately 50 percent of all flagged artifacts (*n* = 140), which are shown in Figure 17.1. Santa Fe Black-on-white ceramics comprised 34 percent of the total ceramic assemblage and smeared-indented and indented corrugated sherds accounted for another 36 percent. Lesser amounts of undefined redwares and Sankawi Black-on-cream were also present, along with a very small number of miscellaneous sherds. Lithic materials were mostly Pedernal chert with lesser amounts of black translucent and opaque brown Jemez obsidian and Polvadera Peak obsidian. A few pieces of basalt and rhyolite debitage were also present. Most of the chipped stone artifacts at LA 127625 were core flakes or pieces of angular debris. One small projectile point fragment was located but was too fragmentary to be identified. A rhyolite milling stone was also recorded during the analysis. Based on the artifact assemblage recorded during the initial phase of this project, the site was thought to date to the Coalition period.

FIELD METHODS

Due to the sparseness of the artifacts at LA 127625 and to their secondary depositional context in colluvium, a site grid was not established. Rather, the site was mapped by acquiring a Global Positioning System (GPS) location for each of the collected artifacts. First, all surface artifacts were located during an intensive pedestrian survey and all identified artifacts were marked with pin flags. Subsequent to this activity, each artifact in the surface assemblage was collected, bagged, and recorded with the GPS unit. Figure 17.2 shows the crew locating and recording the artifacts.

The location of the original site datum, two excavated pits (see below), and a geomorphological pit were also recorded with the GPS unit. A total of 56 lithics, 28 ceramics, and two pieces of ground stone were identified and collected. The lithics found at the site were a mixture of obsidian, chert, and basalt (see results of analysis later in this chapter). The ceramics were a mix of biscuitwares and utilitywares. The ground stone remains included a cobble metate fragment and a one-handed mano fragment.

The artifacts recovered during the surface collection were submitted for analysis. Utilitywares formed the bulk of the ceramic assemblage comprising some 55 percent (Table 17.1). These consist of indented corrugated (3.6%), smeared plain corrugated (21.4%), and plainwares (28.6 %). The majority of decorated ceramics from the surface assemblage were biscuitwares, with lesser amounts of glazewares.

Figure 17.2. Collection of surface artifacts at LA 127625.

Table 17.1. Ceramic types from LA 127625.

Ceramic Types	Frequency	Percent
Northern Rio Grande Whitewares		
Unpainted undifferentiated	3	10.7
Indeterminate organic paint	2	7.1
Biscuitware, slipped both sides	2	7.1
Biscuitware, painted unspecified	2	7.1
Biscuitware, slipped one side	1	3.6
Biscuit B (Bandelier Black-on-gray)	1	3.6
Biscuit B/C body	1	3.6
Northern Rio Grande Utilitywares		
Plain gray body	8	28.6
Indented corrugated	1	3.6
Smeared plain corrugated	6	21.4
Middle Rio Grande Glazeware		
Glaze red body unpainted	1	3.6
Total	**28**	**100.0**

Based on the collection of surface artifacts, two concentrated artifact areas were identified. One was near the site datum in the center of the scatter, and the other was near the geomorphological pit used during the pre-project soil assessment. Two test units were excavated at the site, one in each concentration. These units were designated as Test Pit 1 (near the site datum) and Test Pit 2 (near the geomorphologic test pit). Units were dug in 10-cm levels to a depth of 50 cm. No artifacts were recovered in the subsurface testing.

STRATIGRAPHY (Paul Drakos and Steve Reneau)

The artifacts recovered at LA 127625 are scattered in an area of thick, late-Holocene colluvium with little soil development (Table 17.2). The colluvium at the site post-dates the Ancestral Puebloan occupation in the area, and the cultural material was likely transported to the site in runoff episodes from nearby slopes and mesa top sites. The cultural material recovered at the site is therefore not in its original archaeological context.

Table 17.2. Stratigraphic sequence used during excavation at LA 127625.

LA 127625 Stratigraphic Summary							
Stratum	**Prov.**	**Maximum Thickness**	**Minimum Thickness**	**Elev.**	**Color**	**Texture**	**Comments**
1	Test pits 1 and 2	0.10	0.04	0–10 cm bgs	10YR5/4	Silty sand	Very thin stratum of silty sand. Also a lot of duff and other vegetal matter. Very recent colluvium.
2	Test pits 1 and 2	0.40	0.20	4–50 cm bgs	10YR4/4	Sandy loam	Sandy loam with slightly more inclusions than Stratum 1 including pebbles and artifacts. No mottles. Lower boundary not identified. Thick layer of colluvium.

SITE EXCAVATION

Excavations at LA 127625 were undertaken by Kari Schmidt (crew chief), Mia Jonsson, Mike Kennedy, Timothy Martinez, and Marjorie Wright. As already mentioned, two test pits were dug at this site. The first, Test Pit 1, was located near the center of the site. The surface of this unit consisted of sparse vegetation and pine duff, which continued down only a couple of centimeters or so. Below this the soil was a sandy loam down to at least 45 cm, where excavations ceased because no artifacts were recovered. Test Pit 2 was located in an area that was free of pine duff, so the soil was a sandy loam from start to finish. The only variation in this soil was the presence of some $CaCO_3$ from 35 to 40 cm below the ground surface. As with the other test pit, no subsurface artifacts were found. Figure 17.3 shows both excavated pits in profile.

SITE CHRONOLOGY AND ASSEMBLAGE

Only 86 artifacts were recovered during excavation and recording activities at LA 127625, and all artifacts were analyzed. Analyses of the ceramics, lithics (chipped and ground stone), and archaeobotanical materials were all conducted. Pollen samples were not taken because the artifacts were all recovered from the surface, which was redeposited late-Holocene soil. No faunal remains were recovered at the site. Three pieces of obsidian were submitted for hydration dating. The results of these analyses are presented in the following pages.

Chronology

Obsidian Hydration Dating

Three obsidian artifacts from LA 127635 were submitted to Diffusion Laboratory for age determination using the obsidian hydration method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rind, was measured. Second, the high temperature hydration rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site was estimated in order that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 17.3).

Table 17.3. Obsidian hydration dates for LA 127625.

FS* No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
7	2003-61	Cerro Toledo	3.18	-740	172
10	2003-62	Cerro Toledo	4.46	-3665	254
12	2003-63	Valle Grande	4.44	-3291	239

* Field Specimen

The obsidian hydration dates provide a wide range from 3665 to 740 BC, reflecting Middle to Late Archaic occupations.

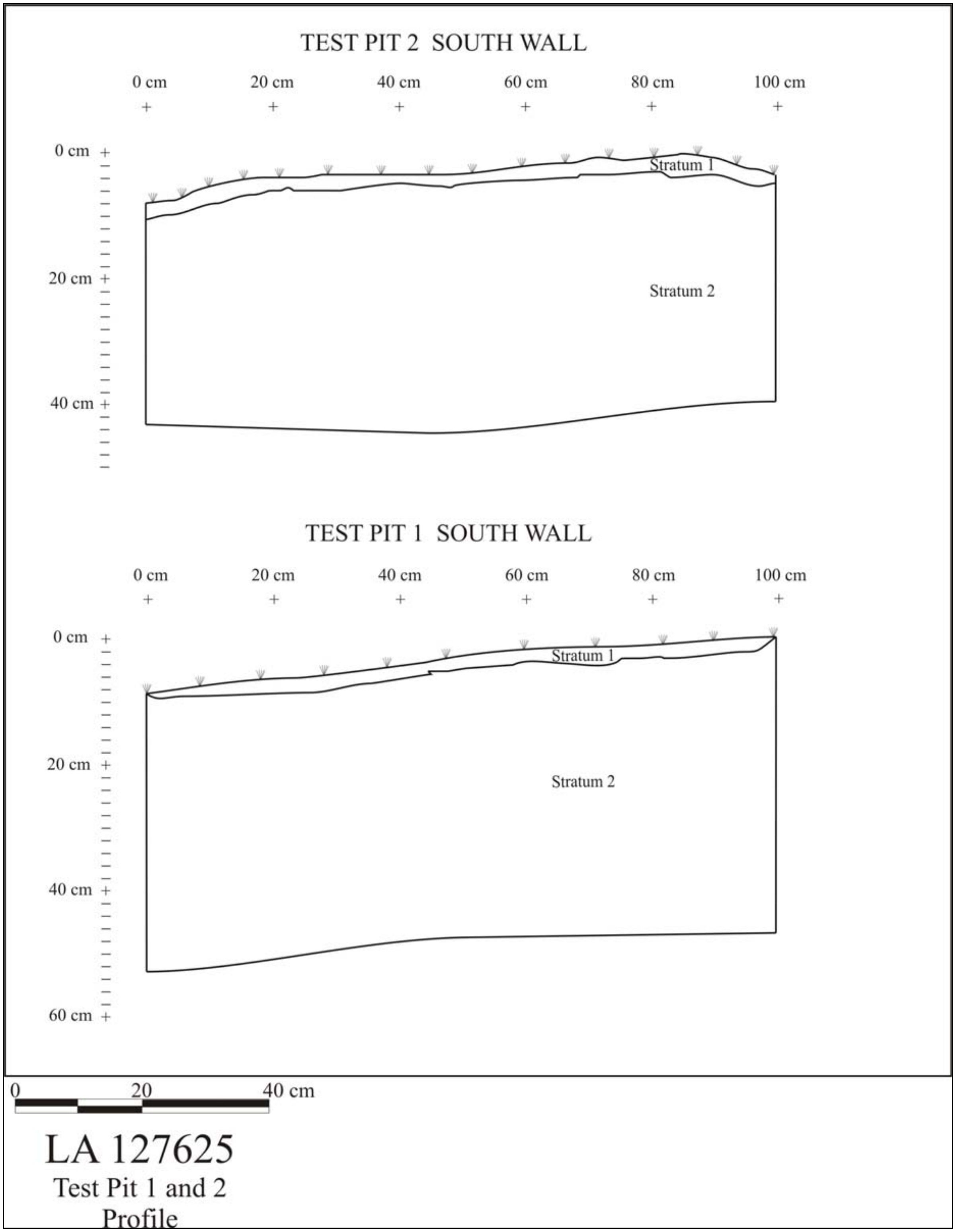

Figure 17.3. Post-excavation profiles of Test Pits 1 and 2.

Ceramic Artifacts (Dean Wilson)

Tables 17.1 and 17.4 through 17.6 show summary ceramic data for LA 127625, including general type, types by tradition, temper material by ware type, and ware by vessel form. Based on the presence of Biscuit B and B/C (Biscuit B?), it appears that the ceramic assemblage primarily reflects a Middle Classic (15th century) occupation.

Table 17.4. Tradition by ware for the LA 127625 ceramic assemblage.

Tradition	Ware						Total	
	Gray		White		Glaze			
Northern Rio Grande (Prehistoric)	15	100.0	11	100.0	--	--	27	96.4
Middle Rio Grande	--	--	--	--	1	100.0	1	3.6
Total	**15**	**100.0**	**12**	**100.0**	**1**	**100.0**	**28**	**100.0**

Table 17.5. Temper by ware for the LA 127625 ceramic assemblage.

Temper	Ware						Total	
	Gray		White		Glaze			
Granitic (mica, quartz, and feldspar)	2	13.3	--	--	--	--	2	7.1
Fine tuff or ash	1	6.6	10	83.3	--	--	11	39.2
Gray crystalline basalt	--	--	--	--	1	100.0	1	3.5
“Anthill” sand	12	80.0	1	8.3	--	--	13	46.4
Tuff and phenocrysts (“anthill”)	--	--	1	8.3	--	--	1	3.5
Total	**15**	**100.0**	**12**	**100.0**	**1**	**100.0**	**28**	**100.0**

Table 17.6. Ware by vessel form for the LA 127625 ceramic assemblage.

Vessel Form	Ware						Total	
	Gray		White		Glaze			
Bowl body	--	--	8	66.6	--	--	8	28.5
Jar neck	2	13.3	1	8.3	--	--	3	10.7
Jar body	13	86.7	2	16.6	--	--	15	53.5
Body sherd polished int-ext	--	--	1	8.3	1	100.0	2	7.1
Total	**15**	**100.0**	**12**	**100.0**	**1**	**100.0**	**28**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 56 artifacts were analyzed from LA 127625, consisting of one core, 53 pieces of debitage, and two ground stone items. These artifacts represent a 100 percent sample of the lithic artifacts recovered during the site excavations. Table 17.7 presents the data on lithic artifact type by material type. The majority of the debitage is made of obsidian, with less chalcedony and other materials. The presence of cortex on 7.5 percent of the debitage indicates that the materials were collected from both primary nodular (*n* = 1) and secondary waterworn sources (*n* = 3). The obsidian is present at nearby sources in the Jemez Mountains, but two obsidian flakes also exhibit waterworn cortex. In contrast, chalcedony, Pedernal chert, and quartzite are available from local Rio Grande Valley gravel sources and the basalt and andesite from bedrock or stream gravels.

Table 17.7. Lithic artifact type by material type at LA 127625.

Artifact Type		Material Type						
		Basalt	**Andesite**	**Obsidian**	**Chalcedony**	**Pedernal**	**Quartzite**	**Total**
Cores	Core	1	0	0	0	0	0	1
	Subtotal	1	0	0	0	0	0	1
Debitage	Angular debris	0	0	3	0	0	0	3
	Core flake	2	1	15	12	3	0	33
	Biface flake	0	0	8	2	1	0	11
	Microdebitage	0	0	3	0	0	0	3
	Undetermined flake	0	0	2	1	0	0	3
	Subtotal	2	1	31	15	4	0	53
Ground Stone	One-hand mano	0	0	0	0	0	1	1
	Basin metate	1	0	0	0	0	0	1
	Subtotal	1	0	0	0	0	1	2
Total		**4**	**1**	**31**	**15**	**4**	**1**	**56**

Eight pieces of debitage from LA 127625 were submitted for X-ray fluorescence analysis (Table 17.8). Most of the artifacts were identified from the Cerro Toledo (Rabbit Mountain/Obsidian Ridge) source, with only two artifacts coming from the Valle Grande (Cerro del Medio) source (see Shackley, Volume 3). Both of these areas are situated about 15 km (10 miles) as the "crow flies" to the southwest and west of the site.

Table 17.8. Obsidian source samples.

FS #	Artifact	Color	Source
7	Debitage	Translucent	Cerro Toledo rhyolite
10	Debitage	Black opaque	Cerro Toledo rhyolite
12	Debitage	Translucent	Valle Grande rhyolite
21	Debitage	Black opaque	Cerro Toledo rhyolite
55	Debitage	Black opaque	Valle Grande rhyolite

60-1	Debitage	Translucent	Cerro Toledo rhyolite
60-2	Debitage	Translucent	Cerro Toledo rhyolite
62	Debitage	Translucent	Cerro Toledo rhyolite

Lithic Reduction

The single core recovered from this site was reduced using a single-directional, multi-face technique and was classified as still useable when discarded (Figure 17.4). Table 17.9 presents the metric information on this core.

Figure 17.4. Core (FS 37) from LA 127625.

Table 17.9. Core type dimensions (mm) and weight (gm).

Core Type	Length	Width	Thickness	Weight
Single-directional	58	71	54	295.6

The debitage from LA 127625 mainly consists of core flakes (62.6%), with some biface flakes, microdebitage, angular debris, and undetermined flake fragments. The majority of the flakes exhibit single platforms (*n* = 5), with cortical (*n* = 2), crushed (*n* = 3), and collapsed (*n* = 2) platforms. Only two of the flakes exhibit abraded/crushed platforms.

The majority of the core flakes consist of distal fragments (*n* = 17), with fewer whole (*n* = 4), proximal (*n* = 5), and midsection (*n* = 3) fragments. Most of the biface flakes are distal fragments (*n* = 6), with fewer whole (*n* = 1), proximal (*n* = 2), and midsections (*n* = 2). The whole core flakes have a mean length of 20.7 mm (*std* = 5.7), whereas, the single whole biface flake has a length of 33.0 mm. Lastly, the angular debris have a mean weight of 1.0 g (*std* = 0.9).

Tool Use

Only a single flake exhibits evidence of damage that could be attributed to use-wear. It was utilized on the end of the flake with a convex edge outline and angle of 40 degrees.

The ground stone consists of a single one-hand cobble mano with slight grinding on both surfaces and a basin metate fragment.

Archaeobotanical Remains (Pamela McBride)

A single charred goosefoot seed was recovered from Test Pit 1 and a fragment of unknown conifer charcoal was recovered from Test Pit 2 (Tables 17.10 and 17.11). Other floral material consisted of unburned goosefoot (*Chenopodium*), purslane (*Portulaca*), and spurge (*Euphorbia*) seeds and conifer (Gymnospermae) duff. The presence of unburned plant material is not surprising considering that samples were taken from Stratum 1, which was a thin layer of silty sand along with a lot of duff and other detritus. The recovery of the charred floral material is somewhat unexpected and problematic. With no thermal feature present, it is unknown how a carbonized goosefoot seed and conifer charcoal became part of the archaeobotanical record at this lithic scatter.

Table 17.10. LA 127625 flotation sample plant remains.

Context	**Test Pit 1, Stratum 1, level 1**	**Test Pit 2, Stratum 1, level 1**
FS Number	67	68
Cultural Annuals		
Goosefoot	1(1)	
Non-Cultural Annuals		
Goosefoot		+
Purslane	+	
Spurge		+
Perennials		
Juniper		+, twig +
Pine	♂ cone	
Piñon	needle +	needle +

All plant remains are seeds unless indicated otherwise; Cultural plant remains are charred, non-cultural plant remains are uncharred; + 1-10/liter.

Table 17.11. LA 127625 flotation sample wood charcoal taxa by count and weight in grams.

FS No.	68
Context	Test Pit 2, Stratum 1, level 1
Unknown conifer	1/<0.1g

SUMMARY

In general, LA 127625 appears to be an area of redeposited colluvium, which probably resulted in the secondary deposition of artifacts from sites located upslope of LA 127625. No subsurface cultural deposits were found during excavations in two 1- by 1-m test pits, and with the site situated just below the eastern edge of a mesa where several large pueblo sites are located, it is likely that this factor resulted in the scatter of artifacts found at the site. Based on the presence of Biscuit B and Biscuit B/C (Biscuit B?), it appears that the site primarily dates to the Middle Classic period (15th century); however, the obsidian hydration dates indicate the possible presence of a Middle to Late Archaic component or reuse of these older materials.

CHAPTER 18
WHITE ROCK TRACT (A-19): LA 127631

Kari M. Schmidt

INTRODUCTION AND SITE SETTING

This chapter presents the results of excavations conducted at LA 127631, an Early Classic period fieldhouse and associated artifact scatter located in the White Rock Tract. LA 127631 (Q-247) is a fieldhouse located on the floodplain at the mouth of Pajarito Canyon. Vegetation in the area of the site is dominated by piñon and juniper woodland, with an understory of saltweed, snakeweed, yucca, and various other native grasses, shrubs, and forbs. LA 127631 is situated at an elevation of 1977 m (6494 ft) and is located approximately 75 m downslope to the south of Area 8 at LA 12587 (Chapter 15, this volume). It is also about 75 m north of New Mexico State Road 4.

SITE DESCRIPTION

The site consists of an eroded one-room fieldhouse and a small artifact scatter. The rock alignments consist of approximately 25 shaped and unshaped tuff blocks situated within a 3.0- by 2.2-m area. The tuff blocks average 25 by 18 by 10 cm in size. Active erosion from a small arroyo leading into the canyon floodplain was visible in the western portion of the site area. Figure 18.1 shows the fieldhouse as it looked before excavation. Pin flags show the location of surface artifacts.

During the survey portion of this project (Vierra et al. 2002a), one Santa Fe Black-on-white sherd was observed in a drainage located 2 m from the feature. No other artifacts were identified in the site area. Based on the presumed association of the sherd to the structure, this site was thought to date to the Coalition period. Excavations in the one-room fieldhouse support this assignation, and the paucity of artifacts and the small size suggests the structure may have been used more for on-site storage rather than shelter. Artifacts recovered from the site suggest either (or both) a Late Coalition or Early Classic period use of the fieldhouse.

FIELD METHODS

Fieldwork was conducted at LA 127631 in October 2002, beginning with an initial assessment of the site. The crew walked over the site area, delineating the site boundaries and identifying the presence of artifact concentrations and features. A 1- by 1-m grid system that was laid out during the initial ground-penetrating radar survey (see Chapter 70, Volume 3) was also used during the excavations to facilitate data corroboration. The central site datum (100N/100E for horizontal control, 10.0 m for vertical control) was established in the area to the southwest of the roomblock and a 1- by 1-m grid was laid out. The intersection of the southwest corner of each grid determined its grid coordinates. Using the established grid, controlled surface collections were made across the entire site, with all the materials being bagged separately by individual grid unit. A 225-m^2 area was surface collected.

Figure 18.1. LA 127631 before excavation.

Hand excavations were conducted in 1- by 1-m grid units around the fieldhouse. Excavations were carried out using natural stratigraphic units, or in cases where the natural stratum was greater than 10 cm thick, in arbitrary 10-cm levels. Strata were defined as distinct depositional units and descriptions for each included soil kind, texture, compactness, and color, which were determined by using a Munsell soil chart (see the following section for an in-depth discussion of the stratigraphic sequence). With the exception of materials removed for pollen, soil, and macrobotanical samples, all hand-excavated materials were screened through 1/8-in. mesh.

Stratigraphic profiles were drawn for several of the individual units. Once the fill in the room was removed in stratigraphic layers, the interior room floor was mapped. Locations of floor features, samples, and artifacts were all included on the maps. Pollen samples were taken from underneath artifacts lying on the floor and in features and other locations (corner of the room) where the context might better preserve these remains. Once excavation of the structure was completed, an additional grid unit (108N/104E) was excavated approximately 4 m to the north of the structure to examine the natural stratigraphy of sediments surrounding the fieldhouse. The test unit was excavated to a depth of 50 cm below the ground surface, with an auger test going down to a depth of 1 m.

STRATIGRAPHY (Paul Drakos and Steve Reneau)

LA 127631 is located at the base of a low gradient colluvial hill slope, with an area of fan deposition to the southwest. Excavations at the site show the hillslope is mantled by a thin (<25 cm) layer of young colluvium overlying a Pleistocene soil (Table 18.1; see Drakos and Reneau, Volume 3 for key). Colluvium is fine to very fine sand and may be composed primarily of reworked aeolian sediment. The fieldhouse is buried by 10 to 19 cm of colluvium, with roomblocks set within a Bw horizon at the boundary between a Bw1 and Bw2 horizon (Table 18.2). The site stratigraphy is consistent with the fieldhouse construction corresponding to the time of construction of Roomblock 3 at LA 12587, which is located about 100 m upslope from the site. Scattered lithics and potsherds occur on the surface in this area and may largely represent a lag or may consist of material transported by surface runoff.

SITE EXCAVATION

The excavations at LA 127631 were undertaken by Kari Schmidt (crew chief), Mia Jonsson, Mike Kennedy, and Timothy Martinez. The fieldhouse was excavated in 1- by 1-m units. Natural stratigraphic levels were used. The top centimeter of fill was a combination of duff and loose sand. Below this, the fill consisted of sandy loam, which had several immature pines growing in it. Below the sandy loam was a reddish clay loam. The clay loam stratum was utilized as a floor by the occupants of the fieldhouse. Figure 18.2 shows the excavated structure and the prepared floor. The floor was not plastered, but was compacted from use.

The uppermost stratum (Stratum 1), which contained the majority of the duff, contained only a single flake. More artifacts were found in the room fill (Stratum 2), which was a sandy loam (Table 18.3). This stratum yielded 15 flakes, 12 sherds, nine fragments of ground stone, and six macrobotanical samples.

The six macrobotanical samples submitted for analysis from Stratum 2 produced the following charred and uncharred taxa: rabbitbrush (*Chrysothammus*), unidentified pine (*Pinus* sp.), juniper (*Juniperus*), unknown conifer (Gymnospermae), unknown non-conifer, and saltbush/greasewood (*Atriplex/Sarcobatus*). The chipped stone artifacts recovered from the fieldhouse consist of obsidian and chalcedony debitage and a mix of ceramics, including Santa Fe Black-on-white, Biscuit A (Bandelier Black-on-gray), Glaze red, plain gray, smeared-indented corrugated, and Sapawe Micaceous. A single bifacial core was found on the floor (Stratum 4) and is shown in situ in Figure 18.3 (noted as a scraper). The total size of the structure was approximately 2 by 1.5 m, and no features were identified (Figure 18.4).

Table 18.1. Stratigraphy of 108N/104E located 4 m north of the fieldhouse.

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile Number	Preliminary Age Estimate	Notes
A	0-7	<5	7.5YR5/3	7.5YR4/3	ls	1msbk	so	so,po	n.o.	none	-	cs		<700-800 yrs	fs-vfs
Bw	7-24	<5	7.5YR6/3	7.5YR4/3	ls	1msbk	so	so,po	n.o.	none	-	cs			fs
ABtb1	24-35	<2	7.5YR5/2	7.5YR4/2	sicl	1-2msbk	so	s,p	2nbr	none	-	as		middle to late Pleistocene	
Bt1b1	35-47+		5YR6/3	5YR4/3	sicl	3msbk	sh-h	s,p	3npfpobr	none	-				

Table 18.2. Geomorphological profile of LA 127631.

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
A	0-12	~5	7.5YR5/3	7.5YR4/3	sl	1msbk	so	so,po	n.o.	none	-	gs	127631-2	<700 yrs	fs-vfs
Bw1	12-19	<5	7.5YR5/4	7.5YR4/3	scl	1-2msbk	so	ss,ps	n.o.	none	-				may include chunks of reworked Bt horizon

Figure 18.2. LA 127631 after excavation.

Table 18.3. Stratigraphic sequence used during excavation at LA 127631.

Provenience	Maximum Thickness	Minimum Thickness	Elevation	Color	Texture	Comments
Stratum 1 (Room 1)	0.04 (m)	0.03 (m)	10.49–10.02	10YR5/4	Duff	Very few inclusions, no artifacts. Some fire-cracked rock on surface and small pebbles in duff. Post-occupational fill.
Stratum 2 (Room 1)	0.35	0.04	10.48–9.98	5YR3/3	Sandy loam	Room fill. Few inclusions, some mottles, and few artifacts. Bottom is Stratum 4, a compact use surface.
Stratum 3 (108N 104E)	0.10	0.02	10.20–10.12	5YR2.5/1	Clay loam	Outside of fieldhouse. Lots of mottles, few artifacts, few to no pebbles. Dark reddish brown.
Stratum 4 (Room 1)	0.01	0.01	10.12–10.00	7.5YR5/3	Clay	Compact use surface of Room 1. Prepared floor. Few artifacts on 'floor', but artifacts and charcoal present. No mottles, some rootlets on surface.
Stratum 5 (108N 104E)	0.07	0.07	10.12–9.99	7.5YR5/4	Silty clay	Outside of fieldhouse. Blocky peds, sub-angular, caliche. Less clay than Strata 3 and 4, but still some present. No artifacts—sterile. Platy.

Eleven flotation samples were processed from materials recovered from the fieldhouse. Charred and uncharred taxa identified in the samples include the following: pigweed (*Amaranthus*), goosefoot (*Chenopodium*), pitseed goosefoot (*Chenopodium berlandieri*), purslane (*Portulaca*), cholla (*Opuntia*), Russian olive (*Elaeagnus angustifolia*), spurge (*Euphorbia*), raspberry/thimbleberry (*Rubus*), grass family (Gramineae), unknown conifer, sunflower (*Helianthus*), juniper, tarweed (*Madia glomerata*), unidentified pine, piñon pine (*Pinus edulis*), prickly pear cactus (*Opuntia*), squash/coyote gourd (*Cucurbita*), maize (*Zea mays*), and sumac (*Rhus*).

Six pollen samples were analyzed from sediments taken from the fieldhouse. Taxa identified in the Stratum 1 (post-occupational fill) pollen samples include the following: sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), spurge family (Euphorbiaceae), unidentified pine, piñon pine, juniper, rose family (Rosaceae), sagebrush (*Artemisia*), cheno-ams, and unidentified grasses (Poaceae). Taxa identified in the pollen samples (*n* = 2) from Stratum 2 (room fill) include the following taxa: maize, lily family (Liliaceae), nightshade family (Solanaceae), mustard family (Brassicaceae), sunflower family, rose family, penstemon family (Scrophulariaceae), evening primrose (Onagraceae), unidentified pine, piñon pine, juniper, sagebrush, cheno-ams, and unidentified grasses. Taxa identified in Stratum 4 (the floor/surface, *n* = 2) include the following taxa: maize, prickly pear, beeweed (*Cleome*), long spine sunflower, sunflower family, parsely family (Apiaceae), spurge family, rose family, unidentified pine, piñon pine, juniper, cheno-ams, and unidentified grasses. A 1- by 1-m geomorphological test pit was excavated just north of the structure. A single pollen sample was taken from this pit and the following taxa were identified: sunflower family, piñon pine, juniper, cheno-ams, and unidentified grasses.

Figure 18.3. Bifacial core on fieldhouse floor.

SITE CHRONOLOGY AND ASSEMBLAGE

Approximately 40 artifacts were recovered from excavations at LA 127631; all artifacts were analyzed. Analyses of the ceramics, lithics (chipped and ground stone), fauna, pollen, and archaeobotanical materials were all conducted. Juniper wood was submitted for radiocarbon dating and two obsidian artifacts for hydration dating. The results of these analyses, as well as associated tables, are presented in the following pages.

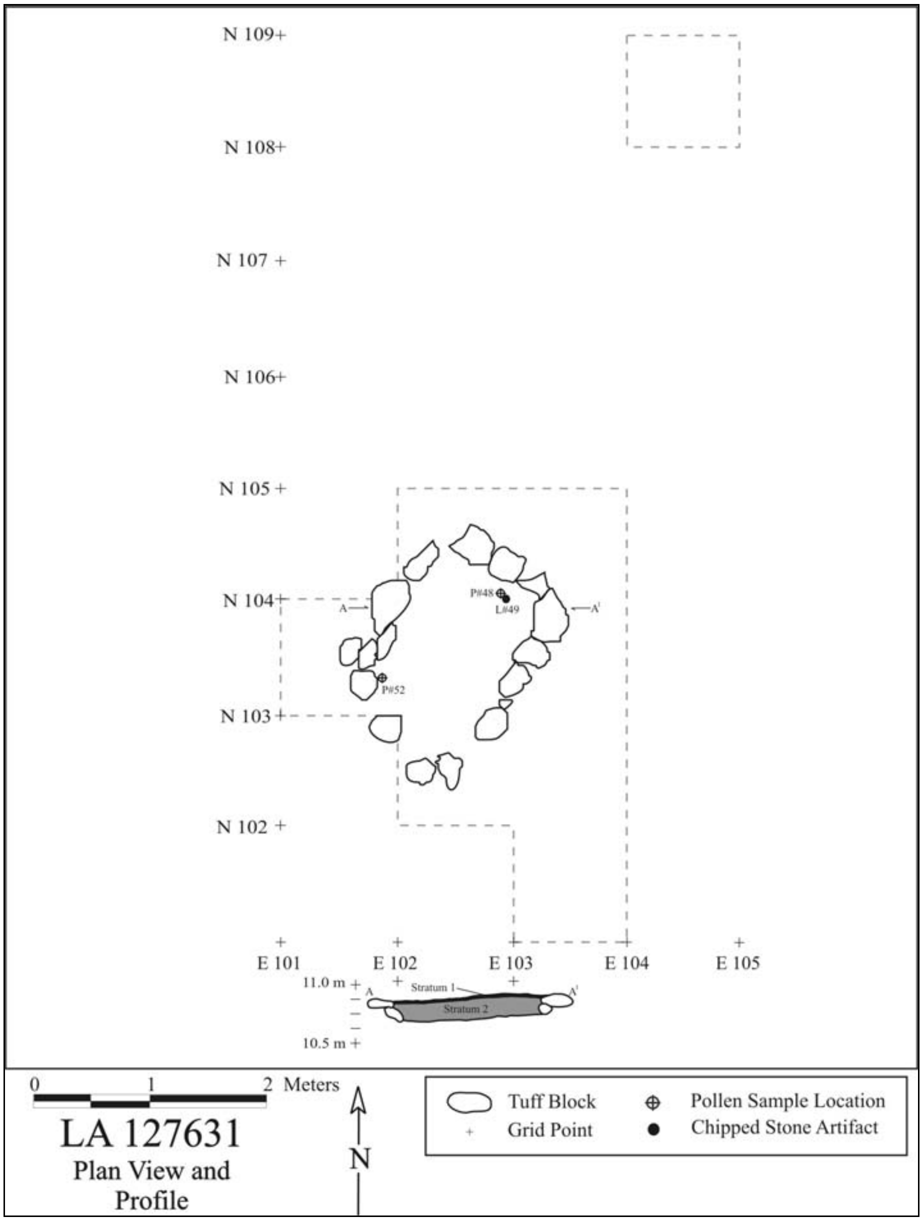

Figure 18.4. Plan view of excavated fieldhouse.

Chronology

Radiocarbon Dating

A single radiocarbon sample was submitted for analysis from this site. A small piece of juniper was collected from a flotation sample (Field Specimen [FS] 32) and dated to the Early Classic period. Table 18.4 presents the information generated from this analysis.

Table 18.4. Radiocarbon dates from LA 127631.

FS#	Material	Laboratory (Beta)#	Conventional radiocarbon age	Intercept of radiocarbon age	2-sigma calibrated result
32	juniper	183754	570±40 BP	AD 1400	AD 1300–1430

Obsidian Hydration Dating

Two obsidian artifacts from LA 127631 were submitted to Diffusion Laboratory for age determination using the obsidian hydration method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rind, was measured. Second, the high temperature hydration rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site was estimated in order that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 18.5).

Table 18.5. Obsidian hydration dates for LA 127631.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
43	2003-59	El Rechuelos	n/a		
58	2003-60	Cerro Toledo	2.41	395	131

The single obsidian hydration date of AD 395 does not correspond with the radiocarbon date of circa AD 1400 and appears to be much too early. It could therefore reflect the reuse of material dating to the Late Archaic.

Ceramic Artifacts (Dean Wilson)

While only 12 sherds were recovered from the fieldhouse at LA 127631, a wide range of types including Santa Fe Black-white, Biscuit A (Abiquiu Black-on-gray), Glaze red, plain gray, smeared corrugated, and Sapawe Micaceous were noted (Table 18.6). This combination of pottery could indicate either, 1) components dating to both the Coalition and Classic periods, or 2) a period sometime intermediate between these periods. Radiocarbon dates recovered from the fieldhouse (see above) support the latter. Tables 18.7 through 18.9 show the summary ceramic data for this site, including general type, types by tradition, temper material by ware type, and ware by vessel form.

Table 18.6. Distribution of ceramic types from LA 127631.

Ceramic Types	Frequency	Percent
Northern Rio Grande Whiteware		
Indeterminate organic paint	1	8.3

Ceramic Types	Frequency	Percent
Santa Fe Black-on-white	2	16.7
Biscuit A (Abiquiu Black-on-gray)	1	8.3
Northern Rio Grande Utilityware		
Plain body	1	8.3
Plain corrugated	1	8.3
Smeared plain corrugated	4	33.3
Sapawe Micaceous	1	8.3
Middle Rio Grande Glazeware		
Glaze red body unpainted	1	8.3
TOTAL	**12**	**100.0**

Table 18.7. Tradition by ware for LA 127631 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	6	100.0	4	100.0	--	--	--	--	10	83.3
Rio Grande (Tewa Micaceous)	--	--	--	--	--	--	1	100.0	1	8.3
Middle Rio Grande	--	--	--	--	1	100.0	--	--	1	8.3
Total	**6**	**100.0**	**4**	**100.0**	**1**	**100.0**	**1**	**100.0**	**12**	**100.0**

Table 18.8. Temper by ware for LA 127631 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Highly micaceous paste	--	--	--	--	--	--	1	100.0	1	8.3
Fine tuff and sand	--	--	4	100.0	--	--	--	--	4	33.3
Gray crystalline basalt	--	--	--	--	1	100.0	--	--	1	8.3
"Anthill" sand	6	100.0	--	--	--	--	--	--	6	50.0
Total	**6**	**100.0**	**4**	**100.0**	**1**	**100.0**	**1**	**100.0**	**12**	**100.0**

Table 18.9. Form by ware for LA 127631 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Bowl rim	--	--	1	25.0	--	--	--	--	1	8.3
Bowl body	--	--	3	75.0	--	--	--	--	3	25.0
Jar neck	2	33.3	--	--	--	--	--	--	2	16.7
Jar body	4	66.7	--	--	1	100.0	1	100.0	6	50.0
Total	**6**	**100.0**	**4**	**100.0**	**1**	**100.0**	**1**	**100.0**	**12**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 17 artifacts were analyzed from LA 127631, consisting of a core, 14 pieces of debitage, and two ground stone items. This represents a 100 percent sample of the lithic artifacts recovered during the site excavations. Table 18.10 presents the data on lithic artifact type by material type. The debitage mostly consist of chalcedony and obsidian, with some other materials. Only a single Pedernal chert flake exhibited waterworn cortex, reflecting 7.1 percent of the total debitage assemblage. The obsidian is present at nearby sources in the Jemez Mountains, chalcedony and Pedernal chert from local Rio Grande Valley gravel sources, and the basalt and andesite from bedrock or stream gravels.

Table 18.10. Lithic artifact type by material type from LA 127631.

Artifact Type		Material Type					
		Basalt	Andesite	Obsidian	Chalcedony	Ped-ernal	Total
Cores	Core	0	0	0	1	0	1
	Subtotal	0	0	0	1	0	1
Debitage	Angular debris	1	0	0	0	0	1
	Core flake	0	0	5	4	1	9
	Biface flake	0	0	0	1	0	1
	Microdebitage	0	0	0	2	0	2
	Subtotal	1	0	5	7	1	14
Ground Stone	Undetermined mano fragment	0	1	0	0	0	1
	Abrading stone	0	1	0	0	0	1
	Subtotal	0	2	0	0	0	2
Total		**1**	**2**	**5**	**8**	**1**	**17**

Five pieces of debitage from LA 127631 were submitted for X-ray fluorescence analysis (Table 18.11). The artifacts were from the Cerro Toledo (Rabbit Mountain/Obsidian Ridge) and Valle Grande (Cerro del Medio) source areas, which are located about 15 km (10 miles) as the "crow flies" to the southwest and west of the site (see Shackley, Volume 3). The El Rechuelos (Polvadera Peak) source area is located about 24 km (15 miles) northwest.

Table 18.11. Obsidian source samples.

FS #	Artifact	Color	Source
18	Debitage	Translucent	Valle Grande rhyolite
23	Debitage	Translucent	Cerro Toledo rhyolite
43-1	Debitage	Translucent	Valle Grande rhyolite
43-2	Debitage	Translucent	El Rechuelos
58	Debitage	Translucent	Cerro Toledo rhyolite

Lithic Reduction

The single core identified at LA 127631 was reduced using a bi-directional, bifacial technique and was classified as still useable when discarded. However, given its roughly ovoid shape, the artifact could also be classified as an early stage biface. Table 18.12 presents the metric information on this core. The debitage mainly consists of core flakes (64.2%), with a biface flake, a piece of angular debris, and two pieces of microdebitage.

Table 18.12. Core type dimensions (mm) and weight (gm).

Core Type	Length	Width	Thickness	Weight
Bi-directional	70	57	32	128.5

Only three flake platforms are present and all of these are single-faceted; however, two of the three flakes do exhibit abraded/crushed platforms. The majority of the core flakes consist of distal fragments (n = 6), with fewer whole (n = 1), proximal (n = 1), and midsection (n = 1) fragments. The single biface flake is whole. The single whole core flake has a mean length of 27.0 mm, whereas, the single whole biface flake has a length of 12.0 mm. Lastly, the single piece of angular debris has a weight of 33.3 gm.

Tool Use

None of the flakes exhibits evidence of damage that could be attributed to use-wear**.**

The ground stone consisted of the fire-cracked midsection of a mano that could represent a two-hand variety. The abrading stone is characterized by a small ground surface on an odd-shaped cobble.

Faunal Remains (Kari Schmidt)

A single animal bone was recovered during the excavations at LA 127631. The bone was identified as a proximal cottontail (*Sylvilagus* sp.) femur, was from the right side, and was burned. Because the bone was recovered from the surface, it is not clear whether it was associated with the occupation of the site or not.

Archaeobotanical Remains (Pamela McBride)

One sample (from room fill) of the nine flotation samples from LA 127631 yielded cultural plant remains. These consisted of maize cupules, a maize embryo fragment, and possible squash/coyote gourd (*Cucurbita*) rind (Table 18.13).

Table 18.13. Flotation sample plant remains from LA 127631.

Feature	Post-occupational fill (FS 15)	Room fill, stratum 2, level 1 (FS 29, 32)		Room fill, stratum 2, level 2 (FS 17, 28, 53)			Outside fieldhouse, stratum 3 (FS 42)	Outside fieldhouse, stratum 5 (FS 51, 55)	
Grid	104N/103E	103N/102E		102N/ 103E	104N/ 102E	103N/ 101E	108N/ 104E	108N/ 104E	102N/ 103E
Cultural Cultivars									
Maize			cupule 6(0), e 1(0) pc						
Other: possible Squash/coyote gourd			rind +						
Non-Cultural Annuals									
Goosefoot			+	+	+	+			+
Pigweed	+		+						
Pitseed goosefoot						+			+
Purslane				+	+	+			
Spurge	fruit +		fruit +	+, fruit +		+, fruit +			+
Sunflower	+					+			
cf. Tarweed	+			+					
Grasses									
Grass family	wp +								
Perennials									
Cholla	+								
Juniper	+, ♂ cone, twig +	twig +	twig +	+, ♂ cone, twig +	+, twig +	+, twig +	twig +	twig +	+, twig +
Pine	bs +, nsg +, umbo +	bs +	bs +	bs +, umbo +	bs +, nsg +	bs +	twig +	♂ cone	
Piñon	needle +, nutshell +	needle +	needle +	needle +	needle +	needle +	needle +	needle +	needle +
Ponderosa pine		needle +							
Prickly pear cactus	+, embryo +		embryo +	+	embryo +				embryo +
Raspberry/ Thimbleberry						+			
Russian olive	+								
cf. Sumac									+

All plant remains are seeds unless indicated otherwise; Cultural plant remains are charred, non-cultural plant remains are uncharred; + 1-10/liter, bs barkscale, e embryo, nsg needle spindle gall, pc partially charred, wp whole plant.

Non-cultural plant remains consisted of conifer duff, cactus seeds, weedy annual seeds, grass, a raspberry or thimbleberry seed, a possible sumac seed, and a Russian olive seed. The uncharred seeds from perennial plants are all from fruits and may represent the remains of a meal enjoyed by a rodent or bird. Nine pieces of juniper and two of unknown conifer charcoal were also recovered in flotation samples. Vegetal samples yielded a fragment of unburned, unknown wood and small pieces of juniper, pine, possible rabbitbrush, and saltbush/greasewood charcoal (Table 18.14). The carbonized maize and possible squash rind suggest the occupants may have been enjoying the fruits of their labor and using local conifer and shrub wood for fuel.

Table 18.14. Vegetal sample wood charcoal taxa, by count and weight in grams, from LA 127631.

Feature	102N/103E, stratum 2, level 2 (FS 19)	104N/103E, stratum 2, level 2 (FS 22)	103N/103E, stratum 2, level 3 (FS 27)	103N/102E, stratum 2, level 1 (FS 38)	104N/102E, stratum 2, level 2 (FS 44)	101N/103E, stratum 2, level 1 (FS 56)
Conifers						
Juniper				3/0.8g	1/<0.1g	
Pine			2/0.2g			
Unknown conifer						1/<0.1g
Non-Conifers						
cf. Rabbitbrush		1/0.4g				
Saltbush/ greasewood					2/0.2g	
Unknown Non-Conifer					1/<0.1g	
Unknown	1/<0.1g u					

cf. compares favorably, u uncharred.

Pollen Remains (Susan J. Smith)

Six pollen samples were analyzed from sediments taken from the fieldhouse. Taxa identified in the Stratum 1 (post-occupational fill) pollen samples include the following: sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), spurge family (Euphorbiaceae), unidentified pine (*Pinus*), piñon pine, juniper, rose family (Rosaceae), sagebrush, cheno-ams, and unidentified grasses (Poaceae). Taxa identified in the pollen samples (n = 2) from Stratum 2 (room fill) include the following taxa: maize, lily family (Liliaceae), nightshade family (Solanaceae), mustard family (Brassicaceae), sunflower family, rose family, penstemon family (Scrophulariaceae), evening primrose (Onagraceae), unidentified pine, piñon pine, juniper, sagebrush, cheno-ams, and unidentified grasses. Taxa identified in Stratum 4 (the floor/surface, n = 2) include the following taxa: maize, prickly pear (*Opuntia/Platy*), beeweed (*Cleome*), long spine sunflower, sunflower family, parsely family (Apiaceae), spurge family, rose family, unidentified pine, piñon pine, juniper, cheno-ams, and unidentified grasses. A 1- by 1-m pit was excavated just north of the structure for geomorphological analyses. A single pollen sample was taken from this pit and the following taxa were identified: sunflower family, piñon pine, juniper, cheno-ams, and unidentified grasses. Maize was the only cultigen identified in the pollen assemblage. Other economic resources in the assemblage included sunflower family, lily family, nightshade family, beeweed, and parsley family.

SUMMARY

LA 127631 is a one-room fieldhouse that may have been used for the in-field storage of crops and/or agricultural equipment. The very small size of the structure indicates that it is unlikely to have been used for even short-term habitation, as it would have been too small to offer much comfort. However, its location near areas suitable for farming and the presence of maize indicate that the site did play a role in agricultural activities. At the time of excavation, the west wall had two stone courses, but the other walls had only a single course. The south wall appeared somewhat disarticulated and was probably where the entryway was located. The ceramic and radiocarbon dates indicate that the structure was probably occupied during the Early Classic period (14th century).

CHAPTER 19
WHITE ROCK TRACT (A-19): LA 128803

Kari M. Schmidt

INTRODUCTION AND SITE SETTING

This chapter presents the results of excavations conducted at LA 128803, an Early Classic period grid garden located in an area of the White Rock Tract slated for economic development. LA 128803 (previous numbers LA 12587A and H-2) is a grid garden located at the mouth of Cañada del Buey, about 140 m north-northwest of State Road 4. Dominant vegetation in the area includes primarily piñon and juniper trees, with an understory comprised of saltweed, snakeweed, yucca, and various other native grasses, shrubs, and forbs. The site is situated at an elevation of 1967 m (6462 ft) and is located on a gentle northeast-facing slope. A fairly deep arroyo that runs east-west is located approximately 35 m north of the grid garden. A two-track powerline road forms the northern boundary of the site perimeter. Large basalt outcrops are located immediately south of the site and were likely the source of construction materials for the grid garden.

SITE DESCRIPTION

The portion of the grid garden that was excavated is composed of several basalt rock alignments located within an area measuring 6 by 3 m. Other subsurface grids were located in a ground-penetrating radar (GPR) survey of the site (see Nisengard et al., Volume 3), but only two were excavated. The site is somewhat eroded, although the integrity of the rock alignments appear to be intact. Figure 19.1 shows the plan view of the site. Only a few artifacts were identified on the surface in the initial visit to the site. These include one chert flake and a quartzite hoe. No ceramics were observed. Based primarily on the construction style of the grid garden and secondarily by the few associated artifacts, the site was given a Classic period assignation. Figure 19.2 shows the relocated hoe on the surface near the southeastern corner of the grid garden. In January of 2003, the quartzite hoe was in the same location as when it was originally identified in 1999, suggesting little disturbance to the area in the four intervening years. The basalt cobbles visible in the photo form the northeastern corner of the eastern grid (see Figure 19.1).

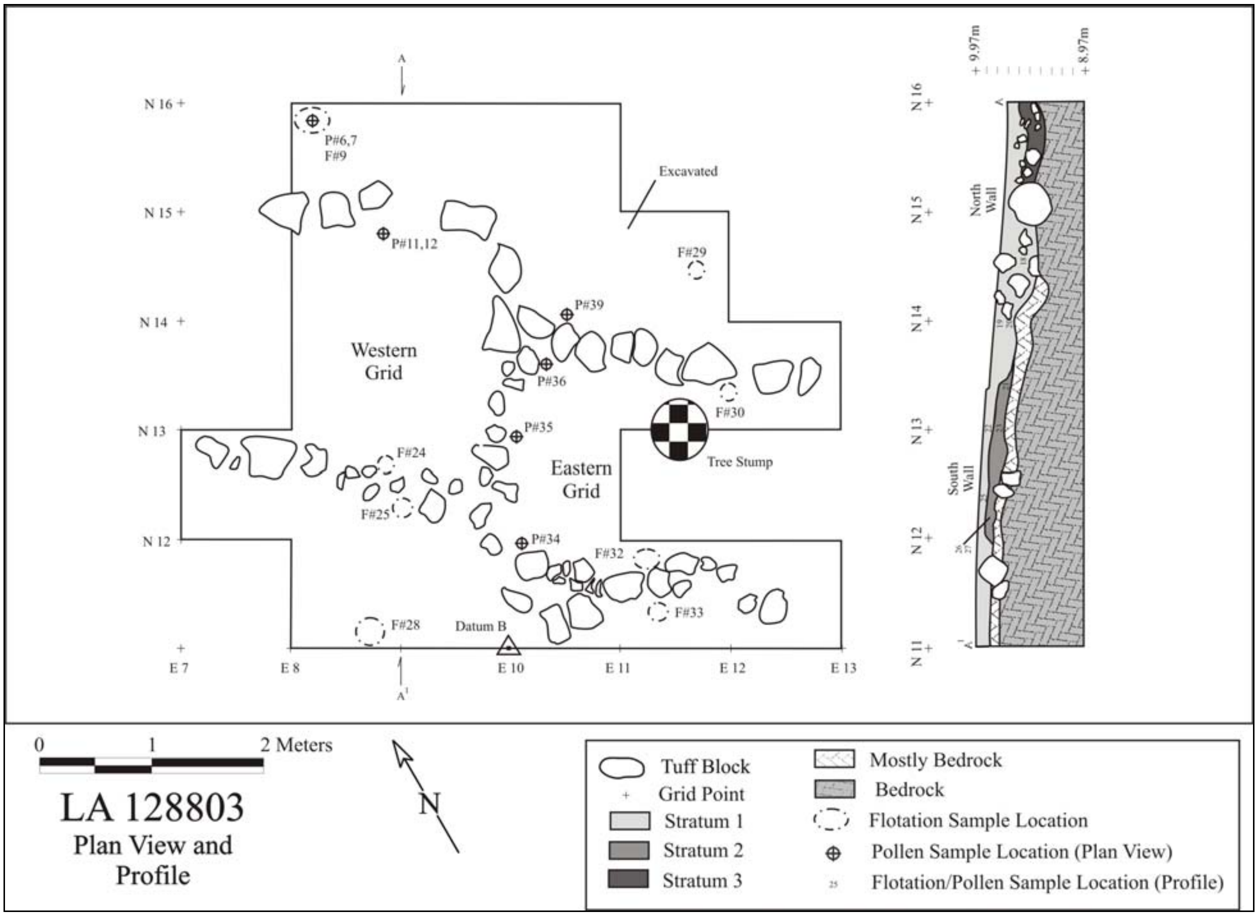

Figure 19.1. Plan view and profile of the grid garden.

FIELD METHODS

Fieldwork began at LA 128803 in early January 2003, with the initial assessment of the site. The crew walked over the site area, delineating the site boundaries and identifying the presence of artifact concentrations and features. Only two surface artifacts were located although a 450-m^2 area was collected. The site grid was set up on the pre-established GPR grid (100N/100E for horizontal control, 10.0 m for vertical control), which was oriented to true north. However, since the excavation strategy for the grid garden was to bisect it as uniformly as possible, a second grid for excavation was laid over the grid garden, matching its orientation. This grid was located at 30 degrees east of north and started at 10N/10E. The 10N/10E point of the superimposed grid corresponded with 100N/106E in the original GPR grid. By doing this, it enabled the trench to be excavated matching the original orientation of the grid garden. In both grids, the intersection of the southwest corner of each grid determined its grid coordinates.

Figure 19.2. Hoe recovered from surface of grid garden.

After the brief surface collection, and starting at the 10N/10E grid point, a meter-wide trench was excavated from outside the upper (or southern) garden wall, through the interior of the grid garden, and on through the lower (or northern) garden wall. This produced a profile that ran parallel to the slope that the grid garden was built to accommodate, thereby offering a look at how effective the garden may have been. Additional excavation was limited to shovel-wide trenches along the inside and outside of the other rock alignments that formed the garden walls. These trenches were dug for two purposes: to increase the number of pollen and flotation samples and to assess the depth and integrity of the grid garden walls. The trenches that paralleled the garden walls averaged approximately 20 to 25 cm deep.

In the meter-wide trench, pollen and flotation samples were collected in distinct stratigraphic units that were determined during site visits by project geomorphologists. Samples of both types were collected upslope and outside of the garden, at several places within the grid garden especially along the middle garden wall and downslope of the garden. Figure 19.1 shows the locations where pollen and flotation samples were collected. The profile can be identified on the plan view by the A-A^1 line. Figures 19.3 and 19.4 show the grid garden as it looked before excavation and after the completion of the meter-wide trench.

Figure 19.3. LA 128803 before excavation with southwest grid visible (north).

Figure 19.4. Trench through LA 128803; upper wall at bottom, middle wall in center, and lower wall at top of photo (south).

STRATIGRAPHY (Paul Drakos and Steve Reneau)

The grid garden is located in an area of discontinuous thin colluvial soils over basalt bedrock. There is a long colluvial slope west of the site that provides surface runoff to the site. The grid gardens may be partially buried by slope wash colluvium. East of the site, the soils thin and the slope becomes steeper above an incised channel of Cañada del Buey.

Four soil profiles were described upslope, within, and downslope of the rock alignments forming the grid garden (Table 19.1; see Drakos and Reneau, Volume 3 for key). Soils were moist when described, and therefore weakly developed soil structure, if present, was difficult to discern. However, two trends are apparent in the soils described in the immediate vicinity of the grid garden. One trend is that the thickness of post-Puebloan soil is greater upslope and within the grid garden, ranging from 16 to 21 cm, than was observed downslope of the grid garden, where the post-Puebloan soil thickness was 10 cm. A second trend is that upper-horizon post-Puebloan soils are finer-grained (a silt loam) within and immediately downslope of the grid garden than was observed upslope of the grid garden (a sandy loam). Both trends are consistent with the rock alignments acting to retain surface runoff and fine-grained slope wash, and are consistent with the rock alignments functioning as a grid garden.

An additional observation was the absence of remnant Pleistocene soils in relatively deep pockets in the basalt within the rock alignments, although such soils were present outside the rock alignments and in a test pit south of the alignments. This observation suggests that first excavating the relatively dense, clay-rich Pleistocene soils, and replacing this material with looser soil may have prepared the area inside the alignments. In general, the soils at LA 128803 are very weakly developed and apparently lack development of Bw horizons observed in Coalition period soils at other White Rock Tract sites. It is therefore inferred that LA 128803 is likely a Classic period feature.

SITE EXCAVATION

The excavations at LA 128803 were undertaken by a combination of graduate and post-baccalaureate students and LANL contractors. The crew consisted of the following people: Aaron Gonzales, Mia Jonsson, Mike Kennedy, Kari Schmidt, and Marjorie Wright.

Table 19.1. Geomorphological characteristics of the LA 128803 deposits.

Profile	Horizon	Depth (cm)	Gravel (%)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
128803-1	AC	0-14	<2	7.5YR4/3	sl	m	(lo)	so,ps	n.o.	none	-	cs	<500 yrs?	Profile moist when described; slopewash upslope of rock alignment
	C	14-19	<2	7.5YR4/3	l	m	(lo)	ss,ps	n.o.	none	-	ai		pockets between boulders
	R	19+												basalt boulder
128803-2	AC	0-13	<2	7.5YR4/3	sil	m	(lo)	ss,ps	n.o.	none	-	cs	<500 yrs?	slopewash
	C	13-21	<2	7.5YR4/3	sl	m	(lo)	ss,ps	n.o.	none	-	ai		layer above basalt (boulder or bed rock)
	R	21+												basalt (boulders?)
128803-3	AC	0-16	<2	7.5YR4/3	sil	m	(lo)	ss,ps	n.o.	none	-	ai	<500 yrs?	slopewash
	R	16+												basalt (boulders?)
128803-4	AC	0-10	10-20	7.5YR4/3	sil	m	(lo)	ss.ps	n.o.	none	-	as	<500 yrs?	
	Btb1	10-20	20-40	5YR4/3	sicl	2msbk		s,p	1-2nbrco	none	-	ai	middle to late Pleistocene	older soil, between boulders
	R	20+												basalt

Initial excavation at LA 128803 concentrated on units just outside the grid garden walls, at the upslope and downslope extents. Beginning with these first two external excavation units, a trench was completed, connecting them through the grid garden to provide a continuous trench. Due to the fact that the excavation was being done in the winter, much of the soil was frozen, which made for slow going. This being the case, and with time constraints on the project, excavations other than the trench were limited to shovel-wide trenches along either side of grid garden walls to be able to collect pollen and flotation samples from as many parts of the garden as possible for comparison. For this purpose, 15 flotation and 21 pollen samples were collected both inside and outside the grid walls for comparative analysis. The grid garden consisted of two U-shaped rock alignments (eastern and western grids) facing in opposite directions and sharing a common baseline, which were slightly offset from one another (see Figure 19.1). The rocks outlining the sides of the "U" were larger, particularly the ones furthest downslope.

Approximately 5 m to the east of the grid garden, another 1- by 1-m unit was excavated as a geomorphologic control unit to compare the soils associated with the grid garden to that of the surrounding natural stratigraphy (Table 19.2; see stratigraphy section for information on how these two areas differed).

Table 19.2. Stratigraphic sequence used during excavations at LA 128803.

LA 128803 Stratigraphic Summary							
Stratum	**Provenience**	**Maximum Thickness**	**Minimum Thickness**	**Elevation**	**Color**	**Texture**	**Comments**
1	11-14N/9E and 94N/107E	0.37 (m)	0.13 (m)	10.02–9.50	7.5YR4/3	Silty loam	Recent colluvium, upper level. In and out of grid garden.
2	11-14N/9E and 94N/107E	0.15	0.05	9.77–9.40	7.5YR4/3	Silty loam	Recent colluvium, lower level. In and out of grid garden.
3	15N/9E	0.10	0.03	9.95–9.30	5YR4/3	Sandy clay loam	Early Holocene/Late Pleistocene soil. Outside and south of grid garden.
4	94N/107E	0.10	0.10	9.85–9.75	5YR3/3	Clay	Middle Pleistocene clay. Outside grid garden only.

SITE CHRONOLOGY AND ASSEMBLAGE

Only four artifacts were recovered from excavations at LA 128803 and included three pieces of chipped stone and a quartzite hoe. Analyses of the lithics (chipped and ground stone), pollen, and archaeobotanical materials were all conducted, but no faunal materials were recovered. Results of these analyses are presented in subsequent sections.

Chronology

Only a single radiocarbon sample was submitted for analysis from this site. Several maize (*Zea mays*) cupules were collected from a flotation sample (Field Specimen [FS] 21) taken from inside the western grid and dated to the Early Classic period. Table 19.3 presents this information.

Table 19.3. Radiocarbon dates from LA 128803.

FS#	Context of sample	Laboratory (Beta)#	Conventional radiocarbon age	Intercept of radiocarbon age	2-sigma calibrated result
21	Stratum 2	183755	530±40 BP	AD 1420	AD 1390-1440

Chipped and Ground Stone (Bradley Vierra and Michael Dilley)

A total of four artifacts were analyzed, consisting of two pieces of debitage and a hoe. This represents a 100 percent sample of the lithic artifacts recovered during the site excavations. The debitage consists of a chalcedony core flake and piece of rhyolite angular debris. The hoe consists of a tabular quartzite cobble that is notched on both sides, but with no obvious use-wear (Figure 19.5).

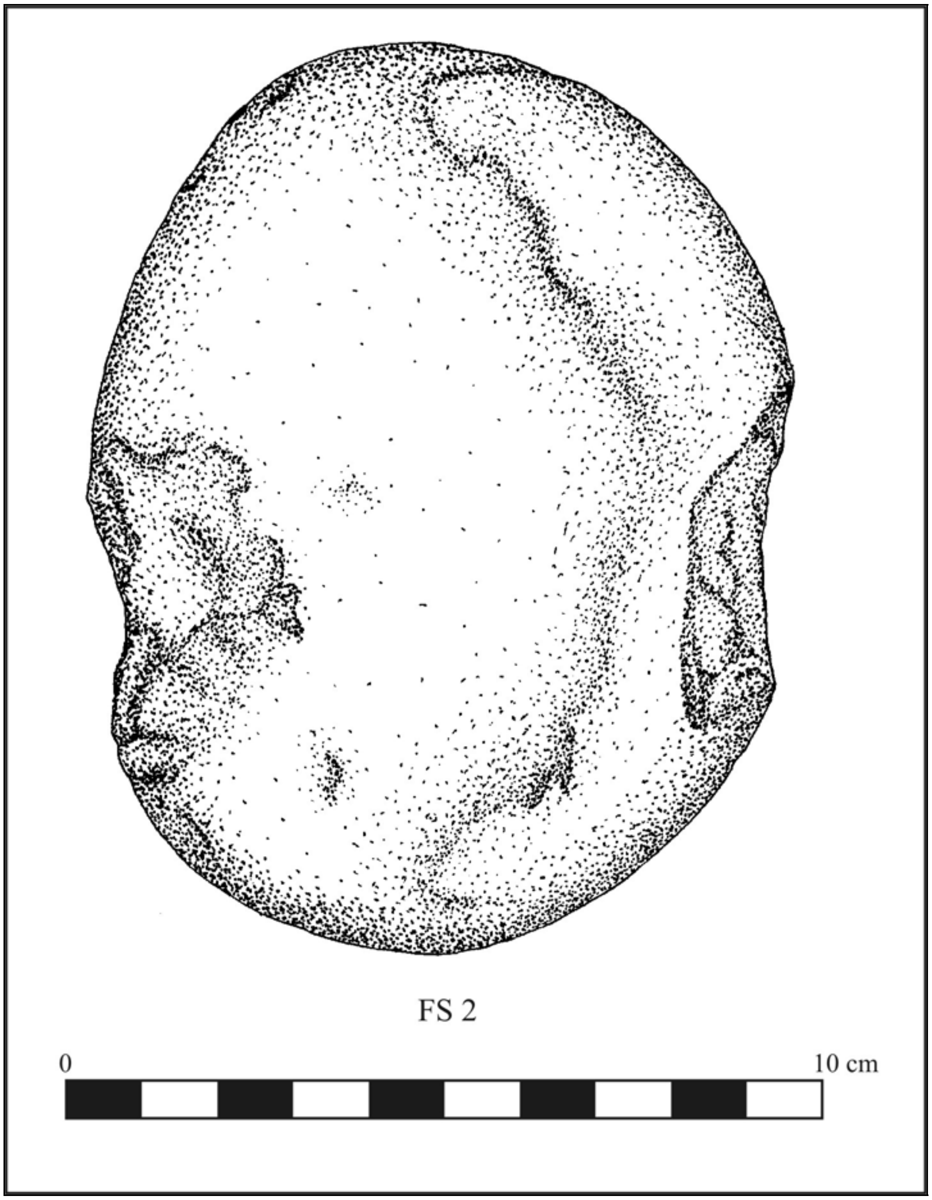

Figure 19.5. Hoe from LA 128803.

Archaeobotanical Remains (Pamela McBride)

Situated at the mouth of Cañada del Buey, farmers who used these grid gardens were taking advantage of run-off from the uplands and the rock borders of the gardens served to capture nutrient-rich sediment. Carbonized corn cupules and goosefoot (*Chenopodium*) and cheno-am (*Chenopodium/Amaranthus*) seeds were identified from three of 10 samples collected from within the grid garden borders (Table 19.4).

Table 19.4. LA 128803 flotation sample plant remains.

FS No.	9	14	16	18	21	24
Feature	15.99N/8.1E	94N/107E stratum 3	94N/107E stratum 4	14.5N/8.99E	13.5N/9E	12.7N/ 8.85E
Cultural Annuals						
Goosefoot						1(0)
Cultivars						
Maize		cupule 1(0)			cupule 2(0)	cupule 4(0)
Non-Cultural Annuals						
Goosefoot					+	
Purslane				+		+
Spurge	fruit +					
Grasses						
Grass family				floret +, leaf +		
Other						
Composite family						+
Unknown				+		
Perennials						
Juniper	twig +	twig +		twig +	twig +	+, ♀ cone, twig +
Pine	bs +, twig +				umbo +	
Piñon	needle +, nut +	needle +	needle +	needle +	needle +	needle +

Table 19.4. LA 128803, flotation sample plant remains (continued).

FS No.	25	28	29	30	32	33
Feature	12.2N/8.9 9E	11N/8. 7E	14.5N/11. 65E	13.33N/11.95 E	11.85N/ 11.2E	11.3N/ 11.3E
Cultural Annuals						
Cheno-Am	1(1)					
Cultivars						
Maize	cupule 1(0)					
Non-Cultural Annuals						
Goosefoot	+					
Purslane	+	+				+
Spurge	fruit +	+				
Sunflower	+					
Grasses						
Grass family	leaf +		leaf +			

FS No.	25	28	29	30	32	33
Other						
Groundcherry			+			
Perennials						
Juniper	+, twig +	+, twig +	+, twig +	+, ♀ cone, ♂ cone +, twig +	+, ♀ cone, twig +	+, ♀ cone, twig +
Pine	♂ cone +, nsg +, umbo +	twig +, umbo +	bs +, cs +, ♂ cone +, nsg +, umbo +	♂ cone +, twig +, umbo +	nsg +, twig +	
Piñon	needle +	needle +	needle +, nut +	needle +	needle +	needle +, twig +
Ponderosa pine	needle +					needle +
Prickly pear cactus			+	+		

All plant remains are seeds unless indicated otherwise; cultural plant remains are charred, non-cultural plant remains are uncharred; + 1-10/liter, bs barkscale, cs conescale, nsg needle spindle gall.

Curiously, a corn cupule fragment was also recovered from Stratum 3 of the test pit that was to the south of the grid gardens. Unknown conifer (Gymnospermae), oak (*Quercus*), rose family (Rosaceae), and saltbush/greasewood (*Atriplex/Sarcobatus*) charcoal were also present. Nearby thermal features were not recorded so it is curious how charred plant remains came to be deposited. Cushing (1974) describes in detail the process of creating a run-off field at the mouth of an arroyo at Zuni. The first year the farmer piles soil up to make an outline of the field boundary and marks the corners with columnar stones. Vegetation is cut away and placed in the center of the field where it is burned. A brush fence is also constructed and strategically placed to catch eolian sediment that results in a fine loam deposit over the field.

Brandt (1995) states that burning brush and the collection of nutrient-laden sediment are the only references to fertilizing fields found in the ethnographic literature. Along with the collection of sediment behind garden borders, it is possible that shelled corncobs and brush were burned to clear or fertilize grid gardens in a similar manner described by Cushing.

Pollen Remains (Susan J. Smith)

Sixteen pollen samples were analyzed in intensive analyses from sediments taken from the grid gardens at LA 128803. Table 19.5 lists the frequency of identified pollen types. Maize and cotton were the only cultigens identified in the pollen assemblage. Economic resources identified in the pollen assemblage included only prickly pear and parsley family. A number of other potential economic resources were identified in the assemblage (Table 19.5), and these are described in detail in Smith's chapter in Volume 3 (Chapter 63).

Table 19.5. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 128803 (*n* = 16)
Cultigens	*Gossypium*	Cotton	1
	Cucurbita	Squash	0
	Zea mays	Maize	7
	Zea Aggregates	Maize Aggregates	1
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	3
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	1
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	4
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	3
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	15
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 128803 (*n* = 16)**
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs and Possible Subsistence Resources	Cheno-Am	Cheno-Am	16
		Cheno-Am Aggregates	6
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	16
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	6
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	1
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	14
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	3
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	3
	Pinus	Pine	15

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 128803 (*n* = 16)
Subsistence?		Pine Aggregates	1
	Pinus edulis type	Piñon	16
	Juniperus	Juniper	15
		Juniper Aggregates	0
	Quercus	Oak	9
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	7
	Artemisia	Sagebrush	13
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

Pollen Samples from Grids

Samples were taken from both inside and outside of the grid and from both upslope and downslope contexts (Table 19.6).

Table 19.6. Pollen and flotation samples selected for analysis.

FS No.	Context	Strat	Level	Comments	Grid	Depth (bgs)	Soil Horizon
6	Grid garden	1	1	Out of grids (north end)	Western	43	R
7	Grid garden	3	2	Out of grids (north end)	Western	47	R
11	Grid garden	1	1	In grids (north end)	Western	47	R
12	Grid garden	1	1	In grids (north end)	Western	37	R
15	Test pit	3	1	Control unit	--	10	R
17	Test pit	4	1	Control unit	--	20	R
19	Grid garden	1	1	In grids (center)	Western	27	R
20	Grid garden	1	1	In grids (center)	Western	32	R
22	Grid garden	1	1	In grids (south end)	Western	21	C
23	Grid garden	2	2	In grids (south end)	Western	27	R

FS No.	Context	Strat	Level	Comments	Grid	Depth (bgs)	Soil Horizon
26	Grid garden	1	1	Just out of grid (south)	Western	12	A
27	Grid garden	2	2	Just out of grid (south)	Western	20	C
34	Grid garden	1	1	In grids (south end)	Eastern	13	A
35	Grid garden	1	1	In grids (center)	Eastern	13	A
36	Grid garden	1	1	In grids (north end)	Eastern	21	C
39	Grid garden	1	1	Out of grids (north end)	Eastern	31	R

Eastern Grid

A trench was excavated through the center of the eastern grid. Taxa identified outside of the grid garden to the north (downslope; FS 6 and FS 7, see Figure 19.1) included the following: cheno-ams, unidentified grasses (Poaceae), mustard family (Brassicaceae), sunflower family (Asteraceae), spurge family (Euphorbiaceae), evening primrose (Onagraceae), unidentified pine (*Pinus*), piñon pine (*Pinus edulis*), juniper (*Juniperus*), oak, rose family, Mormon tea (*Ephedra*), and sagebrush (*Artemisia*). Taxa identified inside the eastern grid just inside the northern wall (FS 11 and FS 12) include the following taxa: maize, ragweed/bursage (*Ambrosia*), cheno-ams, unidentified grasses, sunflower family, globemallow (Sphaeralcea), spurge family, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush. Taxa identified from the center of the eastern grid (FS 19 and FS 20) include the following: maize, cheno-ams, unidentified grasses, mustard family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush. Taxa identified inside the eastern grid just inside the southern (upslope; FS 22 and FS 23) wall include the following taxa: maize, cheno-ams, unidentified grasses, sunflower family, spurge family, evening primrose, fir (*Abies*), unidentified pine, piñon, juniper, oak, rose family, Mormon tea, and sagebrush. Taxa identified outside of the grid garden to the south (upslope; FS 26 and FS27) include the following: maize, prickly pear (*Opuntia*), cheno-ams, unidentified grasses, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, oak, rose family, and sagebrush.

Western Grid

Excavations in the western grid were conducted along the grid walls, where shallow trenches were dug. Four pollen samples were analyzed from this grid and were taken from outside the northern (downslope) grid, as well as along the central grid wall (shared with the eastern grid) and in the center. The pollen sample analyzed from just inside the southern (upslope: FS 34) grid wall includes the following taxa: maize, cheno-ams, unidentified grasses, sunflower family, spurge family, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush. Taxa identified along the central wall in the western grid (FS 35) include the following: cheno-ams, unidentified grasses, sunflower family, spurge family, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush. Identified taxa from just inside the northern (downslope) wall of the western grid (FS 36) include the following: cheno-ams, sunflower family, spurge family, piñon pine, and sagebrush. And, taxa identified outside the western grid to the north (downslope; FS 39) include the following: parsley family (Apiaceae), cheno-ams, unidentified grasses, mustard family, sunflower family, ragweed/bursage, spurge family, fir, unidentified pine, piñon pine, juniper, and sagebrush.

Control Unit

Approximately 5 m to the east of the grid garden, another 1- by 1-m unit was excavated as a geomorphologic pit to compare the soils associated with the grid garden to that of the surrounding natural stratigraphy (Table 19.2; see stratigraphy section for information on how these two areas differed). Two pollen samples (FS 15 and FS 17) were collected from this unit to compare the taxa identified inside the grid garden to those identified outside the walls of the garden. Interestingly, the only cotton (*Gossypium*) samples were identified in the area outside the immediate vicinity of the grid garden walls. Taxa identified in this control unit include the following: cotton, prickly pear, cheno-ams, unidentified grasses, sunflower family, ragweed/bursage, evening primrose, spruce (*Picea*), fir, unidentified pine, piñon pine, juniper, oak, rose family, Mormon tea, and sagebrush.

Textiles

Two small pieces of fiber and textile were identified in the flotation samples analyzed from this site, and these items were analyzed by Laurie Webster. The first item was a small tuft of rabbit fur that may have been associated with a rabbit fur blanket. The second item was a small (1.0 cm wide by 1.5 cm long) piece of textile that was identified as a small scrap of silk ribbon (or other textile) woven in satin weave. The selvages on this piece of textile were missing. Webster (personal communication) deemed that this piece of textile was not a pre-contact fabric and that its earliest possible date was Spanish-Colonial. She also concluded that the fabric could have been more recent.

SUMMARY

LA 128803 is a basalt rock grid garden that was constructed using the abundant outcrops located near the site. The grid garden was built by placing U-shaped alignments back to back but slightly offsetting them and sharing the same interior wall. The opening of each grid is perpendicular to the slope of the hill on which the grid garden is located. These openings could have allowed the water to drain after being slowed by the rocks, preventing over-saturation of the ground. Although only two grids were excavated, additional grids were identified during the GPR survey conducted at the site (see Nisengard et al., Volume 3). It appears that the Middle Classic period farmers who used the grid gardens had dug out the native fill from inside the grids of the garden and then refilled them with a more arable mixture of soil. This soil contained the burned remains of maize, as well as maize pollen. In addition, cotton pollen was identified in a separate test pit. However, it is presumed that this pollen was derived from other unexcavated grid garden features in the area. The results of the geomorphological study indicate that these grid gardens were indeed effective in collecting and retaining soil for growing crops.

CHAPTER 20
WHITE ROCK TRACT (A-19): LA 128804

Kari M. Schmidt

INTRODUCTION AND SITE SETTING

This chapter presents the results of the excavations conducted at LA 128804, a Historic period check dam and Late Coalition/Early Classic artifact scatter. LA 128804 (previous numbers LA 12587-B and H-3) includes an isolated check dam situated on a shallow slope at the mouth of Cañada del Buey. The vegetation in the area is dominated by piñon and juniper trees with an understory of saltbush, snakeweed, yucca, and various other native grasses, shrubs, and forbs. The site sits at an elevation of 1980 m (6495 ft), is located approximately 200 m north-northwest of State Road 4, and lies downslope and approximately 140 m east of LA 12587 (Chapter 14, this volume).

SITE DESCRIPTION

The check dam is an alignment of 12 large basalt blocks ranging in size from 0.60 to 1.25 m in length. The 7-m-long alignment bisects a small northeast-to-south-trending drainage. The site area, including artifacts associated with LA 12587, lies primarily in a 10- by 10-m area. Although a few artifacts were present in the immediate area of the feature when it was originally recorded for this project, it is unclear, and probably unlikely, that they are associated with the feature. Artifacts identified in the site area include smeared-indented utilitywares, Santa Fe Black-on-white, and Wiyo Black-on-white sherds, and numerous pieces of chipped and ground stone, which arre commensurate with the occupation of LA 12587. The date and cultural affiliation of the site during the original recording were undetermined. Figure 20.1 shows the check dam before excavation. Pin flags in the vicinity represent uncollected artifacts identified during the surface collection.

FIELD METHODS

Fieldwork began with an initial assessment of the site. The crew walked over the site area, delineating the site boundaries and identifying the presence of artifact concentrations and features to ascertain if and how they related to the check dam. The area was then gridded into 1- by 1-m units, with the site datum (100N/100E for horizontal control, 10.0 m for vertical control) located next to the check dam. These artifacts were collected and bagged for analysis and provenienced to the nearest meter, using the southwest grid corner for the grid designation. Once the surface collection was finished, a 1- by 2-m grid was excavated perpendicular to the angle of the check dam. This feature was actually offset from the site grid by approximately 28 degrees east of north, and the excavation units were likewise offset so as to orient them to the check dam. A 625-m^2 area was collected around the check dam.

Figure 20.1. LA 128804 before excavation; pin flags represent artifacts.

STRATIGRAPHY (Paul Drakos and Steve Reneau)

LA 128804 is a check dam that is approximately 6 m long and consists of tuff clasts up to 60 cm long. The check dam is aligned across a shallow drainage on a colluvial slope downslope from a large Coalition period roomblock (LA 12587). The dam has been partially breached by an incised channel, and some of the tuff has been transported downslope. Additional tuff blocks are scattered down the gradient along this same channel to the east and may represent the eroded remnants of similar structures.

Soil descriptions for Test Pit 1 show that the check dam was constructed on top of young stratified alluvium, possibly less than 100 years old and deposited in an aggrading stream channel (Table 20.1; see Drakos and Reneau, Volume 3 for key). Deposition of approximately 16 cm of young alluvium has occurred at Test Pit 1 and behind the west part of the dam, with minimal deposition apparent elsewhere. Soils and geomorphic data indicate that the check dam at LA 128804 is a recent structure that is likely post-Puebloan in age and less than 100 years old.

Table 20.1. Geomorphological characteristics of soils in Test Pit 1.

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
C1	0-16	<2	10YR5/4	10YR4/3	s	sg	lo	so,po	n.o.	none	-	cs	<100 yrs?	slightly moist bits of reworked $CaCO_3$, ms-cs
C2	16-32	<2	-	10YR4/4	ls	m	lo	so,po	n.o.	none	-	aw		stratified fs, moist; blocks set on top of C2
Bwb1	32-42+	<2	10YR5/4	10YR4/3	sl	1msbk	so-lo	so,po	n.o.	none	-	-	<1000 yrs	fine-grained alluvium

The C_1-C_2 horizon was found between 0 and 16 cm below the surface and contained less than 2 percent gravels. The sediments in the horizon are a massive, single-grain, brown sand with a loose consistency. Sediments are non-effervescent except for bits of reworked $CaCO_3$, with a clear, smooth lower horizon boundary. The C_2 horizon is located between 16 and 32 cm below the surface and also contains less than 2 percent gravel. Like the stratum above it, it is massive, loose, and single grain, but is dark yellowish brown and loamy sand. Sediments in this stratum are non-effervescent and form an abrupt boundary. The Bwb1 horizon is located between 32 and 42+ cm below the surface and also contains less than 2 percent gravel. Sediments are massive, sub-angular, blocky, brown and have a sandy loam consistency. They are also non-effervescent.

SITE EXCAVATION

The excavations at LA 128804 were undertaken by Kari Schmidt (crew chief), Aaron Gonzales, Mia Jonsson, Mike Kennedy, Bettina Kuru'es, and Timothy Martinez.

Two units were excavated perpendicular to the check dam (Figure 20.2). Test Pit 1 included the area downslope of the dam, as well as the stones of the dam itself and a small portion of the upslope side of the dam. Test Pit 2 was immediately adjacent to Test Pit 1 and on the upslope side of the dam.

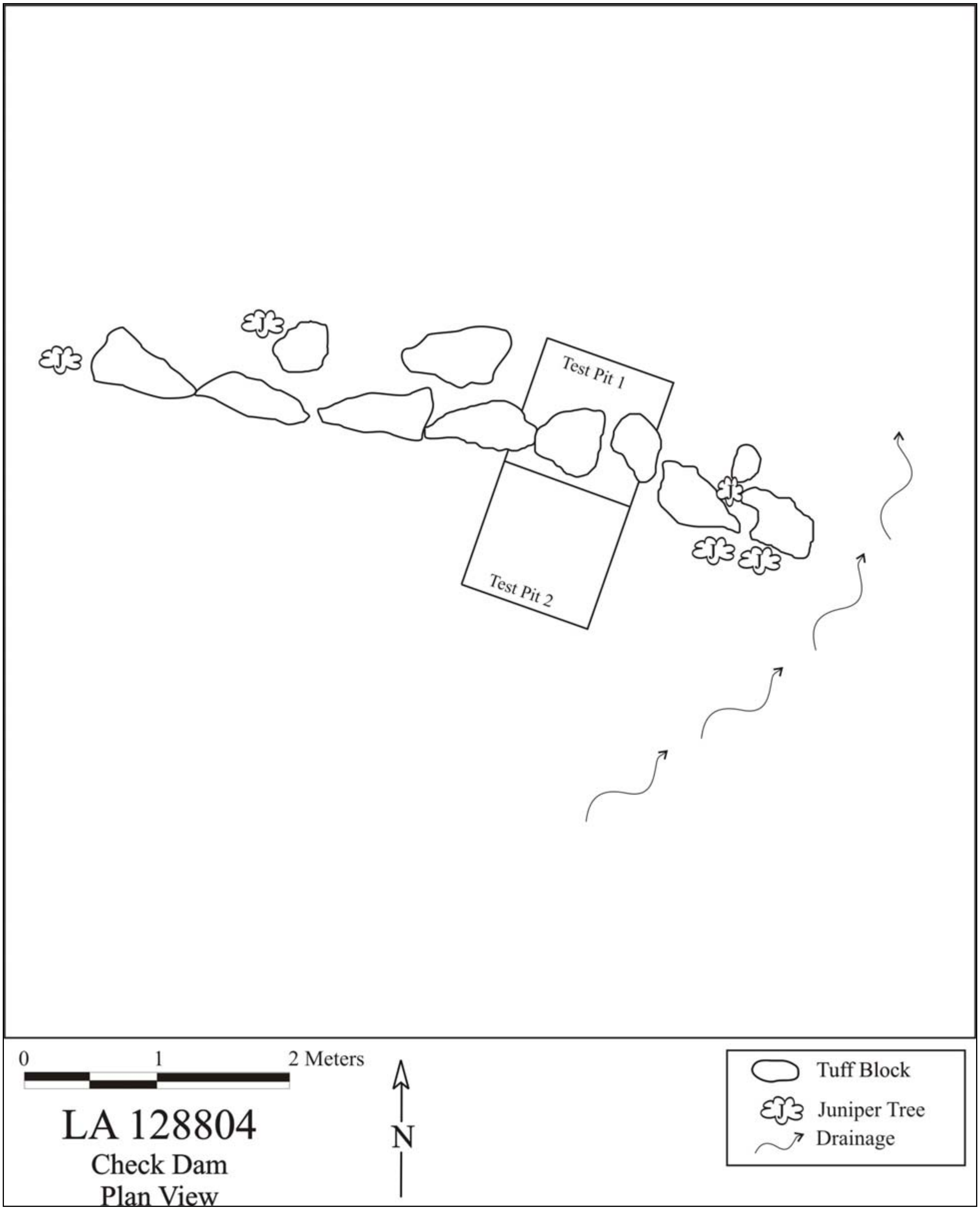

Figure 20.2. Overview of the check dam site.

Test Pit 1

The fill in this 1- by 1-m unit was very loose and sandy (Table 20.2 for strata defined during excavation). Two pieces of obsidian debitage and a smeared-indented corrugated sherd were recovered from the 0- to 10-cm level, and flotation and pollen samples were collected. In the next 10 cm of fill, which were loose and fine, a total of five pieces of obsidian debitage were recovered. From 20 to 30 cm, the sediment was still very loose and sandy, with two pieces of obsidian debitage being recovered. The test pit was excavated down another 10 cm to 40 cm below the ground surface, but no additional artifacts were recovered. The fill in all levels was a sandy loam.

Test Pit 2

The soil of this unit duplicated that of the adjacent Test Pit 1. Artifacts recovered from this unit consist of two pieces of obsidian and chalcedony debitage and a smeared-indented corrugated sherd from the 0- to 10-cm level and eight pieces of obsidian and chalcedony debitage from the 10- to 20-cm level.

Table 20.2. Stratigraphic sequence used during excavation at LA 128804.

LA 128804 Stratigraphic Summary							
Stratum #	Provenience	Maximum Thickness	Minimum Thickness	Elevation	Color	Texture	Comments
1	Test pits 1 and 2	0.40	0.40	0–40 cm below ground surface	10YR5/3	Sandy loam	Very loose sediments. No peds and only inclusions are a few sherds and lithics. Very recent soil, on the order of less than 100 years of development. Bottom of strat not reached, but only identified to bottom of excavated test pits.

SITE CHRONOLOGY AND ASSEMBLAGE

Approximately 510 artifacts were recovered during excavations at LA 128804. All of the ceramics that were identified at the site were analyzed, and just under 50 percent of the chipped stone materials were analyzed. Analyses of the ceramics, lithics (chipped and ground stone), pollen, and archaeobotanical materials were all conducted. No faunal remains were recovered, and no radiocarbon samples were submitted for analysis due to the lack of suitable material. However, nine obsidian artifacts were submitted for hydration dating.

Chronology

Obsidian Hydration Dating

Nine obsidian artifacts from LA 128804 were submitted to Diffusion Laboratory for age determination using the obsidian hydration method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rind, was measured. Second, the high temperature hydration rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site was estimated in order that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 20.3).

Table 20.3. Obsidian hydration dates for LA 128804.

FS* No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
14	2003-68	Cerro Toledo	3.40	1610	20
47	2003-69	Cerro Toledo	4.55	-3839	257
85	2003-70	Valle Grande	2.84	709	89
127	2003-71	Cerro Toledo	7.48	-2429	118
131	2003-72	Cerro Toledo	3.36	-239	132
134	2003-73	Valle Grande	3.40	-1098	182
181	2003-74	Valle Grande	4.08	-2614	227
224	2003-75	Valle Grande	3.47	-1203	184
230	2003-76	Cerro Toledo	3.56	-1479	195

* Field Specimen

The obsidian hydration dates provide a wide range from 3839 BC to AD 1610. It is possible that the surface scatter surrounding the feature is associated with multiple use episodes ranging from Archaic through Ceramic period. Most of the hydration dates seem to reflect a Middle to Late Archaic component.

Ceramic Artifacts (Dean Wilson)

The distribution of ceramic types documented during the analysis of 262 sherds from the artifact scatter surrounding the check dam indicates a Classic period date (Table 20.4). This assignation is reflected by distributions of decorated whiteware types that make up 77.5 percent of the pottery from this site. All the whitewares exhibit tuff temper, pastes, and styles indicative of Rio Grande (or Tewa) tradition types (Tables 20.5 and 20.6). Most of the whiteware sherds at the site represent bowl forms (Table 20.7). Decorated whiteware assemblages from all major contexts are dominated by Biscuitware types, with Biscuit B/C outnumbering Biscuit A (Abiquiu Black-on-gray) by over four to one. On the other hand, the presence of Santa Fe Black-on-white and Wiyo Black-on-white also reflects an earlier Late Coalition period component.

Table 20.4. Distribution of ceramic types from LA 128804.

Pottery Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	5	1.9
Indeterminate organic paint	2	0.8
Santa Fe Black-on-white	4	1.5
Wiyo Black-on-white	1	0.4
Biscuitware (slipped both sides)	3	1.1
Biscuitware painted unspecified	9	3.4
Biscuitware (slipped one side)	2	0.8
Biscuit A (Abiquiu Black-on-gray)	2	0.8
Biscuit B/C body	8	3.1
Northern Rio Grande Utilityware		
Plain gray rim	2	0.8
Plain gray body	21	8.0
Indented corrugated	18	6.9
Plain corrugated	3	1.1
Smeared plain corrugated	22	8.4
Smeared-indented corrugated	133	50.8
Tewa Micaceous Ware		
Sapawe Micaceous	4	1.5
Middle Rio Grande Glazeware		
Glaze red body unpainted	6	2.3
Glaze unslipped body	10	3.8
Glaze red body undifferentiated	4	1.5
Glaze yellow body undifferentiated	2	0.8
Total	**262**	**100.0**

Table 20.5. Tradition by ware for LA 128804 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	199	100.0	37	100.0	--	--	4	100.0	240	91.6
Middle Rio Grande	--	--	--	--	22	100.0	--	--	22	8.3
Total	**199**	**100.0**	**37**	**100.0**	**22**	**100.0**	**4**	**100.0**	**262**	**100.0**

A Classic period association is also supported by the presence of glazewares, which represent 1.5 percent of the pottery from this site. This includes sherds derived from glaze-on-red and glaze-on-yellow vessels. These sherds are tempered with basalt and latite commonly found in pottery produced in areas of the Middle Rio Grande to the south. Gray utilityware types consist of 75.9 percent of the pottery from this site and indicate similar trends. The majority of this pottery is tempered with "anthill sand" (Table 20.6). While a wide range of exterior surface manipulations were noted, most exhibit smeared corrugated exteriors.

Table 20.6. Temper by ware for ceramics from LA 128804.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Sand	--	--	--	--	--	--	2	50.0	2	0.7
Granitic (mica, quartz, and feldspar)	14	7.0	--	--	--	--	2	50.0	16	6.1
Fine tuff or ash	1	0.5	23	62.1	--	--	--	--	24	9.1
Fine tuff and sand	--	--	6	16.2	--	--	--	--	6	2.2
Gray crystalline basalt	--	--	--	--	8	37.4	--	--	8	3.0
San Marcos latite	2	1.0	--	--	14	63.6	--	--	16	6.1
Dark igneous and sand	1	0.5	--	--	--	--	--	--	1	0.3
"Anthill"	181	90.5	3	8.1	--	--	--	--	184	70.2
Tuff with some phenocrysts (anthill)	--	--	5	13.5	--	--	--	--	5	1.9
Total	**199**	**100.0**	**37**	**100.0**	**22**	**100.0**	**4**	**100.0**	**262**	**100.0**

Table 20.7. Form by ware for LA 128804 ceramics.

Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	--	--	1	2.7	8	36.3	--	--	9	3.4
Bowl rim	--	--	1	2.7	--	--	--	--	1	0.3
Bowl body	--	--	21	56.7	--	--	--	--	21	8.0
Seed jar	--	--	--	--	2	9.0	--	--	2	0.6
Jar neck	45	22.6	--	--	4	18.0	--	--	49	18.7
Jar rim	4	1.0	--	--	1	4.5	--	--	5	1.9
Jar body	150	75.3	14	37.8	5	22.7	4	100.0	173	66.0
Body sherd polished int-ext	--	--	--	--	2	9.0	--	--	2	0.6
Total	**199**	**100.0**	**37**	**100.0**	**22**	**100.0**	**4**	**100.0**	**262**	**100.0**

The combination of decorated and utility pottery outlined in Tables 20.4 through 20.7 is consistent with a component dating to the Middle Classic period (15th century). That is, assuming that the Biscuit B/C body sherds represent the Biscuit B type, which seems likely given the presence of Biscuit A. However, the presence of Santa Fe and Wiyo Black-on-white also represents a Late Coalition period component.

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 113 chipped stone artifacts were analyzed from LA 128804, consisting of 108 pieces of debitage, three retouched tools, and two ground stone items. This represents a 44.4 percent sample of the 254 lithic artifacts recovered during the site excavations. Table 20.8 presents the data on lithic artifact type by material type. The majority of the debitage is made of obsidian, with less chalcedony, Pedernal chert, basalt, and other materials. The presence of cortex on 9.4 percent of the debitage indicates that the materials were collected from both secondary waterworn (65.2%) and primary nodule sources. The obsidian is present at nearby sources in the Jemez Mountains. In contrast, chalcedony, Pedernal chert, and chert are available from local Rio Grande Valley gravel sources. The basalt is present in outcrops and stream gravels.

Table 20.8. Lithic artifact type by material type from LA 128804.

Artifact Type		Material Type							
		Undetermined Igneous	Basalt	Andesite	Obsidian	Chalcedony	Chert	Pedernal	Total
Debitage	Angular debris	0	0	0	2	4	0	3	9
	Core flake	0	8	0	15	11	1	5	39
	Biface flake	0	0	0	35	2	0	0	37
	Microdebitage	0	0	0	18	0	0	0	18
	Undetermined flake	0	1	0	3	0	0	0	4
	Subtotal	0	9	0	73	17	1	8	108
Retouched Tools	Retouched piece	1	0	0	1	0	0	0	1
	Biface	0	0	0	1	1	0	0	2
	Subtotal	1	0	0	1	1	0	0	3
Ground Stone	Undetermined metate fragment	1	0	1	0	0	0	0	2
	Subtotal	1	0	1	0	0	0	0	2
Total		**2**	**9**	**1**	**74**	**18**	**1**	**8**	**113**

Twelve pieces of debitage and a biface from LA 128804 were submitted for X-ray fluorescence analysis (Table 20.9). Most of the artifacts were from the Cerro Toledo (Rabbit Mountain/Obsidian Ridge) source area, with fewer from the Valle Grande (Cerro del Medio) source, which are located about 15 km (10 miles) as the "crow flies" to the southwest and west (Shackley, Volume 3).

Table 20.9. Obsidian source samples.

FS #	Artifact	Color	Source
14	Debitage	Translucent	Cerro Toledo rhyolite
44	Debitage	Black opaque	Cerro Toledo rhyolite
47	Debitage	Black opaque	Cerro Toledo rhyolite
66-1	Debitage	Green	Cerro Toledo rhyolite
66-2	Debitage	Black opaque	Cerro Toledo rhyolite
85	Debitage	Translucent	Valle Grande rhyolite
127	Debitage	Translucent	Cerro Toledo rhyolite
131	Debitage	Translucent	Cerro Toledo rhyolite
134	Tool	Translucent	Valle Grande rhyolite
181	Debitage	Translucent	Cerro Toledo rhyolite
224	Debitage	Translucent	Valle Grande rhyolite
230	Debitage	Black opaque	Cerro Toledo rhyolite

Lithic Reduction

The debitage consists of a mixture of core flakes and biface flakes, with fewer pieces of angular debris, microdebitage, and undetermined flake fragments. The majority of the flakes exhibit single platforms (n = 25), with cortical (n = 3), dihedral (n = 1), multi-faceted (n = 5), collapsed (n = 5), and crushed (n = 11) platforms. Sixteen (32.0%) of the flake platforms exhibit evidence of preparation, with most of these being abraded/crushed and five being retouched/abraded platforms.

The majority of the core flakes consist of distal fragments (n = 53; 51.9%), with fewer whole (n = 16), proximal (n = 14), midsection (n = 17), lateral flake (n = 1), and undetermined flake (n = 1) fragments. Most of the biface flakes are midsection fragments (n = 30) and distal (n = 28) fragments, with fewer whole (n = 2), proximal (n = 16), and lateral (n = 1) fragments. The whole core flakes have a mean length of 24.8 mm (*std* = 10.2), whereas, the whole biface flakes have a mean length of 15.0 mm (*std* = 1.4). Lastly, the angular debris have a mean weight of 11.2 g (*std* = 11.5).

The retouched tools consist of a retouched piece and two bifaces. The retouched piece consists of the proximal fragment of a large dacite flake with a bidirectionally retouched lateral edge. The bifaces are both distal fragments that exhibit edge angles from 35 to 45 degrees, indicating that they may have been broken during the middle to late stages of tool manufacturing. One of the bifaces is heavily burned with pot lids.

Tool Use

Only four flakes (3.7%) exhibit evidence of damage that could be attributed to use-wear. All four flakes have straight edge outlines, with one on the end and three along the lateral sides of the artifact. The edge angles range from 35 to 45 degrees. The retouched piece exhibits rounding and polish along the marginally retouched edge and the opposite unretouched edge.

The ground stone assemblage consists of two undetermined metate fragments. One is probably a fragment of a large formal metate with a heavily ground and polished concavity. The other is a small burned fragment that also exhibits a highly ground and polished concave surface.

Archaeobotanical Remains (Pamela McBride)

Non-cultural debris in flotation samples from upslope and downslope of the check dam included spurge seeds, juniper twigs, and piñon needles (Table 20.10). Cultural plant remains were absent from samples, which is not remarkable considering the context and relatively isolated location of the feature.

Table 20.10. Flotation sample plant remains from LA 128804.

FS No.	213	215	219	222
Feature	Test Pit 1			
	Stratum 1, level 1		Stratum 1, level 2	
Non-Cultural Annuals				
Spurge	+			
Perennials				
Juniper	twig +	+, twig +	twig +	twig +
Piñon	needle +	needle +	needle +	

All plant remains are seeds unless indicated otherwise.
Non-cultural plant remains are uncharred.
+ 1-10/liter.

Pollen Remains (Susan Smith)

Four pollen samples were analyzed from around the vicinity of the check dam. Two samples were taken from sediments located upslope of the check dam (FS 214 and FS 223) and downslope from the check dam (FS 216 and FS 220). Taxa identified in the sediments located upslope from the check dam include the following: prickly pear (*Opuntia*), cheno-ams, unidentified grasses (Poaceae), sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), spurge family (Euphorbiaceae), unidentified pine (*Pinus*), piñon pine (*Pinus edulis*), juniper (*Juniperus*), oak (*Quercus*), Mormon tea (*Ephedra*), and sagebrush (*Artemisia*).

Taxa identified in the sediments located downslope from the check dam include the following: prickly pear, cattail (*Typha*), cheno-ams, unidentified grasses, sunflower family, ragweed/bursage, chicory tribe (Liguliflorae), spurge family, spruce (*Picea*), fir, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush.

SUMMARY

Based on appearance and geomorphological assessments conducted at LA 128804, it is probable that the check dam is a relatively recent construction that dates to the Historic period. This supposition was initially based on the relatively pristine condition in which the check dam was found, and indeed, the geomorphologic information also indicated that it is less than 100 years in age. The Puebloan artifacts found in association with the check dam appear both upslope and downslope of the feature in the stream channel within which it is located. The site is also situated immediately downslope of LA 12587 (Chapter 14, this volume), a Late Coalition period roomblock. Nonetheless, the ceramic assemblage indicates a mixture of Late Coalition and Classic period components, with the obsidian hydration dates possibly reflecting a Middle to Late Archaic component.

CHAPTER 21
WHITE ROCK TRACT (A-19): LA 128805

Kari M. Schmidt

INTRODUCTION AND SITE SETTING

This chapter presents the results of excavations conducted at LA 128805, a Middle Classic period fieldhouse and associated artifact scatter. LA 128805 (temporary numbers LA 12587D and H-1) is a large, one-room fieldhouse located on the floodplain between the mouth of Cañada del Buey and Pajarito Canyon. Vegetation in the site area is dominated by piñon and juniper woodland and has an understory dominated by saltbush, snakeweed, yucca, and various other native grasses, shrubs, and forbs. LA 128805 is situated at an elevation of 1978 m (6490 ft) and is located approximately 200 m east of LA 127631 (Chapter 18, this volume), a one-room Late Coalition period fieldhouse. LA 128805 is located about 75 m north of State Road 4 in White Rock.

SITE DESCRIPTION

LA 128805 consists of a one-room fieldhouse with visible wall alignments on a small mound. The room measures 3.3 by 2.5 m in size, and the masonry blocks used in construction range from 0.45 to 1.35 m in length and average 0.35 m in width. The site area has been impacted by heavy erosion and a small drainage runs along the southern edge of the mound. In-field artifact analyses conducted during the initial recording of the site show that Santa Fe Black-on-white and smeared-indented corrugated utilityware sherds dominated the artifact scatter located to the west of the fieldhouse. The lithic artifacts in this area included mostly basalt (60%), with less obsidian, and chert flakes. Artifacts were sparse and scattered in a 15- by 15-m area around the feature, but were heaviest to the southwest along the aforementioned drainage. Figure 21.1 shows the fieldhouse before excavation.

FIELD METHODS

Fieldwork at the site occurred in October and November of 2002. Work began with an initial assessment of the site. The crew walked over the site area, delineating the site boundaries and identifying the presence of artifact concentrations and features to ascertain if and how they related to the fieldhouse. The site was divided into two areas for mitigation: the mounded area of the fieldhouse and the area immediately surrounding the mound were designated as Area 1, and the surface artifact scatter located to the west of the fieldhouse was designated as Area 2. Both areas were then gridded into 1- by 1-m units, with the site datum (100N/100E for horizontal control, 10.0 m for vertical control) located southwest of the fieldhouse. Artifacts were collected and bagged for analysis and provenienced to the nearest meter, using the southwest corner of the grid for its coordinates. Surface collections produced a total of 216 lithics, 113 ceramics, one metate fragment, and one piece of animal bone. In all, a 600-m^2 area around the fieldhouse was surface collected. The distribution of these artifacts is depicted in Figure 21.2.

Figure 21.1. LA 128805 before excavation.

Excavations at LA 128805 occurred only in Area 1. The rubble mound from the fieldhouse covered an area of approximately 23 m^2 but, when excavations were completed, the structure occupied part or all of 10 m^2. Excavation was done in individual meter grids and in natural stratigraphic levels. All fill removed from excavated units was screened through 1/8-in. mesh. Artifacts were collected and bagged by type from each level, and pollen, flotation, and other samples were collected from appropriate locations in the structure.

STRATIGRAPHY (Paul Drakos and Steve Reneau)

LA 128805 is situated on a broad colluvial slope that displays abundant evidence for active erosion. The fieldhouse is at the upslope end of eroding channels that extend to the east, with about 0.5 m of recent erosion estimated on the southeast side. Eroded channels also wrap around the northwest side of the structure. The tuff blocks in the fieldhouse appear to be acting as a local armor, protecting the area occupied by the fieldhouse from erosion while surrounding slopes are stripped. There is potential for some deposition of slope wash colluvium on the upslope (west) side of the fieldhouse, whereas other adjacent areas are experiencing erosion.

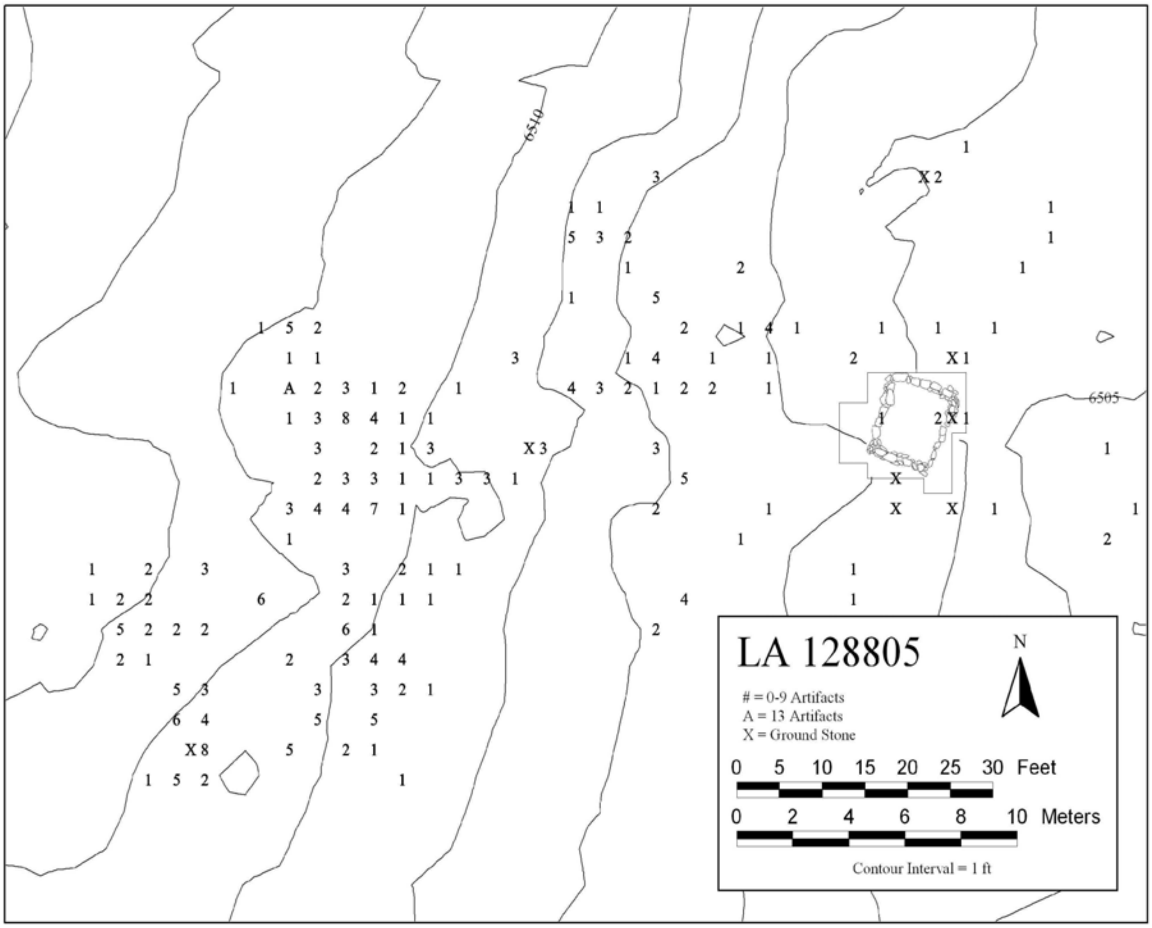

Figure 21.2. Surface distribution of artifacts collected at LA 128805.

An examination of soils in a test pit, which was located 1 m southeast of the southeast corner of the structure, suggests that LA 128805 was constructed on an aggrading colluvial slope that experienced post-occupation deposition before the recent erosion that has occurred at the site (Table 21.1; see Drakos and Reneau, Volume 3 for key). A thin (10 cm thick) A horizon is inferred to post-date occupation of the site (i.e., is less than 500 yrs old). The A horizon overlies a buried (Bwb1) horizon, with soil structure development similar to that observed for older post-Coalition period soils, and is inferred to be 500 to 800 years old. The Bwb1 horizon overlies a buried Pleistocene soil formed in colluvium. The sequence of buried soils at this site suggests rapid deposition of colluvium, possibly during the Coalition period, with continued aggradation after abandonment of this Late Classic period fieldhouse, followed by recent erosion (Drakos and Reneau, Volume 3). Stratigraphic designations used in the field during excavation are shown in Table 21.2.

Table 21.1. Geomorphological characteristics of test pit at LA 128805; pit located 1 m southeast of southeast corner of fieldhouse.

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	Lower Horizon Boundary	Preliminary Age Estimate	Notes
A	0-10	5	10YR 4/4	10YR 3/4	scl	1m sbk	so-lo	ss, ps	n.o.	n	cs	<500 yrs?	post-occupation slopewash
Bw b1	10-40	< 2	10YR 4/4	10YR 3/4	scl	2m sbk	sh	ss, ps	n.o.	n	cs	<700-800 yrs	pre-occupation slopewash ?
Btk b2	40-47 +	< 2	7.5YR4/3	7.5YR3/3	scl	2-3m sbk	h	ss, ps	2nbrc opo	y		late Pleistocene	slopewash; CaCO3 filaments

Table 21.2. Stratigraphic sequence used during excavations at LA 128805.

Stratum #	Provenience	Maximum Thickness	Minimum Thickness	Elevation	Color	Texture	Comments
1	Room 1	0.10 (m)	0.01	9.86–9.37	10YR3/4	Loamy sand	Very loose. Lots of duff with a high vegetal content. Not a thick strat in most places. Few artifacts.
2	Room 1	0.31	0.10	9.9–9.29	10YR3/4	Sandy loam	Room fill. Artifacts are abundant, some mottles present. Bottom is abrupt contact with an increase in clay.
3	Room 1	0.13	0.02	9.62–9.40	10YR4/4	Sandy loam with clay	Clay content higher than previous strat, but sand is still present. Room fill with wall fall.

Stratum #	Provenience	Maximum Thickness	Minimum Thickness	Elevation	Color	Texture	Comments
							Bottom is abrupt contact with prepared clay floor.
4	Room 1	0.01	0.01	9.52–9.40	10YR4/4	Clay	Prepared floor (not plastered).

*Thickness in meters

SITE EXCAVATION

The excavations at LA 128805 were undertaken by Kari Schmidt (crew chief), Aaron Gonzales, Mia Jonsson, Mike Kennedy, and Marjorie Wright.

The fieldhouse at LA 128805 was excavated in 1- by 1-m units and natural stratigraphic levels were used. Three natural strata were encountered. The top centimeter or so was a grayish-brown duff and loose sandy loam that was clearly post-occupational fill. The subsequent stratum was a sandy clay loam and varied from 5 to 20 cm in thickness. Stratum 3 was also a sandy clay loam, but with a higher clay content and varied from 5 to 13 cm thick. The fourth stratum was a prepared floor and its boundary was abrupt. Clay content in this stratum was high, and artifacts were in contact with the surface. Figures 21.3 and 21.4 show the fieldhouse after it was excavated and at the level of the prepared surface. Pink flagging tape in the photo denotes grid coordinates.

During excavations, the boundary between the second and third strata was originally thought to be the floor of the structure, as there were stretches along the west wall where there was good articulation between the wall and floor. This was supported by a mano that was recovered at about the same level. However, upon further excavation, more artifacts were found below the "floor," and excavations down another 10 cm or so revealed an obvious surface. The surface was not plastered, but was clearly prepared. Several artifacts were encountered on the floor and it also contained small patches of charcoal-stained areas that were not present on the upper "floor." The lower surface was clearly the one associated with the use of the fieldhouse.

Figure 21.3. LA 128805 after excavation.

The walls of the fieldhouse were at least two courses high, and in some cases along the eastern wall were three courses high (see Figure 21.4). For the most part, the tuff blocks used in construction were shaped, but several small and unshaped blocks were present in the interstitial spaces along the walls. The corners of the room were all buttressed with smaller cobbles, probably for extra support in the uneven ground. Figure 21.4 shows the site in profile.

Excavations at the fieldhouse produced a total of 131 lithics, 93 ceramics, and eight pieces of ground stone. Of this total, 122 lithics, 89 ceramics, and all of the ground stone artifacts were found in the sandy clay loam fill (Strata 2 and 3).

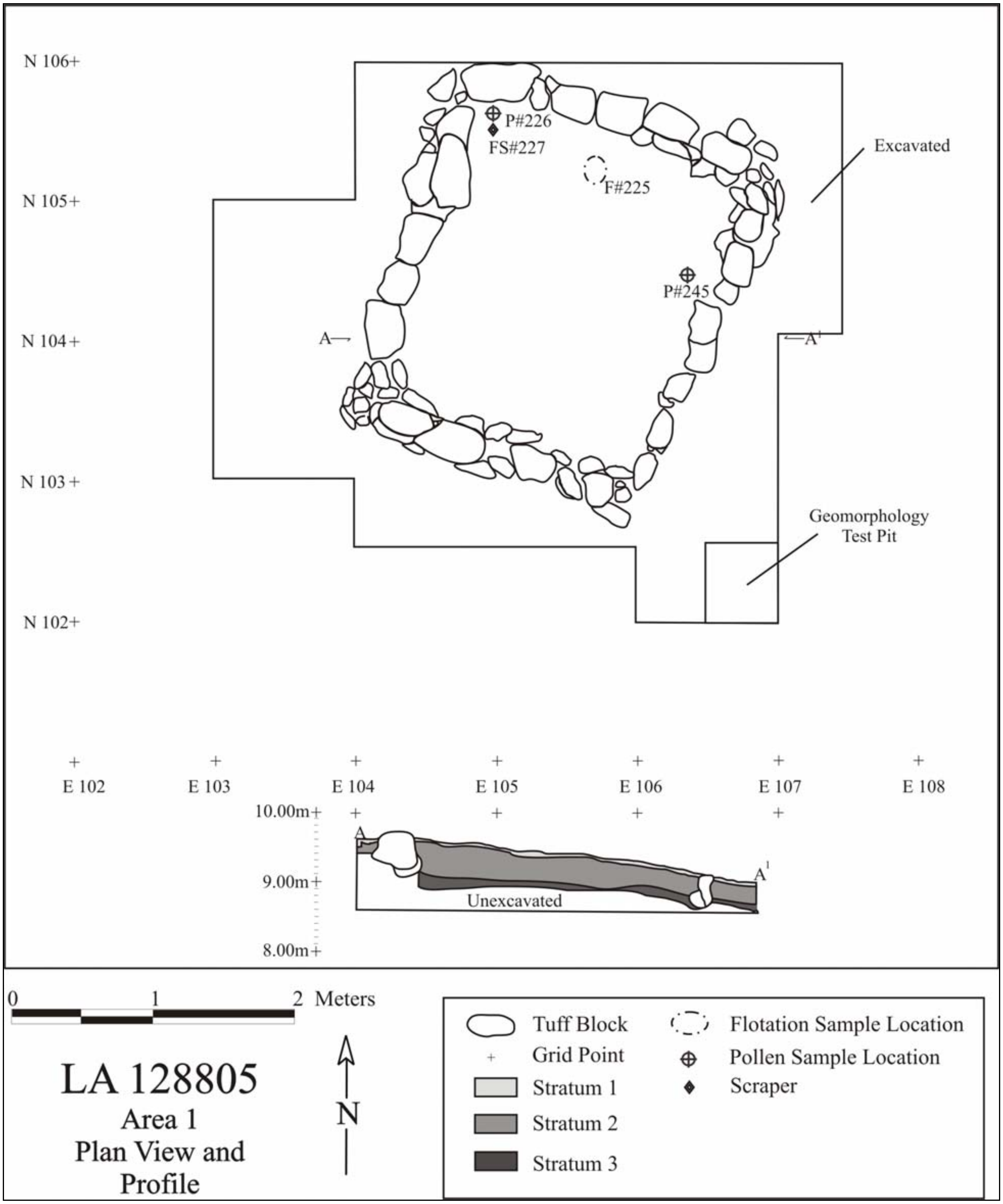

Figure 21.4. Plan view and profile drawing of LA 128805.

SITE CHRONOLOGY AND ASSEMBLAGE

Approximately 550 artifacts and samples were recovered during excavations at LA 128805 and all were submitted for analysis. Analyses of the ceramics, lithics (chipped and ground stone), pollen, and archaeobotanical materials were all conducted. No faunal remains were recovered. A maize sample was submitted for radiocarbon dating and 10 pieces of obsidian for hydration dating. Results of these analyses are presented in subsequent sections.

Chronology

Radiocarbon Dating

A single radiocarbon sample was submitted for analysis from this site. Several maize (*Zea mays*) cupules were collected from a flotation sample (Field Specimen [FS] 225) taken from inside Room 1 just above the floor and dated to the Middle Classic period (AD 1420–1500). Table 21.3 presents the chronometric information.

Table 21.3. Radiocarbon dates from LA 128805.

FS#	Material	Laboratory (Beta)#	Conventional radiocarbon age	Intercept of radiocarbon age	2-sigma calibrated result
225	maize	183756	440±40 BP	AD 1440	AD 1420–1500

Obsidian Hydration Dating

Ten obsidian artifacts from LA 128805 were submitted to Diffusion Laboratory for age determination using the obsidian hydration method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rind, was measured. Second, the high temperature hydration rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site was estimated in order that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 21.4).

Table 21.4. Obsidian hydration dates for LA 128805.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
6	2003-44	Cerro Toledo	4.69	-3866	251
62	2003-45	Cerro Toledo	5.85	1360	20
71	2003-46	Cerro Toledo	4.13	1338	30
114	2003-47	Cerro Toledo	4.35	-3163	238
157	2003-48	Cerro Toledo	4.68	564	60
163	2003-49	Cerro Toledo	3.91	-2224	216

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
186	2003-50	Cerro Toledo	4.32	-3140	238
247	2003-51	Cerro Toledo	4.94	-177	87
253	2003-52	Cerro Toledo	2.68	31	146
254	2003-53	Cerro Toledo	2.17	689	119

The obsidian hydration dates provide a wide range from 3866 BC to AD 1360. The two 14th century dates are closest to the radiocarbon date of circa AD 1440. However, the remainder of the dates are much older than the site occupation and may represent reuse of Middle to Late Archaic materials.

Ceramic Artifacts (Dean Wilson)

The distribution of ceramic types documented during the analysis of 199 sherds from the fieldhouse indicates that the assemblage dates to the Middle Classic period (15th century) (Table 21.5). The Middle Classic period date is reflected by distributions of decorated whiteware types that make up 24.6 percent of the pottery from the site, including Biscuit A, Biscuit B, and Biscuit B/C (Biscuit B?). All the whitewares exhibit tuff temper, pastes, and styles indicative of Rio Grande (or Tewa) tradition types (Tables 21.6 and 21.7). In contrast to assemblages from most other sites examined during this project, a slight majority of the whitewares consist of jar forms (Table 21.8). Decorated whiteware assemblages from all major contexts are dominated by Biscuitware types, with Biscuit A (Abiquiu Black-on-gray), Biscuit B (Bandelier Black-on-gray), and Biscuit B/C. Other Classic period pottery includes Sankawi Black-on-cream. Earlier types are limited to a single Santa Fe Black-on-white sherd.

Table 21.5. Ceramic types from LA 128805.

Pottery Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	3	1.5
Indeterminate organic paint	7	3.5
Santa Fe Black-on-white	1	0.5
Unpainted Biscuit (slipped one side)	14	7.0
Biscuitware (slipped both sides)	2	1.0
Biscuitware painted unspecified	6	3.0
Biscuit A (Abiquiu Black-on-gray)	3	1.5
Biscuit B (Bandelier Black-on-gray)	3	1.5
Biscuit C (Cuyamunge Black-on-tan)	1	0.5
Biscuit B/C body	7	3.5
Sankawi Black-on-cream	2	1.0
Northern Rio Grande Utilityware		
Plain gray rim	10	5.0
Plain gray body	52	26.1

Pottery Type	Frequency	Percent
Unknown gray rim	1	0.5
Indented corrugated	6	3.0
Plain corrugated	6	3.0
Smeared plain corrugated	19	9.5
Smeared-indented corrugated	32	16.1
Sapawe Micaceous	5	2.5
Middle Rio Grande Glazeware		
Glaze red body unpainted	4	2.0
Glaze yellow body unpainted	2	1.0
Glaze unslipped body	7	3.5
Glaze polychrome body	2	1.0
Glaze-on-red body	2	1.0
Glaze-on-yellow body	1	0.5
White Mountain Redware (Cibola)		
Wingate Black-on-red	1	0.5
Total	**199**	**100**

A Classic period association at the fieldhouse is also supported by the presence of glazewares that represent 9 percent of the pottery from the site. While no rim sherds were present, a combination of glaze-on-red, glaze-on-yellow, and glaze polychrome sherds are represented. Most of these sherds are tempered with basalt and latite commonly found in pottery produced in areas of the Middle Rio Grande to the south.

Table 21.6. Tradition by ware for LA 128805 ceramics.

Tradition	Ware										Total	
	Gray		White		Red		Glaze		Micaceous			
Rio Grande (Prehistoric)	126	100.0	49	100.0	--	--	--	--	5	100.0	180	90.4
Middle Rio Grande	--	--	--	--	--	--	18	100.0	--	--	18	9.0
Cibola	--	--	--	--	1	100.0	--	--	--	--	1	0.0.5
Total	**126**	**100.0**	**49**	**100.0**	**1**	**100.0**	**18**	**100.0**	**5**	**100.0**	**199**	**100.0**

Gray utilityware types consist of 63.3 percent of the pottery from this site and indicate similar trends. The majority of the corrugated pottery is tempered with “anthill” sand, in contrast to the plain gray and Sapawe Micaceous shreds which are tempered with micaceous granite (Table 21.7). While a wide range of exterior surface manipulations was noted, it is about equally divided between plain and smeared corrugated forms.

Table 21.7. Temper by ware for LA 128805 ceramics.

Temper	Ware										Total	
	Gray		White		Red		Glaze		Micaceous			
Sand	3	2.3	--	--	--	--	--	--	3	60.0	6	3.0
Granitic (mica, quartz, and feldspar)	21	16.6	--	--	--	--	--	--	--	--	21	10.5
Highly micaceous paste	--	--	--	--	--	--	--	--	2	40.0	2	1.0
Sherd and sand	1	0.7	--	--	1	100.0	--	--	--	--	2	1.0
Fine tuff or ash	--	--	47	95.9	--	--	1	5.5	--	--	48	24.1
Gray crystalline basalt	--	--	--	--	--	--	8	44.4	--	--	8	4.0
San Marcos latite	--	--	--	--	--	--	9	50.0	--	--	9	4.5
"Anthill" sand	101	80.1	--	--	--	--	--	--	--	--	101	50.7
Tuff with some phenocrysts (anthill)	--	--	2	4.1	--	--	--	--	--	--	2	1.0
Total	**126**	**100.0**	**49**	**100.0**	**1**	**100.0**	**18**	**100.0**	**5**	**100.0**	**199**	**100.0**

Table 21.8. Form by ware for LA 128805 ceramics.

Vessel Form	Ware										Total	
	Gray		White		Red		Glaze		Micaceous			
Indeterminate	--	--	1	2.0	--	--	1	5.5	--	--	2	1.0
Bowl rim	--	--	5	10.2	--	--	--	--	--	--	5	2.5
Bowl body	--	--	19	38.7	1	100.0	3	16.6	--	--	23	11.5
Jar neck	19	15.0	3	6.1	--	--	3	16.6	--	--	25	12.5
Jar rim	4	3.1	3	6.1	--	--	1	5.5	--	--	8	4.0
Jar body	99	78.5	18	36.7	--	--	3	16.6	5	100.0	125	62.8
Miniature pinch pot body	4	3.1	--	--	--	--	--	--	--	--	4	2.0
Body sherd polished int-ext	--	--	--	--	--	--	6	30.0	--	--	6	3.0
Indeterminate lug handle	--	--	--	--	--	--	1	5.5	--	--	1	0.5
Total	**126**	**100.0**	**49**	**100.0**	**1**	**100.0**	**18**	**100.0**	**5**	**100.0**	**199**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 353 artifacts were analyzed from LA 128805, consisting of two cores, 331 pieces of debitage, four retouched tools, and 16 ground stone items. This represents a 100 percent sample of the lithic artifacts recovered during the site excavations. Table 21.9 presents the data on lithic artifact type by material type. The majority of the debitage is made of obsidian, with less chalcedony, basalt, and other materials. The presence of cortex on 10.2 percent of the debitage indicates that the materials were collected from both primary nodular (58.8%) and secondary waterworn sources. The obsidian is present at nearby sources in the Jemez Mountains, but four obsidian flakes also exhibit waterworn cortex. In contrast, chalcedony, Pedernal chert, and quartzite are available from local Rio Grande Valley gravel sources.

Table 21.9. Lithic artifact type by material type at LA 128805.

Artifact Type		Material Type												
		Basalt	Vesicular Basalt	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Silicified wood	Orthoquartzite	Quartzite	Total
Cores	Core	0	0	0	0	0	0	1	0	1	0	0	0	2
	Subtotal	0	0	0	0	0	0	1	0	1	0	0	0	2
Debitage	Angular debris	2	0	1	0	0	7	16	0	3	1	0	0	30
	Core flake	22	0	0	0	0	57	48	3	13	0	1	1	145
	Biface flake	11	0	0	0	0	53	3	0	1	0	0	0	68
	Core trimming flake	0	0	0	0	0	1	0	0	0	0	0	0	1
	Microdebitage	14	0	0	0	0	44	11	1	0	0	0	0	70
	Undetermined flake	5	0	1	0	0	11	0	0	0	0	0	0	17
	Subtotal	54	0	2	0	0	173	78	4	17	1	1	1	331
Retouched Tools	Retouched piece	0	0	0	0	0	1	0	0	0	0	0	0	1
	Biface	0	0	0	0	0	2	0	0	0	0	0	0	2
	Uniface	0	0	0	0	0	0	0	0	1	0	0	0	1
	Subtotal	0	0	0	0	0	3	0	0	1	0	0	0	4
Ground Stone	One-hand mano	0	0	0	1	0	0	0	0	0	0	0	0	1
	Basin metate	0	0	1	0	0	0	0	0	0	0	0	0	1
	Undetermined metate fragment	1	1	2	3	2	0	0	0	0	0	0	0	9
	Abrading stone	0	0	0	0	1	0	0	0	0	0	0	0	1
	Undetermined ground stone	0	0	1	3	0	0	0	0	0	0	0	0	4
	Subtotal	1	1	4	7	3	0	0	0	0	0	0	0	16
Total		55	1	6	7	3	176	79	4	19	1	1	1	353

Eleven pieces of debitage and a retouched tool were submitted for X-ray fluorescence analysis from LA 128805 (Table 21.10). All of the artifacts were obtained from the Cerro Toledo (Rabbit Mountain/Obsidian Ridge) source area, which is located about 15 km (10 miles) as the "crow flies" to the southwest (Shackley, Volume 3).

Table 21.10. Obsidian source samples.

FS #	Artifact	Color	Source
6	Debitage	Translucent	Cerro Toledo rhyolite
62	Debitage	Translucent	Cerro Toledo rhyolite
71	Debitage	Green	Cerro Toledo rhyolite
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157-1	Debitage	Black opaque	Cerro Toledo rhyolite
157-2	Debitage	Translucent	Cerro Toledo rhyolite
163	Debitage	Translucent	Cerro Toledo rhyolite
186	Debitage	Black opaque	Cerro Toledo rhyolite
215	Debitage	Black opaque	Cerro Toledo rhyolite
247	Debitage	Green	Cerro Toledo rhyolite
253	Debitage	Translucent	Cerro Toledo rhyolite
254	Debitage	Green	Cerro Toledo rhyolite

Lithic Reduction

The platform core was reduced using a bidirectional, change-of-orientation technique; whereas, the flake core was reduced using a single-directional, single-face technique. The platform core was discarded due to material flaw and the flake core was classified as still useable. Table 21.11 presents the metric information on these cores.

Table 21.11. Core type dimensions (mm) and weight (gm).

Core Type	Length	Width	Thickness	Weight
Flake core	41	49	18	46.8
Bi-directional	59	39	26	57.6

The debitage mainly consists of core flakes (36.3%) and microdebitage (30.1%) with some biface flakes, angular debris, and undetermined flake fragments. Table 21.12 summarizes the various stages of reduction represented by the whole core and biface (tertiary) flakes. The overall cortical:non-cortical ratio of 0.63 reflects an emphasis on later stages of core reduction and tool production.

Table 21.12. Debitage reduction stages.

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Basalt	0	0	2	0	---

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Obsidian	0	3	1	1	1.5
Chalcedony	0	4	7	0	0.57
Pedernal Chert	0	0	0	0	---
Total	0	7	10	1	0.63
Percentage	0	38.8	55.5	5.5	---

The majority of the flakes exhibit single platforms (42.4%; *n* = 31), with cortical (*n* = 10), dihedral (*n* = 2), multi-faceted (*n* = 7), collapsed (*n* = 9), and crushed (*n* = 14) platforms. Twenty-four (28.9%) of the flake platforms exhibit evidence of preparation, with most of these being abraded/crushed and only seven retouched/abraded platforms.

The majority of the core flakes consist of distal fragments (*n* = 60; 41.3%), with fewer whole (*n* = 20), proximal (*n* = 28), midsection (*n* = 34), lateral flake (*n* = 2), and undetermined flake (*n* = 1) fragments. Most of the biface flakes are also midsection fragments (*n* = 23; 33.8%), with fewer whole (*n* = 1), proximal (*n* = 22), and distal (*n* = 22) flakes. The whole core flakes have a mean length of 21.6 mm (*std* = 8.9), whereas, the single whole biface flake has a length of 14.0 mm. Lastly, the angular debris have a mean weight of 4.0 g (*std* = 7.2).

The retouched tools consist of a retouched piece, two bifaces, and one uniface. The retouched piece consists of the distal end of flake with unidirectional dorsal retouch along a lateral edge with an angle of 35 degrees. One of the bifaces is a lateral fragment with an edge angle of 40 degrees, whereas, the other biface is a proximal fragment that may have been broken while attempting to notch the artifact. This break occurred along a material flaw. The uniface is a large flake with unidirectional dorsal retouch along the lateral end and ends with a steep edge angle of 70 degrees (Figure 21.5).

Tool Use

Only six flakes (1.8%) exhibit evidence of damage that could be attributed to use-wear**.** Three have straight lateral edges with angles ranging from 35 to 45 degrees, whereas, two are utilized ends with straight and convex edge outlines and angles of 50 degrees. The last item is a utilized projection.

The uniface is the only retouched tool with evidence of use-wear consisting of some polish and scarring.

The ground stone consists of a one-hand mano, basin metate, and some metate fragments. The one-hand mano is a dacite cobble with a single grinding surface. The basin metate is a fragment that was made on a large piece of andesite. It has grinding surfaces on both sides that consist of deep concavities. The abrading stone is a tuff cobble that exhibits some grinding along high spots on one surface. The undetermined metate and ground stone fragments are tabular pieces of material that exhibit a grinding surface(s). The metate fragments are larger and may represent pieces of millingstones with slightly concave grinding surfaces. Several of the fragments are burned.

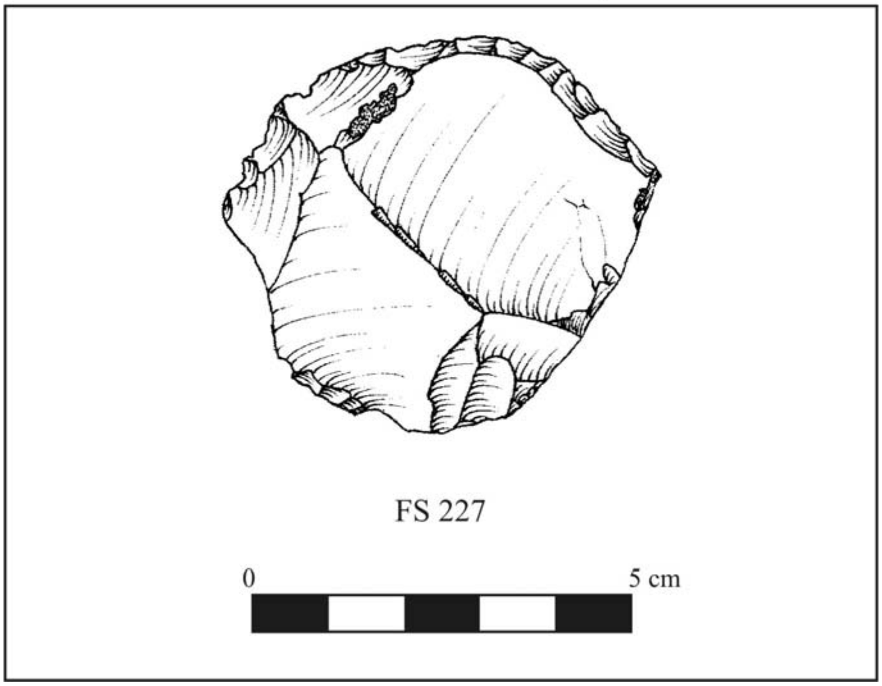

Figure 21.5. Uniface recovered at LA 128805.

Archaeobotanical Remains (Pamela McBride)

Cultural floral remains consisted of an unidentifiable plant part, a maize glume, cupule, and kernel fragments. Unburned intrusive plant parts included weedy annual seeds, grass stems, dropseed grass seeds, prickly pear cactus seeds, and conifer duff (Table 21.13).

Table 21.13. Flotation sample plant remains from LA 128805.

FS No.	161	162	176	185	199	210
Feature	105.2N/104.8E	103N/104E	103N/106E	104.9N/104.3E	104N/104E	102N/106E
Cultural Other						
Unidentifiable		pp 1(0)				
Non-Cultural Annuals						
Goosefoot		+	+	+	+	
Spurge			+	+	+	+
Grasses						
Grass family	culm +					
Other						
Dicot		leaf +				
Perennials						

FS No.	161	162	176	185	199	210
Feature	105.2N/104.8E	103N/104E	103N/106E	104.9N/104.3E	104N/104E	102N/106E
Juniper	twig +	♀ cone +, twig +	♀ cone +, twig +	+, ♀ cone +, twig +	+, ♀ cone +, twig +	twig +
Pine	twig +	twig +	nsg +, twig +		twig +	twig +
Piñon	needle +	needle +	needle +, nutshell +	needle +	needle +	needle +, nutshell +
Ponderosa pine					needle +	
Prickly pear cactus			+	+, embryo +		

Table 21.13 (continued). Flotation sample plant remains from LA 128805.

FS No.	211	225	246	248
Feature	105N/106E	105.2N/105.7E	104.3N/106.4E	103N/104E
Cultural Cultivars				
Maize	cf. glume 1(1)	cupule 2(0), cf. kernel 1(0)		
Non-Cultural Annuals				
Goosefoot	+	+	+	+
Pitseed goosefoot	+			
Spurge			+	+
Grasses				
Dropseed grass		+		
Perennials				
Juniper	♀ cone +, twig +	twig +	+, twig +	twig +
Pine	bs +	bs +	bs +	twig +
Piñon	needle +		needle +	needle +
Ponderosa pine	needle +		needle +	
Prickly pear cactus	+			

All plant remains are seeds unless indicated otherwise; Cultural plant remains are charred, non-cultural plant remains are uncharred; + 1-10/liter, bs barkscale, cf. compares favorably.

Flotation wood charcoal included unidentified pine, piñon, and saltbush/greasewood (Table 21.14). Vegetal samples from room fill yielded a maize kernel and kernel fragments and cupules (Table 21.15). Piñon was the most common wood by weight in vegetal samples, followed by ponderosa and cf. rabbitbrush. Two fragments of cf. wolfberry were also identified, along with several pieces of oak, pine, unknown conifer, saltbush/greasewood, and unknown non-conifer. Since maize was the only identifiable non-wood plant recovered, it might be safe to say that tending maize fields was the primary focus of fieldhouse occupants. Despite the absence of a formal thermal feature, the presence of maize and wood charcoal indicates maize was processed inside the structure and that a variety of locally available conifers and shrubs were used for fuel or construction material.

Table 21.14. Flotation sample wood charcoal taxa by count and weight in grams from LA 128805.

FS No.	199	211	246	248
Conifers				
Pine	1/<0.1g			
Piñon		3/<0.1g		
Unknown conifer		3/<0.1g	2/<0.1g	
Non-Conifers				
Saltbush/greasewood		1/<0.1g		2/<0.1g
Unknown non-conifer				1/<0.1g

Table 21.15. LA 128805 room fill, vegetal sample carbonized plant remains, by count and weight in grams.

FS No.	152	153	155	160	164	173	178	189
Non-Wood Cultivars								
Maize	kernel 1(1)/0.1 g		cf. kernel 8(0)/<0.1g		cupule 1(0)/<0.1g		poss. kernel 7(0)/<0.1g	
Wood Conifers								
Pine								1/<0.1g
Piñon		3/0.3g		4/0.1g	4/0.1g			
Ponderosa pine			1/<0.1g	1/<0.1g	1/<0.1g	3/0.2g		
Unknown conifer		1/<0.1g						
Non-Conifers								
Oak					1/<0.1g			1/<0.1g
cf. Rabbitbrush				2/0.1g			1/<0.1g	6/0.7g
Saltbush/ greasewood				2/<0.1g	3/0.1g			
cf. Wolfberry				2/0.4g				
Totals	-	4/0.3g	1/<0.1g	11/0.6g	9/0.2g	3/0.2g	1/<0.1g	8/0.7g

Table 21.15 (continued). LA 128805 room fill, vegetal sample carbonized plant remains, by count and weight in grams.

FS No.	192	195	198	216	220	230	233	234
Stratum	2, level 2					3, level 3	2, level 2	3, level 3
Non-Wood Cultivars								
Maize		cupule 1(1)/<0.1g				kernel 1(1)/<0.1g		
Wood Conifers								
Pine			2/0.1g		1/<0.1g	1/<0.1g		
Piñon						6/1.0g		1/0.1g
Ponderosa pine			2/<0.1g	2/0.8g		3/0.1g		
Unknown conifer	1/<0.1g							
Non-Conifers								
Oak			1/<0.1g			1/<0.1g		
cf. Rabbitbrush			5/0.2g					
Saltbush/ greasewood			1/<0.1g				1/0.1g	
Unknown Non-Conifer						1/<0.1g		
Totals	1/<0.1g	-	11/0.3g	2/0.8g	1/<0.1g	12/1.1g	1/0.1g	1/0.1g

Table 21.15 (continued). LA 128805 room fill, vegetal sample carbonized plant remains, by count and weight in grams.

FS No.	238	241	249	Total Wood	
Stratum	3, level 3				
Wood Conifers					
Pine	4/0.2g	1/0.2g	1/0.1g	0.6g	12%
Piñon				1.6g	33%
Ponderosa pine	1/<0.1g			1.1g	22%
Unknown conifer				<0.1g	<1%
Non-Conifers					
Oak				<0.1g	<1%
cf. Rabbitbrush				1.0g	20%
Saltbush/greasewood				0.2g	4%
Unknown Non-				<0.1g	<1%

Conifer					
cf. Wolfberry				0.4g	8%
Totals	5/0.2g	1/0.2g	1/0.1g	4.9g	100%

Pollen Remains (Susan Smith)

Eight pollen samples were analyzed from the fieldhouse. Taxa identified in the Stratum 1 (post-occupational fill) pollen sample include the following: prickly pear (*Opuntia/Platy*), cheno-ams, unidentified grasses (Poaceae), sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), evening primrose (Onagraceae), fir (*Abies*), unidentified pine (*Pinus*), piñon pine (*Pinus edulis*), juniper (*Juniperus*), Mormon tea (*Ephedra*), and sagebrush (*Artemisia*). Taxa identified in the pollen samples (*n* = 5) from Stratum 2 (room fill) include the following taxa: prickly pear, beeweed (*Cleome*), buckwheat (*Eriogonum*), sunflower family, ragweed/bursage, globemallow (Sphaeralcea), spurge (Euphorbiaceae), evening primrose, fir, unidentified pine, piñon pine, juniper, oak (*Quercus*), birch (*Betula*), Mormon tea, sagebrush, cheno-ams, and unidentified grasses. Taxa identified in the pollen samples (*n* = 1) from Stratum 3 (wallfall/room fill) include the following taxa: maize, sunflower family, ragweed/bursage, unknown sunflower family (possibly marshelder), unidentified pine, piñon, oak, rose family (Rosaceae), sagebrush, cheno-ams, and unidentified grasses (Poaceae). Taxa identified in Stratum 4 (the floor/prepared surface, *n* = 1) include the following taxa: prickly pear, cattail (*Typha*), sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon, juniper, sagebrush, cheno-ams, and unidentified grasses.

SUMMARY

LA 128805 consists of a large single-room fieldhouse, constructed of both shaped and unshaped tuff blocks. The presence of maize and numerous jar sherds reflects the agricultural function of the site, with some core reduction and milling activities. The site is located downslope from LA 12587 (Chapter 14, Volume 2) and some of the Coalition period artifacts may have come from the occupation of this site. Nonetheless, the main occupation of the fieldhouse (Area 1) and the artifact scatter (Area 2) date to the Middle Classic period (15th century), as evidenced by the radiocarbon date and ceramic assemblage. The presence of the artifact scatter reflects an extended period of occupation at the site, presumably during the maize growing season.

CHAPTER 22
AIRPORT-SOUTH TRACT (A-5-1): LA 86533

Jennifer E. Nisengard

INTRODUCTION AND SITE SETTING

This chapter presents the results of the archaeological fieldwork conducted at LA 86533. The site consists of a dispersed artifact scatter that is located east of the Los Alamos town site and south of State Road 502 (see Figure 13.2). The Airport Tract parcel includes a gently sloping mesa between a tributary to Pueblo Canyon on the north and DP Canyon, a tributary to Los Alamos Canyon, on the south. The tract ranges in elevation from 2153 m to 2196 m (7060 to 7200 ft), and the vegetation is primarily piñon-juniper woodland with areas of ponderosa pine forest and an understory of saltweed, snakeweed, yucca, and various other native grasses, shrubs, and forbs. The site is located at an elevation of 2123 m (6965 ft).

LA 86533 is an artifact scatter located south of LA 86534 (see Chapter 24, this volume) and east of LA 139418 (see Chapter 23, this volume) and dates to the Ancestral Pueblo period. The site was identified during a pedestrian survey of the area in 1984 and rerecorded in 1991 by Los Alamos National Laboratory (LANL) archaeologists. An initial surface survey identified a dispersed lithic and ceramic scatter that included a Late Archaic (Armijo) projectile point. In May of 2003, LANL personnel conducted a surface reconnaissance of the site area to identify the overall distribution of artifacts. This work was completed by Jennifer Nisengard (crew chief), Aaron Gonzales, and Bettina Kuru'es.

SITE DESCRIPTION

The site consists of a lithic and ceramic scatter that is dispersed across a 350- by 40-m area. The majority of the artifacts were recovered from an open grassy area south of Highway 502 (Figures 22.1 and 22.2). No features or structures were identified at the site, although a possible rock alignment was noted. Nine of the 11 ceramics at LA 86533 were recovered from the east end of the scatter, which lies directly south of LA 86534. It, therefore, seems likely that these sherds were originally associated with this Coalition period roomblock.

FIELD METHODS

Due to the sparse nature of the artifact distribution, a geographic positioning system (GPS) point location was taken for each artifact at LA 86533. The artifact was collected and bagged and the GPS location was noted. The site area was highly eroded, with shallow colluvial soils or exposed bedrock. Therefore, no subsurface testing was conducted.

SURFACE COLLECTION

Forty-six artifacts were recovered from LA 86533. Most of the artifacts consist of debitage with two retouched tools and 14 sherds (Figure 22.1). The debitage primarily consists of obsidian core flakes, with an obsidian biface and Late Archaic point. On the other hand, most of the ceramics are Santa Fe Black-on-white and smeared-indented corrugated sherds. A single ceramic ladle handle was also recovered. The assemblage appears to include Late Archaic and Coalition period components. As previously noted, the latter is presumably associated with the roomblock at LA 86534.

Figure 22.1. Establishing the grid at LA 86533 with the Nikon DTM.

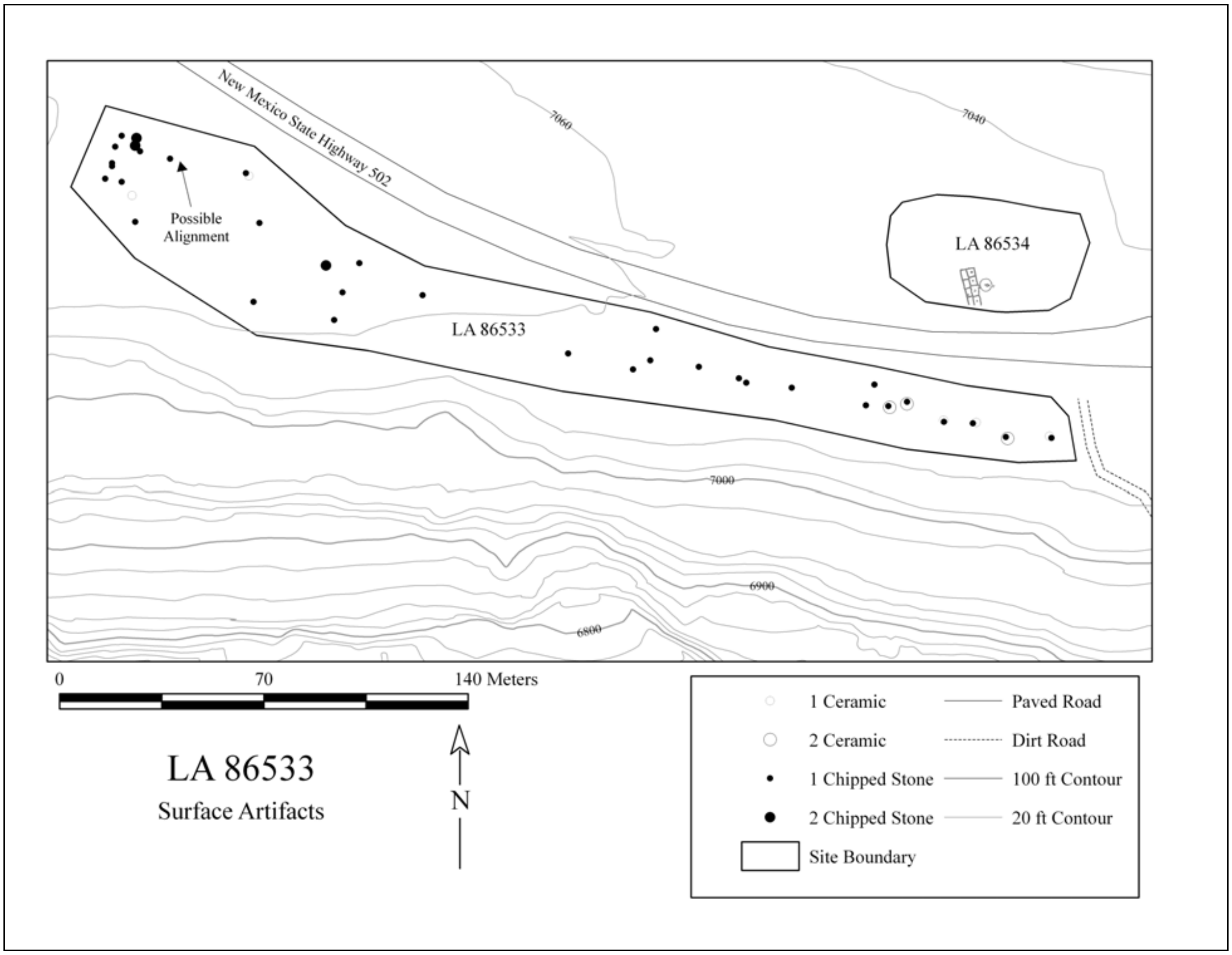

Figure 22.2. Distribution of surface artifacts at LA 86533.

ANALYSES

All 46 artifacts recovered from LA 86533 were analyzed. No archaeobotanical, pollen, or faunal remains were recovered since no subsurface excavations were conducted at the site.

Ceramics (Dean Wilson)

The ceramic assemblage is limited to 14 sherds (Table 22.1). Most of these are either Santa Fe Black-on-white or smeared-indented corrugated ceramics which date to the Coalition period.

Table 22.1. Ceramic types from LA 86533.

Pottery Type	Frequency	Percent
Northern Rio Grande Whiteware		
Undetermined painted ware	4	28.6

Pottery Type	Frequency	Percent
Santa Fe Black-on-white	3	21.4
Jemez, Santa Fe, or Vallecitos Black-on-white	2	14.3
Northern Rio Grande Utilityware		
Smeared-indented corrugated	5	35.7
Total	**14**	**100.0**

Chipped and Ground Stone (Bradley Vierra and Michael Dilley)

Material Selection

A total of 32 artifacts were analyzed from LA 86533, consisting of 30 pieces of debitage, and two retouched tools. This represents a 100 percent sample of the lithic artifacts recovered during the site surface collections. Table 22.2 presents the data on lithic artifact type by material type. The majority of the debitage is obsidian, with lesser amounts of other materials. In addition, both retouched tools are also made of obsidian. Obsidian is present in the nearby Jemez Mountains source areas. The chalcedony, Pedernal chert, and chert are available from local Rio Grande Valley gravel sources. Otherwise, the basalt is available both as bedrock outcrops and in stream gravels that cross-cut the Pajarito Plateau.

Table 22.2. Lithic artifact type by material type from LA 86533.

Artifact Type		Material Type													
		Basalt	Vesicular Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Silicified wood	Quartzite	Other	Total
Debitage	Angular debris	0	0	0	0	0	0	0	0	0	2	0	0	0	**2**
	Core flake	1	0	0	0	0	0	11	3	3	4	0	0	0	**22**
	Biface flake	0	0	0	0	0	0	5	0	0	0	0	0	0	**5**
	Microdebitage	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
	Undetermined flake	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	Subtotal	1	0	0	0	0	0	17	3	3	6	0	0	0	**30**
Re-touched Tools	Retouched piece	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	Biface	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
	Projectile point	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
	Subtotal	0	0	0	0	0	0	2	0	0	0	0	0	0	**2**

Artifact Type	Material Type													
	Basalt	Vesicular Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Silicified wood	Quartzite	Other	Total
Total	**1**	**0**	**0**	**0**	**0**	**0**	**19**	**3**	**3**	**6**	**0**	**0**	**0**	**32**

Most of the debitage consists of core flakes, with fewer biface flakes, pieces of angular debris, and microdebitage. The biface consists of a broken midsection, and the projectile point is the base of a Late Archaic stemmed dart point (Figure 22.3). The tip was presumably broken during impact, but cracked on an inclusion in the obsidian. Metrical and descriptive information on the projectile point is presented in Table 22.3.

Table 22.3. Projectile point metrical (mm) and descriptive data.

FS #	Material	Condition	Overall Length	Blade Length	Neck Width	Stem Length	Stem Width	Thickness	Weight (g)	Haft Type	Blade Shape	Base Shape
6	Obsidian	Proximal	--	--	11.2	7.9	11.5	4.4	1.1	Stemmed	---	Strt.

FS is Field Specimen

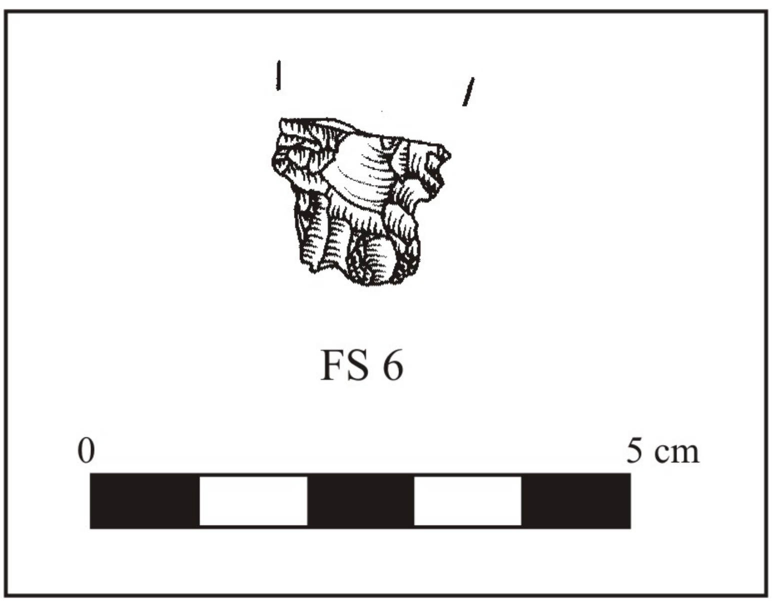

Figure 22.3. Late Archaic projectile point.

SUMMARY AND CONCLUSIONS

LA 86533 consists of a dispersed lithic and ceramic scatter that includes at least two temporal components. One of these components dates to the Late Archaic period and is primarily situated in the western area of the site. On the other hand, the Santa Fe Black-on-white and smeared-indented corrugated sherds located in the eastern section of the site are probably associated with the nearby Coalition period roomblock at LA 86534.

CHAPTER 23
AIRPORT-SOUTH TRACT (A-5-1): LA 139418

Jennifer E. Nisengard, Kari M. Schmidt, and Bradley J. Vierra

INTRODUCTION AND SITE SETTING

This chapter presents the results of surface collections and excavations conducted at LA 139418. The site is located in the Airport-South Tract east of the Los Alamos town site and south of State Road 502. LA 139418 consists of a grid garden and surrounding lithic and ceramic scatter. A Coalition period roomblock (LA 135290) is located to the north of the site and a multi-component artifact scatter to the east (LA 86533) (see Figure 13.2). The site was identified during a pedestrian survey of the area in 2002, with excavations being conducted by Jennifer Nisengard (crew chief), Joseph Aguilar, Jennifer Boyd, and Todd Pitezel in 2003. The site is situated on a piñon and juniper covered mesa top at an elevation of 2123 m (6965 ft).

SITE DESCRIPTION AND FIELD METHODS

LA 139418 consists of an isolated grid garden feature that was surrounded by an extensive lithic and ceramic scatter. Overall, the artifact scatter covers approximately 2000 m^2. It is situated on a gentle southeast-sloping area of the mesa that affords minimal runoff over the site. Unlike LA 86533, which was heavily eroded, there appears to be about 70 cm of soil overlying the bedrock. Nonetheless, small erosional drainages are present in the area that have cut down through these surface soils and partially affected the distribution of surface artifacts.

A pedestrian survey was conducted by the field crew to identify the aerial extent of the scatter. The site was subsequently divided into 1- by 1-m grid units. The initial site grid was established using a transit and a Nikon DT 521 Electronic Mapping Station. Using baseline points, 100-m tapes were laid out and a surface collection was conducted in 1- by 1-m units. This grid system covered a roughly 40- by 50-m area (60-95N/80-125E). The crew encountered hundreds of artifacts, with surface items being collected and bagged by artifact type within the specific grid units. Figure 23.1 illustrates the location of the grid garden relative to the chipped stone artifact scatter. As can be seen, there are several artifact concentrations that are spread across the site area. The artifact scatter and grid gardens were therefore divided into five separate areas or providences (Table 23.1).

Area 1 is 26 by 18 m in size and includes the grid garden feature. Excavations were limited to the grid garden, with few surface artifacts being present in the area. Area 2 is 40 by 12 m in size and is situated to the east and southeast of Area 1. Two dense concentrations of artifacts were identified in Area 2, although no features were present. Area 3 is 25 by 14 m in size and is located to the south of Area 1. Area 3 includes an artifact scatter and a southeast-trending erosional drainage, within which a concentration of chipped stone artifacts was identified. Otherwise, no features were identified within this locale. Area 4 is 17 by 9 m in size and is situated to the west and northwest of Area 1. It contains a concentration of artifacts, but also includes portions of the southeast-trending erosional drainage that continues into Area 3. Again, no features were identified within this area. Lastly, Area 5 is situated to the south and southeast of Area 1 and was defined by the presence of three isolated artifact clusters located adjacent to the mesa edge and DP Canyon. Artifacts within this area were collected by geographic positioning system (GPS) location and not within the 1- by 1-m site grid system.

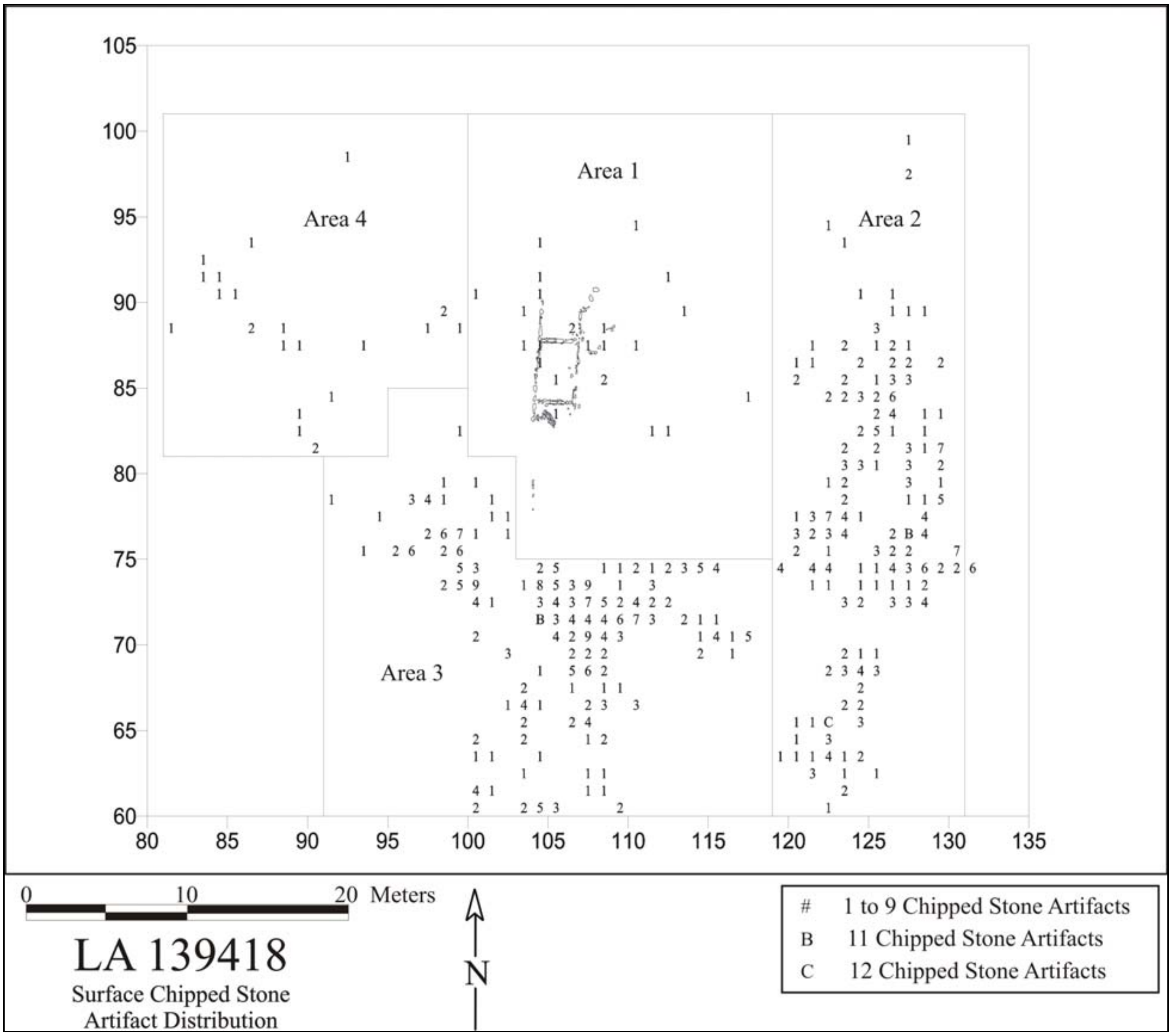

Figure 23.1. Distribution of chipped stone artifacts and features at LA 139418.

Table 23.1. Areas defined during the excavation of LA 139418.

Area Number	Area Location (Grids N/E)	Area Description
1	N 75-100/E 100-118	Grid gardens and the associated artifact scatter.
2	N 60-100/E 119-131	Sample area of artifact scatter to the east of Area 1.

Area Number	Area Location (Grids N/E)	Area Description
3	N 60-85/E 91-118	Artifact concentration south of Area 1.
4	N 81-100/E 81-99	Artifact concentration west of Area 1.
5	3970926N 386014E	Three artifact concentrations near canyon rim.

STRATIGRAPHY

Geomorphologists Steve Reneau and Paul Drakos (Voulme 3, Chapter 57) characterized the stratigraphy at LA 139418 using three profiles from inside the grid gardens and one from the control unit to the east (Table 23.2). Four major soil horizons were defined within the grid garden. These consist of AC (Stratum 1), Bw (Stratum 2), Btb2 (Stratum 3), and Btkb2 (Stratum 5). They correlated the soil profile at LA 139418 with the soil profile at the nearby Classic period fieldhouse at LA 141505 and suggest that the both sites are associated with the top of the Bw soil horizon. This contrasts with the Coalition period roomblock at LA 135290, which is situated at the bottom of the Bw soil and at the Bw and Bwb1 interface. Therefore, the LA 139418 grid garden would appear to date to the Classic period.

Table 23.2. Stratigraphic descriptions for LA 139418.

Stratigraphic Unit	Area	Grid	Thickness (meters)	Color	Texture	Description
0	1	1, 2, 3	0	10YR 4/4	Silty loam	Post-occupational fill. Loose aeolian surface sediments.
1	1	1, 2, 3	0–0.04	10YR 4/4 to 3/4	Silty loam	Post-occupational fill. Loose aeolian surface sediments with some crumbling tuff block and some modern trash.
2	1	1, 2, 3	0.04–0.15	10YR 3/4 to 4/5	Silty loam	Grid garden fill. Loose, unconsolidated silty loam with small rocks and gravels, small roots, and few artifacts.
3	1	1, 2, 3	0.15–0.55	10YR 4/4	Silty clay	Pre-occupational fill. More structured with some mottles, larger roots, very few rocks, gravels, and/or artifacts.
4	1	1	0.15–0.20	10YR 4/4	Silty clay	Pre-occupational fill.
5	1	2, 3	0.55–0.80	7.5YR 4/4	Silty clay	Pre-occupational fill. Compact silty clay with peds and some calcium

Stratigraphic Unit	Area	Grid	Thickness (meters)	Color	Texture	Description
						carbonate. Roots in Grid 3 not in Grid 2.
6	1	3	0.04–0.07	7.5YR 4/6	Silty loam	Pre-occupation fill. Thin layer of reddish-brown compact silty loam with a few volcanic tuff inclusions. Strata not recognized by geomorphologists.
7	2	-	0.79–0.81	10YR 4/3	Silty clay	Thin layer of unconsolidated clay directly atop bedrock (only identified in 86N 121E).
8	1, 2	-	0.07–0.15	10YR5/3 (dry) 10YR 3/3 (wet)	Silty loam	Thin layer of whitish-gray silty loam, between Strata 1 and 3. Only found in units outside the grid gardens, indicative of a strong soil formation.

Table 23.3 presents all of the artifacts recovered during excavation of the grid garden in their stratigraphic context.

Table 23.3. LA 139418 artifact counts by stratum.

Stratum	Ceramics	Chipped Stone	Ground stone	Total Number of Artifacts
1	2	21	0	23
2	10	10	0	20
3	1	13	0	14
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
Total	**13**	**44**	**0**	**57**

SITE EXCAVATION

Area 1

Excavation of the grid garden feature was conducted in June and July, 2003. It consists of three attached grid garden units within a 3 by 8 m area. Figure 23.2 illustrates the plan view and profile of the north-south excavation trench that cross-cuts the agricultural feature. Root and rodent disturbance was a problem in the uppermost levels of the excavated units, with two juniper trees and one large piñon tree being located south of Grid 3. Rodent disturbances were most common in the excavation units closest to the grid walls, where gaps between wall rocks and soft sediments associated with the grids were plentiful. In addition, a 1- by 1-m control unit (86N/121E) was also excavated to the east of the feature to establish a comparative stratigraphic soil profile.

Grid 1. Grid 1 is the northernmost grid and appears to have sustained some minimal damage that may be associated with nearby road construction. The eastern and westerns walls of Grid 1 are a single course high and extended approximately 2 m from the central wall. Strata 1 to 5 were exposed within this bounded area (Figure 23.3). Three pieces of chalcedony, obsidian, and basalt debitage and a smeared-indented corrugated, Sapawe Micaceous, and undifferentiated whiteware sherd were recovered during excavation of Grid 1 (Table 23.4). Maize pollen was identified in samples taken from Strata 1 and 2.

Grid 2. Grid 2 is the central grid and is the most complete and elaborate of the three grids. The upper sections of the northern and southern walls are relatively narrow, while the bottom course of the wall is almost twice as wide. Relatively thin, wide blocks were used to build the foundation for the northern and southern walls, while larger blocks were used to construct the upper course (Figure 23.4). Interestingly, the eastern and western walls were constructed in a different manner. These walls consist of a single course of tuff blocks, many of which are upright.

Strata 1, 2, 3, and 5 were exposed in Grid 2 (Figure 23.5). However, unlike Grid 1, no maize pollen was identified in any of the strata. Cultural deposits associated with Grid 2 are relatively shallow (4 to 15 cm), although the wall is quite deep (0 to 30 cm). Calcium carbonate was observed within 10 cm of the surface in some of the units within Grid 2. Most of the artifacts recovered from the grid garden were derived from Grid 2 (Table 23.5). These primarily consist of obsidian and chalcedony microdebitage, with Sapawe Micaceous, plain gray body, and undifferentiated whiteware sherds.

Grid 3. The eastern and western walls of Grid 3 were quite similar to those exposed in Grid 1. That is, they consisted of a single course of shaped and unshaped tuff blocks, except in this case, the grid opens to the south. Strata 1, 2, 3, and 5 were also exposed within Grid 3, and like Grid 2, no maize pollen was identified. However, like Grid 1, very few artifacts were recovered during the excavation of Grid 3 (Table 23.6). These consist of chalcedony and Pedernal chert debitage and smeared-indented corrugated and undifferentiated whiteware sherds.

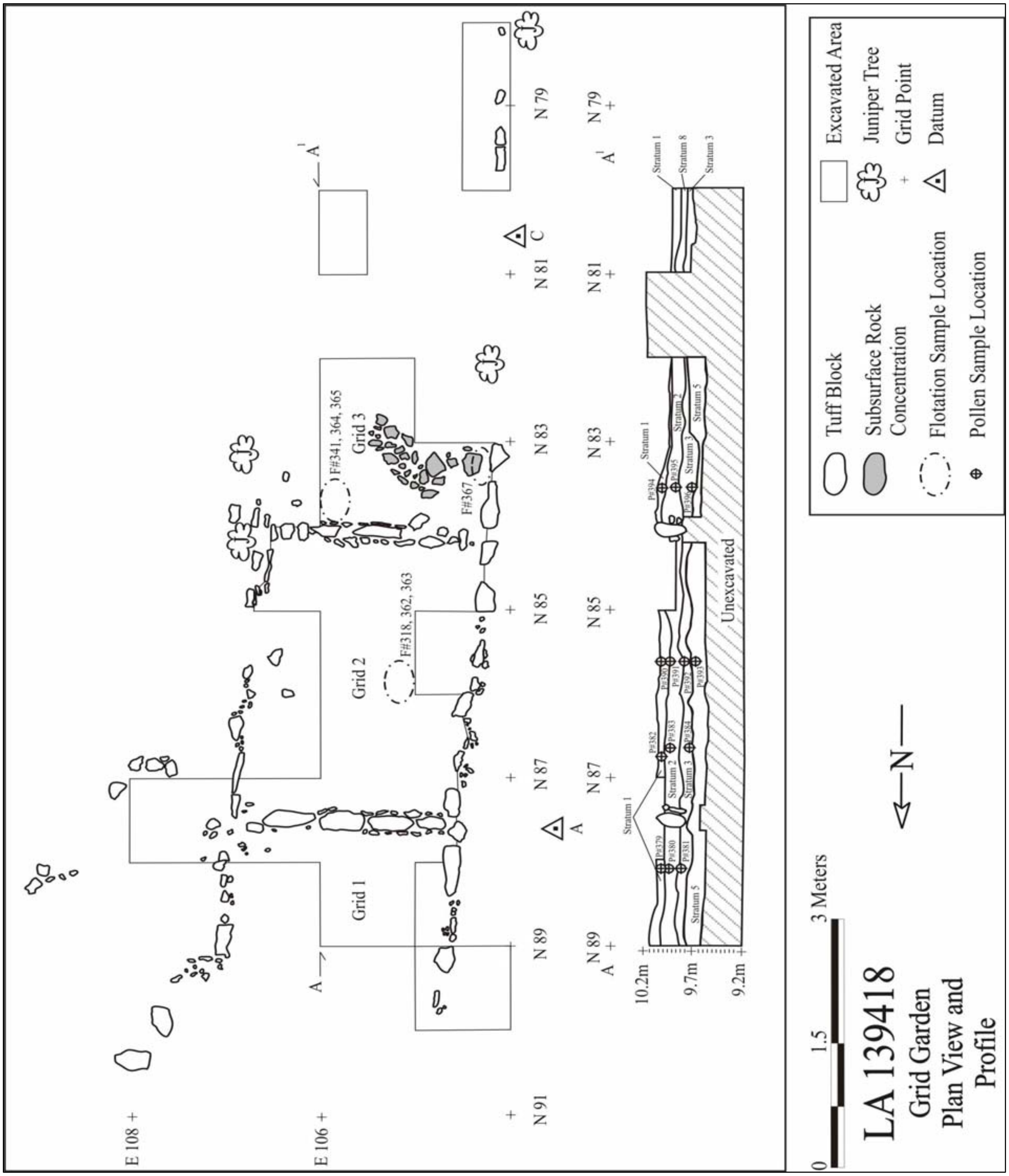

Figure 23.2. Plan view and profile of LA 139418 after excavation.

Figure 23.3. East wall profile of Grid 1.

Figure 23.4. The tuff block wall that separates Grids 2 and 3. Note that the lower course consists of thin and wide blocks versus thick and narrow blocks in the upper course.

Table 23.4. Artifacts recovered from Grid 1.

Stratigraphic Unit	Level	Chipped Stone	Ceramics
1	1	1	0
2	1	0	2
3	2	2	1

Table 23.5. Artifacts recovered from Grid 2.

Stratigraphic Unit	Level	Chipped Stone	Ceramics
1	1	10	0
2	1	4	4
3	1	10	0
3	2	2	0

Figure 23.5. East profile of Grid 2 with geomorphologic strata defined.

Table 23.6. Artifacts recovered from Grid 3.

Stratigraphic Unit	Level	Chipped Stone	Ceramics
1	1	8	0

Stratigraphic Unit	Level	Chipped Stone	Ceramics
2	1	2	3
3	1	1	1

Two 0.50- by 1-m units were also excavated to the south of Grid 3 to determine if any cultural remains were present in this area. Although none were encountered, the stratigraphic sequence is informative. Strata 1, 8, and 3 were exposed. In this case, Stratum 8 replaces Stratum 2 (cultural grid fill) and consists of a well-developed soil horizon; that is, the undisturbed virgin soil present around the grid garden feature.

A concentration of fist-sized rocks was identified in the northwest corner of Grid 3 in units 82N/105E, 83N/105E, and 83N/104E (Figure 23.6). The rock concentration was relatively shallow and did not appear to have been part of any formal construction. Excavators hypothesized that these rocks may have been stacked for use during grid construction or for wall repair.

Figure 23.6. A concentration of small tuff blocks encountered near the wall separating Grids 2 and 3.

Areas 2, 3, 4, and 5

Area 2 is located east and southeast of the grid garden. A total of 313 artifacts were recovered from surface collections in 131 1- by 1-m grid units (Figures 23.1 and 23.7). These consist of 303 pieces of chipped stone, nine ceramics, and one piece of ground stone.

A 1- by 1-m control unit was excavated within Area 2 to provide a geomorphic comparison with the soil profile observed in the grid garden. Excavation of 86N/121E proceeded in arbitrary 10-cm levels down to a depth of 60 cm below the surface. Strata 1, 3, 5, and 7 were exposed in the soil profile. That is, the soil profile is similar to the one exposed within the grid garden, with the exception of the absence of Stratum 2 (cultural fill). This also corresponds with the excavation unit located south of Grid 3, which failed to identify the presence of Stratum 2. Several pollen and flotation samples were collected from the unit, but no artifacts were recovered. Prickly pear, cheno-ams, grass, piñon pine and juniper pollen were the most common species identified.

Area 3 is situated south of Area 1. A total of 338 artifacts were surface collected within this provenience. The majority of these are obsidian, chalcedony, Pedernal chert, and basalt pieces of debitage, with three utilityware sherds.

Figure 23.7. Area 2 artifact scatter.

Area 4 consists of a sparse surface scatter located to the west of Area 1. Forty-nine artifacts were collected from 29 1- by 1-m grids. These consist of 23 chipped stone artifacts, 25 ceramics, and one ground stone fragment.

Area 5 consists of three small obsidian concentrations near the canyon edge. Ninety six chipped stone artifacts and two ceramics were collected in this locale. All the artifacts were found on the exposed bedrock and were point located using a GPS unit. In at least one case, it appears that some of the artifacts were collected from the nearby surface scatter and then placed in a pile on the exposed bedrock.

Figure 23.8 illustrates the distribution of ceramic and ground stone artifacts at the site. These artifacts are primarily distributed across the northern section of the site where the grid gardens are located. This contrasts with the distribution of chipped stone artifacts, which are primarily situated in the eastern (Area 2) and southern (Area 3) portions of the site. This northern ceramic assemblage is dominated by the presence of Classic period glazeware ceramics, which could be associated with the use of the grid garden and/or the fieldhouse located to the north at LA 141505. On the other hand, the remainder of the lithic scatter may represent a separate component that, in part, dates to the Late Archaic. A single Late Archaic projectile point was found in Area 2, and this scatter could represent a continuation of the Late Archaic period occupation located to the east at LA 86533.

SITE CHRONOLOGY AND ASSEMBLAGE

Approximately 400 artifacts were recovered during the excavations and surface collections at LA 139418. All of these artifacts were analyzed, with a set of pollen, flotation, and macrobotanical samples that were analyzed from the excavations conducted within the grid garden. The pollen and flotation samples were selected from each stratigraphic layer within the three individual garden grids. No faunal remains were recovered. A single piece of piñon pine was submitted for radiocarbon dating and eight obsidian artifacts for hydration dating. The results of these artifact and sample analyses are presented in this section.

Chronology

Radiocarbon Dating

A single radiocarbon sample was submitted for analysis from this site. Several piñon pine (*Pinus edulis*) fragments were collected from a macrobotanical sample (Field Specimen [FS] 334) taken from Stratum 2 within Grid 1. Maize pollen was recovered from this grid, so the sample was presumed to be in good association with the use of the grid garden. However, this yielded an intercept date of AD 690, with a two sigma range of AD 650 to 790 (Table 23.7). Based on the surface ceramics and geomorphologic context, it seems probable that the feature dates to the Classic period. If so, this charcoal may represent surface material that simply washed down into the grid from its open northern end.

Table 23.7. Radiocarbon dates from LA 139418.

FS#	Material	Laboratory #	Conventional radiocarbon age	Intercept of radiocarbon age	2-sigma calibrated result
334	piñon pine	199390	1310±50 BP	AD 690	AD 650–790

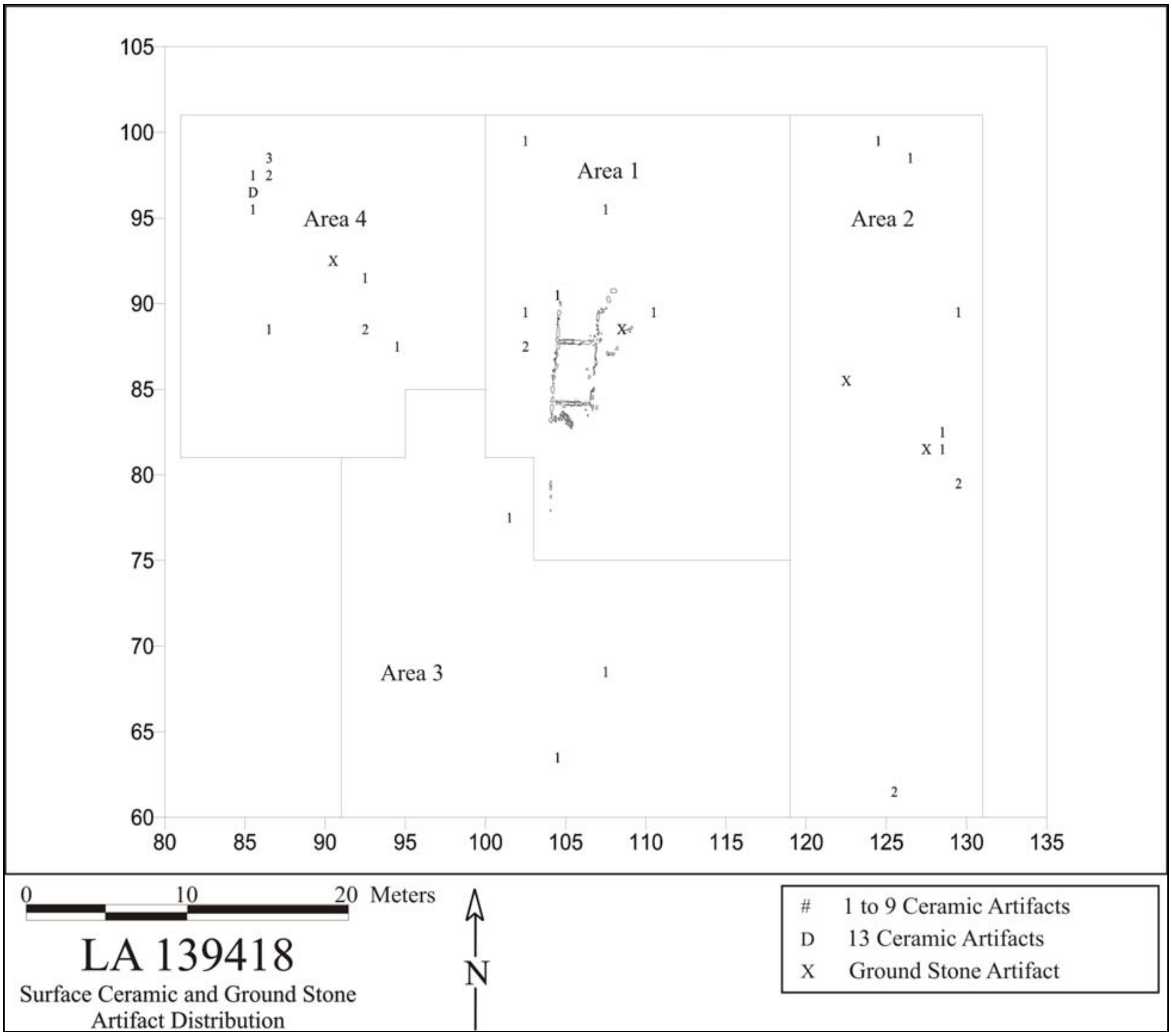

Figure 23.8. Distribution of ceramics, ground stone artifacts, and features at LA 139418.

Obsidian Hydration Dating

Eight obsidian artifacts from LA 139418 were submitted to the Diffusion Laboratory for age determination using the obsidian hydration dating method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rim, was measured. Second, the high temperature hydration rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site was estimated in order that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 23.8).

Table 23.8. Obsidian hydration dates for LA 139418.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
4	2006-48	Valle Grande	3.77	669	69
26	2006-49	Valle Grande	4.99	-7908	399
53	2006-50	Cerro Toledo	3.31	-2379	265
104	2006-51	Valle Grande	4.29	-341	108
109	2006-52	Valle Grande	3.61	-3113	284
111	2006-53	Cerro Toledo	3.38	-2460	265
116	2006-54	Valle Grande	3.17	-1901	247
146	2006-55	Valle Grande	3.22	-2151	259

All of the hydration dates are from artifacts recovered in the Areas 2 and 3 surface scatter. Based on these dates, it would appear that Early, Middle, and Late Archaic components may be represented, as well as the Developmental period. However, only Late Archaic points with Coalition and Classic period ceramics were recovered from these contexts.

Ceramic Artifacts (Dean Wilson)

The ceramic assemblage can be separated into the artifacts recovered during the excavation of the grid garden feature in Area 1 and artifacts recovered from surface contexts across the site.

The ceramics from the grid garden consist of plain gray body, smeared-indented corrugated, Sapawe micaceous, and several undifferentiated whiteware sherds (Table 23.9). These ceramics appear to represent a mix of Coalition and Classic period types that could have been derived from adjacent surface deposits. The small surface assemblage recovered from the site is dominated by Classic period glazeware ceramics, with a few biscuitwares and Coalition period whiteware sherds (Table 23.10). The 21 glazeware sherds are all tempered with crushed basalt and appear to represent both jars and bowls. In contrast, the biscuitware sherds are from jars, but the Coalition period whitewares are from bowls. The latter could have been derived from the nearby Coalition period roomblock at LA 135290, with the remainder being associated with the use of the grid garden feature.

Table 23.9. LA 139418 (Area 1, grid garden) ceramic types.

Pottery Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted Undifferentiated	4	44.4

Pottery Type	Frequency	Percent
Northern Rio Grande Utilityware		
Plain Gray Body	2	22.2
Smeared-indented Corrugated	2	22.2
Sapawe Micaceous	1	11.1
Total	**9**	**100.0**

Table 23.10. LA 139418 (Areas 2, 3, and 4) ceramic types.

Pottery Type	Frequency	Percent
Northern Rio Grande Whiteware		
Santa Fe Black-on-white	1	3.8
Wiyo Black-on-white	2	7.7
Biscuitware painted unspecified	2	7.7
Middle Rio Grande Glazeware		
Glaze Red body unpainted	17	65.4
Glaze unslipped body	1	3.8
Glaze Red body undifferentiated	2	7.7
Glaze unslipped body	1	3.8
Total	**26**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 365 artifacts were analyzed from LA 139418, consisting of 352 pieces of debitage, 10 retouched tools, and three ground stone artifacts. This represents a 44 percent sample of the 831 total lithic artifacts recovered during data recovery activities. The site was separated into two distinctive proveniences. Area 1 includes the excavated grid garden feature and Areas 2 through 5 consist of the surrounding lithic and ceramic scatter. Table 23.11 presents the data on lithic artifact type by material type for Area 1 (n = 42). Debitage was the only lithic artifact recovered during the excavations. The majority of these consist of core flakes, angular debris, and microdebitage, with two biface flakes. The artifacts are primarily made of chalcedony with lesser amounts of obsidian and other materials. In contrast, a total of 323 artifacts were collected from surface contexts in Areas 2, 3, and 4. The information on artifact type by material type is presented in Table 23.12. Again, most of the debitage is made of chalcedony with lesser amounts of obsidian, Pedernal chert, and other materials. The retouched tools are also primarily made of chalcedony and obsidian. Lastly, the ground stone items are made of igneous materials.

Table 23.11. Area 1 lithic artifact type by material type.

Artifact Type		Material Type												
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Silicified wood	Quartzite	Total
Debitage	Angular debris	1	0	0	0	0	0	0	9	0	1	0	0	11
	Core fake	1	0	0	0	0	0	5	11	0	1	0	1	19
	Biface flake	0	0	0	0	0	0	2	0	0	0	0	0	2
	Microdebitage	0	0	0	0	0	0	6	4	0	0	0	0	10
	Subtotal	2	0	0	0	0	0	13	24	0	2	0	1	42
Total		**2**	**0**	**0**	**0**	**0**	**0**	**13**	**24**	**0**	**2**	**0**	**1**	**42**

Table 23.12. Areas 2, 3, and 4 lithic artifact type by material type.

Artifact Type		Material Type												
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Silicified wood	Quartzite	Total
Debitage	Angular debris	2	0	0	0	0	0	7	26	0	6	0	0	41
	Core flake	11	0	3	1	0	0	35	65	1	19	2	4	141
	Biface flake	0	0	0	0	0	0	18	19	0	0	0	1	38
	Microdebitage	0	0	0	0	0	0	10	33	0	0	0	0	43
	Undetermined flake	2	0	0	1	0	0	16	21	0	6	0	1	47
	Subtotal	15	0	3	2	0	0	86	164	1	31	2	6	310
Retouched Tools	Retouched piece	0	0	0	0	0	0	0	3	0	0	0	0	3
	Notch	0	0	0	0	0	0	0	0	0	1	0	0	1
	Biface	0	0	0	0	0	0	3	2	0	0	0	0	5
	Projectile Point	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	4	5	0	1	0	0	10
Ground Stone	Undetermined mano	0	0	1	1	0	0	0	0	0	0	0	0	2
	Polishing stone	0	0	0	0	1	0	0	0	0	0	0	0	1
	Subtotal	0	0	1	1	1	0	0	0	0	0	0	0	3
Total		**15**	**0**	**4**	**3**	**1**	**0**	**90**	**169**	**1**	**32**	**2**	**7**	**323**

The presence of cortex on 5.4 percent of the debitage from Areas 2 and 3 indicates that these materials were collected from nodule and waterworn sources. The chalcedony, Pedernal chert, and quartzite are available from local Rio Grande Valley gravel sources and the basalt from gravels and bedrock outcrops. Obsidian is present at nearby primary sources in the Jemez Mountains. Otherwise, the ground stone artifacts are primarily made from igneous materials, which are available both as bedrock outcrops and in stream gravels that cross-cut the Pajarito Plateau.

Ten pieces of debitage, three retouched tools, and a projectile point were submitted for XRF analysis. With the exception of the projectile point, all of these artifacts were recovered from Areas 2 and 3. Most of the artifacts were from the Valle Grande source, with three from the Cerro Toledo source and a single retouched tool from the El Rechuelos source (Table 23.13; see Shackley, Volume 3). The Valle Grande (Cerro del Medio) and Cerro Toledo (Rabbit Mountain/Obsidian Ridge) source areas are located about 18 km (11 miles) as the "crow flies" to the west and southwest of the site; whereas, the El Rechuelos (Polvadera Peak) source area is situated about 24 km (15 miles) to the northwest.

Table 23.13. Obsidian source samples.

FS #	Artifact	Color	Source
4	Debitage	Translucent	Valle Grande rhyolite
26	Debitage	Translucent	Valle Grande rhyolite
53	Debitage	Translucent	Cerro Toledo rhyolite
104	Debitage	Translucent	Valle Grande rhyolite
109	Debitage	Translucent	Valle Grande rhyolite
111	Debitage	Translucent	Cerro Toledo rhyolite
116	Debitage	Translucent	Valle Grande rhyolite
146	Debitage	Translucent	Valle Grande rhyolite
149	Projectile point	Gray	Valle Grande rhyolite
155	Debitage	Mahogany	Valle Grande rhyolite
174	Debitage	Green	Valle Grande rhyolite
184	Tool	Translucent	Valle Grande rhyolite
192	Tool	Black dusty	El Rechuelos
259	Tool	Black opaque	Cerro Toledo rhyolite

Lithic Reduction

The majority of the flakes in Areas 2 and 3 exhibit single-faceted platforms (*n* = 17), with crushed (*n* = 13), collapsed (*n* = 7), multi-faceted (*n* = 5), and cortical (*n* = 2) platforms. Ten (22.7%) of the flake platforms do exhibit evidence of preparation, with all but one of these being abraded/crushed and the other being abraded/ground.

The majority of the core flakes consist of distal fragments (*n* = 71; 44.3%), with fewer whole (*n* = 12), proximal (*n* = 26), midsection (*n* = 46), and undetermined fragments (*n* = 5). Most of the biface flakes are proximal fragments (*n* = 16; 40.0%), with fewer whole (*n* = 2), midsection (*n* = 13), and distal (*n* = 9) fragments. The whole core flakes have a mean length of 24.2 mm (*std* = 8.3), whereas, the whole biface flakes exhibit a mean length of 19.7 mm (*std* = 0.1). Lastly, angular debris have a mean weight of 2.6 g (*std* = 2.8).

The retouched tools consist of a mix of expedient flakes tools like retouched pieces and a notch, whereas the formal tools consist of bifaces and a projectile point. All of the retouched pieces exhibit a unidirectional dorsal retouched edge, with a straight outline and angles ranging from 55 to 75 degrees. The notched tool consists of a single notch situated at the distal end of a flake with an edge angle of 35 degrees. The bifaces are midsection and distal fragments. They were presumably broken during the middle to late stages of the manufacturing process, having edge angles that range from 35 to 50 degrees. The projectile point is a Late Archaic stemmed point midsection with distinctive tangs (Figure 23.9).

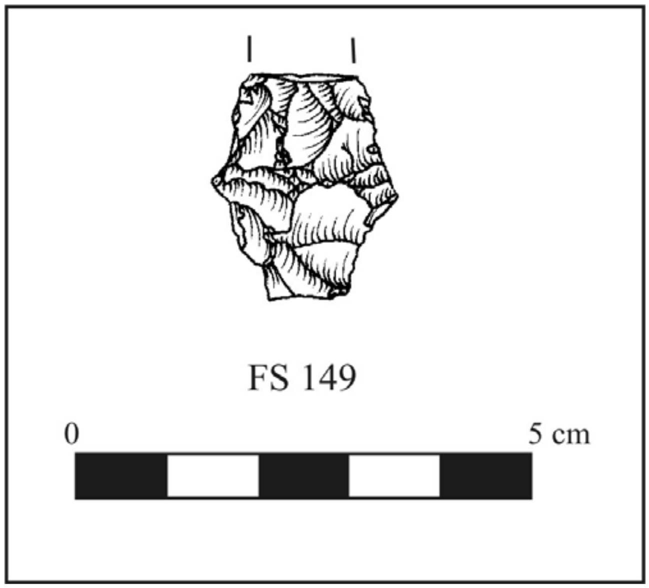

Figure 23.9. Late Archaic stemmed point from LA 139418.

Tool Use

Only two flakes (1%) exhibit evidence of damage that can be attributed to use. One of these was used at the end of the flake with an edge angle of 65 degrees and the other was used along the lateral side of the flake with an edge angle of 45 degrees. The projectile point was presumably broken during the use, having a broken tip and base.

The ground stone artifacts consist of two undetermined mano fragments that are broken cobbles with ground surfaces. The polishing stone is a pebble with a slightly concave polished surface. The polished area exhibits a gray discoloration, as compared to the rest of the pebble, which is a tan/orange color.

Samples

Pollen, flotation, and macrobotanical samples were collected from the grid garden and from the control unit (Table 23.14). Four stratigraphic units were included from the grid garden: Stratum 1 (AC), Stratum 2 (Bw), Stratum 3 (Btb2), and Stratum 5 (Btkb2). An additional soil horizon (Stratum 7; Btkb2/3) was also included from the control unit.

Table 23.14. Pollen and flotation samples selected for analysis from LA 139418.

FS Number	Stratigraphic Unit	Geomorphic Stratum	Grid Number	Sample Type	Comments
318	2	Bw	2	Flotation	Representative sample from inside grid garden
341	2	Bw	3	Flotation	Representative sample from inside grid garden
362	3	Btb2	2	Flotation	Representative sample from inside grid garden
363	5	Btkb2	2	Flotation	Representative sample from inside grid garden
364	3	Btb2	3	Flotation	Representative sample from inside grid garden
365	5	Btkb2	3	Flotation	Representative sample from inside grid garden
367	2	Bw	3	Flotation	From rock concentration
379	1	AC	1	Pollen	From east profile
380	2	Bw	1	Pollen	From east profile
381	3	Btb2	1	Pollen	From east profile
382	1	AC	2	Pollen	From east profile
383	2	Bw	2	Pollen	From east profile
384	3	Btb2	2	Pollen	From east profile
390	1	AC	2	Pollen	From east profile
391	2	Bw	2	Pollen	From east profile
392	3	Btb2	2	Pollen	From east profile
393	5	Btkb2	2	Pollen	From east profile
394	1	AC	3	Pollen	From east profile
395	2	Bw	3	Pollen	From east profile
396	3	Btb2	3	Pollen	From east profile
405	1	AC	CU	Pollen	Control Unit
406	3	Btb2	CU	Pollen	Control Unit
407	5	Btkb2	CU	Pollen	Control Unit
408	7	Btkb2/b3	CU	Pollen	Control Unit
410	3	Btb2	CU	Pollen	Control Unit

Macrobotanical samples were also recovered from all three of the grid garden units (Table 23.15).

Table 23.15. Charcoal samples from LA 139418.

FS Number	Stratigraphic Unit	Grid Number	Sample Type
325	2	2	Charcoal

FS Number	Stratigraphic Unit	Grid Number	Sample Type
332	3	2	Charcoal
333	2	2	Charcoal
334	2	1	Charcoal
344	3	1	Charcoal
347	3	1	Charcoal
354	3	3	Charcoal

Archaeobotanical Remains (Pamela McBride)

Flotation samples from two of the three garden grids at LA 139418 produced unburned non-cultural plant remains, all representative of plants or trees growing in the immediate vicinity of the site today, including goosefoot seeds and conifer duff (Table 23.16). A fragment of pine and another of unknown conifer charcoal were recovered from the rock concentration in the northwest corner of Grid 3. Vegetal sample charcoal was primarily pine (75% by weight), with lesser amounts of cf. piñon, cf. ponderosa pine, unknown conifer, and saltbush/greasewood (Table 23.17). The presence of charcoal in the grid garden could be a product of burning brush to clear or fertilize the fields as described in the discussion of grid gardens at LA 128803. On the other hand, it could also represent natural slope wash into the grids.

Table 23.16. Flotation sample plant remains from LA 139418.

FS No.	318	363	341	367
Feature	Grid 2		Grid 3, Stratum 2, level 1	
	Stratum 2, level 1	Stratum 5, level 1	83.9/105.9	from rock concentration in NW corner
Non-Cultural				
Annuals				
Goosefoot	+		+	+
Perennials				
Juniper	twig +		+, twig +	+, twig +
Pine	umbo +		♂ cone +, umbo +	umbo +
Piñon	needle +, nutshell +	needle +	needle +	needle +
Ponderosa pine	needle +		needle +	needle +

Table 23.17. Vegetal wood charcoal taxa, by count and weight in grams from LA 139418.

FS No.	344	347	325	332	333	334	354	Totals	
Feature	Grid 1		Grid 2				Grid 3	Weight	%
	Stratum 3, level 1	Stratum 3, level 2	Stratum 2, level 1	Stratum 3, level 1	Stratum 2, level 2	Stratum 2, level 2	Stratum 3, level 2		
Conifers									
Pine	5/0.3 g	3 pc/ 9.3 g						9.6 g	75%
cf. Piñon						3/0.3 g		0.3 g	2%
cf. Ponderosa pine			3/0.8 g	3/0.5 g	5/1.1 g		3/0.3 g	2.7 g	21%
Unknown conifer				3/0.2 g				0.2 g	2%
Non-Conifers									
Saltbush/ greasewood	1/ <0.1 g							<0.1 g	<1%
Totals	6/0.3 g	3/9.3 g	3/0.8 g	6/0.7 g	5/1.1 g	3/0.3 g	3/0.3 g	12.8 g	100%

pc = partially charred.

Pollen Remains (Susan Smith)

A total of 18 pollen samples were analyzed from LA 139418. Table 23.18 lists the frequency of identified pollen types. Cultigens identified in the assemblage included maize and cholla. Economic resources identified in the pollen assemblage included prickly pear, cactus family, beeweed, sunflower type, and cattail. A number of other potential economic resources were identified in the assemblage (Table 23.18), and these are described in detail in Smith's chapter in Volume 3 (Chapter 63).

Table 23.18. Pollen types identified by taxa and common names with sample frequency from LA 139418.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 139418 (*n* = 18)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	2
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	1
Economic Resources	*Opuntia* (Platy)	Prickly Pear	10
		Prickly Pear Aggregates	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 139418 (*n* = 18)
	Cactaceae	Cactus Family	1
	Cleome	Beeweed	3
	cf. *Helianthus*	Sunflower type	2
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	1
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	6
	Eriogonum	Buckwheat	1
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Poaceae	Grass Family	18
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	1
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native weeds, Herbs, and Shrubs	Cheno-Am	Cheno-Am	17
		Cheno-Am Aggregates	1
	Fabaceae	Pea Family	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 139418 (*n* = 18)**
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	16
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	7
		Ragweed/Bursage Aggregates	0
		Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	6
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	4
	Scrophulariaceae	Penstemon Family	2
	Onagraceae	Evening Primrose	1
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Potential Subsistence Resources	*Pseudotsuga*	Douglas Fir	2
	Picea	Spruce	0
	Abies	Fir	7
	Pinus	Pine	14
		Pine Aggregates	1
	Pinus edulis type	Piñon	16
	Juniperus	Juniper	16
		Juniper Aggregates	0
	Quercus	Oak	12

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 139418 (*n* = 18)**
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	8
	Artemisia	Sagebrush	13
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	3
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	1
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

Pollen samples were collected from Grids 1, 2, and 3, as well as from a control unit located several meters east of the grid garden. The results of these analyses are presented below.

Grid 1. Three samples were analyzed from Grid 1. Taxa identified in Stratum 1 included maize (*Zea mays*), prickly pear (*Opuntia*), cheno-ams, grass family (Poaceae), sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), broad spine sunflower, fir (*Abies*), unidentified pine (*Pinus* sp.), piñon pine (*Pinus edulis*), juniper (*Juniperus*), oak (*Quercus*), Mormon tea (*Ephedra*), and sagebrush (*Artemisia*). Taxa identified in Stratum 2 included maize, beeweed (*Cleome*), cheno-ams, grass family, sunflower family, fir, piñon pine, juniper, oak, and sagebrush. Taxa identified in Stratum 3 included cheno-ams, grass family, sunflower family, ragweed/bursage, fir, unidentified pine, piñon pine, juniper, rose family (Rosaceae), Mormon tea, and sagebrush.

Grid 2. Seven pollen samples were analyzed from Grid 2. The two samples from Stratum 1 included the following taxa: prickly pear, cheno-ams, grass family, broad spine sunflower, sunflower family, ragweed/bursage, spurge family, penstemon family (Scrophulariaceae), fir, unidentified pine, piñon pine, juniper, oak, rose family, Mormon tea, and sagebrush. Two samples were collected from Stratum 2, and the identified taxa included cholla (*Opuntia*), prickly pear, cactus family (Cactaceae), buckwheat (*Eriogonum*), cheno-ams, grass family, sunflower family, evening primrose (Onagraceae), spurge family, piñon pine, rose family, sagebrush, and juniper. Two samples were analyzed from Stratum 3. Identified taxa included prickly pear, cheno-ams, grass family, sunflower family, long spine sunflower, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush. A single sample was analyzed from Stratum 5. Taxa identified in this stratum included prickly pear, long spine sunflower, cheno-ams, grass family, sunflower family, ragweed/bursage, broad spine sunflower, unidentified pine, piñon pine, juniper, and oak.

Grid 3. Three pollen samples were analyzed from Grid 3, one each from Strata 1, 2, and 3. Taxa identified in Stratum 1 included prickly pear, beeweed, cattail (*Typha*), cheno-ams, sunflower family, broad spine sunflower, ragweed/bursage, penstemon family, fir, unidentified pine, piñon pine, juniper, oak, walnut (*Juglans*), rose family, Mormon tea, and sagebrush. Taxa identified in Stratum 2 included prickly pear, beeweed, cheno-ams, grass family, sunflower family, Douglas fir (*Pseudotsuga*), unidentified pine, piñon pine, juniper, oak, rose family, and Mormon tea. Taxa identified in Stratum 3 included cheno-ams, grass family, sunflower family, ragweed/bursage, fir, unidentified pine, piñon pine, juniper, oak, and sagebrush.

Control Unit. Six pollen samples were collected in a control unit that was excavated south of Grid 3. Taxa identified in two samples from the uppermost stratum included prickly pear, cheno-ams, grass family, sunflower family, Douglas fir, unidentified pine, piñon pine, juniper, oak, rose family, Mormon tea, and sagebrush. Two samples were taken in Stratum 3. Identified taxa included prickly pear, cheno-ams, grass family, sunflower family, ragweed, spurge family, unidentified pine, piñon pine, juniper, and oak. One sample was collected in Stratum 5 and identified taxa included: cheno-ams, grass family, spurge family, fir, unidentified pine, piñon pine, and sagebrush. One sample was collected from Stratum 7. Pollen grains in this sample were too deteriorated to be identified.

CONSTRUCTION HISTORY

The central grid garden walls, those dividing Grids 1 and 2 and 2 and 3, appear to have been constructed first (Figure 23.10). The central walls consisted of two courses of shaped and unshaped tuff blocks. As previously mentioned the lower course was wider than the upper course, although the blocks used for construction were thinner. The eastern and western walls, which run uninterrupted from north to south were added to the central walls and consist solely of one course.

SUMMARY AND CONCLUSIONS

LA 139418 represents a relatively small agricultural feature, which consisted of one complete and two partial grids. The central grid garden (Grid 2) was 2 by 3 m and the northern and southern walls were very well constructed, with large shaped tuff blocks in the center and smaller unshaped tuff blocks on either side. The eastern and western walls of Grids 1, 2, and 3 were not as elaborate as the northern and southern walls and were constructed using fewer rocks with several gaps between the rocks. Grid 1 was not enclosed at the northern end and Grid 3 was not enclosed on the southern end. Deposits further than 2 m from the central walls were determined to be natural and not cultural, thereby supporting the contention that Stratum 2 represented the cultural fill of the grid garden. Maize pollen was recovered from Strata 1 and 2 in Grid 1, but not within either Grids 2 or 3. Nonetheless, it indicates that this important food staple was being grown at the site. The ceramic and geomorphological evidence indicate that the agricultural feature probably dates to the Classic period, being situated in a similar context as the Classic period fieldhouse located to the north at LA 141505.

On the other hand, hundreds of artifacts were found distributed across the site in Areas 2 and 3. Although these may include a Ceramic period component, it seems likely that much of this reflects a Late Archaic period occupation. If so, it would represent a continuation of the Late Archaic surface scatter situated to the east at LA 86533. The obsidian hydration dates indicate that a Middle Archaic component may also be represented.

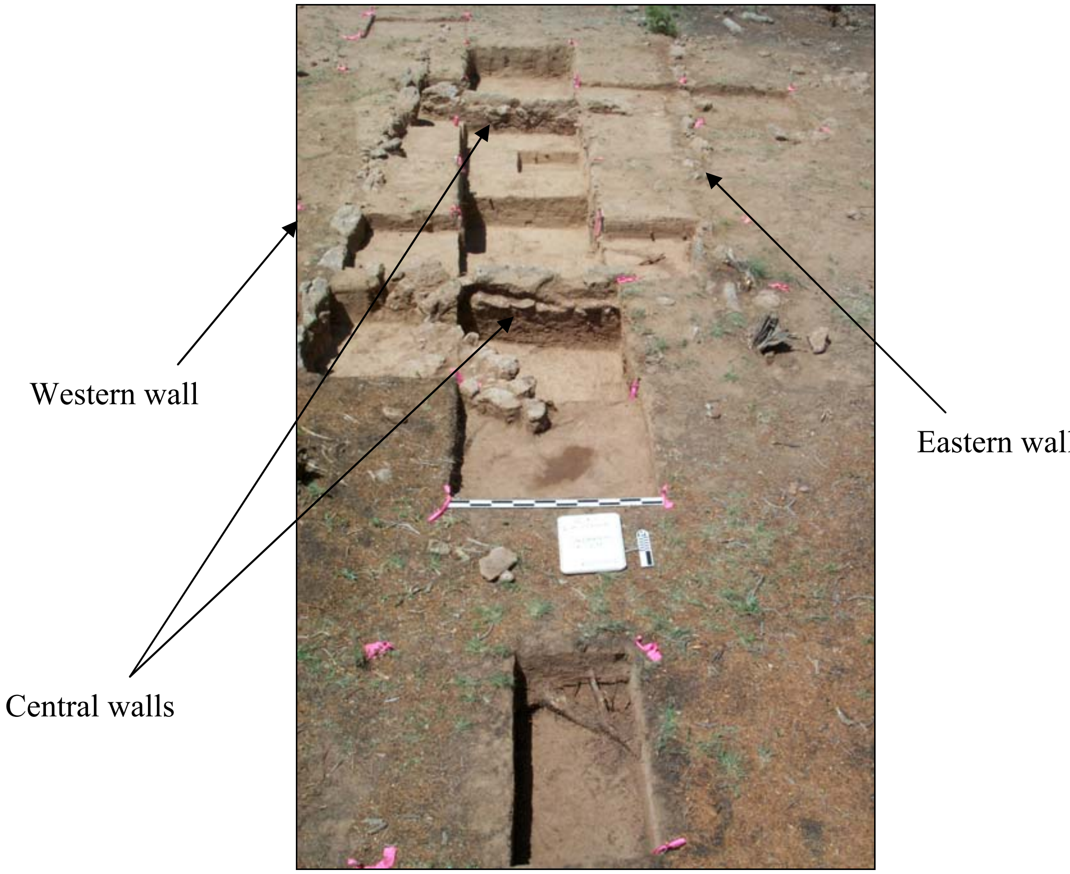

Figure 23.10. LA 139418 post-excavation.

CHAPTER 24
AIRPORT-EAST TRACT (A-3): LA 86534

Kari M. Schmidt

INTRODUCTION AND SITE SETTING

This chapter presents the results of excavations conducted at LA 86534. The site is located in the Airport-North Tract, east of the Los Alamos town site along the north side of State Road 502. The tract is situated near the eastern end of a gently sloping mesa between a tributary to Pueblo Canyon on the north and DP Canyon, a tributary to Los Alamos Canyon, on the south. The parcel ranges in elevation from 2153 m to 2196 m (7060 to 7200 ft) and is covered with a piñon-juniper woodland, isolated ponderosa pines, and an understory of saltweed, snakeweed, yucca, and various other native grasses, shrubs, and forbs.

The site is well-situated between the mountain slopes and the canyon lowlands, with ready access to both environments. The piñon nuts, grass seeds, and other plant foods available in the area were probably attractive to the settled agriculturalists, and the tree cover at the site and extending up the valley toward the mountain likely provided reliable fuel. Game animals on the mountain slopes and in the adjacent canyons could have provided food and hides, and the riparian zone along the drainage would have offered resources not widely available in this arid region.

Geologically, the soil within the tract is a Hackroy sandy loam that generally has a high potential for agriculture (Nyhan et al. 1978). However, with the tract being near the tip of the mesa, the soil deposit is fairly thin and often absent along the mesa edges. The lack of soil and rooting depth severely limits the potential to support agriculture. Bedrock beneath the mesa consists of the Tshirege Member of the Bandelier Tuff (unit Qbt). The mesa is capped by fine-grained soils that likely constitute either eolian sediments or locally reworked eolian sediments. Recent (late Holocene) sediments unconformably overly thin Pleistocene soils.

SITE DESCRIPTION

LA 86534 is located immediately north of Highway 502 at an elevation of 2149 m (7050 ft). The original cultural resource survey identified LA 86534 (temporary number S-11) as a possible roomblock. The roomblock area was characterized by several alignments of shaped and unshaped tuff blocks that measured approximately 18 m north-south by 16 m east-west. The rock alignments were situated amongst several piñon and juniper trees that partially obscured surface visibility. Figure 24.1 shows the site as it looked before excavation but with the 1- by 1-m grid laid out and several cleared piñon and juniper trees. Note the presence of abundant architectural stone on the surface and the mounded appearance.

Figure 24.1. Gridded units before excavation in western area of LA 86534.

In addition to the possible roomblock, a midden area was also identified in the southwest section of the site consisting of a small mound or rise that was located adjacent to New Mexico Highway 502. Although there was a sparse artifact scatter in the area to the east of the possible roomblock, it was unclear at the time of the cultural resource survey whether this rise reflected a buried cultural deposit or was simply disturbed road fill. The associated artifact scatter covered an area measuring approximately 50 m north-south by 44 m east-west. The majority of the identified ceramics consisted of Santa Fe Black-on-white with fewer indented corrugated, smeared-indented corrugated, St. John's Black-on-red, and Wiyo Black-on-white. The lithic artifacts consisted of obsidian and chert debitage, and a single obsidian projectile point tip was observed. One mano fragment was found in the midden area, and one possible polishing stone was also noted. Based on the diagnostic surface ceramics identified during the initial survey, it was thought the site likely dated to the Coalition period.

Initial excavations were undertaken at LA 86534 in the area identified as the possible roomblock. Within a couple of weeks, it became clear that the area associated with the shaped and unshaped tuff blocks on the surface was actually in a heavily disturbed area. Based on the excavations, it was determined that the tuff blocks were secondarily deposited in the area during road construction and that there were no intact alignments.

In addition to the excavations in the area of the possible roomblock and in accord with the data recovery plan (Vierra et al. 2002a), several test pits were placed in areas where 1) there was a high concentration of surface artifacts and 2) where there were areas of stone concentrations. The first test pit was placed over a stone concentration in the area identified as the midden in the initial survey. Just below the surface, an intact wall was identified. The excavation of the test pit and the exposure of the identified wall are shown in Figure 24.2. Excavation efforts immediately shifted to this area, and eventually, a nine-room pueblo was uncovered in an area where little to no surface rubble was present (Figure 24.3). The area suspected to be a roomblock during the initial survey turned out to be redeposited tuff blocks, while the area identified as the midden was overlying a buried roomblock and kiva.

Figure 24.2. Test pit in midden area where roomblock eventually was uncovered.

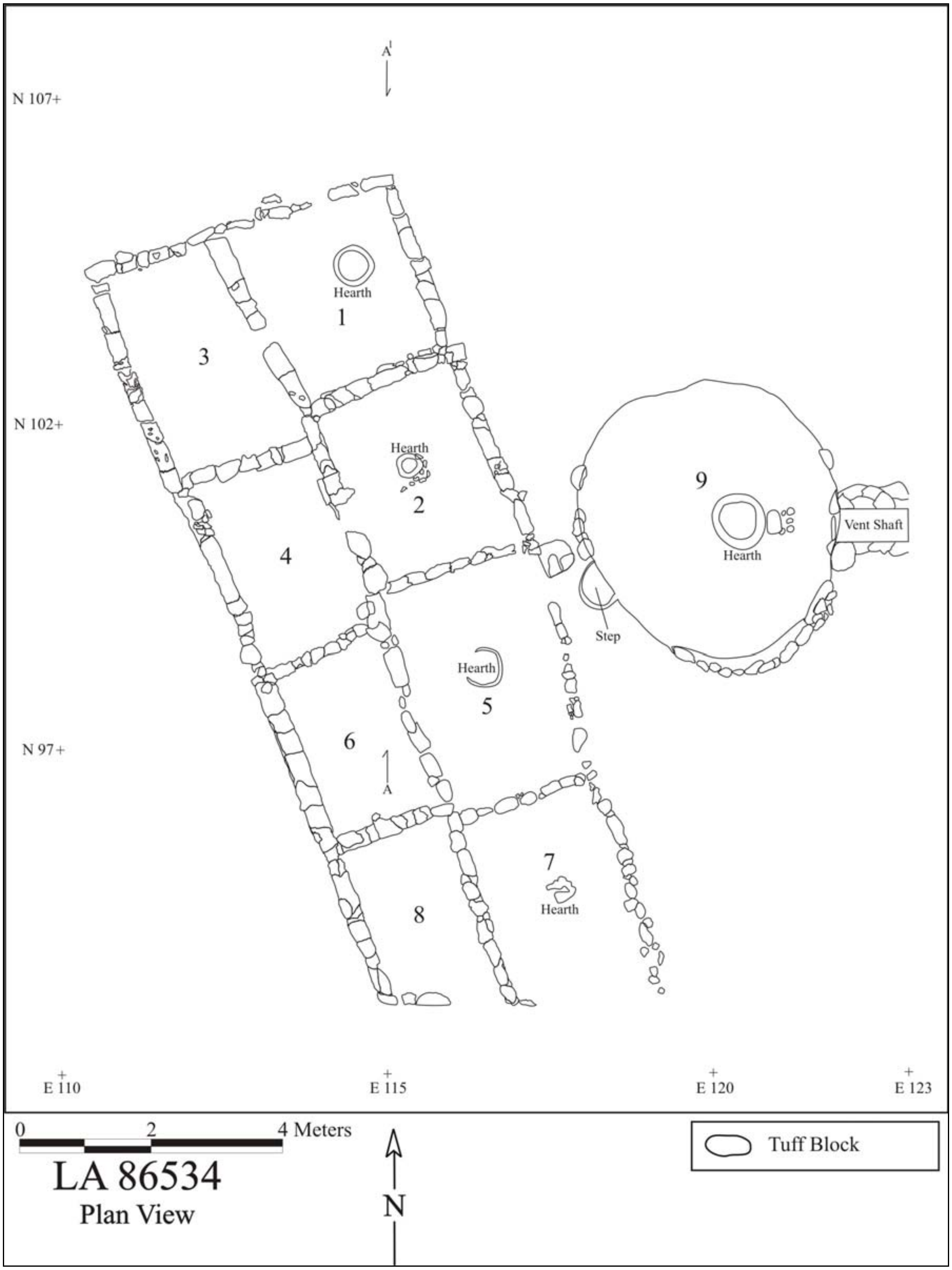

Figure 24.3. Final plan view map of LA 86534.

FIELD METHODS

Prior to any subsurface excavations at the site, both geomorphic and geophysical evaluations were conducted. The project geomorphologists visited the site and assessed its geomorphic context and integrity by digging shovel test holes in the areas around the sites (see Drakos and Reneau, Volume 1). The geophysical evaluation of the site involved a ground-penetrating radar (GPR) survey that was conducted over the surface of the site (see Nisengard et al., Volume 3). The GPR study was conducted in January 2002 to identify possible rock alignments, buried features, and rooms present at the site. The GPR technique was especially important at the outset of excavations at LA 86534 because of the poor condition of the site and the lack of surface visibility resulting from dense vegetative cover.

The site area at LA 86534 was not cleared of trees before the GPR survey and, as a result, portions of the site covered with piñon and juniper trees were not included. In addition to this complication, the area that was GPR'ed was directly correlated with the area where the possible roomblock was thought to be located. As already mentioned, this location turned out to be disturbed, and the actual location of the roomblock was some 8 m to the east. Because of this, the GPR survey picked up only the very western edge of the roomblock and missed the kiva entirely. Rock alignments thought to be walls were noted in the analysis of the data, but were not immediately recognized because of their distance from the supposed location of the roomblock. Post-excavation ground-truthing showed that the location of the possible walls correlated with the southwestern portion of the roomblock.

Fieldwork began at LA 86534 in June, 2002 with an initial assessment of the site. The crew walked over the site area, delineating the site boundaries and identifying the presence of artifact concentrations and features. A 1- by 1-m grid system that was laid out during the initial GPR survey was also used during the excavations to facilitate data corroboration. The central site datum (100N/100E for horizontal control, 10.0 m for vertical control) was established in the area to the southwest of the roomblock and a 1- by 1-m grid was laid out. The intersection of the southwest corner of each grid determined its grid coordinates. Using the established grid, controlled surface collections were made across the entire site, with all the materials being bagged separately by individual grid unit (see section on surface collections later in this chapter). Based on the distribution of surface artifacts and suspected features, three areas were designated at the site. Table 24.1 describes each of these areas and Figure 24.4 shows the relative proximity of these areas to each other.

Table 24.1. Designated areas at LA 86534.

Area Number	Area Location (Grids N/E)	Area Description
1	90 to 130N/125 to 140E	Midden area east of roomblock
2	90 to 130N/90 to 125E	Roomblock (western is original, eastern is actual)
3	130 to 135N/100 to 135E	Disturbed two-track just north of roomblock and midden

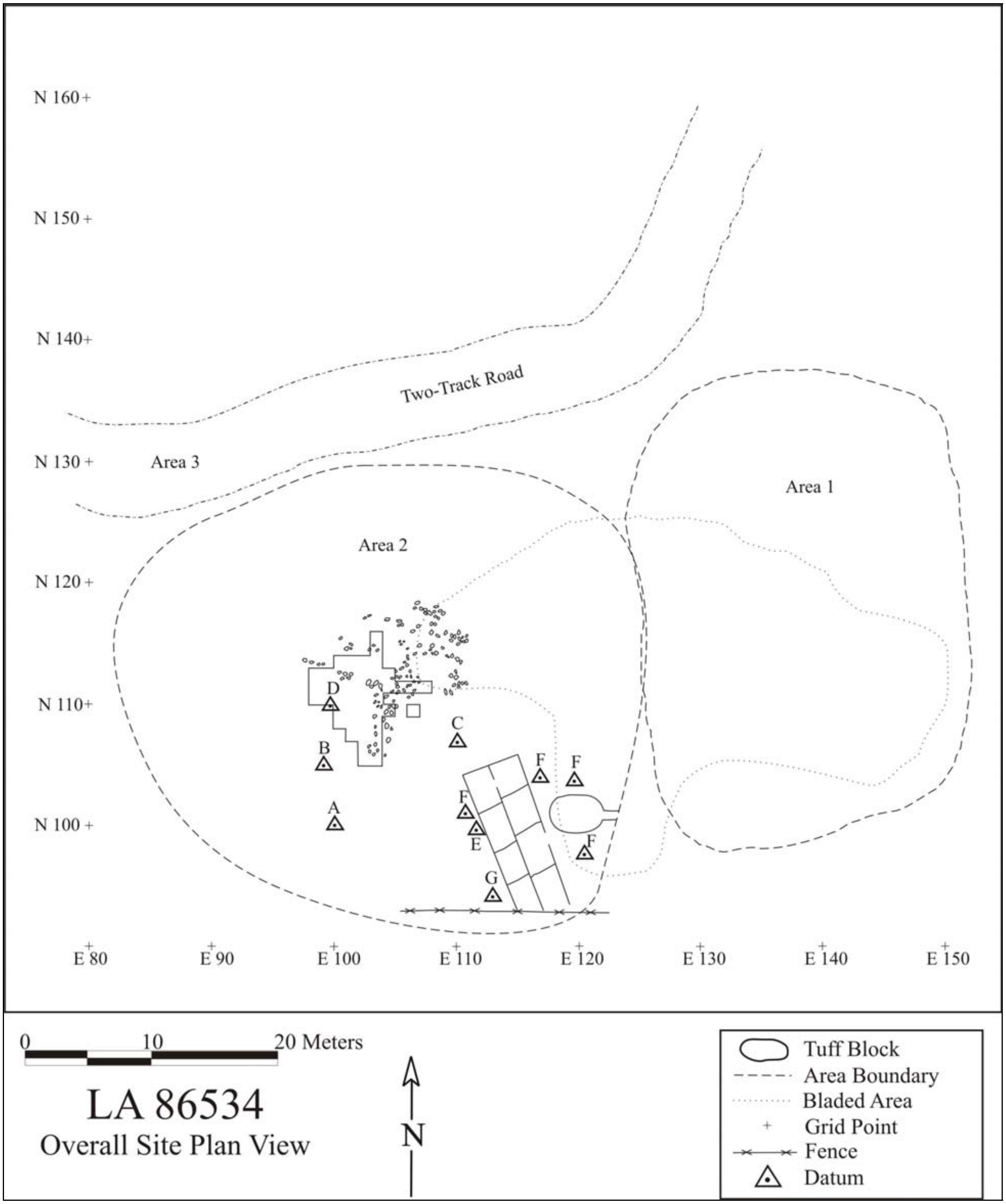

Figure 24.4. Map showing the general areas at LA 86534.

The designation of areas at LA 86534 was based on the presumed location of the possible roomblock at the beginning of excavation. Area 2 was designated as the roomblock and a demarcation point of 125E was selected. Initial observations of the artifact distribution showed a visible increase of artifacts to the east of this line, possibly suggesting a midden. As a result, the site was divided at this location to demarcate Area 1 (the midden) from Area 2 (the roomblock). Although the location of the actual roomblock was some 8 m east of the original presumed location, the revised location still fell within the confines of Area 2. A new area number was not given to the actual roomblock but was simply designated as the eastern portion of Area 2. Consequently, the western portion of Area 2 contains only the original area of excavation in the possible roomblock.

There was also a dense concentration of artifacts to the north of Areas 1 and 2, but they were clearly in a disturbed area. A fairly large two-track road paralleled the northern boundary of the site. The road had a number of prehistoric and historic artifacts associated with it, but it also had areas of gravel and concrete placed throughout its length. The two-track seemed to drop off into the canyon to the north of the site. Surface artifacts in Area 3 were sampled differently than Areas 1 and 2. In Areas 1 and 2, the artifacts from each 1- by 1-m grid were collected and bagged separately. In Area 3, which was heavily disturbed, two 3-m dogleash samples were collected. The southwest corner of a particular grid was used as the center point and artifacts were collected from 1.5 m in a complete circle around the grid point.

Hand excavation of LA 86534 began in earnest on June 24, 2002. Excavations were carried out by natural stratigraphic units, or in cases where the stratum was greater than 10 cm thick, in arbitrary 10-cm levels. Strata were defined as distinct depositional units and descriptions for each included soil kind, texture, compactness, and color using a Munsell soil chart (see the following section for an in-depth discussion of the stratigraphic sequence). With the exception of pollen, soil, and macrobotanical samples, all hand-excavated materials were screened through 1/8-in. mesh.

As outlined in Vierra et al. 2002a, roomblock excavations began by defining visible wall alignments based on surface indications (also see this volume). Once the outline of rooms was defined and the approximate center of the mound was identified, a north-south cross-section through the roomblock was excavated. The entire grid line was excavated minus the 1- by 1-m unit where the east-west cross-section intersected the north-south line. Although this procedure was implemented at LA 86534, the north-south line was tied in to the original test pit (101N/115E) conducted in the area of the roomblock and was not located directly in the center of the mound as there were no surface indications of the roomblock. As it happened, the 115E line ran through the front set of rooms and was located just east of the center. Once the majority of the 115E line was excavated, a profile was drawn. The intersecting east-west line was not excavated in one block as critical units in the 103N line were removed before a complete profile was drawn.

Stratigraphic profiles were drawn for many of the individual units. Once the fill in each of the rooms was removed in stratigraphic layers, each interior room floor was mapped. Locations of floor features, samples, and artifacts were all included on the maps. Pollen samples were taken from underneath artifacts lying on the floor and in features and other locations (corners of rooms) where the context might preserve these remains. After the floor artifacts were removed, the floor samples were taken, and the features were excavated, a single sub-floor test pit was dug to identify the presence of any earlier floors or features.

In previous excavations conducted at Coalition Period roomblocks at Los Alamos National Laboratory (LANL), kivas have typically been located east of the roomblock. Because there were no surface indications of the roomblock at LA 86534, and based on the pattern mentioned above, the area all around the roomblock was stripped in an attempt to locate potential wall alignments and possible features in the midden area. In late August 2002, a bobcat was brought to the site and an area about 25 m north-south by 45 m east-west to the north and east of the roomblock was surface-stripped (see Figure 24.4, bladed area). On average, 10 to 15 cm of sediment was removed in this 1125-m^2 area. While no dense concentrations of artifacts or obvious extramural features were found in the large area that was surface-stripped, not too surprisingly, a wall alignment was located to the east of the roomblock. A test pit was placed over this small exposure of linear rubble that was located 15 cm below the surface and a wall was identified almost immediately. Figure 24.5 shows this wall as it was initially being exposed.

Figure 24.5. Room 9 wall exposed in test pit; note rubble flush with bladed surface.

A 1- by 2-m test pit was dug on top of this wall alignment and an intact plastered floor was uncovered at 1.75 m below the bladed surface (8.02- to 7.98-m elevation). Due to time constraints, the hand excavation of Room 9 was not possible, and a bobcat was eventually used to remove the post-occupational fill and the wallfall in the kiva. Before the upper fill was removed, however, the entire perimeter of the kiva was exposed by hand excavation (Figure 24.6). To avoid damaging the walls, the perimeter grids were dug in 1- by 1-m units and were excavated to create a visual demarcation of Room 9 before mechanical excavation.

Figure 24.6. Perimeter of Room 9 being exposed before mechanical excavation of the fill.

Using the stratigraphic sequence established in the hand excavation of the 1- by 2-m unit, the bobcat removed the fill in the kiva to the top of rooffall. During the mechanical excavation of Room 9, the room was divided down the center along the 120E line. The bobcat removed the fill in four sections: west half, Stratum 1 (post-occupational fill), west half, Stratum 2 (wallfall), east half, Stratum 1 (post-occupational fill), and east half, Stratum 2 (wallfall). Figure 24.7 shows the removal of the west half of Stratum 1. The fill removed by the bobcat was screened through 1/8-in. mesh, and it was recorded and bagged according to the provenience enumerated above. At approximately the 8.3-m elevation, or the top of rooffall, the use of mechanical excavation ceased and we returned to hand excavation. For the excavation of Stratum 15 (kiva rooffall), 1- by 1-m grids were again used. This stratum was excavated down to the plastered floor of the kiva.

After excavation of the roomblock was completed in November of 2002, three walls were knocked down to assess the construction history of the roomblock. The knocked-down walls include the north wall of Room 2 (an interior wall), the west wall of Room 4 (an exterior wall), and the east wall of Room 5 (adjacent to the kiva entrance). The results of these efforts are discussed in detail later in this chapter.

Figure 24.7. Removal of kiva fill in the west half of Stratum 1.

SITE STRATIGRAPHY

This section is divided into two parts. The first section will document the general stratigraphic sequence used during the hand excavations at LA 86534. It will include an overall table describing the strata encountered during excavation and provides brief descriptions of these strata. It then presents total artifact counts for each individual stratum (i.e., post-occupational fill, room fill, wallfall, rooffall, and floor) in each room. The second part of this section is a post-excavation summary, which was generated by Paul Drakos and Steve Reneau (see Volume 3).

Stratigraphic Sequence used During Excavation

A basic stratigraphic sequence has been identified during previous excavations conducted at Coalition period pueblos at LANL. This sequence includes four major stratigraphic units. From top to bottom they are recent surface soil, a cap of rubble debris, construction debris that may or may not include roofing material, and interior room floor surface. This general stratigraphic sequence was also present at LA 86534 (Figure 24.8). All features were assigned a separate stratum number. Table 24.2 presents the general stratigrahic sequence for the site and gives data on stratum numbers, general provenience, feature numbers, color, texture, and thickness and then gives a general description of each stratum.

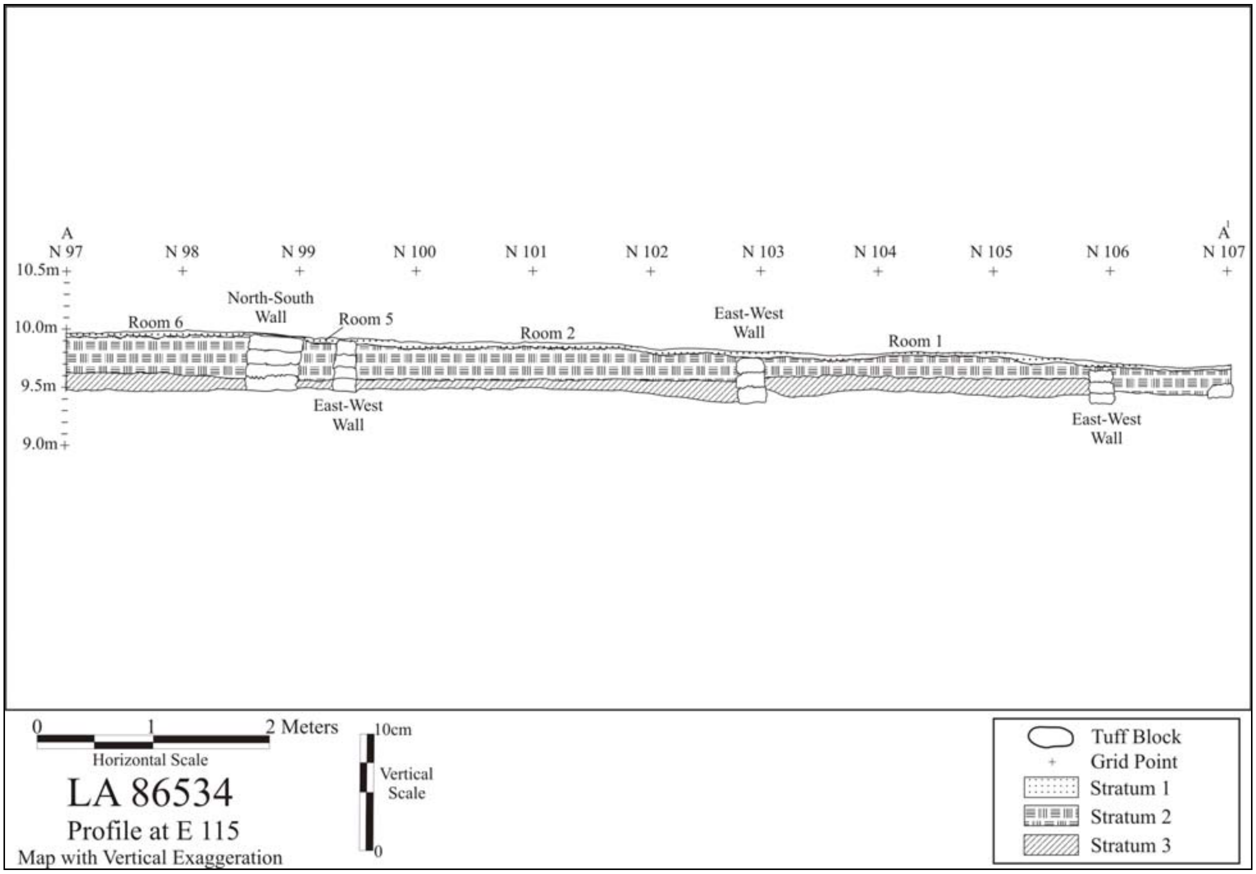

Figure 24.8. Profile of the E115 line through the roomblock.

Table 24.2. General stratigraphic descriptions for LA 86534.

LA 86534 Stratigraphic Summary							
Stratum #	**Provenience**	**Maximum Thickness**	**Minimum Thickness**	**Elevation**	**Color**	**Texture**	**Comments**
1	Area 2 (eastern and western areas)	1.03*	0.12*	10.03–9.00	7.5YR5/3–6/3	Loamy sand	Post-occupational fill. Loose topsoil. Very unconsolidated. Some areas of high organic content from pine duff. A/o Horizon.
2	Area 2 (eastern and western areas)	1.30	0.30	9.70–8.40	7.5YR5/3–6/4	Loamy sand	Room fill and rubble wallfall in eastern area, disturbed tuff blocks in western area. Loose and unconsolidated. Abrupt lower boundary (rooffall) in eastern area. Inclusions include artifacts, charcoal, and pieces of tuff.
3	Area 2 (Disturbed western area)	0.30	0.07	9.60–9.30	7.5YR 6/3.5	Sandy loam	Disturbed colluvium. Hard sub-angular blocky peds. Upper boundary distinct from loose, disturbed soil.
4	Area 2 (Disturbed western area)	0.20	0.05	9.40–9.20	5YR4/3	Clay loam	Late Pleistocene clay. Hard, sub-angular blocky peds. No bioturbation. Red.
5	Area 2 (Disturbed western area)	0.10	0.04	9.76–9.66	5YR4/2	Clay	Middle Pleistocene clay. Mottles are present. Pebble and gravel inclusions. No bioturbation. Red.
6	Area 2 Roomblock (eastern area)	0.11	0.04	9.60–9.49	7.5YR5/3	Clay loam with adobe	Rooffall from roomblock. Consolidated adobe with small pebbles, charcoal, and artifacts. In some areas, small layer of fill beneath (7), in other areas, lower boundary is floor (8).

LA 86534 Stratigraphic Summary							
Stratum #	**Provenience**	**Maximum Thickness**	**Minimum Thickness**	**Elevation**	**Color**	**Texture**	**Comments**
7	Area 2 Roomblock (eastern area)	0.10	0.02	9.55–9.45	7.5YR4/3	Silty loam	Loose fill below rooffall and above floor in some areas of the roomblock. Inclusions include small pieces of tuff and charcoal. Lower boundary is a plastered floor.
8	Area 2 Roomblock (eastern area)	0.07	0.02	9.55–9.48	10YR7/1	Plastered floor	Patchy floor. Plaster in some areas in quite thick, in others, very thin. Very rodent disturbed. Artifacts on top of floor. Some charcoal inclusions.
9	Room 1, Feature 4 Hearth, remodeling	0.19	0.11	9.62–9.42	7.5YR5/4	Ashy sand	Fill from most recent use of the collared hearth in Room 1. Ash and sand with scattered flecks of charcoal. Some small pieces of tuff in the fill. Lower boundary is plastered.
10	Room 2, Feature 2 Hearth	0.16	0.02	9.55–9.47	7.5YR5/4	Ashy sand	Fill from most recent use of the collared hearth in Room 2. Ash and sand with scattered flecks of charcoal, and some small pieces of tuff. Lower boundary is plastered.
11	Room 1, Feature 4 Hearth, primary use	0.08	0.03	9.45–9.36	7.5YR5/4	Ashy sand	Hearth fill, original use. Ashy soil with small bits of charcoal and oxidized soil. Ash comprises about 60% of the fill, with remaining portions being small bits of tuff.
12	Room 5, Feature 5 Hearth	0.12	0.05	9.50–9.38	7.5YR4/3	Ashy sand	Hearth fill. Very loose and granular. Significantly rodent disturbed. Sediments are ashy but mixed with quite a bit of sand from rodents. Some inclusions (artifacts and charcoal). Lower boundary is plastered.

LA 86534 Stratigraphic Summary							
Stratum #	**Provenience**	**Maximum Thickness**	**Minimum Thickness**	**Elevation**	**Color**	**Texture**	**Comments**
13	--	--	--	--	--	--	This stratum was designated, and then duplicated by stratum 19. See stratum 19 for description.
14	Room 6, Feature 12 Amorphous pit	0.28	0.14	9.58–9.30	7.5YR4/4	Silty	Fill from an amorphous pit in back central room. Very loose and unconsolidated. Heavily rodent disturbed. Inclusions include small pebbles and a few artifacts. Bedrock boundary.
15	Room 9, Kiva	0.33	0.07	8.30–7.97	7.5YR5/3	Sandy loam	Kiva rooffall. Consolidated adobe with small pebbles and charcoal inclusions. Lower boundary is plastered kiva floor. Some pieces of tuff and artifacts also. Timber impressions.
16	Room 6, Feature 13, Milling bin	0.22	0.05	9.71–9.49	--	Silty	Mealing bin fill. Very loose and unconsolidated. Rodent disturbed. Inclusions include pebbles, pieces of tuff, artifacts, and charcoal. Lower boundary is bedrock.
17	Room 9, Kiva	0.05	0.02	8.02–7.97	7.5YR5/3	Plastered floor	Kiva floor. Very compact and nicely plastered. In excellent condition. Tuff and clay temper. Lower boundary is bedrock.
18	Room 9, Kiva	0.27	0.02	7.97–7.70	10YR5/2	Silty sand	Sub-floor in kiva. Very sandy. Mostly in fissures between areas of bedrock.

LA 86534 Stratigraphic Summary							
Stratum #	**Provenience**	**Maximum Thickness**	**Minimum Thickness**	**Elevation**	**Color**	**Texture**	**Comments**
19	Room 7, Feature 9 Hearth				7.5YR4/3	Ashy sand	Hearth fill. Loose, ashy, and unconsolidated. Pebbles, artifacts, and charcoal in fill. Lower boundary is plastered but condition of both floor and hearth are poor and heavily deteriorated because of extensive rodent activity.
20	Room 9, Feature 16 Hearth	0.30	0.05	8.05–7.75	10YR8/1	Ashy	Fill from kiva hearth. Loose, but pieces of consolidated ash in the bottom of the hearth. Inclusions are pebbles, some artifacts, and charcoal. Plastered floor and collar.
21	Room 9 Feature 17 Ash pit	0.13	0.03	7.97–7.84	10YR5/2	Ashy sand	Fill from the ash pit in the kiva. Very loose and unconsolidated. Almost all ash with far less sand. Few pebbles, artifacts, or charcoal. Some pieces of tuff. Bottom is bedrock.
22	Room 9 Feature 18, Sipapu	0.22	0.22	8.02–7.80	10YR5/2	Silty sand	Fill from the sipapu in the kiva. Very loose and unconsolidated. Few pebbles, artifacts, or charcoal. Some pieces of tuff. Bottom is bedrock.

*Thickness in meters

At LA 86534, the first stratum was used in both the eastern and western portions of Area 2 and was generally a 10- to 15-cm layer of post-occupational fill, except in the kiva (Room 9), where it was just over 1 m thick. Where trees were present up to, and during, the time of excavation, this layer was typically thicker. Artifacts were most abundant in this stratum, but are likely skewed by the thick layer of post-occupational fill in the kiva. Table 24.3 shows the general artifact counts by strata across the site.

Table 24.3. General artifact counts by stratum.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	TOTAL
1	6775	734	128	24	**7661**
2	3839	486	18	20	**4363**
1,2	4279	536	18	57	**4890**
6	483	44	9	10	**546**
6,7	1163	210	20	20	**1413**
8	72	9	12	5	**98**
11	0	0	1	0	**1**
14	4	2	9	1	**16**
15	1331	145	1	37	**1514**
16	0	0	1	0	**1**
17	1	0	0	0	**1**
19	1	1	0	0	**2**
20	1	2	1	0	**4**
21	0	12	0	0	**12**
TOTAL	**17,949**	**2181**	**218**	**174**	**20,522**

The second stratum is composed primarily of wallfall and contains a large amount of shaped and unshaped tuff blocks along with some chunks of adobe. Artifacts were also abundant in this stratum, again, likely skewed by inclusion of materials from the kiva. The stratigraphic designation “1,2” combines materials from both of these strata. As the end of the season neared and time became an issue, excavations continued in one large level down to rooffall (Stratum 6 in the roomblock and Stratum 15 in the kiva). As a result, Strata 1 and 2 were combined and artifacts from both lumped together. Stratum 1,2 in the kiva also included the large bulk removed by the bobcat.

Rooffall, the third stratigraphic level, consisted primarily of hard-packed adobe fragments and small pieces of charcoal in a soil matrix. However, no evidence of roof beams was encountered. This stratum was abundant at this site and was generally about 5 to 8 cm thick. Rooffall was consistently present in all of the rooms and, often, many artifacts were encountered either in the rooffall layer or at the level of wallfall and rooffall contact. In some areas, particularly the upslope portion of the roomblock at the northern end, there was a thin layer of sediment (Stratum 7) between rooffall and the floor. This suggests the floor may have been exposed for some time before the collapse of the room. It may also suggest more bioturbation, of which there was some evidence, in this portion of the roomblock. The Stratum “6,7” designation was used because Stratum 7 was difficult to detect and excavators were often already to floor before they realized they had gone through it. Stratum 7 was very thin and was only confidently detected in Room 1, but no artifacts were recovered. As a result, the Stratum 6 and 6,7 designations are from the same context.

The number of artifacts, with the exception of ceramics, associated with the floors (Stratum 8) is generally low. In general, the room floors (Stratum 8) were plastered and in fair condition. For the most part, they were largely patchy and had some smoke staining. The two middle rear rooms (4 and 6) were in the best condition, while the front rooms were in much poorer condition. Significant bioturbation was noted in many of these rooms. The floor of the kiva (Room 9) was in excellent condition. It was nearly 100 percent intact and was slightly smoke-stained in areas near the hearth and ash pit. Aside from these general stratigraphic designations, all features were given their own stratum numbers.

In addition to the strata assigned to the general stratigraphic sequence in the roomblock, the strata in the western portion of Area 2 (or the original area of excavation) were assigned different numbers because of their highly disturbed nature. A small number of artifacts came from this area of the site, but the artifacts were of the same general type as those from the roomblock and the midden. This suggests the disturbed area may be related to the original LA 86534 roomblock and the artifacts could have come from the southern end of the roomblock when it was damaged and disturbed by the construction of New Mexico Highway 502. Geomorphic analyses of these soils suggest they post-date the Puebloan occupation. The presence of tuff blocks overlying a fine-grained, post-Puebloan soil lacking colluvium derived from the roomblock area indicates that the surficial tuff blocks are not in place.

Stratigraphic Sequence Derived from Geomorphological Examination (Paul Drakos and Steve Reneau)

The following section contains a brief summary of the geomorphological deposits identified at LA 86534. Drakos and Reneau describe soil profiles in three locations and derive interpretations regarding the geomorphological history at the site. Their chapter (Drakos and Reneau, Volume 3) should be consulted for additional information of the general geomorphic setting at LA 86534 and in the Airport Tract and on the analytical methods they employed during their analyses.

LA 86534 Geomorphology and Stratigraphy

LA 86534 is underlain by a thin (15 to 20 cm thick) Pleistocene Bt horizon inferred to be 100 to 200 ka or older, based on correlation with soils described by McFadden et al. (1996). The Bt horizon is a reddened (5YR) silty to sandy clay that is a potential clay source. Roomblocks were apparently built on top of the Bt horizon. In proximity to the roomblock, the Bt horizon is overlain by Bw horizons formed in colluvium derived in part from the roomblock. Outside of the rubble mound surrounding the roomblock, the Bt horizon is overlain by a 20- to 25-cm eolian deposit that apparently post-dates the Puebloan occupation. The Bt horizon appears to be the lower part of an originally thicker Pleistocene soil that has been partially stripped by erosion. The presence of only a thin Pleistocene soil underlying young eolian deposits in the vicinity of LA 86534 suggests that erosional processes predominated in this area before the Coalition period. Near the roomblock (approximately 3 m northeast), two episodes of mixed colluvial and eolian deposition are recorded in soil profile LA 86534b (Table 24.4).

A 5-cm-thick AC horizon, inferred to be less than 200 years old, overlies a 27-cm-thick buried soil (Bw1b1-Bw2b1) formed in sediments derived in part from erosion of the roomblock. The Bw1b1-Bw2b1 soil is therefore less than 750 to 850 years old. The Bw2b1 horizon overlies the Pleistocene Bt horizon. The Bw2-Bw1 horizon sequence is developed in a colluvial deposit derived from erosion of the roomblock, with fines representing likely eolian deposition. The greater abundance of tuff clasts (60% to 70% gravel) in the lower (Bw2b1) horizon is indicative of sediment derived primarily from the roomblock, whereas a decrease in gravel content to 10 percent in the Bw1b2 horizon suggests eolian deposition in the rough surface created by wall remnants and the rubble mound surrounding the ruin.

West and north of the buried roomblock, scattered tuff blocks were observed on the surface. These tuff blocks were originally thought to represent the location of a roomblock. However, the tuff blocks occur within or on top of an A horizon that overlies fine-grained deposit dominated by silt and very fine sand with little soil development (Bw horizon, location LA 86534a, approximately 8 m west and 3 m north of the roomblock). This deposit, extending to a depth of 25 cm, apparently post-dates the Puebloan occupation here. The presence of tuff blocks overlying a fine-grained, post-Puebloan soil lacking colluvium derived from the roomblock indicates that the surficial tuff blocks are not in place. These blocks may have been moved during highway construction. Beneath the post-Puebloan deposit is the reddish, clay-rich Pleistocene Bt soil horizon that directly overlies tuff bedrock. The contact between the two soil horizons is abrupt and probably records stripping of part of the older soil followed by fairly recent burial of the horizon by eolian sediments.

The mesa top soil described outside of the roomblock rubble mound (LA 86534c) comprises a non-gravelly AC horizon overlying an eroded Bt horizon (Table 24.4). The AC horizon consists of well-sorted fine sand and extends to a depth of 21 cm. This horizon likely represents eolian deposition, possibly mixed with fine-grained colluvium. Based on the relative absence of soil structure, the AC horizon is inferred to post-date Puebloan occupation. The 21-cm-thick AC horizon and eolian deposit at LA 86534c is roughly correlative to the 25-cm-thick A-Bw profile and eolian deposit at LA 86534a.

Table 24.4. Summary of soil morphology at LA 86534.

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Comments
LA 86534a, Airport Land Transfer Parcel, east wall, 108N/103E														
A	0-8	<2	7.5YR4/3	7.5YR3/2	ls	1msbk	so	so po	no	none	-	cs	<700–800 yrs	abundant organics, vfs-si, scattered ms-cs, w/ tuff blocks at surface, possible cumulative A horizon
Bw	8-25	<2	7.5YR5/3	7.5YR4/3	sl	2msbk	so-sh	ss ps	no	none	-	as		si +vfs, young
Bt1b1	25-45	c2	5YR4/4	5YR4/3	sicl	2-3fabk	sh	vs vp	3nkbrpopf	non	-	as (?)	middle-late Pleistocene (100–200ka)	si + clay
R	45+													Qbt
LA 86534b, Airport Land Transfer Parcel, 3 m north of NE corner of roomblock														
Oi	0-1	<5	10YR4/2	10YR2/2	l	s.g.	lo	so,po	no	non	-	as	<100–200 yrs	60% organic matter (piñon litter), 40% vfs
AC	1-6	<5	10YR4/3	10YR4/3	ls	1fsbk	so	so,po	no	non	-	as		
Bw1b1	6-21	10	7.5YR4/3	7.5YR3/3	l	2m-csbk	sh	ss,ps	no	non	-	cw	<700–800 yrs	scattered tuff clasts
Bw2b1	21-33	60-70	7.5YR4/3	7.5YR3/3	l	1-2msbk	so	ss,ps	no	non	-	cw		tuff clasts
Btb2	33-48	<2	5YR5/6	5YR4/6	sc	3f-vfabk	h	s,p	3mkpopfbr	non	-	as	middle-late Pleistocene (100–200ka)	good clay source
R	48+													Qbt

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Comments
LA 86534c, Airport Land Transfer Parcel, 60 m east of 86534b, at old barrow pit														
AC	0-21	<2	7.5YR4/4	7.5YR4/3	ls	m	lo	so,ps	no	non	-	as	<700–800 yrs	well sorted fs - Qe+Qc surface
Bt1b1	21-36	<2	5YR5/3	5YR4/3	sic	2-3f-msbk	sh	s,p	3n-mkbrpopf	non	-	as	middle-late Pleistocene (100–200ka)	good clay source
R	36+													Qbt

Key in Appendix K.

SURFACE COLLECTION

All surface artifacts within the boundary of the site were collected using a 1- by 1-m grid system. Using the grid initially established during the GPR survey of the site, the site was gridded out in 1- by 1-m units (Figure 24.9). Magnetic north was used in both the GPR and excavation grids.

The 100N/100E site datum was established in the southwestern corner of the site. After the grid was laid out and before the collection of any artifacts, the crew walked around the site area and pin-flagged surface artifacts. The use of pin flags allowed for better visualization of the site boundary. Based on the visual demarcation of artifact density, surface artifacts were collected in a 2400-m^2 area. This area included the original possible roomblock slated for excavation, the associated midden (actual roomblock), and the actual midden area (not originally documented in the cultural resource survey). Figure 24.9 shows the surface collections being undertaken in the area of the eastern portion of the kiva. Note the lack of architectural stones on the surface at the beginning of the field season.

Figure 24.9. Surface collection in Area 1.

During the surface collection, all artifacts were collected according to their unit designation. Artifacts were bagged separately according to material type (except when the total number of artifacts from the grid was less than five), and each bag was given a separate field specimen (FS) number. While chipped stone debitage and ceramics were collected within the general 1- by 1-m grid they were located in, the location of formal chipped stone tools and ground stone items was point provenienced.

At the time of surface collection, trees had only been removed from the area surrounding the possible roomblock in the western portion of Area 2. This left several trees standing in the immediate area of the roomblock. Their presence created a thick accumulation of duff and, as a result, few surface artifacts were visible in the areas under the trees. If artifacts were missed during the original surface collection because of elevated amounts of duff, they were collected during the excavation of the 1- by 1-m grids.

Subsequent to the field season, all artifacts collected from the individual grids were entered into Surfer, version 7. From these data, maps of surface artifact distribution were generated. Figure 24.10 shows the distribution of all surface artifacts from the site. These maps show a general distributional pattern seen at several Coalition period roomblocks at LANL: a low density of surface artifacts on top of the roomblock that is surrounded by an increasingly dense arched area of artifacts from northeast of the roomblock to southeast of the roomblock. In this case, the area to the southeast of the roomblock has been disturbed by the construction of New Mexico Highway 502.

SITE EXCAVATION

Excavations at LA 86534 were conducted from June through October 2002. The field crew consisted of Kari Schmidt (crew chief), Bonnie Bagley, David Barsanti, Sandi Copeland, Mike Dilley, Joaquín Gallegos, Aaron Gonzales, Brian Harmon, Mia Jonsson, Mike Kennedy, Bettina Kuru'es, Timothy Martinez, Janet McVickar, Jennifer Nisengard, Joanne Tactikos, Brad Vierra, and Scott Worman. Leo Martinez operated the bobcat during the surface scraping and the mechanical excavation of the kiva. Timothy Martinez and Aaron Gonzales were tribal monitors for San Ildefonso Pueblo.

As already discussed in the site methods for LA 86534, three areas were designated at the site based on the distribution of surface artifacts and suspected features (see Figure 24.4). Excavations were conducted in Area 2. Except for surface scraping by the bobcat, no earth-moving activities occurred in Areas 1 and 3.

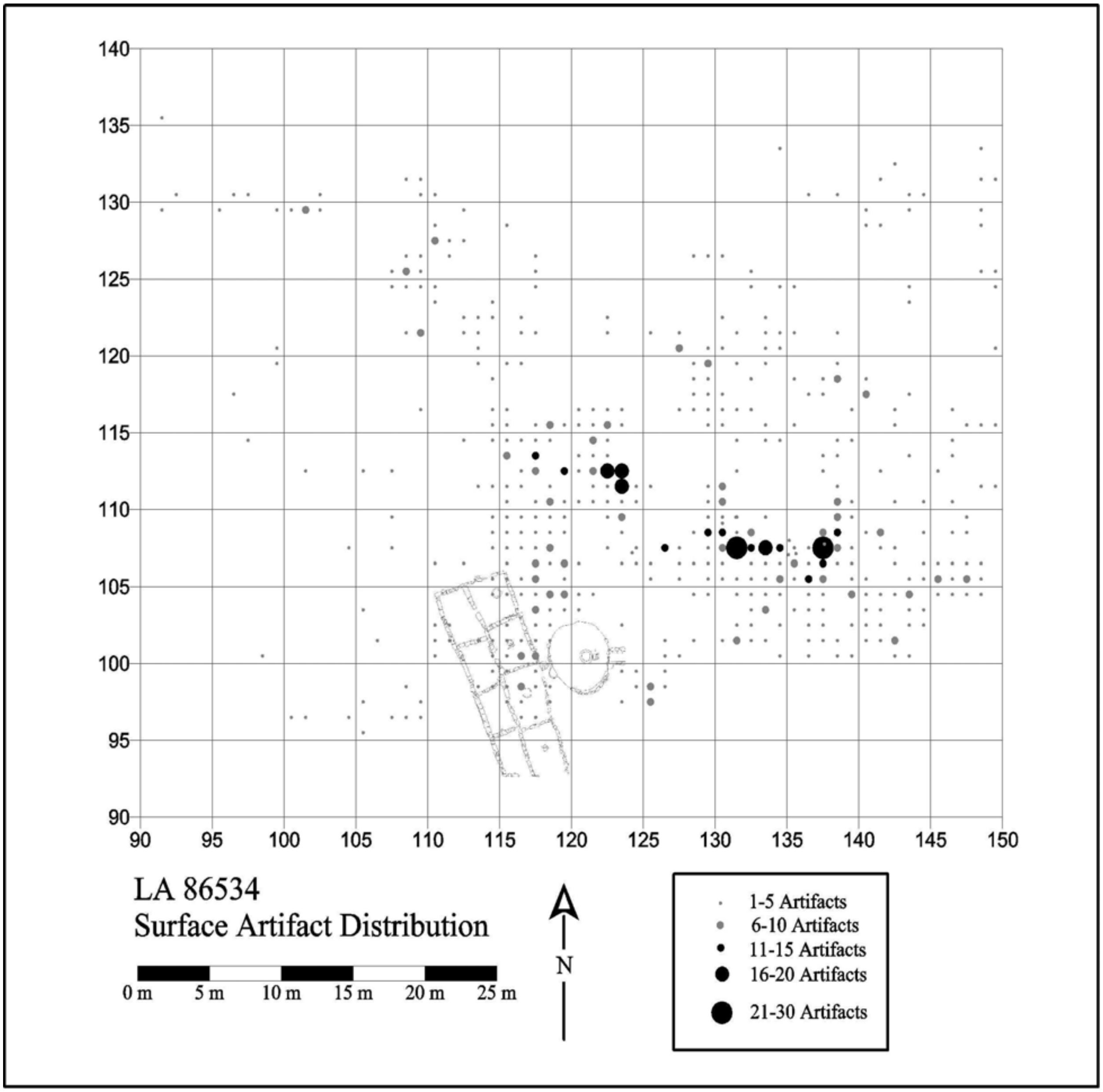

Figure 24.10. Map showing the distribution of surface artifacts.

Area 1

Area 1 was demarcated based on an increased density of surface artifacts immediately to the north and east of the roomblock. Although the area was not a formal midden per se, the higher density suggested a different use and warranted a distinct notation. The area was delineated at the 125E line; all artifacts to the east of this line were associated with Area 1 and all artifacts to the west were associated with Area 2. No features were identified in Area 1 despite extensive surface scraping by the bobcat. Of the 1125 m^2 bladed at the site, some 742 m^2, or just over two-thirds, were in Area 1. The artifacts in Area 1 are similar to those recovered from the roomblock. Surface artifacts from 106-108N/124-147E were selected for analysis. Based on their demonstrated relatedness, it is probable that Area 1 may have been a midden area used by inhabitants of the roomblock.

Area 2

The designation of areas at LA 86534 was based on the presumed location of the possible roomblock at the beginning of excavation. Area 2 was designated as the roomblock and a demarcation point of 125E was selected. The demarcation was based on two things: 1) the increased density of artifacts to the east of this line and 2) the cessation of architectural stone on the surface. Although the location of the actual roomblock was some 8 m east of the original presumed location, the revised location still fell within the confines of Area 2. A new area number was not given to the actual roomblock but was simply designated as the eastern portion of Area 2. Consequently, the western portion of Area 2 contains only the original area of excavation in the possible roomblock, while the eastern area contains a nine-room pueblo with an associated kiva.

Western Portion of Area 2 (Original location of possible roomblock)

In the original cultural resource survey of the site area, LA 86534 was identified as a possible roomblock. The area of the site designated as the possible roomblock was characterized by several possible alignments of shaped and unshaped tuff blocks that covered an area of approximately 18 m north-south by 16 m east-west and was slightly mounded. Because of the presence of architectural surface stone and a mound, it was presumed that a roomblock was likely present in this locale. Excavation of the area began on the 24th of June and continued until the second week of July. Per provisions in the data recovery plan, a north-south line through the approximate center of the front set of rooms was selected for excavation. Additionally, an east-west line through the approximate center of the mound was also selected for excavation. By the time these units were excavated (105-116N/104E and 111N/98-107E), it was clear that excavations were progressing in a disturbed area. Although the presence of possible alignments of shaped and unshaped blocks associated with artifacts was at first perplexing, it soon became clear that excavators were digging in redeposited sediments that likely resulted from highway construction south of the mound. Figure 24.11 shows the distribution of tuff blocks in the area of the mound at the cessation of excavation. Based on the arrangement of stones at the end of excavations in the area, it is clear that no intact alignments were present.

Artifact density in the western portion of Area 1 was not great, but ceramics, chipped stone, ground stone, and faunal remains were all present. Artifacts were analyzed from the north-south trench through the mound (104E line) as well as from the two adjacent north-south lines (103N and 105N). Identified ceramics included Santa Fe Black-on-white and a number of utilitywares, and the chipped stone remains included Pedernal chert and obsidian. These results show that the artifacts in the disturbed mound were of similar composition to that in the roomblock (the eastern portion of Area 2), thereby supporting the contention that the western portion of Area 2 is likely disturbed fill from the eastern portion of Area 2.

Figure 24.11. Western portion of Area 2 just before the end of excavation.

Table 24.2 shows the stratigraphic units identified in this portion of the site. Strata 1 and 2 (post-occupational fill and rubble fill) are comparable to those located in the eastern portion of Area 2. Strata 3, 4, and 5 were identified in the western portion of Area 2. These strata include disturbed colluvium (Stratum 3), Late Pleistocene clay (Stratum 4), and Middle Pleistocene clay (Stratum 5). Figure 24.12 shows a stratigraphic profile drawn along the eastern wall of 104E. All five strata are clearly visible and the presence of tuff cobbles becomes increasingly sparse with depth. No features were identified in the excavated areas of the western portion.

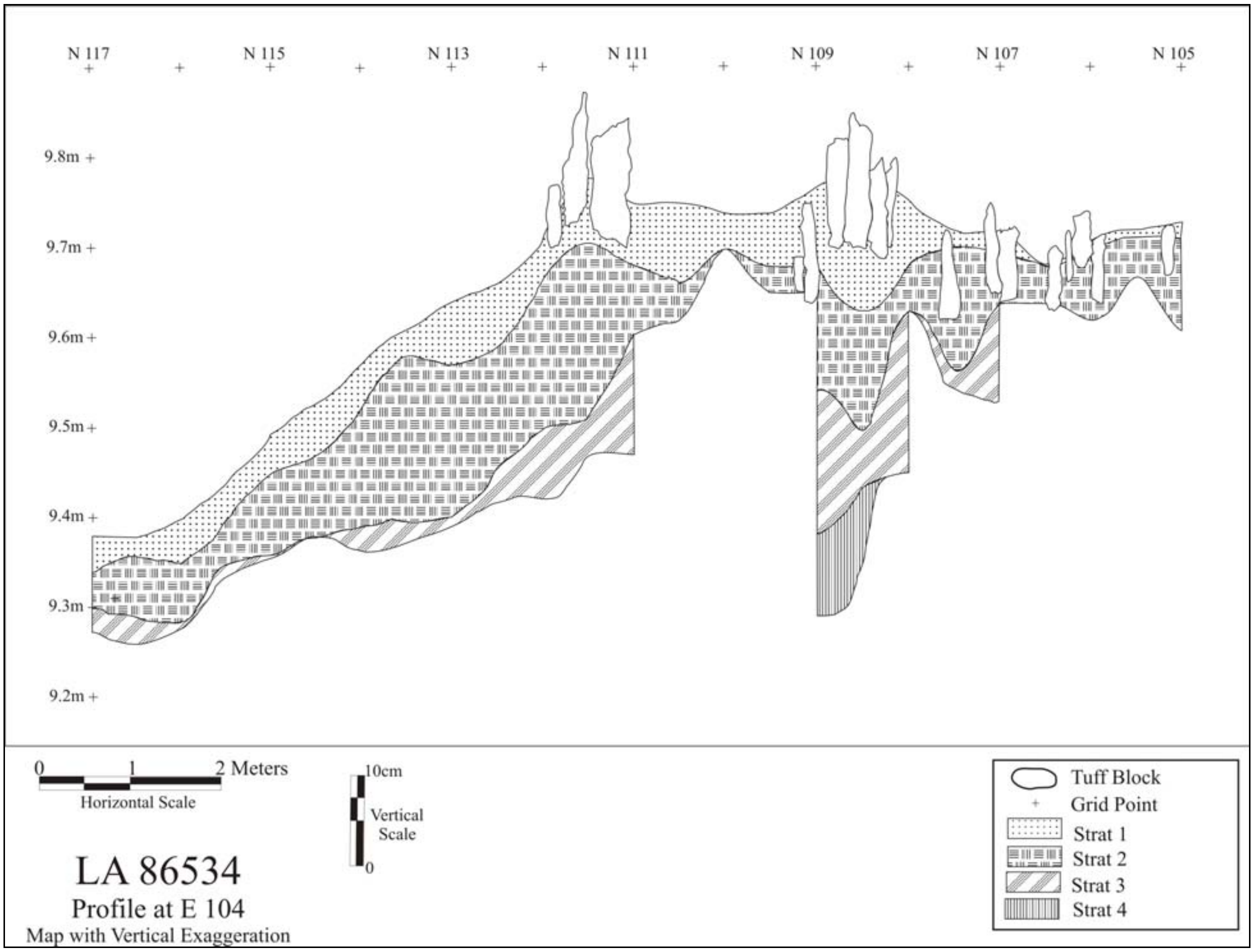

Figure 24.12. Profile of the E104 line in the western portion of Area 2.

Eastern Portion of Area 2 (Actual location of LA 86534 roomblock)

As mentioned above, the initial excavations at LA 86534 were conducted in a disturbed area some 8 m west of the actual roomblock. The lack of surface architectural stones in the area of the roomblock, and their presence in the disturbed area, dictated where the early excavations at the site occurred. When the test pit in 101N/115E was excavated and it was clear that there were intact room deposits in the area, all excavation shifted to this locale. By mid-October, a total of eight habitation rooms (Rooms 1 through 8) had been excavated, as had a circular kiva (Room 9) that was located just east of the roomblock. Room 9 was not attached to the roomblock, but a section of the western wall was less than 1 m away from the northeastern corner of Room 5. These two areas were attached by a small passageway (Feature 15; see Room 9 summary).

Architecture and Stratigraphy

The site consisted of a compact roomblock of nine rooms, a sparse but extensive artifact scatter, and a disturbed two-track road on the northern perimeter of the site. The roomblock consisted of a rectangular block of eight rooms (four front and four back) and a circular kiva located just to the east of the roomblock (Figure 24.13). The roomblock was oriented slightly west-of-north off the cardinal directions. The roomblock walls were generally in good condition, with one to two courses present on the northern end and up to four courses present in the center of the rooms. The southern walls of Rooms 7 and 8 were destroyed during the construction of NM 502.

Figure 24.13. Roomblock and kiva.

Walls were constructed from unshaped and shaped tuff blocks and had an adobe mortar. The walls also had a foundation of upright tuff blocks. These blocks were roughly shaped and were slightly smaller than the tuff blocks used in wall construction. The general size of the basal upright stones was approximately 25 by 15 by 10 cm, while the general size of wall blocks was approximately 40 by 20 by 10 cm. Figure 24.14 shows the upright stones still in place after the north wall of Room 2 had been knocked down. The horizontal block visible on the left side of the photo is part of the basal course of the north wall of Room 2 and is 42 by 22 by 18 cm. The upright stones had been set in a shallow trench filled with some adobe mortar, and the bases of the stones were resting on the bottom of the trench. Therefore, they probably represent the foundation of the walls.

Construction techniques at LA 86534 were similar to other Coalition period roomblock sites on the Pajarito Plateau (see Figure 24.3). It appears as though the central north-south wall was continuous and presumably built first, with the wall between Rooms 6 and 8 built at the same time. The east-west walls in the back rooms were then built, followed by the back north-south wall. It then appears that the front rooms were built, which denotes a construction configuration of four possible units: 1) center wall and east-west wall between Rooms 6 and 8; 2) Rooms 3, 4, 6, and 8; 3) Rooms 1 and 2; and 4) Rooms 5 and 7. However, there is no evidence to show that any appreciable length of time passed between the construction of the units. It is probable that all eight rooms in the roomblock were built within a short period of time and possibly in a single building episode. It is not clear when Room 9 was built relative to the rest of the roomblock, but it is likely that it was built at the same time as Rooms 5 and 7 given the connecting feature between Rooms 5 and 9.

Figure 24.14. Wall foundation of upright stones in situ, Room 2.

In several isolated places in each of the rooms, a tan clay plaster covered the tuff blocks on the interior faces of the rooms. No rooms lacked wall plaster suggesting that preservation at the site was good. This is corroborated by the abundance of rooffall in the rooms. The fill of all rooms contained abundant, but usually small, fragments of adobe similar to that observed in the walls. Although these fragments could represent rooffall, wall debris, or both, it is most likely that they represent rooffall given the presence of impressions and fingerprints on several of the chunks, as well as an abundance of artifacts at the top of the rooffall stratum (6). No postholes were identified in the rooms, suggesting that the walls were load-bearing and indicating that the roof was not substantial. This follows the general Ancestral Puebloan pattern of viga and latilla roofs covered with mud and (probably) juniper.

Room floors at LA 86534 were thinly plastered with fine clay mud, identical to and occasionally coping into the surviving wall plaster. Floors in the roomblock were differentially preserved. In the well-preserved sections (Rooms 4 and 6; Figure 24.15), the floor was compact and appears to have been burnished. Little cracking was present in these two rooms, and they were the most level of all the floors. The floor in Room 3 was semi-intact. It was easily discernible in the southern half of the room, but was patchier in the northern half. A large stump was in the northern wall and its roots likely destroyed the floor in this room. Floors in Rooms 1, 2, 5, 7, and 8 were essentially non-existent. The floor in Room 1 was destroyed by a large piñon stump and its associated roots, as well as by extensive rodent damage. Rooms 2 and 5 were both heavily rodent disturbed. In both of these rooms, the only areas with intact floor were around the hearths, but both of the hearths were significantly destroyed. The floor in Rooms 7 and 8 were heavily damaged by road construction as these rooms were immediately adjacent to the construction berm. Only a single patch was identified in the northwestern corner of Room 7.

Figure 24.15. Room 4 (back, center) floor.

The front rooms of the roomblock were typically slightly larger than those in the back. This fits the general pattern visible on the Pajarito Plateau. Table 24.5 shows the room dimensions and floor area for each of the nine rooms. Due to the destruction of the southern portions of Rooms 7 and 8 by construction activities, their dimensions are incomplete. A histogram was generated based on the surface area of the floors in each of the nine rooms (Figure 24.16). The figure groups the front rooms, the back rooms, and the circular kiva. The two incomplete rooms are the last in each of their respective series.

Table 24.5. Room dimensions and floor area.

Room Number	Length (m)	Width (m)	Floor Area (m^2)
1	2.60	2.48	6.45
2	3.11	2.40	7.46
3	3.20	2.00	6.40
4	3.10	1.80	5.58

Room Number	Length (m)	Width (m)	Floor Area (m^2)
5	3.50	2.30	8.05
6	2.95	1.80	5.31
7	3.10*	2.20	6.82*
8	2.60*	1.80	4.68*
9	4.30	4.10	17.63

*incomplete dimensions due to highway construction

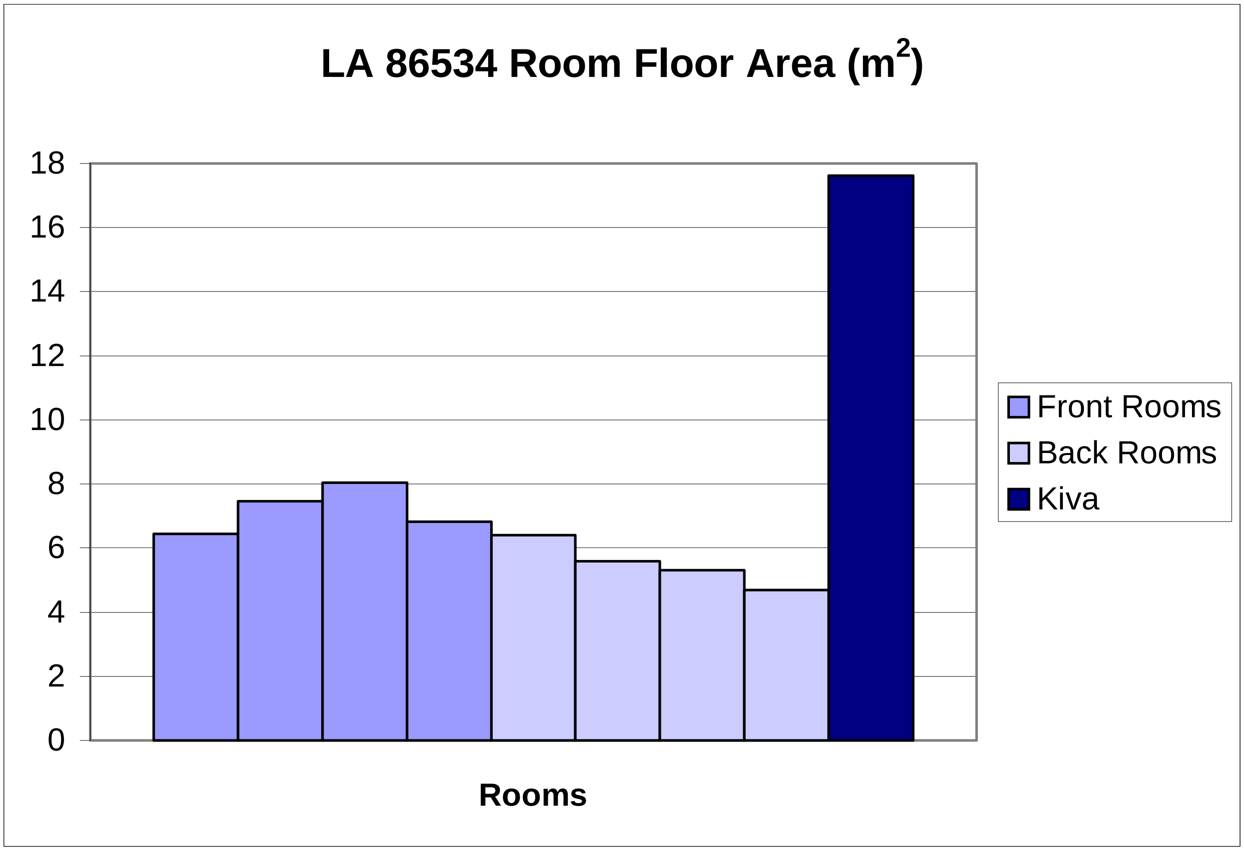

Figure 24.16. Histogram showing room size at LA 86534.

Room 1

Sequence of Excavation. Room 1 is located in the northeastern corner of the roomblock and is the most northerly of the front rooms. The room measures 2.6 m north-south by 2.48 m east-west, giving 6.45 m^2 of interior space. The room was highly disturbed by both rodents and roots. A large juniper stump was located in the center of the room, just over the eventual location of the hearth (Feature 4) and extends to the north wall (Figure 24.17). Its roots incurred a significant amount of damage to the collar, shape, and fill of the upper use of the hearth. Units in the 115E line were excavated first as part of the overall profile trench of the roomblock. These units were excavated in stratigraphic units (and in 10-cm levels within the strata if it was thicker than 10 cm) to the top of rooffall (Stratum 6). At this point, excavations ceased temporarily until all units in the roomblock were down to the top of the rooffall level. Units in Room 1 that were not in the 115E line were excavated in one large level (Strata 1 and 2) down to the top of the rooffall level. All units in the room were then excavated down to floor (Stratum 8). A doorway (Feature 10) was identified between the west wall of Room 1 and the east wall of Room 3.

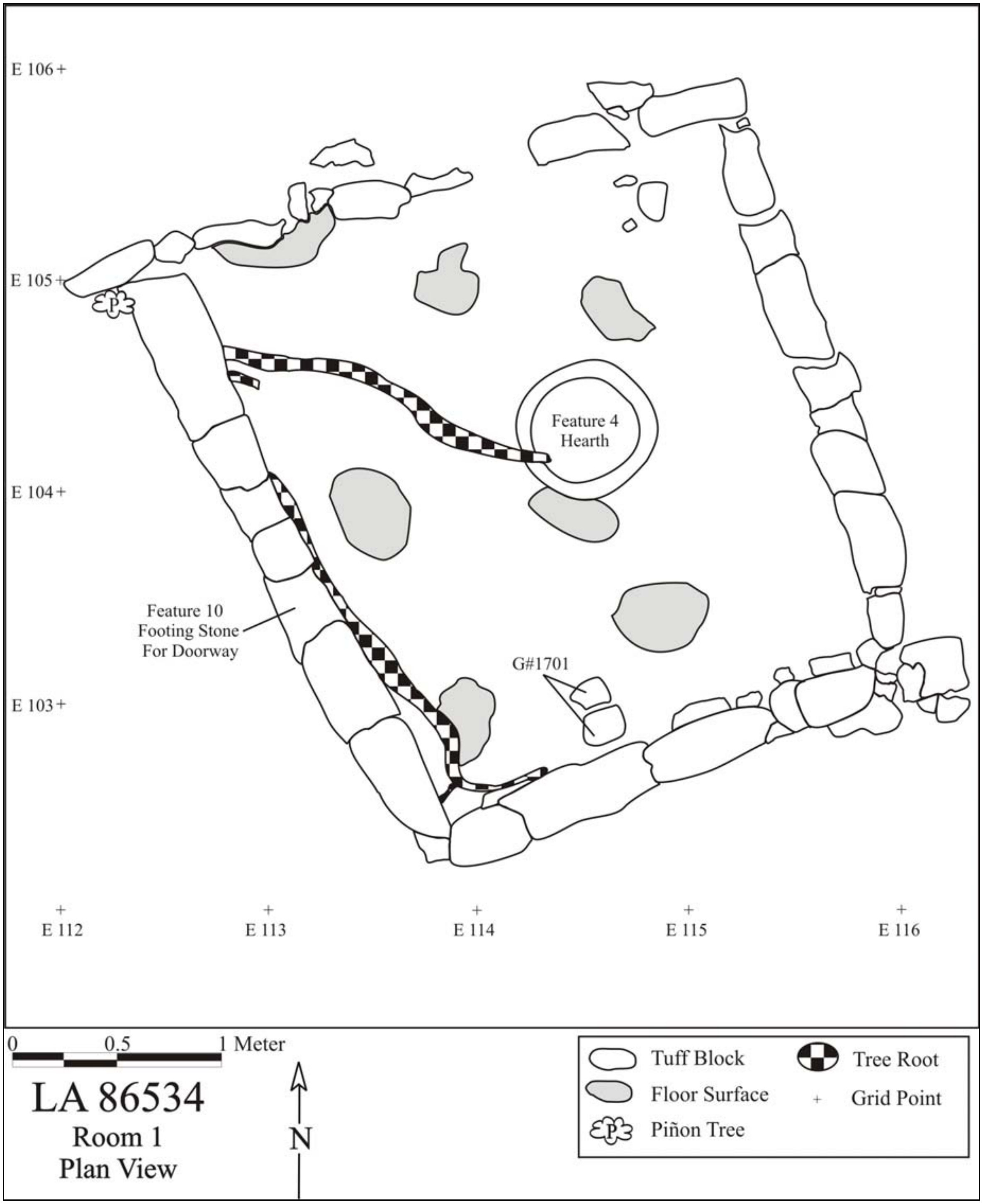

Figure 24.17. Room 1, post-excavation.

Fill. On average, Stratum 1 was an approximately 10-cm-thick layer of post-occupational fill and consisted of very loose and unconsolidated soil. Some areas contained a high organic content from the duff associated with the juniper located just outside the north wall. Artifact density in this level was high. Stratum 2 consisted of the general room fill, which contained an abundant amount of rubble wallfall and was about 25 cm thick. The stratum was also loose and unconsolidated, and artifact density was lower than Stratum 1. The bottom of this stratum contained the abrupt contact with rooffall (Strata 6 and 7). Stratum 6 is the actual rooffall layer, but Stratum 7, only positively identified in Room 1, was a very thin layer of sediment between the rooffall and the floor. This stratum was present throughout the roomblock, but was very difficult to identify due to heavy rodent disturbance. As a result, Stratum 7 is combined with Stratum 6 throughout the roomblock, but no artifacts or samples, except for a flotation sample (FS 1271) from Room 1, were collected from this stratigraphic unit.

Taxa identified in the flotation sample from Stratum 7 included maize (*Zea mays*), unknown conifer (Gymnospermae), and piñon pine (*Pinus edulis*). Counts in Table 24.6, as well as those in the following pages, will combine Stratum 6 and 7 but will essentially only represent Stratum 6. In Room 1, Stratum 6 was about 20 cm thick at its thickest point, but averaged about 7 cm thick. Rooffall in this room contained abundant, but usually small, fragments of adobe similar to that observed in the walls, and artifact density was about half as much as in Stratum 2. Stratum 8 was associated with the floor in this room, which was only present along the western wall where it articulated with the wall under the doorway (Feature 10). Stratum 11 was the fill from the centrally located collared hearth (Feature 4). Table 24.6 shows the general artifact counts by stratigraphic unit for this room.

Table 24.6. Room 1 artifact counts by stratigraphic units.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
1	873	82	8	4	**967**
2	479	33	3	1	**516**
6	216	27	1	1	**245**
6,7	19	4	0	0	**23**
8	2	0	4	0	**6**
11	0	0	1	0	**1**
Total	**1589**	**146**	**17**	**6**	**1758**

Floor. The floor in this room was in very poor shape. The only place where intact floor existed was along the western wall just under the doorway (Feature 10). In this area, the plastered floor coped with the wall plaster. Very small patches of floor (smaller than a quarter) were visible in the areas around the collar of the hearth. One tuff grinding slab (FS 1701) was recovered from the floor of this room, but was broken into four pieces (thus, $n = 4$ in Table 24.6). The ceramics associated with the floor were recovered in a general floor sweep, and because their exact provenience was unknown, they were not analyzed. One macrobotanical sample (FS 1700) was collected from the floor and the following taxa were identified: mountain mahogany (*Cercocarpus*), unknown conifer, ponderosa pine (*Pinus ponderosa*), and Douglas fir (*Pseudotsuga menziesii*).

Wall Construction. Shaped and unshaped tuff blocks were used in the construction of this room. It appears as though the western wall of the room was constructed first, then the eastern wall was built, and finally the northern and southern walls were abutted to the eastern and western walls. One to two courses were present for all walls except the southern wall where up to four courses were present. Table 24.7 shows the general wall measurements for all four walls.

Table 24.7. Room 1 wall measurements.

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	2.42	0.25	0.24
South	2.46	0.44	0.22
East	2.58	0.28	0.22
West	2.62	0.41	0.23

Artifacts and Samples. Artifacts from two 1- by 1-m units were selected for analysis. Grids selected from Room 1 include 103N/114E (FS 1030 through FS 1035, FS 1042, FS 1248 through FS 1251, and FS 1701) and 104N/114E (FS 353, FS 887, FS 1068 through FS 1074, FS 1076 through FS 1078, FS 1271 through FS 1279, and FS 1333 through FS 1338). All artifacts from these two columns were analyzed. Analyzed artifacts from this room that were not recovered in either of these two units included an obsidian projectile point (FS 706) and a tuff grinding slab (FS 1042) that was selected for a pollen wash, but was determined post-excavation to be a less than acceptable sample. Neither of the other two artifacts that were selected for pollen washes (FS 1001 and FS 680) were submitted for the analysis because of post-excavation determinations of sample integrity.

Identified ceramics from these two grids include nine unpainted sherds, one Wiyo Black-on-white sherd, 11 Santa Fe Black-on-white sherds, four plainware sherds, 17 smeared-indented corrugated sherds, one coiled necked sherd, five indented corrugated sherds, one wide neckbanded sherd, two organic-painted sherds, and one plain corrugated sherd. Ground stone artifacts identified in the sampled grids include one siltstone ground stone fragment, two dacite one-handed manos, and two tuff grinding slabs. All of the faunal remains recovered from this room were analyzed and identified remains included one pocket gopher bone, one small/medium-sized mammal long bone fragment, and a fragment of a mule deer (*Odocoileus hemionus*) radius. Table 24.8 lists the chipped stone materials recovered in this room.

Table 24.8. Chipped stone artifacts recovered from sampled units in Room 1.

Type	Material	Number
Core	Chalcedony	1
Unidentified flake fragment	Chalcedony	3
	Black translucent obsidian	1
Ground stone flake	Dacite	1
Core flake	Chalcedony	12
	Basalt	1
	Cerro del Medio obsidian	1

Type	Material	Number
	Black translucent obsidian	1
	Pedernal chert	4
Biface flake	Chalcedony	1
	Black translucent obsidian	1
Hammerstone flake	Quartzite	1
Microdebitage	Chalcedony	4
	Black translucent obsidian	2
	Basalt	1
	Orthoquartzite	1
Angular debris	Chalcedony	5
	Pedernal chert	2

Macrobotanical remains from the same grids selected for the artifact samples were identified for analysis. However, due to the paucity of macrobotanical items at the site, a sufficient sample was not attained. Therefore, a 20 percent sample from each stratum within each room was selected. This strategy was employed in each of the rooms except Room 9 (see Room 9 for discussion of sampling strategy for macrobotanical remains in that room). Based on a 20 percent sampling strategy, a sufficient sample was assembled. A total of 9 macrobotanical samples were analyzed from Room 1 and identified taxa include ponderosa pine, piñon pine, unknown conifer, Douglas fir, juniper, mountain mahogany, and cottonwood/willow (*Populus/Salix*). Samples were collected from all strata except 7 and 9, which represent the most recent use of the hearth. Only ponderosa pine wood was identified in the hearth (FS 1333). Table 24.9 lists the samples taken from Room 1. No pollen or flotation samples were taken from the floor because of its extremely patchy nature and the heavy root and rodent disturbance.

Table 24.9. Samples selected for analysis in Room 1.

Stratum	SAMPLE TYPE					
	Pollen	Pollen wash	Flotation	Macrobotanical	TL	Archaeomagnetic
1,2	1000	1042, 1001	1002	999, 1070	--	--
2	727	680	--	794, 828, 961	--	--
6	--	--	--	1393, 1396	--	--
7	--	--	1271	--	--	--
8	--	--	--	1700	--	--
9	1275	--	1272, 1273, 1274	--	1336	Taken
11	1334	--	1335	1333	--	--

Taxa identified in the flotation fill sample from Room 1 (FS 1002) include the following: goosefoot, purslane (*Portulaca*), maize, unknown conifer, juniper, unidentified pine, piñon pine, and oak (*Quercus*). Taxa identified in the two pollen samples from Room 1 fill (FS 727 and FS 1000) include beeweed (*Cleome*), cheno-ams (*Chenopodium/Amaranthus*), grass family, sunflower family, ragweed (*Ambrosia*), spurge family (Euphorbiaceae), unidentified pine, piñon pine, juniper, rose family (Rosaceae), and sagebrush (*Artemisia*).

Room 1 Features

Feature 4 (Hearth). This feature is a plaster-lined collared hearth in Room 1 (104N/114E; Figure 24.18). There were two uses of this hearth: Stratum 9 represents a remodeling of the hearth and a secondary use, while Stratum 11 is from the primary use of the hearth.

Figure 24.18. Hearth (Feature 4) in Room 1.

The hearth is approximately 50 by 50 cm in size and is circular in shape. The depth of the hearth is about 20 cm below the room floor (Figure 24.19; plan and profile). The collar around the hearth is raised approximately 10 cm above the floor. This is distinct from the hearths in Rooms 2 and 5, which were flush with the floor. The hearth was misshapen from a large juniper root running along its western edge, but was not heavily rodent disturbed. No artifacts were recovered from the fill of the hearth. An archaeomagnetic sample was taken from Stratum 9; see subsequent section for results. When sampling was finished, the top of a one-handed dacite mano was visible (FS 1337), suggesting a second use of the hearth.

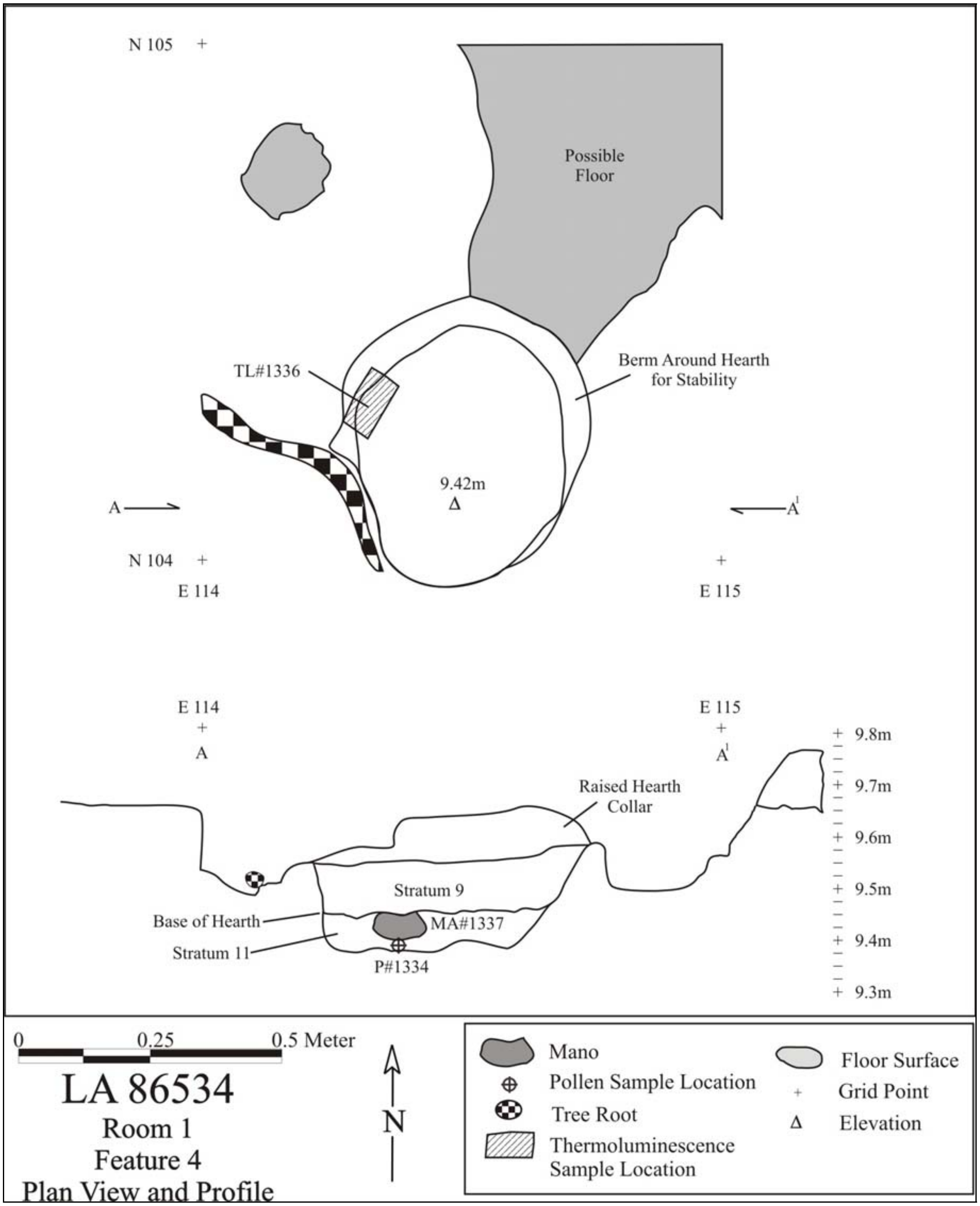

Figure 24.19. Plan view and profile of Feature 4.

Further excavations identified that the hearth contained two separate use episodes. The lower and original use of the hearth includes the Stratum 11 fill. Archaeomagnetic samples taken from the burned adobe associated with Stratum 11 produced a date range of AD 1065 to 1265; whereas, burned adobe associated with the upper fill (Stratum 9) and the subsequent remodeling event provided a date range from AD 1170 to 1230. A piece of maize (*Zea mays*) identified in FS 1272 from Stratum 9 was submitted for radiocarbon analysis. This sample yielded an age for Feature 4 of 860±40 BP (Beta-183760) and a date of cal AD 1190 with a two-sigma date range of cal AD 1040–1260, which is nearly identical to the archaeomagnetic result. The thermoluminescence analysis, which was conducted on a piece of burned plaster from the collar of the hearth (FS 1336), produced a date of 1230±42. This dated slightly later than both results derived from archaeomagnetic and radiocarbon analyses.

In addition to the dated materials collected from the hearth, two pollen samples and four flotation samples were taken. Taxa identified in the pollen samples (FS 1275 and FS 1334) included beeweed, purslane, sunflower family, prickly pear, ragweed/bursage, spurge family, Douglas fir, unidentified pine, piñon, juniper, sagebrush, rose family, cheno-ams, and unidentified grasses. Taxa identified in the flotation samples (FS 1272, FS 1273, FS 1274, and FS 1335) included goosefoot, goosefoot family (Chenopodiaceae), cheno-ams, grass family, maize, mountain mahogany, snow-on-the-mountain, saltbush/greasewood (*Atriplex/Sarcobatus*), purslane, unknown conifer, unidentified pine, ponderosa pine, juniper, and piñon pine.

Feature 10 (Doorway). Located centrally along the western wall, this doorway goes between Rooms 1 and 3. The dimensions of the doorway are 40 by 21 by 16 cm. A shaped footing stone was present at the base of the doorway. Because much of the western wall of Room 1 was collapsed and this portion of the wall was only one course high, there was no fill remaining when the feature was identified. As a result, no artifacts were recovered from the fill and no samples were taken. No plan map or profile was drawn.

Room 2

Sequence of Excavation. Room 2 is located in the middle of the roomblock in the northern section. Room 2 is 3.40 m north-south by 2.40 m east-west, giving an interior floor space of 7.46 m^2. Room 2 is in the front set of rooms and is located immediately south of Room 1. The initial test pit that identified the roomblock was in the center of this room. The room was highly disturbed by bioturbation and, as a result, the floor was in very poor condition (Figure 24.20). Units in the 115E line were excavated first as part of the overall profile trench of the roomblock (see Figure 24.8). These units were excavated in stratigraphic units (and in 10-cm levels within the stratum if it was thicker than 10 cm) to the top of rooffall (Stratum 6). At this point, excavations ceased temporarily until all units in the roomblock were down to the top of the rooffall level. Units in Room 2 that were not in the 115E line were excavated in one large level (Strata 1 and 2) down to the top of the rooffall level. All units in the room were then excavated down to floor (Stratum 8). Two features were identified in the room: Feature 2 was a collared hearth located near the center of the room, and Feature 3 was the doorway between the western wall of Room 2 and the eastern wall of Room 4 (Figure 24.20).

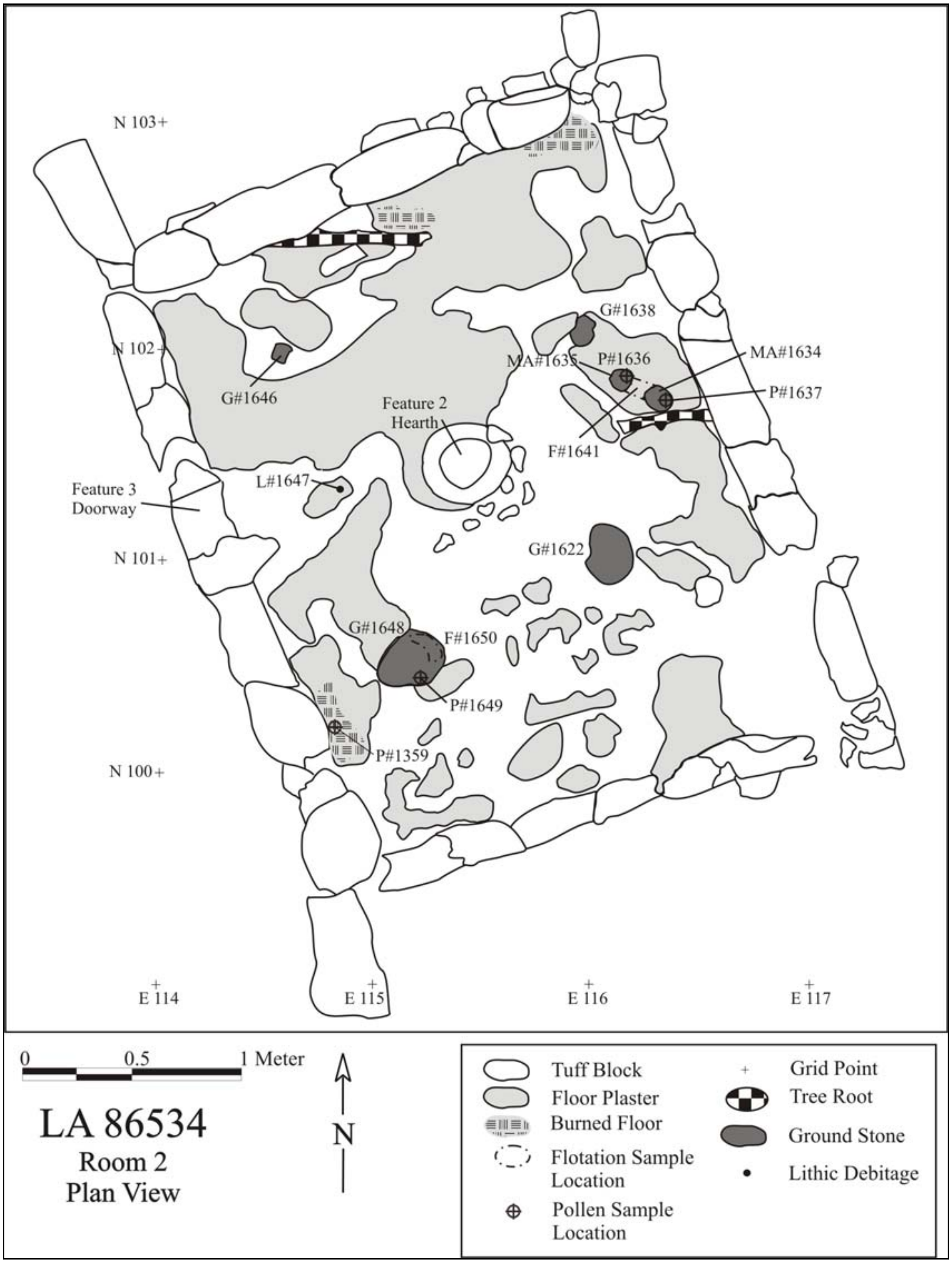

Figure 24.20. Plan view map of Room 2 after excavation.

Fill. Stratum 1 was an approximately 10-cm-thick layer of post-occupational fill that consisted of the very loose and unconsolidated soil. Some areas contained a high organic content from the duff associated with piñon and juniper trees in the area. Artifact density in this level was the highest. Stratum 2 consisted of the general room fill, which contained an abundant amount of rubble wallfall and was about 25 to 30 cm thick. Stratum 2 was also loose and unconsolidated, and artifact density was lower than Stratum 1, but still considerably high. The bottom of Stratum 2 contained the abrupt contact with rooffall (Strata 6 and 7). Stratum 6 is the actual rooffall layer, but Stratum 7, only identified in Room 1, was a very thin layer of sediment between the rooffall and the floor.

In Room 2, Stratum 6 was anywhere from 5 to 15 cm thick at its thickest point. Rooffall in this room contained abundant, but usually small, fragments of adobe similar to that observed in the walls, and artifact density was considerably less than in Strata 1 and 2. Stratum 8 was the floor stratum in Room 2. Small patches of floor were present throughout the room, but there were no large contiguous areas of floor at all. Several times, excavators at the floor level punched through and fell into significant rodent burrows, especially in the southern half of the room. Stratum 10 was the fill from the centrally located collared hearth (Feature 2). Table 24.10 shows the general artifact counts by stratigraphic unit for this room.

Table 24.10. Room 2 artifact counts by stratigraphic units.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
1	689	71	16	0	**776**
2	566	85	4	1	**656**
1,2	135	2	0	0	**137**
6	37	8	0	2	**47**
6,7	206	17	0	2	**225**
8	33	8	6	1	**44**
Total	**1666**	**191**	**26**	**6**	**1889**

Floor. The floor in this room was in poor condition. The best patch of floor was located along the western wall just under the doorway (Feature 3). As in Room 1, the plastered floor in this area coped with the wall plaster. Several other patches of floor along the northern and southern wall articulated with the wall plaster. In the remaining portions of the room, very small patches (less than 10 by 10 cm) of floor were visible. In addition, there were some small areas of floor plaster in the areas around the collar of the hearth. The hearth (Feature 2) was the only feature associated with the floor. A number of artifacts were found on the floor and included the following: a welded tuff millingstone (FS 1622), two quartzite one-handed manos (FS 1634 and FS 1635) and associated pollen samples (FS 1636 and FS 1637, respectively; see below), an andesite axe (FS 1638), an unidentified dacite ground stone fragment (FS 1646), a piece of obsidian debitage (FS 1647), a piece of burned juniper wood in the northeastern corner of the room (FS 1668), and a welded tuff millingstone (FS 1648) and associated pollen and flotation samples (FS 1649 and FS 1650, respectively; see below). Other artifacts, such as the 33 ceramics and seven pieces of chipped stone noted in Table 24.10, were collected from a floor sweep, and as such, were not analyzed because their exact provenience was unknown. A single jackrabbit (*Lepus* sp.) rib fragment was also identified in the floor sweep. In addition to the samples taken in association with artifacts on the floor, several other samples were taken on the floor. Flotation samples include FS 1360, FS 1625, and FS 1641 and pollen samples include FS 1359 and FS 1624.

Pollen samples were taken in association with two artifacts on the floor. Those samples associated with two quartzite manos (FS 1634 and FS 1635, respectively) produced a number of pollen signatures. Taxa identified in FS 1636 (associated with FS 1634) included cholla and prickly pear, beeweed (*Cleome*), lily family (Liliaceae), grass family (Poaceae), cheno-ams, sunflower family, unidentified pine, piñon pine, juniper, and oak. Taxa identified in FS 1637 (associated with FS 1635) included prickly pear, beeweed, cheno-ams, grass family, sunflower family, ragweed, unidentified pine, piñon pine, and sagebrush.

A pollen (FS 1649) and flotation (FS 1650) sample were also taken in association with a millingstone (FS 1648). Taxa identified in the pollen sample included prickly pear, beeweed, sunflower family, cheno-ams, ragweed, pea family (Fabaceae), unidentified pine, piñon, juniper, rose family, and sagebrush. Taxa identified in the flotation sample included goosefoot, maize, unknown conifer, juniper, unidentified pine, piñon pine, ponderosa pine, and oak.

One pollen sample (FS 1359) and one flotation sample (FS 1641) from the floor of Room 2 were analyzed. Taxa identified in the pollen sample included cholla, prickly pear, beeweed, cheno-ams, grass family, sunflower family, ragweed, spurge family (Euphorbiaceae), unidentified pine, piñon pine, juniper, rose family, and sagebrush. Taxa identified in the flotation sample included goosefoot, maize, unknown conifer, juniper, unidentified pine, piñon pine, ponderosa pine, and oak.

Wall Construction. Shaped and unshaped tuff blocks were used in the construction of this room. It appears as though the western wall of the room was constructed first as part of the central wall for the entire roomblock, that the eastern wall was built either next or at the same time as the western wall, and that the northern and southern walls were then abutted to the western and eastern walls. At least three courses were present in all the walls. Table 24.11 shows the general wall measurements for each of the walls.

Table 24.11. Room 2 wall measurements.

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	2.40	0.46	0.22
East	3.10	0.34	0.23
South	2.37	0.39	0.23
West	3.00	0.40	0.23

Artifacts and Samples. Artifacts and samples from two 1- by 1-m units were selected for analysis. Grids selected from Room 2 include 100N/115E (FS 349, FS 967, FS 968, FS 1310 through FS 1315, FS 1370 through FS 1375, and FS 1648 through FS 1650) and 101N/115E (FS 351, FS 573 through FS 575, FS 584 through FS 587, FS 596 through FS 599, FS 735 through FS 738, FS 857 through FS 861, FS 1319 through FS 1326, FS 1651, and FS 1691 through FS 1693). All artifacts from these two columns were analyzed, as was the bottom of a corrugated vessel (FS 1880). Table 24.12 lists all the samples that were selected for analysis from Room 2. Pollen and flotation samples from Stratum 8 were discussed in the section describing the Room 2 floor.

Table 24.12. Samples selected for analysis in Room 2.

Stratum	SAMPLE TYPE				
	Pollen	Flotation	Macrobotanical	TL	Archaeomagnetic
1	--	916	891, 930	--	--
2	769	--	597, 820, 846, 855	--	--
6,7	--	1291	1290, 1381	--	--
8	1359, 1636, 1637, 1649	1641, 1650	1660, 1663, 1668	--	--
10	1325, 1326	1321, 1322, 1323, 1324	--	1651	Taken

As outlined in the description of Room 1, 20 percent of the macrobotanical samples from each stratum in Room 2 were selected for analysis. A total of 11 samples were analyzed from Room 2, and samples were recovered from all strata except Stratum 10, which was the hearth fill. The following taxa were identified in the macrobotanical samples: box elder (*Acer negun*), mountain mahogany (*Cercocarpus*), saltbush/greasewood (*Atriplex/Sarcobatus*), Douglas fir (*Pseudotsuga menziesii*), juniper (*Juniperus* sp.), piñon pine (*Pinus edulis*), oak (*Quercus*), ponderosa pine (*Pinus ponderosa*), unidentified pine (*Pinus* sp.), unknown conifer (Gymnospermae), and rose family (Rosaceae). A pollen sample was taken in Stratum 2 and the following taxa were identified: maize (*Zea mays*), cholla and prickly pear, beeweed (*Cleome*), lily family (Liliaecea), buckwheat (*Eriogonum*), pea family (Fabaceae), sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), spurge family (Euphorbiaceae), evening primrose family (Onograceae), unidentified pine, piñon pine, juniper, oak, fir (*Abies*), sagebrush (*Artemisia*), rose family, long spine (Sunflower), unknown sunflower (possibly marshelder), morning glory family (Convolvulaceae), cheno-ams, and unidentified grasses (Poaceae). Two flotation samples were taken in Strata 1 and 3 and only maize, unknown conifer, and unidentified pine remains were identified.

Identified ceramics from these two grids included 29 smeared-indented corrugated sherds, 18 unpainted sherds, 19 plainware sherds (body and rim), 19 Santa Fe Black-on-white sherds, 21 indented corrugated sherds, one polished gray sherd, one coiled necked sherd, one plain incised sherd, and one undifferentiated mineral-painted sherd. One ground stone artifact, a welded tuff millingstone, was identified in the sampled grid units. All of the faunal remains recovered from this room were analyzed; identified remains included a single element from each of the following taxa: wood rat (*Neotoma* sp.), pocket gopher (*Thomomys* sp.), cottontails (*Sylvilagus* sp.), jackrabbit (*Lepus* sp.), and mule deer (*Odocoileus hemionus*). No worked bones were identified in this room. Table 24.13 lists the chipped stone materials recovered in this room.

Table 24.13. Chipped stone artifacts recovered from sampled units in Room 2.

Type	Material	Number
Microdebitage	Unidentified metamorphic	1

Type	Material	Number
	Black translucent obsidian	1
	Chalcedony	1
	Quartzite	1
Core flake	Unidentified metamorphic	1
	Pedernal chert	5
	Chalcedony	12
	Greenstone	1
Angular debris	Chalcedony	2
	Black translucent obsidian	1
	Pedernal chert	1
Flake fragment	Chalcedony	1
Biface flake	Black translucent obsidian	1
	Black opaque obsidian	1

Room 2 Features

Feature 2 (Hearth). Feature 2 is a centrally located plaster-lined collared hearth in Room 2 (101N/115E; Figures 24.21 and 24.22). Stratum 10 represents the fill removed from this hearth. The hearth is approximately 60 by 60 by 15 cm in size and is roughly circular in shape. The collar around the hearth is raised only slightly (less than 2 cm) above the floor. This is distinct from the hearth in Room 1, which is raised some 10 cm above the floor. The hearth was not disturbed significantly by rodent activity like the rest of the room was, but no artifacts were recovered from the fill of the hearth.

A number of samples were taken from Feature 2. These include an archaeomagnetic sample, two pollen samples, four flotation samples, and a thermoluminescence (TL) analysis sample. The following taxa were identified in the pollen samples (FS 1325 and FS 1326): maize, beeweed, sunflower family, ragweed/bursage, spurge family, evening primrose family, fir, unidentified pine, piñon pine, juniper, rose family, sagebrush, long spine sunflower, cheno-ams, and unidentified large grasses. The following taxa were identified in flotation samples from Feature 2 (FS 1321 through FS 1324): goosefoot, cheno-ams, maize, prickly pear, New Mexico locust (*Robinia*), tobacco (*Nicotiana*), mountain mahogany, saltbush/greasewood, oak, juniper, piñon pine, ponderosa pine, unidentified pine, and unknown conifer (Gymnospermae). The TL sample from a piece of the adobe hearth (FS 1651) dated to AD 918±180, while the archaeomagnetic sample dated later, falling between AD 1225 and 1300. A piece of maize (*Zea mays*) identified in a flotation sample (FS 1321) from the hearth was submitted for radiocarbon analysis. The maize yielded an age of 730±40 BP (Beta-183761) and a date of cal AD 1280 with a two-sigma date range of cal AD 1240–1300, which is consistent with the archaeomagnetic result, but quite different than the TL result.

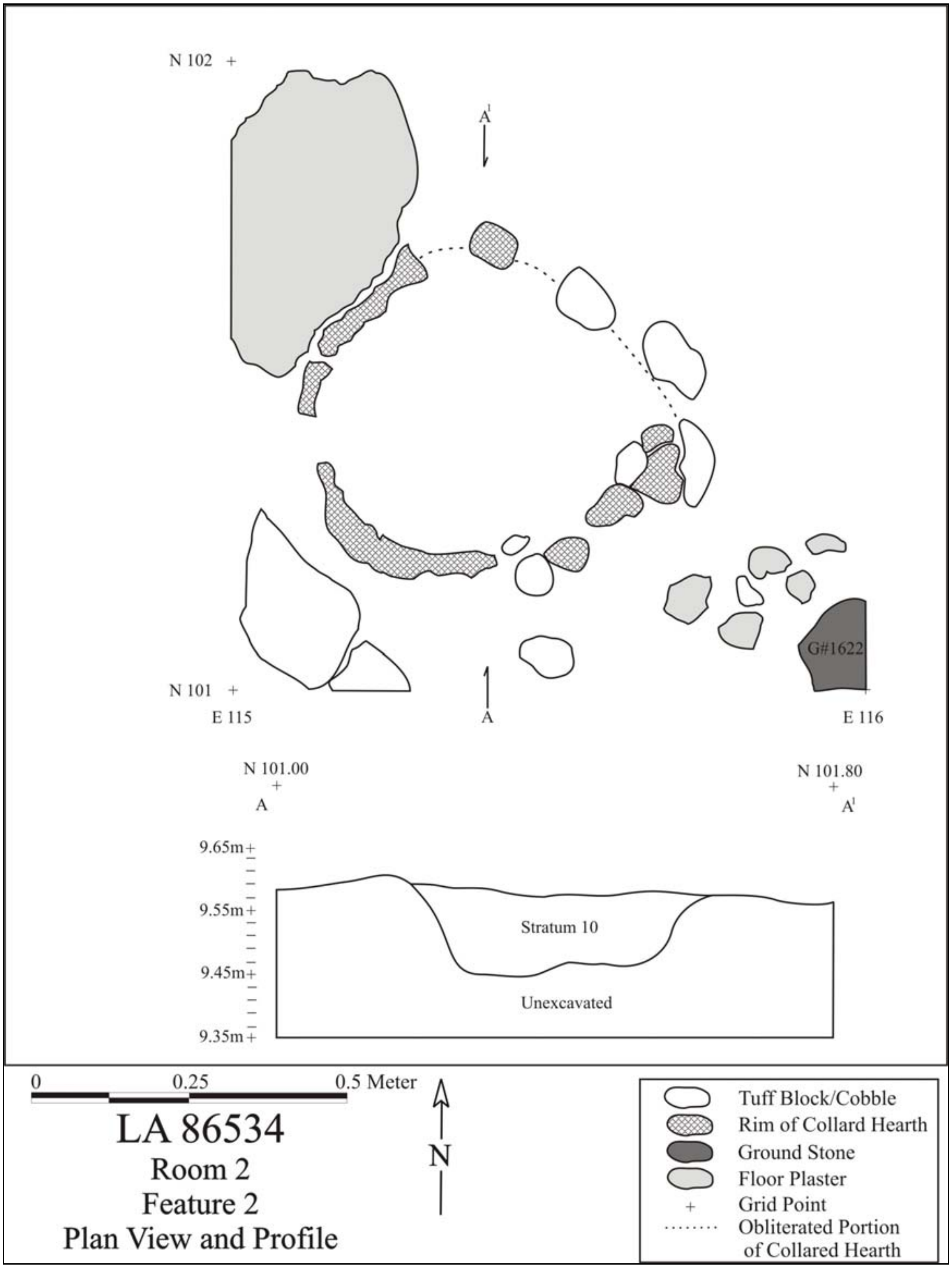

Figure 24.21. Plan view and profile of Feature 2.

Figure 24.22. Hearth (Feature 2) in Room 2.

Feature 3 (Doorway). Located centrally along the west wall, this doorway passes between Rooms 2 and 4. The dimensions of the doorway are 45 by 58 by 20 cm and it lies directly west of Feature 2. There is a considerable amount of plaster that is flush with the bottom of the doorway. As in Room 1, there is a footing stone at the base of the wall that measures 31 by 20 by 20 cm. Three courses of stone were present in the wall to the south, and two were present in the wall to the north of the doorway. Neither a plan map nor a profile was drawn for the doorway feature.

Room 3

Sequence of excavation. Room 3 is located in the northwestern corner of the roomblock. It is the most northerly of the back rooms and is 3.2 m north-south by 2.0 m east-west, giving about 6.4 m^2 of interior space. It is in the back row of rooms and is located immediately to the west of Room 1. In general, the room was uniformly disturbed in the northern two-thirds by roots associated with the juniper tree outside the north wall of Room 3. Units in this room were excavated in stratigraphic units (and in 10-cm levels within the strata if it was thicker than 10 cm) to the top of rooffall (Stratum 6). Once units were excavated to the top of rooffall, the excavations ceased temporarily until all units were dug to the same level. Then, all units in the room were excavated down to floor (Stratum 8). A single doorway feature (Feature 10) was identified in the eastern wall between Rooms 1 and 3 (Figure 24.23).

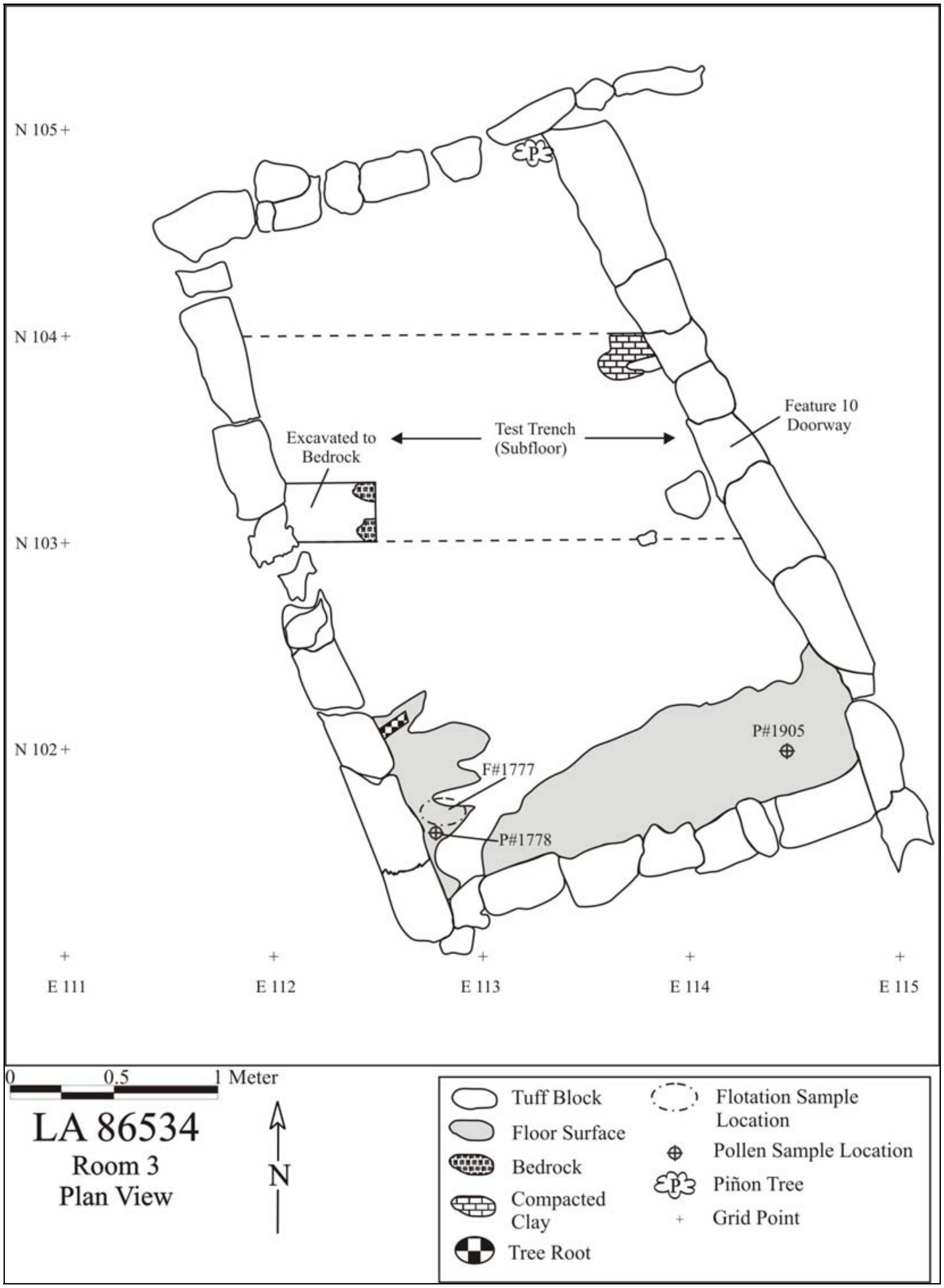

Figure 24.23. Plan view of Room 3 floor after excavation.

Fill. On average, Stratum 1 was an approximately 10-cm-thick layer of post-occupational fill that consisted of the very loose and unconsolidated soil. This stratum was much thinner in a large majority of the room but was thickest in the northeastern corner near a large juniper tree. Some areas contained a high organic content from the duff associated with piñon and juniper trees in the area. Artifact density in this stratum was the highest. Stratum 2 consisted of the general room fill, which contained an abundant amount of rubble wallfall and was about 25 to 30 cm thick. The stratum was also loose and unconsolidated, and artifact density was lower than Stratum 1, but still higher than the other strata in the room. The bottom of Stratum 2 contained the abrupt contact with rooffall (Strata 6 and 7). Stratum 6 is the actual rooffall layer, but Stratum 7, only definitively identified in Room 1, was a very thin layer of sediment between rooffall and floor.

In Room 3, Stratum 6 was anywhere from 5 to 15 cm thick at its thickest point, but averaged about 8 cm. Rooffall in this room contained abundant, but usually small, fragments of adobe similar to that observed in the walls, and artifact density was considerably less than in Strata 1 and 2. As with all the other rooms in the roomblock, Stratum 8 was the floor stratum in this room. Floor was only present in the southern one-third of the room, with a very small patch present along the northern wall. The middle one-third of the room contained no discernible floor, and, as a result, excavations in this area went too deep. It is likely that the northern two-thirds of the room incurred significant damage from two substantial piñon trees located just north of the roomblock. In general, artifact density in this back room was lower than the density of artifacts in the front rooms. No floor features were identified in this room. Table 24.14 shows the general artifact counts by stratigraphic unit for this room.

Table 24.14. Room 3 artifact counts by stratigraphic units.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	2	0	0	0	**2**
1	673	77	0	1	**751**
2	282	39	3	0	**324**
6,7	204	33	8	0	**245**
8	0	0	0	0	**0**
Total	**1161**	**149**	**11**	**1**	**1322**

Floor. In general, the floor in the northern two-thirds of this room was in poor condition. The best patch of floor was located along the southern wall and in the southwest corner, and the plastered floor in this area coped with the wall plaster. No artifacts were found on the floor of this room, but one flotation sample (FS 1777) and two pollen samples (FS 1778 and FS 1905) were taken directly on the floor. Taxa identified in the flotation sample included pigweed (*Amaranthus*), goosefoot (*Chenopodium*), cheno-ams (*Chenopodium/Amaranthus*), maize (*Zea mays*), unknown conifers (Gymnospermae), juniper (*Juniperu*s), unidentified pine (*Pinus* sp.), piñon pine (*Pinus edulis*), and ponderosa pine (*Pinus ponderosa*). Taxa identified in the pollen samples include beeweed (*Cleome*), buckwheat (*Eriogonum*), mustard family (Brassicaceae), sunflower family (Asteraceae), globemallow (Sphaeralcea), spurge family (Euphorbiaceae), Douglas fir (*Pseudotsuga menziesii*), juniper, unidentified pine, piñon pine, Mormon tea (*Ephedra*), sagebrush (*Artemisia*), cheno-ams, and unidentified grasses (Poaceae).

Wall Construction. Shaped and unshaped tuff blocks were used in the construction of this room. It appears as though the western wall of the room was constructed first as part of the rear wall for the entire roomblock and that the eastern wall (central roomblock wall) was built either next or at the same time as the western wall. After these two walls were constructed, the northern and southern walls were then abutted to the western and eastern walls. One to two courses were present in the northern and eastern walls and three to four courses in the western and southern walls. Table 24.15 shows the general wall measurements for each of the walls.

Table 24.15. Room 3 wall measurements.

Wall Orientation	Length (m)	Height (m)	Thickness (m)
West	3.35	0.29	0.21
East	3.00	0.30	0.22
South	1.85	0.35	0.19
North	2.20	0.25	0.20

Artifacts and Samples. Artifacts and samples from two 1- by 1-m units were selected for analysis. Grids selected from Room 3 include 102N/113E (FS 765, FS 784 through FS 786, FS 816, FS 817, FS 841, FS 952 through FS 956, FS 960 and FS 961, FS 1316 through FS 1318, and FS 1720 through FS 1722) and 103N/112E (FS 1063, FS 1067, FS 1097 through FS 1101, and FS 1541 through FS 1544). All artifacts from these two columns were analyzed. In addition to the artifacts analyzed from these two 1- by 1-m units, several other artifacts were analyzed, including a quartzite hammerstone (FS 955), several large Santa Fe Black-on-white sherds (FS 1086), an andesite axe (FS 1947), and a welded tuff ground stone fragment (FS 1947). Table 24.16 lists the samples selected for analysis from Room 3.

Table 24.16. Samples selected for analysis in Room 3.

Stratum	SAMPLE TYPE					
	Pollen	Pollen wash	Flotation	Macrobotanical	TL	Archaeomagnetic
1	--	1087	--	972, 1083	--	--
2	1063	--	925	905	--	--
6,7	--	--	--	1530, 1532, 1543	--	--
8	1778, 1905	--	1777	--	--	--

As outlined in the description of Room 1, 20 percent of the macrobotanical samples from each stratum in Room 3 were selected for analysis. A total of six samples were submitted for analysis from Room 3. Samples are from all strata except the floor where no macrobotanical remains were encountered, but none of the samples produced identifiable material. Pollen and flotation samples were also taken from this room. The following taxa were identified in the pollen sample (FS 1063): sunflower family (Asteraceae), juniper, unidentified pine, piñon pine, oak (*Quercus*), sagebrush, cheno-ams, and unidentified grasses. Two flotation samples were taken: taxa identified in FS 1777 are discussed in association with the floor, and taxa identified in FS 925 include rose family (Rosaceae), maize, mountain mahogany (*Cercocarpus*), unknown conifer (Gymnospermae), unidentified pine, and ponderosa pine.

Identified ceramics from these two grids included nine smeared-indented corrugated sherds, one polished gray sherd, 11 unpainted sherds, six plainware sherds, six Santa Fe Black-on-white sherds, four indented corrugated sherds, and one Chupadero Black-on-white sherd. One ground stone artifact, an unidentified piece of welded tuff, was identified in the sampled grid units. All of the faunal remains recovered from this room were analyzed; identified remains include one partially burned proximal femur from a kangaroo rat (*Dipodomys* sp.). No worked bones were identified in this room. Table 24.17 shows the distribution of chipped stone materials recovered in this room.

Table 24.17. Chipped stone artifacts recovered from sampled units in Room 3.

Type	Material	Number
Hammerstone	Quartzite	1
Core flake	Chalcedony	8
	Pedernal chert	1
	Greenish/gray chert	1
Notching flake	Black translucent obsidian	1
Angular debris	Chalcedony	2
Microdebitage	Chalcedony	9
	Black translucent obsidian	2

Room 3 Features

Feature 10 (Doorway). This feature was the only feature identified in Room 3. Located centrally along the western wall, this doorway allowed passage between Rooms 1 and 3. The dimensions of the doorway measured 40 by 21 by 16 cm. A shaped footing stone was present at the base of the doorway. Because much of the eastern wall of Room 1 had collapsed and this portion of the wall was only one course high, there was no fill remaining when the feature was identified. As a result, no artifacts were recovered from the fill and no samples were taken. No plan map or profile was drawn of the feature.

Room 4

Sequence of excavation. Room 4 is located in the north-central portion of the roomblock and is 3.1 m north-south by 1.8 m east-west, giving about 5.58 m^2 of interior space (Figure 24.24). Room 4 is in the back row of rooms and is located immediately to the south of Room 3 and to the west of Room 2. In general, the room was in very good shape, with the least disturbance of any rooms. No roots or stumps were identified, and the floor was the best preserved of any rooms at the site (Figure 24.25).

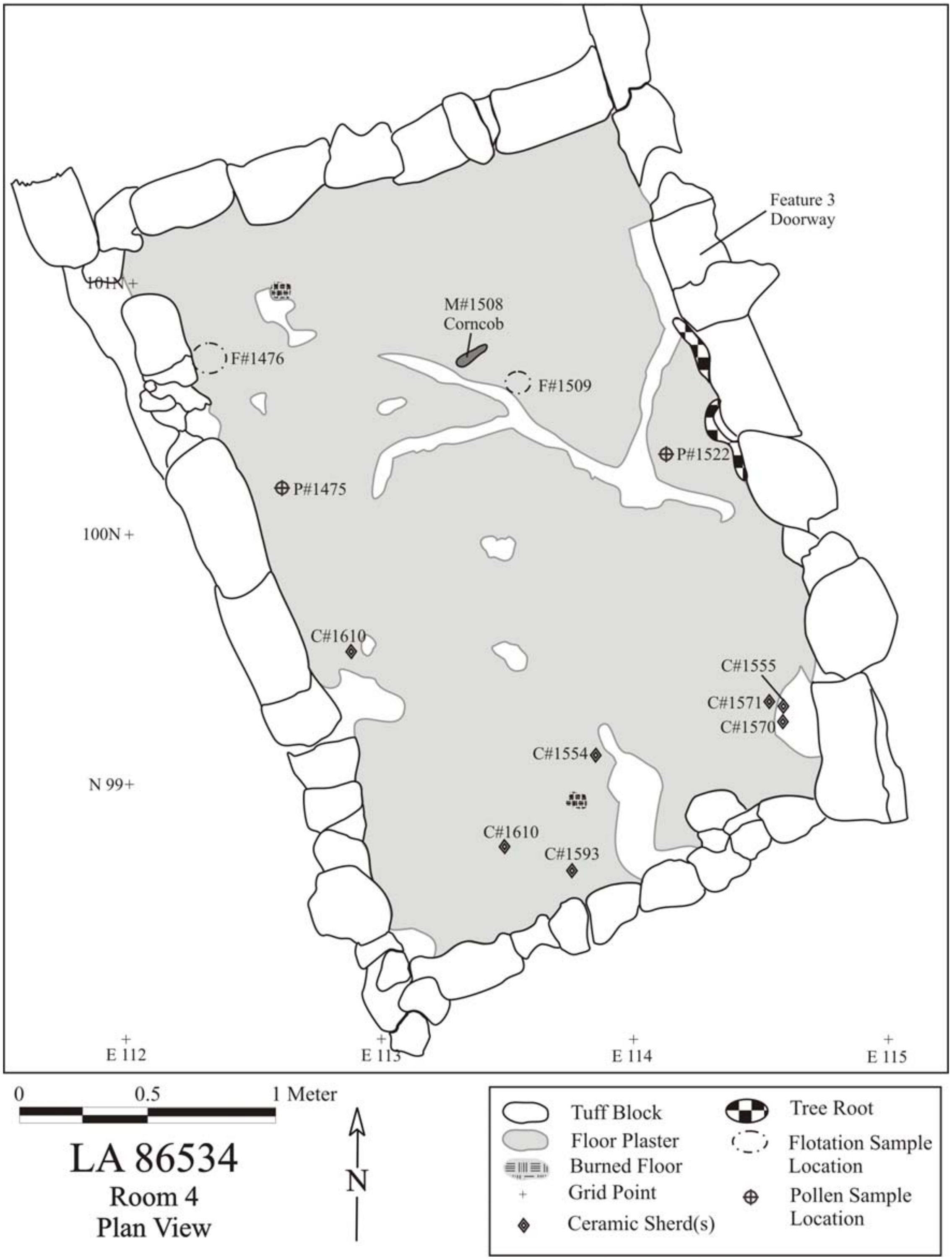

Figure 24.24. Plan view of Room 4 floor after excavation.

Figure 24.25. Floor in Room 4.

As in the other rooms, units in this room were excavated in stratigraphic units to the top of rooffall (Stratum 6). Once units were excavated to the top of rooffall, the excavations ceased temporarily until all units were at the same level. Then, all units in the room were excavated down to floor (Stratum 8). A single doorway feature (Feature 3) was identified in the eastern wall of the room between Rooms 2 and 4.

Fill. On average, Stratum 1 was an approximately 10-cm-thick layer of post-occupational fill and consisted of very loose and unconsolidated soil. Some areas contained a high organic content from the duff associated with piñon and juniper trees in the area. Artifact density in Stratum 1 was the highest. Stratum 2 consisted of general room fill, which contained an abundant amount of rubble wallfall and was about 25 to 30 cm thick. The stratum was also loose and unconsolidated, and artifact density was lower than Stratum 1, but still higher than in the subsequent strata. The bottom of Stratum 2 contained the abrupt contact with rooffall (Stratum 6).

In Room 4, Stratum 6 was anywhere from 5 to 18 cm thick at its thickest point, but averaged about 12 cm. Rooffall in this room contained abundant, but usually small, fragments of adobe similar to that observed in the walls, and artifact density was considerably less than in Strata 1 and 2. As with all the other rooms in the roomblock, Stratum 8 was the floor stratum. Floor was present throughout the entire room, with only minimal rodent disturbance present in the central and eastern portions along the southern wall and in a small area in the center of the room. In general, artifact density in this back room was lower than the density of artifacts in the front rooms. No floor features were identified in this room, but a number of sherds and a small corn cob fragment were identified on the floor. Table 24.18 shows the general artifact counts by stratigraphic unit for Room 4.

Table 24.18. Room 4 artifact counts by stratigraphic units.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	1	0	0	0	**1**
1	619	65	6	3	**693**
2	161	12	2	0	**175**
1,2	107	8	0	1	**116**
6,7	124	23	1	3	**151**
8	7	0	0	0	**7**
Total	**1019**	**108**	**9**	**7**	**1143**

Floor. In general, the floor in Room 4 was in excellent condition. It was the most intact of all the floors in the roomblock, with some 80 percent of the floor still remaining. There were two small areas in the room where floor was still present, but in poor condition. These areas occurred along the central and eastern portions of the southern wall and in the center of the room (see Figure 24.25). In nearly all portions of the room along the wall, the plastered floor coped with the wall plaster. In addition, coping was present along the wall underneath the doorway (Feature 3) between Rooms 2 and 4. The base of the footing stone associated with this feature was flush with the floor plaster. A number of artifacts were found on the floor, including seven sherds (FS 1471, FS 1554, FS 1555, FS 1570, FS 1571, FS 1593, and FS 1610) and a corncob (FS 1508), which was submitted for radiocarbon analysis. The maize cob yielded an age of 850±40 BP (Beta-183763) and a date of cal AD 1200 with a two-sigma date range of cal AD 1170–1240. The identified ceramics included three basket impressed sherds, one Wiyo Black-on-white sherd, one unpainted sherd, and two plainware sherds.

In addition, two flotation samples (FS 1476 and FS 1509) and two pollen samples (FS 1475 and FS 1522) were taken directly on the floor. FS 1509 was taken in the area around the corncob and included the following charred taxa: maize (*Zea mays*), goosefoot (*Chenopodium*), cheno-ams (*Chenopodium/Amaranthus*), saltbush/greasewood (*Atriplex/Sarcobatus*), unknown conifer (Gymnospermae), unidentified pine (*Pinus* sp.), and piñon pine (*Pinus edulis*). The other flotation sample (FS 1476) produced the following charred taxa: goosefoot, goosefoot family (Chenopodiaceae), maize, unknown conifer, unidentified pine, ponderosa pine (*Pinus ponderosa*), and piñon pine. Pollen samples included the following taxa: beeweed (*Cleome*), maize, sunflower (Asteraceae), juniper, unidentified pine, piñon pine, spurge family (Euphorbiaceae), Mormon tea (*Ephedra*), rose family (Rosaceae), sagebrush (*Artemisia*), cheno-ams, and unidentified grasses (Poaceae).

Wall Construction. Construction activities in this room involved the use of shaped and unshaped tuff blocks. It appears as though the western wall of the room was constructed first as part of the rear wall for the entire roomblock and that the eastern wall (central roomblock wall) was built either next or at the same time as the western wall. After these two walls were constructed, the northern and southern walls were then abutted to the western and eastern walls. Three to four courses were present in each of the walls. Table 24.19 shows the general wall measurements for each of the walls.

Table 24.19. Room 4 wall measurements.

Wall Orientation	Length (m)	Height (m)	Thickness (m)
West	3.05	0.46	0.24
North	1.80	0.35	0.19
East	3.00	0.43	0.23
South	1.75	0.48	0.22

Artifacts and Samples. Artifacts and samples from two 1- by 1-m units were selected for analysis in this room. Grids selected from Room 4 include 100N/113E (FS 1017 through FS 1022 and FS 1505 through FS 1509) and 99N/114E (FS 406, FS 799, FS 897, FS 913 and FS 914, FS 957 and FS 958, FS 1510 and FS 1511, FS 1555, FS 1558 through FS 1561, FS 1567 through FS 1571, and FS 2240). All artifacts from these two columns were analyzed. Table 24.20 lists the samples selected for analysis from Room 4.

Table 24.20. Samples selected for analysis in Room 4.

Stratum	SAMPLE TYPE				
	Pollen	Flotation	Macrobotanical	TL	Archaeomagnetic
1	921	--	--	--	--
1,2	913	--	836, 957	--	--
6	1510	1511, 1578	1504, 1569	--	--
8	1475, 1522	1476, 1509	1508	--	--

Twenty percent of the macrobotanical samples from each stratum in Room 4 were selected for analysis. A total of five samples were analyzed from Room 4, and samples are from all strata except post-occupational fill. Wood taxa included Douglas fir, juniper, mountain mahogany, oak, unidentified pine, piñon pine, ponderosa pine, saltbush/greasewood, and unknown conifer. Maize cupules were identified in FS 836 and FS 1508. Taxa identified in the samples collected from the floor are referenced above. Flotation samples recovered in the rooffall stratum include goosefoot purslane (*Portulaca*), saltbush/greasewood, maize, unknown conifer, juniper, unidentified pine, piñon pine, and mountain mahogany (*Cercocarpus*). Taxa identified in the pollen samples include maize, prickly pear, beeweed, long spine sunflower, broad spine sunflower, sunflower, plantain (*Plantago*), nightshade family (Solanaceae), cheno-ams, grass family, ragweed/bursage, spurge family (Euphorbiaceae), evening primrose (*Onagraceae*), unidentified pine, piñon pine, juniper, oak (*Quercus*), rose family, and sagebrush.

Identified ceramics from these two grids included 17 smeared-indented corrugated sherds, 17 Santa Fe Black-on-white sherds, 18 unpainted sherds, one Glaze yellow sherd, seven plainware sherds, one plain corrugated sherd, nine indented corrugated sherds, one mineral-painted sherd, two Wiyo Black-on-white sherds, one Gallup Black-on-white sherd, two Galisteo Black-on-white sherds, and three basket impressed sherds. All of the faunal remains recovered from this room were analyzed. Identified remains include a single turkey (*Meleagris gallopavo*) tarsometatarsus, one red-tailed hawk (*Buteo jamaicensis*) phalanx, one pocket gopher (*Thomomys bottae*) innominate, an indeterminate rodent (Rodentia) bone, a mule deer (*Odocoileus hemionus*) rib and metatarsal fragment, and a single unidentified small/medium-mammal long bone fragment. No worked bones were identified in this room. Table 24.21 lists the chipped stone materials recovered in this room.

Table 24.21. Chipped stone artifacts recovered from sampled units in Room 4.

Type	Material	Number
Core flake	Basalt	2
	Chalcedony	9
	Pedernal chert	7
	Rhyolite	1
Biface flake	Black translucent obsidian	1
	Silicified wood	2
	Opaque obsidian	1
Microdebitage	Chalcedony	3
	Black translucent obsidian	1
	Green obsidian	1
	Pedernal chert	4
Angular debris	Chalcedony	3
	Quartzite	1
	Pedernal chert	2
Cobble uniface	Welded tuff	1
Retouched piece	Pedernal chert	1
Uniface	Pedernal chert	1
Biface	Chalcedony	1

Room 4 Features

Feature 3 (Doorway). This is the only feature identified in the room. Located slightly north of center along the eastern wall, this doorway allows passage between Rooms 2 and 4. The dimensions of the doorway are 45 by 58 by 20 cm and it lies directly west of Feature 2, the collared hearth in Room 2. There is a considerable amount of plaster that is flush with the bottom of the doorway, and there is a footing stone at the base of the wall that measures 31 by 20 by 20 cm. Three courses of stone were present in the wall to the south, and two were present in the wall to the north of the doorway. Three unpainted ceramics (FS 1691) and a sample of wall mortar (FS 1693) were collected from the doorway.

Room 5

Sequence of excavation. Room 5 is located in the south-central portion of the roomblock and is 3.50 m north-south by 2.30 m east-west, giving an interior floor space of 8.05 m^2. Room 5 is in the front set of rooms and is located immediately south of Room 2 and west of Room 9. This room is the largest of the front rooms and has an entry/exitway in the northeast corner to Room

9. The room was highly disturbed by bioturbation and, as a result, the floor was in very poor condition (Figure 24.26).

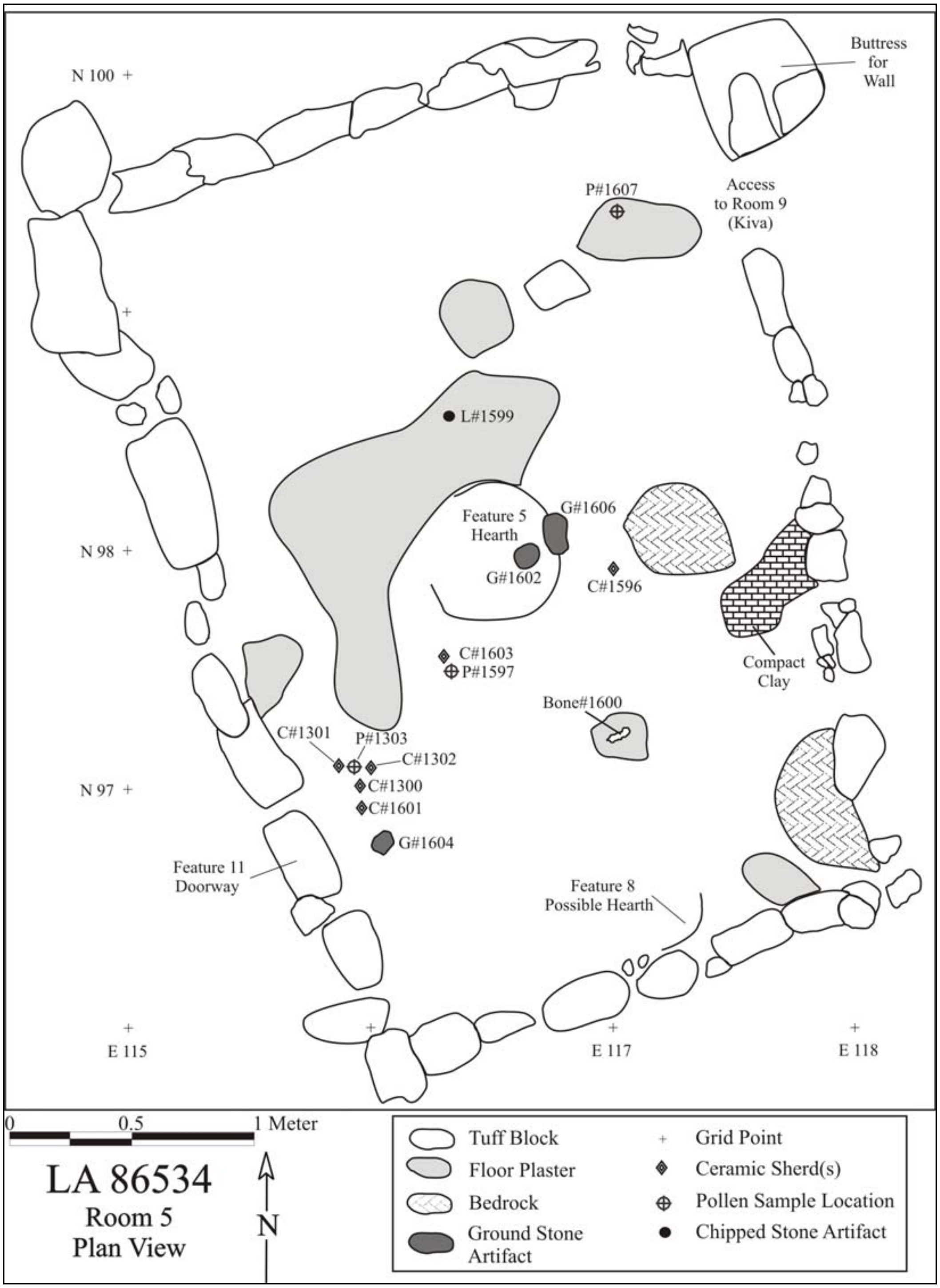

Figure 24.26. Plan view of Room 5 floor after excavation.

Units in the 115E line were excavated first as part of the overall profile trench of the roomblock. These units were excavated in stratigraphic units to the top of rooffall (Stratum 6). At this point, excavations ceased temporarily until all units in the roomblock were down to the top of the rooffall level. Units in Room 5 that were not in the 115E line were excavated in one large level (Strata 1 and 2) down to the top of the rooffall level. All units in the room were then excavated down to floor (Stratum 8).

Three features were identified in the room: Feature 5 was a collared hearth located near the center of the room, Feature 8 was a possible second hearth located along the southern wall, and Feature 11 was the doorway between the western wall of Room 5 and the eastern wall of Room 6. Feature 8 was in extremely poor condition and all that remained was a 10 cm section of probable collar. Both hearths were heavily disturbed and mostly destroyed, which precluded the collection of samples.

Fill. On average, Stratum 1 was an approximately 10- to 15-cm-thick layer of post-occupational fill and consisted of the very loose and unconsolidated soil. Some areas contained a high organic content from the duff associated with piñon and juniper trees in the area. Artifact density in this stratum was the highest. Stratum 2 consisted of the general room fill, which contained an abundant amount of rubble wallfall and was about 25 to 35 cm thick. The stratum was also loose and unconsolidated, and artifact density was lower than Stratum 1, but still considerably high. Strata 1 and 2 were combined throughout this room. The bottom of Stratum 2 contained the abrupt contact with rooffall (Strata 6 and 7).

In Room 5, Stratum 6 was anywhere from 7 to 20 cm thick at its thickest point, but averaged about 10 cm. Rooffall in this room contained abundant, but usually small, fragments of adobe similar to that observed in the walls, and artifact density was considerably less than in Strata 1 and 2. As with all the other rooms in the roomblock, Stratum 8 was the floor stratum. Floor was present in small patches throughout the room. The northern one-third of the room was particularly disturbed by rodents, and in much of this portion of the room, excavations went sub-floor because floor was never encountered. The middle one-third of the room was in better shape, with patchy floor. In general, artifact density in this front room was comparable to other front rooms and lower than the density of artifacts in the back rooms. Table 24.22 shows the general artifact counts by stratigraphic unit for Room 5.

Table 24.22. Room 5 artifact counts by stratigraphic units.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
1	1204	160	73	4	**1441**
1,2	59	6	0	0	**65**
6	185	40	8	6	**239**
6,7	359	43	3	8	**413**
8	5	1	3	1	**10**
Total	**1812**	**250**	**87**	**19**	**2168**

Floor. The floor in this room was in poor condition. The best patches of floor were located in the center of the room, and the only area where floor plaster coped with wall plaster was located in the southeastern corner of the room. Most of the intact floor was close to the central hearth, but was patchy at best (Figure 24.27). Two hearths were identified in this room. The central hearth (Feature 5) was in good condition in terms of its external appearance, but was heavily disturbed in the interior of the hearth. Feature 8, a possible hearth located along the southern edge of the room, was in very poor condition, and all that remained was a 10-cm section of plaster. No collar was identified in association with this hearth.

Figure 24.27. Feature 5 (hearth) in center of Room 5.

A number of artifacts were found on the floor and include the following: five plainware sherds, one Santa Fe Black-on-white sherd, and one indented corrugated sherd (FS 1300, FS 1301, FS 1302, FS 1594, FS 1596, FS 1601, and FS 1603), a basalt cobble biface (FS 1599), a medium- to large-sized mammal long bone shaft fragment (FS 1600), and three pieces of ground stone (FS 1602, FS 1604, and FS 1606). These items included a one-hand basalt mano, a one-hand dacite mano, and a vesicular basalt grinding slab.

Three pollen samples were taken from under artifacts on the floor of Room 5 (FS 1303, FS 1597, and FS 1607). FS 1303 was taken from under one of the plainware sherds (FS 1302) and identified taxa included maize, cholla (*Opuntia*), lily family (Liliaceae), cheno-ams, grass family, sunflower family, ragweed/bursage, unidentified pine, piñon pine, and Mormon tea (*Ephedra* sp.). FS 1597 was taken from under the Santa Fe Black-on-white sherd (FS 1603) and identified taxa included prickly pear (*Opuntia*), cheno-ams, pea family (Fabaceae), sunflower family, ragweed/bursage, chicory Tribe (Liguliflorae), evening primrose (Onagraceae), unidentified pine, piñon pine, juniper, oak, rose family, and sagebrush. FS 1607 was taken from under a plainware sherd (FS 1601) and identified taxa included cholla, prickly pear, parsley family

(Apiaceae), cheno-ams, grass family, sunflower family, ragweed/bursage, unidentified pine, piñon pine, juniper, and sagebrush. No flotation samples were collected from the floor because of the extensive rodent disturbance.

Wall Construction. Both shaped and unshaped tuff blocks were used in the construction of this room. It appears as though the western wall of the room was constructed first as part of the central wall of the roomblock and that the eastern wall (front roomblock wall) was built either next or at the same time as the western wall. After these two walls were constructed, the northern and southern walls were then abutted to the western and eastern walls. The eastern wall is only a single course high and is not contiguous between the northern and southern walls. The northern, western, and southern walls are each three to four courses high and are generally in good condition. Table 24.23 shows the general wall measurements for each of the walls.

Table 24.23. Room 5 wall measurements.

Wall Orientation	Length (m)	Height (m)	Thickness (m)
North	2.33	0.41	0.19
South	2.21	0.32	0.21
East	3.51	0.32	0.22
West	3.63	0.29	0.23

Artifacts and Samples. Artifacts and samples from 98N/117E (FS 405, FS 1036 through FS 1038, FS 1183 through FS 1186, FS 1430 through FS 1434, FS 1605, and FS 2132 through FS 2134) and 96N/116E (FS 409, FS 1092 through FS 1096, FS 1132 and FS 1133, FS 1435 through FS 1439, and FS 1604) were selected for analysis in this room, and all artifacts from these two 1- by 1-m columns were analyzed. In addition to the artifacts analyzed from these two units, several other artifacts were selected for analysis. These include a vesicular basalt grinding slab fragment recovered from the floor (FS 1606), a Pedernal chert hammerstone (FS 1294), a basalt cobble biface (FS 1599), a polished gray ceramic pipe stem (FS 1416), a possible deflector (FS 1605), the proximal end of a black translucent obsidian projectile point (FS 1266), and a one-hand quartzite mano (FS 1390). Table 24.24 lists the samples selected for analysis from Room 5.

Table 24.24. Samples selected for analysis in Room 5.

Stratum	SAMPLE TYPE				
	Pollen	Flotation	Macrobotanical	TL	Archaeomagnetic
1	--	1170	1096, 1219	--	--
1,2	--	--	1241	--	--
6	1297	1402, 1512	1262, 1285, 1412	--	--
8	1303, 1597, 1607	--	--	--	--
12	--	1353, 1389	--	--	1205

Twenty percent of the macrobotanical samples from each stratum in Room 5 were selected for analysis. A total of six samples were analyzed from Room 5, but none of the vegetal materials were identifiable. Samples were collected from all strata except the floor and the hearth, as no macrobotanical remains were identified from either of these contexts. Pollen and flotation samples were also taken from this room. Taxa identified in the flotation samples include the following taxa: pigweed, goosefoot, saltbush/greasewood, maize, unknown conifers, juniper, piñon pine, ponderosa pine, oak, and other unidentified remains. The flotation samples from the rooffall stratum included both maize and bean remains. Taxa identified in the analyzed pollen samples include maize, cholla (*Opuntia*), lily family (Liliaceae), parsley family (Apiaceae), sunflower family, ragweed/bursage, broad spine sunflowers, spurge family (Onagraceae), unidentified pine, piñon pine, juniper, oak, rose family (Rosaceae), sagebrush, Mormon tea (*Ephedra*), Chicory tribe (Liguliflorae), cheno-ams, and unidentified grasses.

Identified ceramics from these two grids included 29 smeared-indented corrugated sherds, 16 unpainted sherds, 14 Santa Fe Black-on-white sherds, two plainwares, seven indented corrugated sherds, one plain corrugated sherd, and one Chupadero Black-on-white sherd. Five pieces of ground stone were identified and included three unidentified quartzite ground stone fragments, one dacite one-hand mano, and one welded tuff formal slab metate fragment. Of the 33 pieces of bone recovered from this room, 17 were identified to at least the level of class. The pocket gopher (*Thomomys bottae*) remains were likely intrusive, and the kangaroo rat (*Dipodomys* sp.) specimen may also have been intrusive, as all were associated with the rooffall level. Several of the bones, including the red-tailed hawk (*Buteo jamaicensis*), the cottontail (*Sylvilagus* sp.), and the coyote (*Canis latrans*) bones were recovered from just above the floor. No worked specimens were recovered from this room. Table 24.25 lists the chipped stone materials recovered in this room.

Table 24.25. Chipped stone artifacts recovered from sampled units in Room 5.

Type	Material	Number
Angular debris	Rhyolite	1
	Pedernal chert	2
	Unidentified metamorphic	1
	Quartzite	4
	Chalcedony	3
Core flake	Chalcedony	9
	Rhyolite	2
	Pedernal chert	2
	Quartzite	1
	Unidentified metamorphic	1
Microdebitage	Chalcedony	10
	Black translucent obsidian	1
Manuport	Quartzite	1
Unidentified flake	Unidentified metamorphic	1
Biface flake	Black translucent obsidian	1
	Chalcedony	1
	Pedernal chert	1
	Rhyolite	1
Biface	Black translucent obsidian	1

Room 5 Features

Feature 5 (Hearth). Feature 5 is a plaster-lined collared hearth located in the center of Room 5 (see Figures 24.26 and 24.27). Stratum 12 represents the fill removed from this hearth. The hearth is approximately 51 by 47 by 15 cm in size and is roughly circular in shape. The collar around the hearth is raised only slightly (less than 2 cm) above the floor, similar to the hearth in Room 2, just to the north. Both of these hearths are distinct from the hearth in Room 1, which is raised some 10 cm above the floor. The hearth was excavated into bedrock and then plastered, and the collar was burned. Feature 5 was significantly rodent disturbed, especially on the western side. Because of the heavy disturbance throughout the hearth fill, no pollen samples were taken. Two flotation samples were taken (FS 1353 and FS 1389) in the least disturbed portions of the hearth, and the following carbonized taxa were identified in the samples: goosefoot seeds, saltbush/greasewood, maize cupule and kernel fragments, unknown conifers, juniper, piñon pine needles, ponderosa pine, and oak. A single ground stone artifact, a quartzite one-hand mano (FS 1390), was recovered from the hearth. During excavation, it was difficult to distinguish the hearth fill from the general fill because of the deteriorated nature of the hearth. As a result, neither a plan map nor a profile was drawn. Archaeomagnetic samples procured from the hearth produced a date range of AD 1235–1270. Maize cupules were identified in FS 1389 and were submitted for radiocarbon analysis. The sample yielded an age of 800±40 BP (Beta-183762) and a date of cal AD 1250 with a two-sigma date range of cal AD 1210–1270, which closely matched the archaeomagnetic date from the feature.

Feature 8 (Partial Hearth). Feature 8 is a possible partial hearth located in the southern portion of Room 5 (see Figure 24.26). The feature is located due south of Feature 5 and is flush with the southern wall of the room. Only a small portion of the feature remained when it was identified during excavation. The plaster lining that remained in the feature was cracked and crumbling and was approximately 2 cm thick. The remaining portion of the hearth measures 30 by 13 cm, and there is no depth to the feature. Because of its significantly disturbed and destroyed nature, there was no fill and no samples were taken.

Feature 11 (Doorway). Feature 11 is a doorway located slightly south of center along the western wall. The doorway allowed passage between Rooms 5 and 6. The dimensions of the doorway are 47 by 20 by 16 cm, and it lies directly east of Feature 5, the collared hearth in Room 5. There is almost no plaster at the bottom of the doorway, which is flush with the floor, and there is a footing stone at the base of the doorway that measures 28 by 19 by 18 cm. Four courses of stone were present in the wall to the south and three were present in the wall to the north of the doorway. No artifacts were collected from the doorway fill. Neither a plan map nor a profile of the feature was drawn.

Room 6

Sequence of excavation. Room 6 is located in the south-central portion of the roomblock and is 2.95 m north-south by 1.8 m east-west, giving about 5.30 m^2 of interior space. It is in the back row of rooms and is located immediately to the south of Room 4 and to the west of Room 5. In general, the room was in good shape, with a minimal amount of disturbance. No roots or stumps were identified in the room, and the floor was in decent shape with about 50 percent of the floor intact (Figure 24.28).

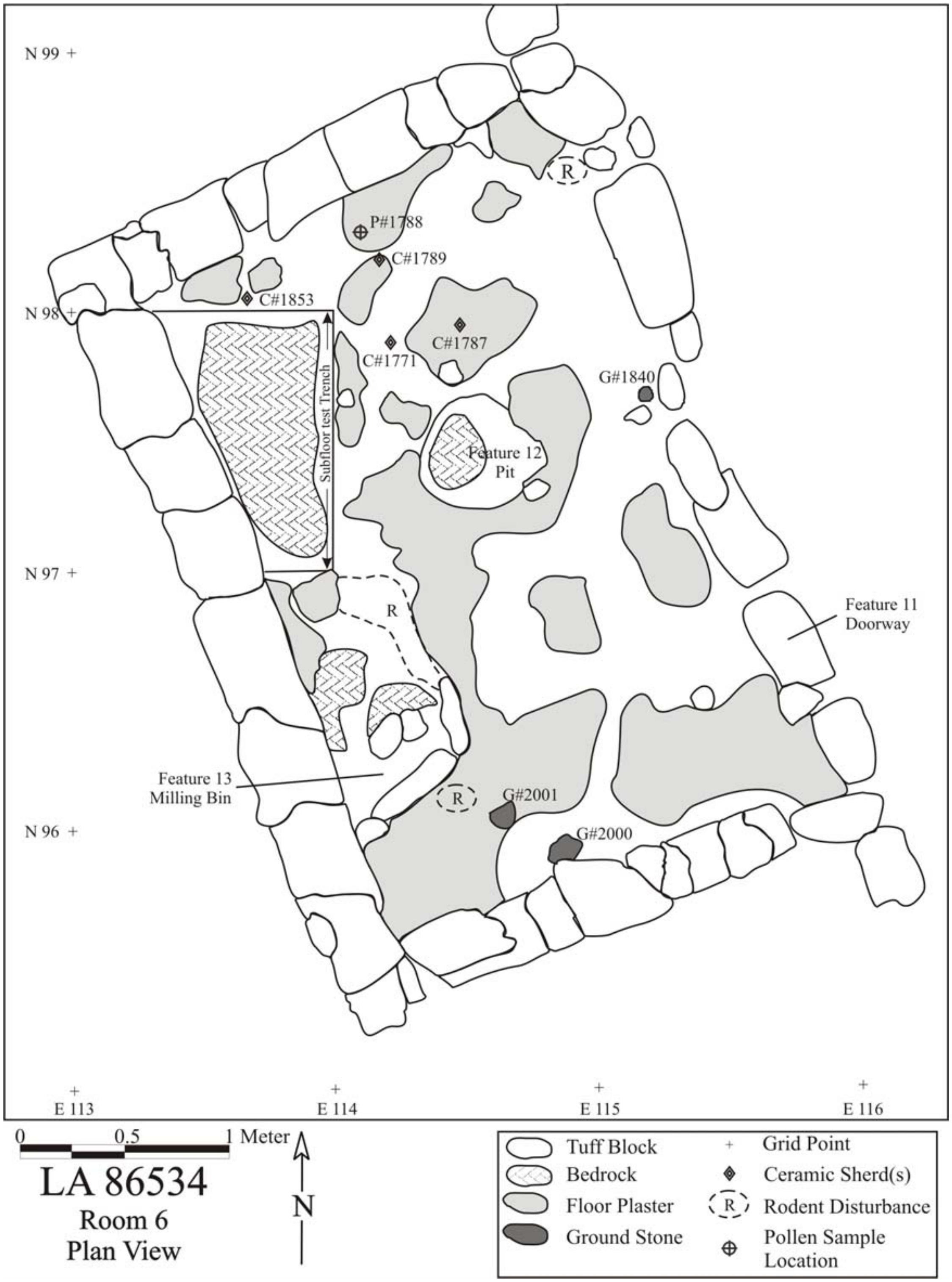

Figure 24.28. Plan view of Room 6 floor after excavation.

As in the other rooms, 1- by 1-m units in this room were excavated in stratigraphic units (and in 10-cm levels within the strata if it was thicker than 10 cm) to the top of rooffall (Stratum 6). Once units were excavated to the top of rooffall, the excavations ceased temporarily until all units were at the same level. Then, all units in the room were excavated down to floor (Stratum 8). Three features were identified in this room: a doorway (Feature 11), a shallow plaster-lined pit (Feature 12), and a milling bin (Feature 13).

Fill. On average, Stratum 1 was an approximately 10-cm-thick layer of post-occupational fill and consisted of very loose and unconsolidated soil. As in the other rooms, some areas contained a high organic content from the duff associated with piñon and juniper trees in the area. Artifact density in Stratum 1 was the highest. Stratum 2 consisted of the general room fill, which contained an abundant amount of rubble wallfall and was about 25 to 30 cm thick. The stratum was also loose and unconsolidated, and artifact density was lower than Stratum 1, but still considerably high. The bottom of Stratum 2 contained the abrupt contact with rooffall (Stratum 6).

In Room 6, Stratum 6 was anywhere from 7 to 20 cm thick at its thickest point, but averaged about 10 cm. Rooffall in this room contained abundant, but usually small, fragments of adobe similar to that observed in the walls, and artifact density was considerably less than in Strata 1 and 2. As with all the other rooms in the roomblock, Stratum 8 was the floor stratum in this room. Floor was present in about half of the room, with large patches in the southern half, the center, and along the western wall. In general, artifact density in this back room was lower than the density of artifacts in the adjacent front rooms. A shallow, plaster-lined pit (Feature 12) and a milling bin (Feature 13) were identified in this room. Stratum 14 represents the fill from Feature 12 and Stratum 16 represents the fill from Feature 13. Table 24.26 shows the general artifact counts by stratigraphic unit for Room 6.

Table 24.26. Room 6 artifact counts by stratigraphic units.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
1	766	103	20	4	**893**
6	38	6	0	1	**45**
6,7	141	21	6	1	**169**
8	6	0	1	3	**10**
14	4	2	9	1	**16**
16	0	0	1	0	**1**
Total	**955**	**132**	**37**	**10**	**1134**

Floor. The floor in this room was in fairly good condition (see Figure 24.28). Several rooms were in much worse shape, and only Room 4 contained better patches of floor. The dominant area of floor was located in the southern half of the room and along the western wall. Small patches also exist near the center of the room and in the southeastern corner. Some of the floor plaster coped with wall plaster in the southeastern corner of the room. A milling bin was identified in the southwestern portion of the room, and a small, shallow, plaster-lined pit was identified near the center of the room. The feature was amorphous but roughly circular in shape and was heavily rodent disturbed. Its function is unknown. A concentration of ceramics (FS 1771, FS 1787, FS 1789, FS 1853, and FS 1998) and one welded tuff grinding slab (FS 2000) were found on the floor of the room. Two other ground stone fragments (FS 1840 and FS 2001) were found just above the floor. The ceramics included two smeared-indented corrugated sherds, three indented corrugated sherds, and one plainware sherd. In addition, a macrobotanical sample (FS 1997) and a pollen sample (FS 1788) were collected from the floor. Two fragments of ponderosa pine charcoal and one of unknown conifer were identified in the macrobotanical sample. The following taxa were identified in the pollen sample: maize, prickly pear, beeweed, buckwheat (*Eriogonum*), sunflower family, ragweed/bursage, unidentified pine, piñon pine, juniper, sagebrush, cheno-ams, and unidentified grasses.

Wall Construction. Both shaped and unshaped tuff blocks were used in the construction of this room. It appears as though the western wall of the room was constructed first as part of the rear wall of the roomblock and that the eastern wall (central roomblock wall) was built either next or at the same time as the western wall. After these two walls were constructed, the northern and southern walls were then abutted to the western and eastern walls. All four walls were at least three courses high. Table 24.27 shows the general wall measurements for each of the walls.

Table 24.27. Room 6 wall measurements.

Wall Orientation	Length (m)	Height (m)	Thickness (m)
West	2.96	0.30	0.21
East	2.94	0.31	0.23
North	1.80	0.47	0.20
South	1.75	0.32	0.25

Artifacts and Samples. All artifacts and samples from 97N/114E (FS 1149 through FS 1153, FS 1765 through FS 1771, FS 1787, FS 1856 through FS 1860, FS 1906 through FS 1910, FS 1915, FS 1929, FS 1961 through FS 1963, FS 1965, and FS 2247) and 96N/114E (FS 1115 through FS 1118, FS 1187 through FS 1192, FS 1652 through FS 1656, FS 1960, FS 1964, FS 1966, FS 1999, and FS 2001) were analyzed. In addition, several other artifacts were selected for analysis and included two Santa Fe Black-on-white sherds (FS 1919 and FS 1969) from Feature 12 and a black translucent obsidian projectile point (FS 1852). Table 24.28 lists the samples selected for analysis from Room 6.

Table 24.28. Samples selected for analysis in Room 6.

Stratum	SAMPLE TYPE				
	Pollen	Flotation	Macrobotanical	TL	Archaeomagnetic
1,2	--	--	1064, 1124	--	--
6	--	--	1655, 1959	--	--
8	1788	--	1997	--	--
14	1908, 1915	1860, 1906	1858, 1965	--	--
16	1960	1966	1964	--	--

Twenty percent of the macrobotanical samples from each stratum in Room 6 were selected for analysis, generating a total of eight samples. The following taxa were identified in these samples: unidentified pine, piñon pine, ponderosa pine, oak, and unknown conifer. Pollen and flotation samples were also taken from this room. Taxa identified in the flotation samples from Room 6 include goosefoot, maize, four-wing saltbush (*Atriplex*), saltbush/greasewood, unknown conifer, juniper, piñon pine, ponderosa pine, oak, and uncharred tobacco (*Nicotiana*). Pollen samples included the following taxa: maize, prickly pear, cactus family (Cactaceae), beeweed, buckwheat, purslane (*Portulaca*), sunflower family, ragweed/bursage, broad spine sunflower, long spine sunflower, unidentified pine, piñon pine, juniper, oak, sagebrush, pea family (Fabaceae), spurge family, rose family (Rosaceae), cheno-ams, and unidentified grasses.

Identified ceramics from these two grids included nine unpainted sherds, 12 Santa Fe Black-on-white sherds, one Chupadero Black-on-white sherd, 11 smeared-indented corrugated sherds, five indented corrugated sherds, one plain corrugated sherd, and three plainware sherds. Ten pieces of ground stone were identified and included one andesite mano fragment, one rhyolite mano fragment, two dacite one-hand manos, two dacite abrading stones, one dacite metate fragment, one welded tuff one-handed mano, and two welded tuff metate fragments. Of the eight pieces of bone recovered from this room, only two were identified to the level of class. Identified remains are likely intrusive and include a single pocket gopher (*Thomomys bottae*) and indeterminate rodent (Rodentia) bone. No worked bones were identified in this room. Table 24.29 lists the chipped stone materials recovered in this room.

Table 24.29. Chipped stone artifacts recovered from sampled units in Room 6.

Type	Material	Number
Hammerstone	Quartzite	1
	Chalcedony	1
Core flake	Chalcedony	17
	Pedernal chert	5
	Black translucent obsidian	2
	Quartzite	1
	Unidentified metamorphic	1
	Rhyolite	1
Angular debris	Chalcedony	1
	Quartzite	1
	Pedernal chert	3
Microdebitage	Pedernal chert	2
	Chalcedony	4
	Black translucent obsidian	1
Biface flake	Chalcedony	1

Room 6 Features

Feature 11 (Doorway). Feature 11 is a doorway located slightly south of center along the eastern wall that sits between Rooms 5 and 6. The dimensions of the doorway are 47 by 20 by 16 cm, and it lies directly east of Feature 5, the collared hearth in Room 5. There is almost no plaster at the bottom of the doorway that is flush with the floor, and there is a footing stone at the base of the doorway that measures 28 by 19 by 18 cm. Four courses of stone were present in the wall to the south, and three were present in the wall to the north of the doorway. No artifacts were collected from the doorway fill. Neither a plan map nor a profile was draw.

Feature 12 (Pit). Feature 12 is a shallow, plaster-lined pit located near the center of Room 6 (see Figure 24.28). Stratum 14 represents the fill removed from the pit. The amorphous pit is approximately 55 by 60 by 25 cm in size and is roughly circular to ovoid in shape. The function of the pit is unknown and its integrity as a feature is doubtful, but the patches of plaster lining the pit would appear to be intentional. The north side and most of the bottom was missing due to extensive rodent disturbance. The remaining portion of the pit was constructed by lining dacite cobbles in a constructed depression, and then plastering over the cobbles. A large piece of charred ponderosa pine (*Pinus ponderosa*; FS 1858) was recovered in the feature fill. One section of the bottom of the pit was well-preserved and contained hard ash and charcoal. A few sections of the plaster lining the pit were burned, but other sections were completely unburned.

The western side of the feature was heavily rodent disturbed. Samples were taken, but are less reliable than those recovered from the intact eastern half. As a result, only one flotation sample (FS 1860) from the western half of the hearth was submitted for analysis. Charred taxa identified in this sample included maize, four-wing saltbush, unknown conifer, juniper, piñon pine, ponderosa pine, and oak. One flotation sample (FS 1906) and one pollen sample (FS 1908) were taken from the eastern half. Taxa identified in the flotation sample included maize, unknown conifer, juniper, unidentified pine, piñon pine, and oak. Taxa identified in the pollen sample included prickly pear, beeweed, purslane, sunflower family, spurge family, unidentified pine, piñon pine, juniper, rose family, sagebrush, cheno-ams, and unidentified grasses. Five pieces of ground stone were identified in the feature. They included a dacite metate fragment, a dacite one-hand mano, a welded tuff metate fragment, and two dacite abrading stones. In addition, a chalcedony hammerstone and core flake (FS 1910 and FS 1961) and four smeared-indented corrugated sherds were recovered from this feature. Figure 24.29 shows a photograph of the amorphous pit in Room 6.

Figure 24.29. Feature 12, an amorphous pit in Room 6.

Feature 13 (Milling Bin). Feature 13 is a shallow milling bin located along the western wall of Room 6 and is approximately 60 cm south of Feature 12 (see Figure 24.28). Stratum 16 represents the fill removed from the milling bin. The feature is approximately 60 by 60 by 25 cm in size and is roughly ovoid in shape. The feature is defined by two upright stones and a probable third and fourth stone that may have enclosed the bin on three sides (Figure 24.30).

The western wall of Room 6 would have formed the back of the bin. The inside of the feature was lined with plaster and had a well-preserved plastered floor. One flotation sample (FS 1966) and one pollen sample (FS 1960) were taken from this feature. The following taxa were identified in the flotation sample: uncharred tobacco (*Nicotiana*), maize, saltbush/greasewood, unknown conifer, juniper, and ponderosa pine. Results from the pollen sample included the following taxa: prickly pear, long spine sunflowers, pea family (Fabaceae), sunflower family, spurge family, unidentified pine, piñon pine, juniper, oak, sagebrush, cheno-ams, and unidentified grasses. A one-hand dacite mano (FS 1999) and a macrobotanical sample (FS 1964) were collected from the feature. The macrobotanical sample contained remnants of unknown conifer, unidentified pine, ponderosa pine, and oak.

Figure 24.30. Feature 13, a milling bin.

Room 7

Sequence of Excavation. Room 7 is located in the southeast corner of the roomblock and is 3.1 m north-south by 2.20 m east-west, giving about 6.82 m^2 of interior space. The north-south measurements and the overall interior floor space measurement are incomplete. This is due to the fact that Room 7 is the most southerly of the front rooms and was heavily impacted by the construction of NM 502. Based on the dimensions of the room, it is likely that construction just clipped the southern wall of the room, but it was not located during excavation. Room 7 is located immediately south of Room 5 and east of Room 8. In general, the remaining portion of the room was in fair shape. The south wall was gone, the floor was only present in about half of the room, and the remaining three walls were still upright (Figure 24.31). As in the other rooms, units in this room were excavated in stratigraphic units (and in 10-cm levels within the strata if it was thicker than 10 cm) to the top of rooffall (Stratum 6). Once units were excavated to the top of rooffall, excavations ceased temporarily until all units were excavated to the same level. Then, all units in the room were excavated down to floor (Stratum 8). A significantly disturbed hearth (Feature 9) was identified in the center of the room.

Fill. On average, Stratum 1 was an approximately 10-cm-thick layer of post-occupational fill and consisted of the very loose and unconsolidated soil. As in the other rooms, some areas contained a high organic content from the duff associated with piñon and juniper trees in the area. Additionally, Stratum 1 in this room included a dense concentration of road rubble that was deposited in the upper layers of the roomblock during highway construction. This stratum, as well as the top few centimeters of Stratum 2, contained a number of cobbles, gravel, and chunks of tar and concrete. Unlike any of the other rooms in the roomblock, artifact density was not the highest in Stratum 1. Stratum 2 consisted of the general room fill, which contained an abundant amount of rubble wallfall and was about 35 to 40 cm thick. This stratum was thicker in Rooms 7 and 8 because of the deposited construction material. Stratum 2 was also loose and unconsolidated, and artifact density was lower than Stratum 1. Road construction debris was present in this stratum down to the contact with rooffall (Stratum 6).

In Room 7, Stratum 6 was anywhere from 5 to 25 cm thick, but averaged about 12 cm. Rooffall contained abundant, but usually small, fragments of adobe similar to that observed in the walls, and artifact density was higher than in Strata 1 and 2. This is different compared to other rooms, but is likely due to the disturbance that resulted from construction. As in the other rooms, Stratum 8 was the floor stratum. Floor was present in about half of the room, with large patches along the eastern and western walls. A shallow, collared hearth (Feature 9) was identified near the center of the room, and no artifacts were identified on the floor. Stratum 19 represents the fill from Feature 9. Table 24.30 shows the general artifact counts by stratigraphic unit for Room 7.

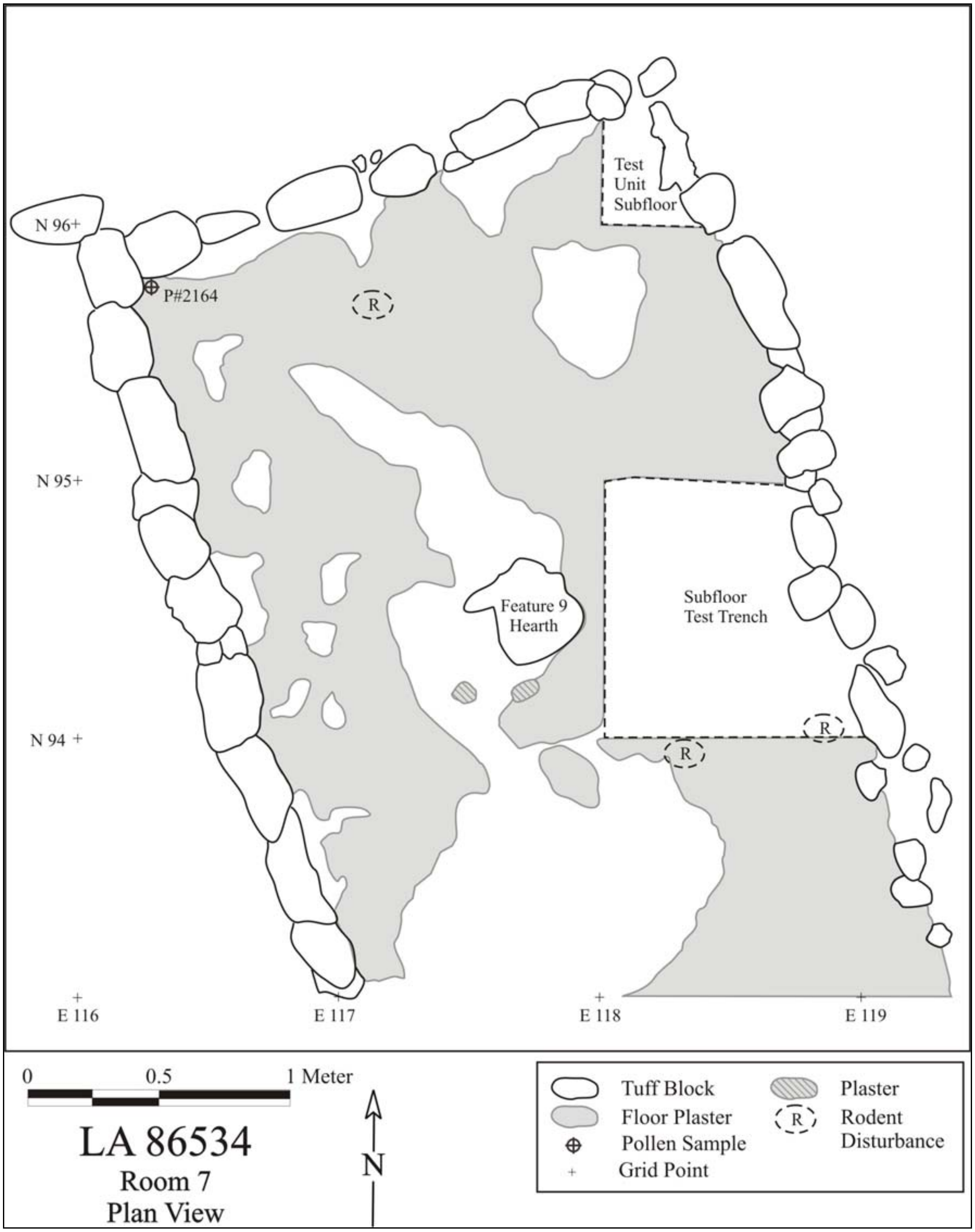

Figure 24.31. Plan view of Room 7 after excavation.

Table 24.30. Room 7 artifacts by stratigraphic units.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
1	195	8	0	0	**203**
2	107	33	2	0	**142**
1,2	193	20	1	0	**214**
6,7	206	22	2	4	**234**
19	1	1	0	0	**2**
Total	**702**	**84**	**5**	**4**	**795**

Floor. The floor in this room was in fair condition. The dominant area of floor was located along the eastern and western walls where there were some good areas of articulation between the floor and the walls (see Figure 24.31). Small patches were also located near the center of the room, but were very disturbed around the hearth (Feature 9). The hearth is plaster-lined and was identified in the center of the room. Unlike Rooms 1, 2, and 5, the central hearth was not collared. It is possible that it may have been collared originally, but significant rodent disturbance severely damaged the structural integrity of the hearth. No artifacts were found on the floor, but one pollen sample (FS 2164) was collected. Taxa identified on the floor included prickly pear, beeweed, nightshade family, cheno-ams, grass family, sunflower family, ragweed/bursage, broad spine sunflowers, piñon pine, juniper, and sagebrush.

Wall Construction. Shaped and unshaped tuff blocks were used in the construction of this room. It appears as though the western wall of the room was constructed first as part of the central wall of the roomblock and that the eastern wall (front roomblock wall) was built either next or at the same time as the western wall. After these two walls were constructed, the northern and (probably) southern walls were then abutted to the western and eastern walls, although this is uncertain given the fact that the southern wall was obliterated by the construction of NM 502. The western wall is three courses high, while the eastern and northern walls vary between one and two courses. Table 24.31 shows the general wall measurements for each of the remaining walls.

Table 24.31. Room 7 wall measurements.

Wall Orientation	Length (m)	Height (m)	Thickness (m)
West	3.00	0.25	0.23
North	2.20	0.25	0.17
East	3.55	0.20	0.18
South	--	--	--

Artifacts and Samples. Artifacts and samples from two 1- by 1-m units were selected for analysis in this room. Grids selected from Room 7 include 95N/117E (FS 1134, FS 1135, FS 1206, FS 1976 through FS 1979, and FS 2165 through FS 2167) and 94N/118E (FS 1684 through FS 1686, FS 1726, FS 1758, FS 1760, and FS 1763 through FS 1764), and all artifacts from these two columns were analyzed. In addition to the artifacts analyzed from these two units, a single black translucent obsidian biface (FS 1615) was analyzed. Table 24.32 lists the samples selected for analysis from Room 7.

Table 24.32. Samples selected for analysis in Room 7.

Stratum	SAMPLE TYPE				
	Pollen	Flotation	Macrobotanical	TL	Archaeomagnetic
1	--	--	984	--	--
2	--	--	2004, 2143	--	--
6	--	1726	1760, 1978	--	--
8	2164	--	--	--	--
19	1645	2172	2170	--	--

Twenty percent of the macrobotanical samples from each stratum in Room 7 were selected for analysis. A total of six macrobotanical samples were analyzed from Room 7. Samples were collected and analyzed from all strata except the floor. The following taxa were identified in these samples: maize, mountain mahogany (*Cercocarpus*), cottonwood/willow (*Populus/Salix*), oak, unknown conifer, juniper, unidentified pine, piñon pine, and ponderosa pine. Pollen and flotation samples were also taken from this room. Taxa identified in the pollen samples include maize, cholla and prickly pear, beeweed, buckwheat, nightshade family, mustard family, broad spine sunflower, sunflower family, ragweed/bursage, possible marshelder (low spine), spurge family, unidentified pine, piñon pine, juniper, sagebrush, cheno-ams, and unidentified grasses. Carbonized remains identified in the flotation samples include the following taxa: cheno-ams, maize, unknown conifer, juniper, pine, piñon pine, and oak.

Identified ceramics from these two grids included 10 Santa Fe Black-on-white sherds, five unpainted sherds, 15 smeared-indented corrugated sherds, five indented corrugated sherds, one Wiyo Black-on-white sherd, one Galisteo Black-on-white sherd, and one plainware sherd. Of the seven pieces of bone recovered from this room, only one was identified to at least the level of class and was a pocket gopher (*Thomomys bottae*) humerus. Based on the appearance of this specimen, the bone is likely intrusive and not related to the original occupation of the site. No worked bones were identified in this room. Table 24.33 lists the chipped stone materials recovered in this room.

Table 24.33. Chipped stone artifacts recovered from sampled units in Room 7.

Type	Material	Number
Core flake	Chalcedony	3
	Black translucent obsidian	1
	Quartzite	1
	Basalt	1
	Chert	1
Angular debris	Chalcedony	2
Microdebitage	Black translucent obsidian	1
Hammerstone flake	Quartzite	1

Room 7 Features

Feature 9 (Hearth). Feature 9 is a centrally located hearth in Room 7. The feature was almost completely destroyed by rodent activity, and the fill was heavily disturbed. The bottom of the hearth is patchy at best, with a few small areas of plaster still intact. There is no collar on this hearth, which makes it distinct from all of the other hearths on the site, with the exception of Feature 8, the partial hearth in Room 5. The hearth measures 55 by 40 by 15 cm. Several artifacts were recovered from the hearth. These include a piece of black translucent obsidian microdebitage (FS 2169) and a single smeared-indented corrugated sherd (FS 2171). A pollen sample (FS 1645), a flotation sample (FS 2172), and a macrobotanical sample (FS 2170) were collected from the hearth. The pollen sample included the following taxa: maize, cholla, beeweed, buckwheat, mustard family, sunflower family, ragweed/bursage, possible marshelder (low spine), spurge family, unidentified pine, piñon pine, juniper, sagebrush, cheno-ams, and unidentified grasses.

The flotation sample included the following taxa: cheno-ams, maize, unknown conifer, juniper, unidentified pine, piñon pine, ponderosa pine, and oak. Juniper, piñon pine, and ponderosa pine were identified in the macrobotanical sample collected from the hearth. Maize cupules were identified in FS 2172 and were submitted for radiocarbon analysis. This sample yielded an age of 850±40 BP (Beta-183764) and a date of cal AD 1200 with a two-sigma date range of cal AD 1170–1240.

Room 8

Sequence of Excavation. Room 8 is located in the southwest corner of the roomblock and is 2.60 m north-south by 1.80 m east-west, giving about 4.68 m^2 of interior space. The north-south measurements and the overall interior floor space measurement are incomplete. This is due to the fact that Room 8 is the most southerly of the back rooms and, like Room 7, was heavily impacted by the construction of NM 502. Based on the dimensions of the room relative to other back rooms, it is likely that construction completely obliterated the southern wall of the room and it would have been an additional meter south of where our excavations ceased.

Room 8 is located immediately south of Room 6 and west of Room 7. The remaining portion of Room 8 was in poor shape. The south wall was gone, the floor was non-existent, and the remaining three walls were semi-stable at best (Figure 24.32). As in the other rooms, 1- by 1-m units were excavated in stratigraphic units (and in 10-cm levels within the strata if it was thicker than 10 cm) to the top of rooffall (Stratum 6). Once units were excavated to the top of rooffall, the excavations ceased temporarily until all units were at the same level. Then, all units in the room were excavated down to floor (Stratum 8). No features were identified in the room.

Fill. On average, Stratum 1 was an approximately 10-cm-thick layer of post-occupational fill and consisted of the very loose and unconsolidated soil. Stratum 1 in this room included a dense concentration of road rubble that was deposited in the upper layers of the roomblock during highway construction. This stratum, as well as the top few centimeters of Stratum 2, contained a number of cobbles, gravel, and chunks of tar and concrete. As in the other rooms, artifact density was not the highest in Stratum 1.

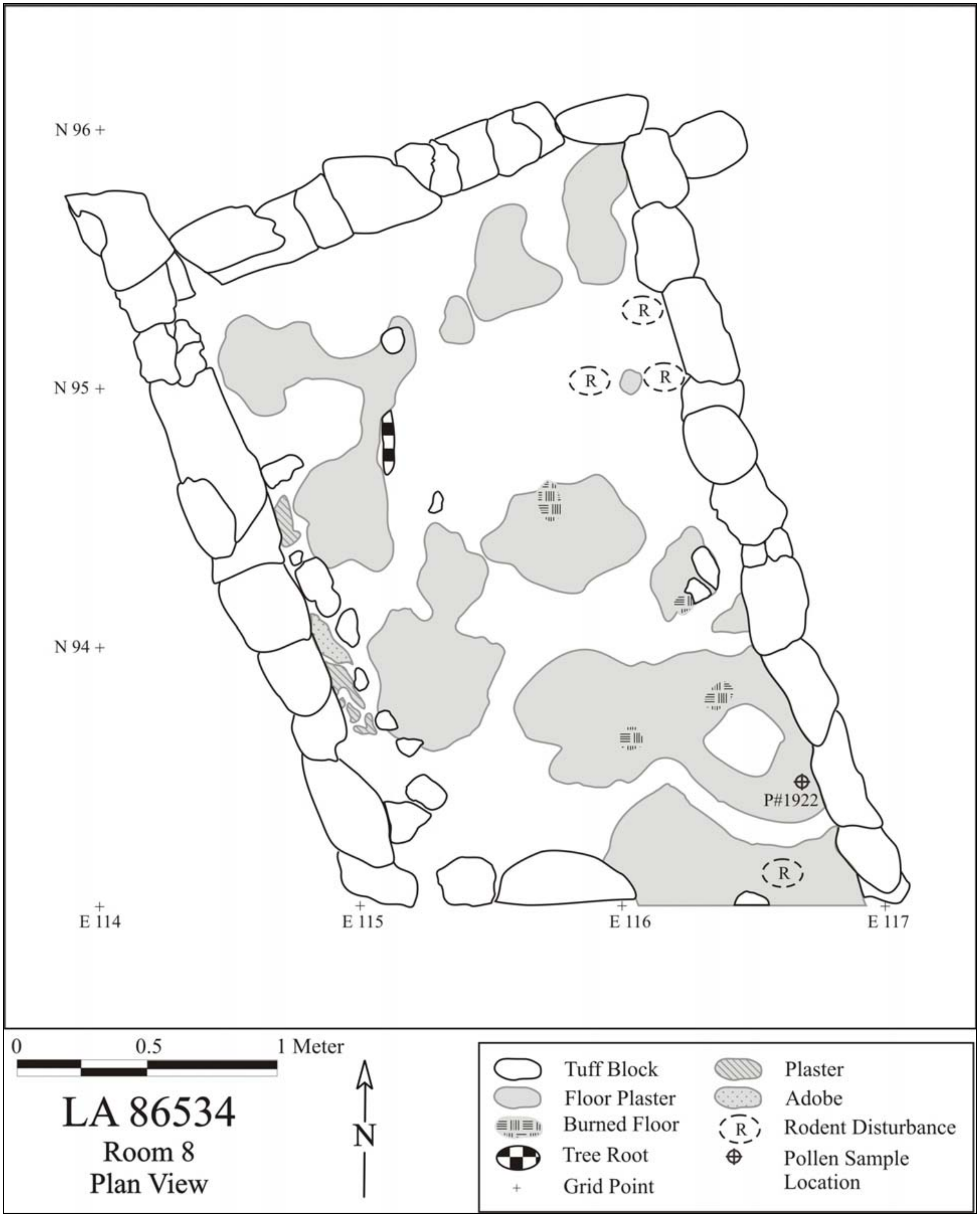

Figure 24.32. Plan view of Room 8 after excavation.

Stratum 2 consisted of the general room fill, which was about 35 to 40 cm thick and contained an abundant amount of rubble wallfall. This stratum was thicker in Rooms 7 and 8 because of the deposited construction material. Stratum 2 was also loose and unconsolidated, and artifact density was lower than in Stratum 1. Road construction debris was present in this stratum down to the contact with rooffall (Stratum 6). In Room 8, Stratum 6 was anywhere from 5 to 23 cm thick at its thickest point, but averaged about 11 cm. Rooffall in this room contained abundant, but usually small, fragments of adobe similar to that observed in the walls.

As with other rooms in the roomblock, Stratum 8 was the floor stratum. Patches of floor were present in some areas of the room and covered about one-third of the interior space. The floor was difficult to identify in this room because of disturbance related to road construction. No features were identified. Table 24.34 shows the general artifact counts by stratigraphic unit for Room 8.

Table 24.34. Room 8 artifacts by stratigraphic units.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
1	205	28	2	2	**237**
2	14	1	0	0	**15**
1,2	112	22	0	1	**135**
6	7	3	0	1	**11**
6,7	104	47	0	1	**152**
Total	**442**	**101**	**2**	**5**	**550**

Floor. In general, the floor in this room was in poor condition. The best patch of floor was located along the western wall, and the plastered floor in this area coped with the wall plaster (see Figure 24.32). The remainder of the room contained small patches of floor, which were disturbed by rodent activity. No artifacts were found on the floor of this room, but one pollen sample (FS 1922) was taken directly on the floor. Identified taxa from this sample include prickly pear, beeweed, purslane, sunflower family, ragweed/bursage, spurge family, piñon pine, unidentified pine, juniper, sagebrush, cheno-ams, and unidentified grasses.

Wall Construction. Shaped and unshaped tuff blocks were used in the construction of this room. It appears as though the western wall of the room was constructed first as part of the rear wall of the roomblock and that the eastern wall (central roomblock wall) was built either next or at the same time as the western wall. After these two walls were constructed, the northern and (probably) southern walls were then abutted to the western and eastern walls. The southern wall was obliterated by construction of NM 502, and so its construction history is uncertain. All three walls vary between one and two courses high. Table 24.35 shows the general wall measurements for each of the remaining walls.

Table 24.35. Room 8 wall measurements.

Wall Orientation	Length (m)	Height (m)	Thickness (m)
East	2.94	0.35	0.22
North	1.77	0.45	0.20

Wall Orientation	Length (m)	Height (m)	Thickness (m)
West	2.30	0.32	0.19
South	--	--	--

Artifacts and Samples. Artifacts and samples from 95N/115E (FS 1051 through FS 1055, FS 1203 through FS 1205, FS 1579 through FS 1581, FS 1682 and FS 1683, and FS 1835 and FS 1836) and 94N/115E (FS 1193 through FS 1195, FS 1331 and FS 1332, and FS 1805 through FS 1807) were selected for analysis in Room 8. All artifacts from these two columns were analyzed. Table 24.36 lists the samples selected for analysis from Room 8.

Table 24.36. Samples selected for analysis in Room 8.

Stratum	SAMPLE TYPE				
	Pollen	Flotation	Macrobotanical	TL	Archaeomagnetic
1	--	--	1235	--	--
1,2	--	--	1258	--	--
6	--	--	1581, 1667	--	--
8	1922	--	--	--	--

As outlined in the description of Room 1, 20 percent of the macrobotanical samples from each stratum in Room 8 were selected for analysis. A total of four macrobotanical samples were analyzed from Room 8. Samples were collected and analyzed from all strata except the floor. The following taxa were identified in these samples: unidentified pine, piñon pine, and ponderosa pine. Due to the heavy disturbance from both road construction and rodent activity in this room, few samples were taken, but a single pollen sample was taken from a small patch of floor. Identified taxa include prickly pear, beeweed, purslane, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, sagebrush, cheno-ams, and unidentified grasses.

Identified ceramics from these two grids included 12 Santa Fe Black-on-white sherds, one Chupadero Black-on-white sherd, nine unpainted sherds, 15 smeared-indented corrugated sherds, four indented corrugated sherds, and one plainware sherd. Two pieces of ground stone, a dacite grinding slab and a welded tuff ground stone fragment, were identified in the room. Of the five pieces of bone recovered from this room, two were identified to at least the level of class. A single wood rat (*Neotoma* sp.) ulna and a mule deer (*Odocoileus hemionus*) naviculocuboid were recovered in this room. No worked bones were identified in this room. Table 24.37 lists the chipped stone materials recovered in this room.

Table 24.37. Chipped stone artifacts recovered from sampled units in Room 8.

Type	Material	Number
Angular debris	Quartzite	2
	Chalcedony	1
Core flake	Quartzite	1
	Opaque obsidian	1
	Chalcedony	9

Type	Material	Number
	Pedernal chert	1
Microdebitage	Chalcedony	1
	Pedernal chert	1
	Black translucent obsidian	2

No features were identified in Room 8.

Room 9

Sequence of Excavation. Room 9 is located east of the roomblock and is immediately adjacent to Rooms 2 and 5. Room 9 is a subterranean, circular kiva that was constructed into bedrock. The room measures 4.3 m north-south by 4.1 m east-west, giving about 17.63 m^2 of interior space, which is by far the largest of any of the rooms. In general, the kiva was in excellent shape. The floor was well preserved and was continuous across the entire surface. The bedrock walls were in good condition, and the stacked masonry walls on top of the kiva were still present in the northeast and southern areas. Figure 24.33 shows Room 9 after it was completely excavated.

Figure 24.33. Room 9 after excavation.

No surface indications of the kiva were present before excavation. Therefore, a bobcat was used to scrape the area east of the roomblock, with a very ephemeral rock alignment being detected (see Figure 24.5). A 1- by 2-m test pit was placed over this alignment and was excavated almost 2 m down to floor. At this point, only one other 1- by 1-m unit was excavated by hand. This unit was located along the eastern wall of the kiva and was excavated in 20-cm arbitrary levels for stratigraphic control. Once the initial three units were excavated, all grids around the perimeter of the kiva were excavated by hand to expose the wall. This was done because the bobcat was going to remove the interior fill of the kiva and it was important for the operator to be able to see the perimeter. Once the perimeter of the kiva was entirely exposed, the bobcat removed the fill. The removal was done in four units. First, the kiva was bisected along the 120E line to separate the eastern and western halves. Then, the interior fill was separated into post-occupational fill and wallfall. The bobcat removed the fill in the following sequence: west half, post-occupational fill; west half, wallfall; east half, post-occupational fill, and east half, wallfall. Stratum 2 (wallfall) was mechanically removed to the top of the rooffall layer (Stratum 15). All kiva fill removed by the bobcat was screened and the artifacts collected. Once the fill was removed, we returned to hand excavation of 1- by 1-m grids. The rooffall stratum was removed by hand to the floor of the kiva (Stratum 17).

Nine features were identified in Room 9. These features included two wall niches (Features 7 and 20), a floor niche (Feature 6), a ventilator shaft (Feature 14), an entryway between Rooms 5 and 9 (Feature 15), a collared and plaster-lined hearth (Feature 16), an unplastered ash pit (Feature 17), a sipapu (Feature 18), and a series of five holes and a groove between the ventilator shaft and the ash pit (Feature 19). Each of these features will be discussed individually in the following pages.

Fill. On average, Stratum 1 was an approximately 90- to 110-cm-thick layer of post-occupational fill that consisted of very loose and unconsolidated soil. Some surface areas contained a high organic content from the duff associated with piñon and juniper trees in the area. This stratum contained no rubble fill, but artifact density was high. Stratum 2 consisted of the general room fill, which contained an abundant amount of rubble wallfall and was about 60 to 80 cm thick. The stratum was also loose and unconsolidated with tuff blocks in the fill. Strata 1 and 2 were comparable to strata identified in the roomblock and, as in the roomblock, were combined during excavation when necessary. The bottom of Stratum 2 contained the abrupt contact with rooffall (Stratum 15). Artifact density in Strata 1 and 2 was the highest.

In Room 9, Stratum 15 was anywhere from 20 to 44 cm thick at its thickest point, but averaged about 25 cm. Rooffall in this room contained abundant fragments of adobe similar to that observed on the walls, and artifact density was considerably less than in Strata 1 and 2. Several areas of silty concentrations were identified in the rooffall stratum, suggesting that the top of the roof may have been exposed to the elements for a period of time before the kiva was filled in. These areas of silt were distinct in texture and appearance and contained small clay balls.

The floor stratum in the kiva was Stratum 17. The floor in this room was in excellent condition, and there were only very small patches of the interior where floor was not identified. These areas were located primarily in the northwestern section of the kiva where a fissure in the bedrock had developed. Five floor features were identified in this room: Feature 6 was a floor niche, Feature 16 was a collared hearth (Stratum 20), Feature 17 was an ash pit located immediately east of the hearth (Stratum 21), Feature 18 was a sipapu located directly west of the hearth, and Feature 19 was a series of five small holes and grooves located just east of the ash pit. In addition to the floor features, four additional features were identified and included two wall niches (Features 7 and 20), a ventilator shaft (Feature 14), and an entryway between Rooms 5 and 9 (Feature 15). Table 24.38 shows the general artifact counts by stratigraphic unit for Room 9.

Table 24.38. Room 9 artifacts by stratigraphic units.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
1	1551	140	3	7	**1701**
2	2230	283	4	9	**2526**
1,2	3673	478	17	55	**4223**
15	1331	145	1	37	**1514**
17	1	0	0	0	**1**
20	1	2	1	0	**4**
21	0	12	0	0	**12**
Total	**8787**	**1060**	**26**	**108**	**9981**

Floor. In general, the floor in Room 9 was in excellent condition and was in better shape than any of the floors in the roomblock. The plastered floor coped well with the plastered portions of the wall, and the best evidence for this occurred in the southern half of the kiva (Figure 24.34). The floor of the kiva was not burned and it was constructed immediately above bedrock. There seemed to be evidence of remodeling in some very small portions of the floor in the northwestern portion of the kiva, but two distinct floors were not observed. Five floor features were identified in this room: Feature 6 (floor niche), Feature 16 (collared hearth), Feature 17 (ash pit located immediately east of the hearth), Feature 18 (a sipapu located directly west of the hearth), and Feature 19 (five small holes and grooves located just east of the ash pit). Only one artifact (FS 1969) was recovered from the floor of the kiva and was a Santa Fe Black-on-white sherd. In addition, a number of pollen and flotation samples were taken directly on the floor.

Pollen samples taken from the floor of the kiva include the following FS numbers: 1967, 1991, 1993, and 2175. Identified taxa include maize, cholla and prickly pear, beeweed, sunflower family, parsley, buckwheat, fir (*Abies*), unidentified pine, piñon pine, juniper, oak, sagebrush, long spine sunflower, broad spine sunflower, evening primrose, spurge, and cheno-ams.

Flotation samples taken from the floor of the kiva include the following FS numbers: 1968, 1990, 1992, and 2176. Identified taxa include pigweed, goosefoot, cheno-ams, uncharred tobacco (*Nicotiana*), sunflower family, maize, saltbush/greasewood, mountain mahogany (*Cercocarpus*), unknown conifer, juniper, unidentified pine, piñon pine, ponderosa pine, and oak.

Wall Construction. The subterranean, circular kiva was constructed by excavating into the Bandelier Tuff bedrock. Shallow scoring marks were visible along the kiva walls indicating that digging sticks had presumably been used to finish these surfaces. Several courses of masonry were constructed above the level of bedrock. These courses seem to be prominent in the areas where bedrock dips significantly as along the eastern and southern walls. Figure 24.35 shows some of the masonry construction along the eastern wall just north of the ventilator shaft and above one of the wall niches (Feature 7). It is likely that masonry construction was used around the perimeter of the kiva, but much of it may have fallen into the center. This is suggested by the large amounts of rubble present in Stratum 2.

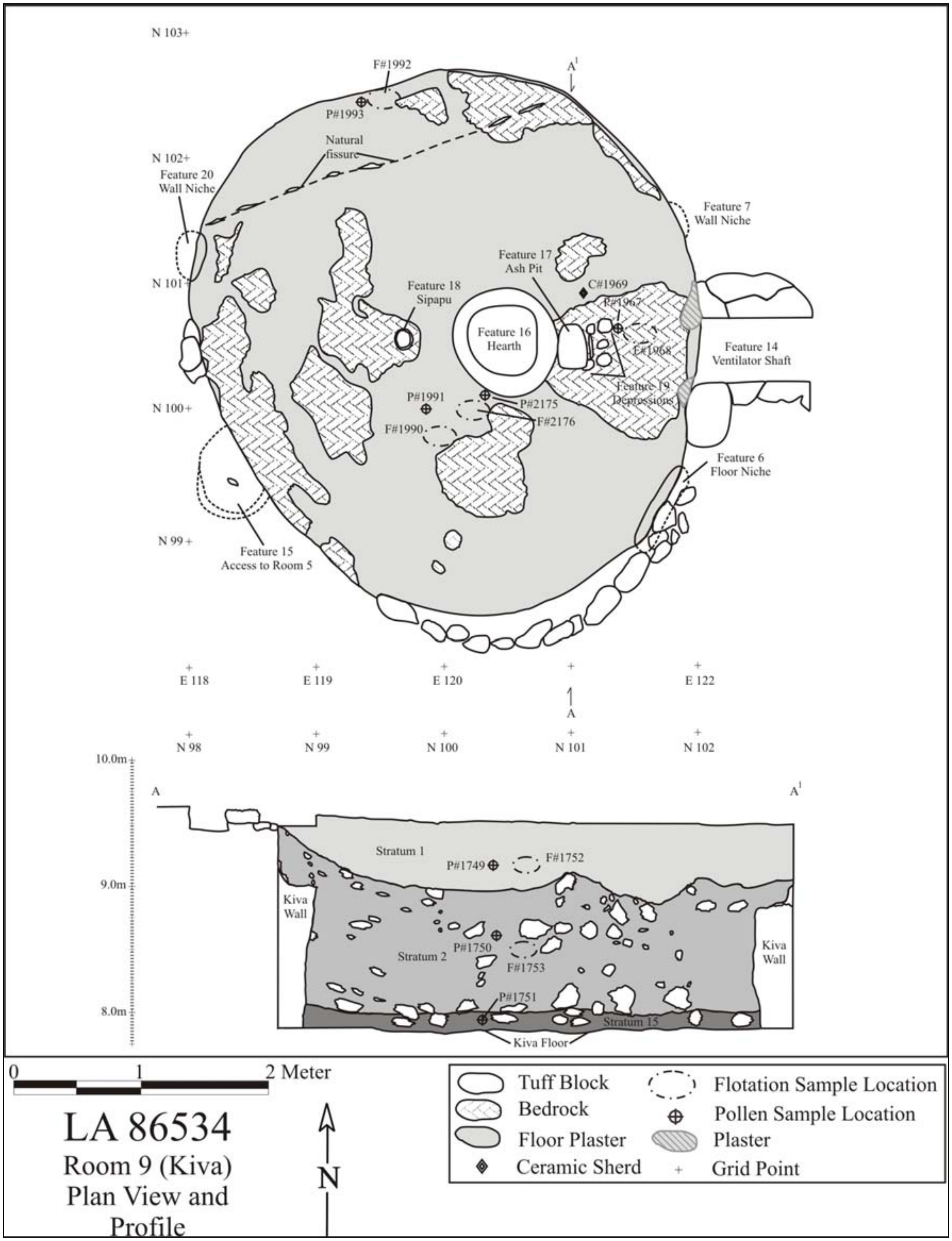

Figure 24.34. Plan view of Room 9 after excavation.

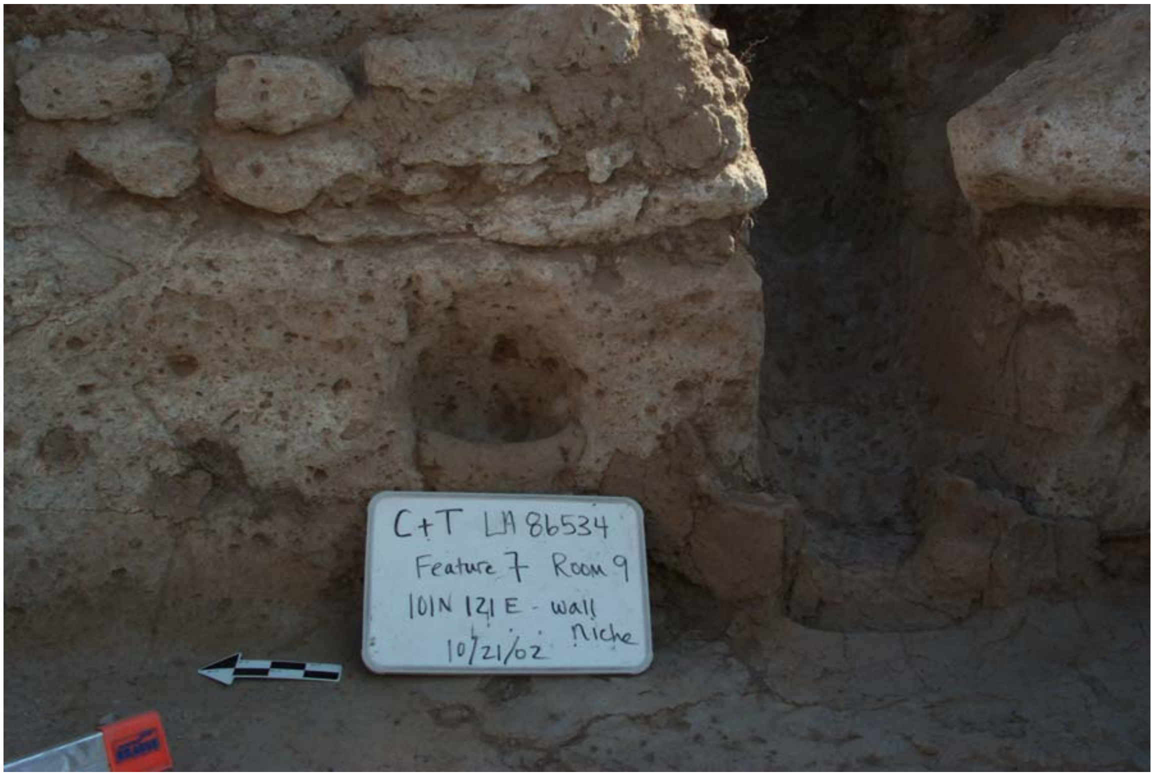

Figure 24.35. Room 9, masonry construction above bedrock.

Four features were present in the kiva walls. These include two wall niches (Features 7 and 20), the ventilator shaft (Feature 14), and an entryway between Rooms 5 and 9 (Feature 15). The entryway contained visible hand and foot holds that lead up to a shallow, ovoid feature. Features 7 and 14 are shown in Figure 24.35. Feature 7 is located on the eastern wall about 25 cm above the floor and 30 cm north of the ventilator shaft, and Feature 20 is located along the western wall about 30 cm above the floor.

Artifacts and Samples. Artifacts and samples from one 1- by 1-m unit were selected for analysis in the kiva. 100N/121E (FS 1687 through FS 1690, FS 1712 through FS 1719, FS 1727 through FS 1729, FS 1745 through FS 1748, FS 1779 through FS 1781, FS 1980 through FS 1985, FS 2175 and FS 2176, FS 2204 and FS 2205, FS 2219, and FS 2229 through FS 2232), the only completely hand-excavated grid in the kiva, was chosen. All artifacts from this column were analyzed. In addition to the artifacts analyzed from this unit, a number of artifacts were analyzed from different contexts, including three ceramic pipe fragments (FS 1459, FS 1460, and FS 1890), a ceramic ladle (FS 1872), and a ceramic pestle (FS 1878).

In addition to the artifacts analyzed from this room, macrobotanical, pollen, and flotation samples from throughout the stratigraphic sequence were analyzed (Table 24.39). Because of the paucity of macrobotanical remains alluded to earlier in this chapter, very few remains were collected in 100N/121E. To augment the sample size, materials selected for analysis were generated from the fill removed by the bobcat. Macrobotanical samples from post-occupational fill and wallfall (Strata 1 and 2) were selected from the eastern half of the kiva. Once all the wallfall was removed, hand excavation to the floor resumed. Macrobotanical samples from the rooffall stratum were generated by selecting the grids that were located beneath the eastern half of the kiva where samples were selected from Strata 1 and 2. These included 99-100N/100E. All macrobotanical samples from the rooffall context in these grids were analyzed.

Table 24.39. Samples selected for analysis in Room 9.

Stratum	SAMPLE TYPE				
	Pollen	Flotation	Macrobotanical	TL	Archaeomagnetic
1	1749, 1772	1752, 1773	1847	--	--
1,2	1974	1975	1677	--	--
2	1750, 1786	1753, 1785	1830, 1866, 1869	--	--
15	1751, 1762	1761, 2142	1988, 2009	--	--
17	1967, 1991, 1993, 2175	1968, 1990, 1992, 2176	--	--	--
20	2204, 2205, 2219	2199, 2200, 2201, 2202, 2203, 2212, 2214, 2215, 2216, 2217, 2223	2213, 2224	2238, 2250	Taken
21	2229, 2232	2234	2233	--	--
22	2225	2226	--	--	--

A total of 10 macrobotanical samples were analyzed from Room 9. Samples were collected and analyzed from all strata except the floor, which did not produce any remains suitable for analysis. The following taxa were identified in these macrobotanical samples: maize, saltbush/greasewood, mountain mahogany, cottonwood/willow, Douglas fir (*Pseudotsuga menziesii*), juniper, wolfberry (*Lycium*), unknown conifer, unidentified pine, piñon pine, ponderosa pine, and oak.

Charred and uncharred taxa identified in flotation samples from Room 9 included pigweed, goosefoot, cheno-am, tobacco, purslane sunflower family, groundcherry, sage (*Salvia*), mountain mahogany, hedgehog cactus (*Echinocereus*), mint family (Labiatae), maize, grass family, four-wing saltbush, saltbush/greasewood, juniper, unknown conifer, unidentified pine, piñon pine, ponderosa pine, prickly pear, squash/coyote gourd (*Cucurbita*), and oak.

Analyzed pollen samples included maize, squash, cholla and prickly pear, beeweed, buckwheat, plantain (*Plantago*), mustard family (Brassicaceae), sunflower family, parsley (Apiaceae), ragweed/bursage, spurge family, penstemon family (Scrophulariaceae), pea family (Fabaceae), spruce (*Picea*), unidentified pine, piñon pine, juniper, oak, rose family, buckthorn family (Rhamnaceae), Mormon tea, sagebrush, long spine sunflower, broad spine sunflower, evening primrose, cheno-ams, and unidentified grasses.

Identified ceramics from this grid included 16 plainwares, 13 unpainted sherds, 29 Santa Fe Black-on-white sherds, 23 smeared-indented corrugated sherds, 11 indented corrugated sherds, three mudware sherds, two organic-painted sherds from the Coalition period, two plain corrugated sherds, two Wiyo Black-on-white sherds, and one Biscuit A (Bandelier Black-on-gray) sherd. Two quartzite one-hand manos were recovered. Room 9 contained far more faunal remains than any other room at LA 86534. Unidentified remains were the most abundant, followed by the intrusive pocket gopher (*Thomomys bottae*) remains, cottontails (*Sylvilagus* sp.), rock squirrels (*Spermophilus variegatus*), red-tailed hawk (*Buteo jamaicensis*), mule deer (*Odocoileus hemionus*), indeterminate rodents (Rodentia), jackrabbits (*Lepus* sp.), carnivores (Carnivora), and turkey (*Meleagris gallopavo*). Species diversity was also the greatest in this room, which may be related to its use as a kiva. More birds were identified in this room relative to the rest of the site, and other unusual taxa, including toads (Ranidae), skunk (*Mephitis mephitis*), and coyote (*Canis latrans*) remains were also identified. One bone bead was recovered from the wallfall stratum in the kiva. Table 24.40 lists the chipped stone materials recovered in this room.

Table 24.40. Chipped stone artifacts recovered from sampled units in Room 9.

Type	Material	Number
Hammerstone	Quartzite	1
Core	Pedernal chert	1
Biface	Black translucent obsidian	1
Core flake	Chalcedony	22
	Basalt	1
	Pedernal chert	10
	Rhyolite	1
	Black translucent obsidian	1
	Silicified wood	1
Angular debris	Chalcedony	6
	Pedernal chert	3
Microdebitage	Pedernal chert	3
	Unidentified metamorphic	1
	Black translucent obsidian	1
Biface flake	Chalcedony	1
	Basalt	1
	Black translucent obsidian	1

Kiva Features

A total of nine features were identified in the kiva. These include two wall niches (Features 7 and 20), a floor niche (Feature 6), a ventilator shaft (Feature 14), an entryway between Rooms 5 and 9 (Feature 15), a collared and plaster-lined hearth (Feature 16), an ash pit (Feature 17), a sipapu (Feature 18), and a series of five holes and grooves between the ventilator shaft and the ash pit (Feature 19). The majority of these features are visible in Figure 24.34 (plan view of kiva) and each is discussed in the following pages.

Feature 6 (Floor Niche). This feature is a floor niche located on the eastern wall of the kiva. The feature dimensions are 38 by 60 by 26 cm, and it is located 68 cm south of the ventilator shaft. The niche is medium-sized and has a plastered lip on the lower boundary that lies 3 cm above the floor. The niche is in excellent condition, with plaster on most of the base and lipped area, but only small patches on the ceiling. The fill from this feature was screened separately and produced artifacts, but was not given a different stratum designation because it was filled with the general kiva fill. Figure 24.36 shows a photograph of this niche.

Figure 24.36. Room 9, floor niche (Feature 6).

Feature 7 (Wall Niche). This feature is a wall niche located on the eastern wall 25 cm above the kiva floor. The feature dimensions are 29 by 29 by 18 cm, and it is located 30 cm north of the ventilator shaft. The niche is on the small side and has a plastered lip on the lower boundary. The niche was in good condition, with patches of plaster present throughout. As with Feature 6, the fill from this feature was screened separately and produced artifacts, but was not given a different stratum designation because it was filled with the general kiva fill. Figure 24.37 shows a photograph of this niche.

Figure 24.37. Room 9, wall niche (Feature 7).

Feature 14 (Ventilator Shaft). Feature 14 is the ventilator shaft located on the east side of the kiva. The shaft is oriented due east and is in alignment with several of the floor features. The bottom of the ventilator shaft is flush with the floor, but has a lip at its opening that rises approximately 5 cm above the floor. The shaft slopes gradually upwards to the surface. A plastered groove was identified directly in front of the opening to the ventilator shaft. The groove may represent a footing for some type of cover, although no stone was in place at the time of excavation and nothing of its likeness was identified during excavation of the adjacent areas. Some portions of the ventilator shaft were also plastered although most of it was patchy. The dimensions of the ventilator shaft are 120 by 40 by 75 cm. A number of artifacts were identified in the fill of Feature 14 (FS 1892, FS 1893, FS 1904, and FS 1971) and include one plainware sherd, a quartzite hammerstone, an andesite metate fragment, a basalt mano fragment, two chalcedony projectile points, five Pedernal chert core flakes, 12 chalcedony core flakes, six chalcedony pieces of angular debris, two chalcedony biface flakes, seven pieces of chalcedony microdebitage, one piece of black translucent obsidian microdebitage, one andesite core flake, one unidentified manuport, one piece of salmon pink chert microdebitage, one piece of quartzite microdebitage, and one orthoquartzite core flake. Figure 24.38 shows the ventilator shaft and its location relative to a number of the kiva features.

Figure 24.38. Room 9, ventilator shaft and other kiva features.

Feature 15 (Entry/Exit Way). This feature is an entry/exit way between Rooms 5 and 9. It is semi-circular in shape and contains a ledge at the edge of bedrock. This portion of the feature measures 65 by 63 by 24 cm. There is also a hand-hold at the top of the flattened bedrock and a probable toe-hold on the kiva wall directly below the feature. During initial excavations in this area, the connection between Rooms 5 and 9 was not identified. It was only after we returned to the site several weeks after the completion of excavations to examine the construction techniques used in the walls that the nature of this feature was recognized. During this visit, the eastern wall of Room 5 was knocked over and the connection between the rooms was verified (Figures 24.39 and 24.40). When the wall in Room 5 was removed, it was clear that no tuff blocks were in place. What appeared to be tuff blocks forming the wall of Room 5 were actually concentrations of plaster that resembled blocks. When the fill in this area was subsequently removed, it was clear that there was a doorway between the two rooms. A palette (FS 1970) was the only artifact recovered from this feature.

Figure 24.39. Room 9, Feature 15 as it appeared in October 2002.

Figure 24.40. Room 9, Feature 15 as it appeared in December 2002.

Feature 16 (Collared Hearth). Features 16 through 20 are all floor features and are all aligned on the same east-west line. Feature 14, the ventilator shaft, is also aligned with these five features. Feature 16 is the kiva hearth. The hearth is located slightly east of center and is immediately adjacent to the sipapu (Feature 18) to the west and the ash pit (Feature 17) on the right. The plaster-lined collared hearth measures 85 by 85 by 30 cm and is larger than the hearths in the individual rooms. It was in excellent condition, with only a small patch missing from the northern wall. The hearth was heavily burned, and the bottom 5 to 10 cm consisted of a hard-packed ash layer. Both ceramics and lithics were recovered from the interior of the feature. Figure 24.41 shows the plan map and profile of the hearth. A photograph of the hearth is shown in Figure 24.42.

A single marcrobotanical sample was collected from the hearth and included the following taxa: unknown conifer, unidentified pine, and ponderosa pine. Flotation samples included the following taxa: pigweed, goosefoot, cheno-am, tobacco, mint family, maize, four-wing saltbush, juniper, unknown conifer, unidentified pine, piñon pine, and ponderosa pine. In addition to those taxa already mentioned, the following taxa were identified in the pollen samples collected from the hearth: sunflower family, ragweed/bursage, and unidentified pine.

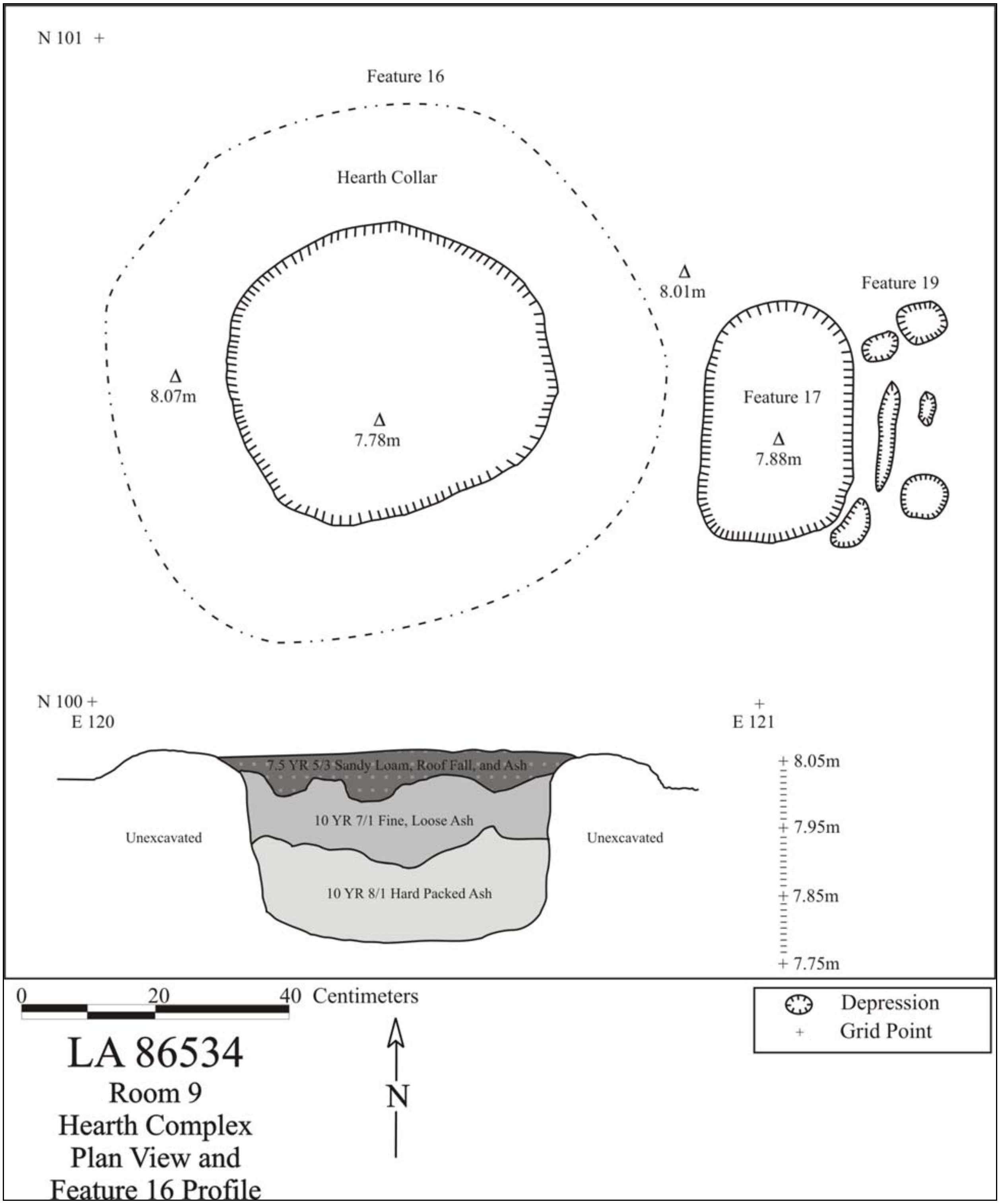

Figure 24.41. Plan view and profile of Feature 16.

Figure 24.42. Room 9, Feature 16.

Additionally, TL (FS 2238 and FS 2250), archaeomagnetic, and radiocarbon samples were all taken from the hearth and submitted for analysis. The TL sample from the adobe in the hearth (FS 2250) dated to AD 1221±52. The archaeomagnetic sample produced two probable date ranges, one at AD 1185–1240 and the other at 1250–1315. Maize cupules were identified in a flotation sample taken from the hearth (FS 2202) and were submitted for radiocarbon analysis. This sample yielded an age of 790±40 BP (Beta-183765) and a date of cal AD 1260 with a two-sigma date range of cal AD 1220–1270. These results strongly suggest a date in the middle to late 13th century, and all span a fairly tight period of time. Several artifacts (FS 2220, FS 2221, and FS 2206) were recovered from the hearth and included a smeared-indented corrugated sherd, a chalcedony core flake, an unidentified chalcedony flake fragment, and a quartzite polishing stone.

Feature 17 (Ash Pit). This feature is the ash pit associated with the hearth. As with Features 16 through 18 and Feature 20, the ash pit is aligned on an east/west coordinate. The ash pit is located just east of the hearth and just west of the holes and groove feature. The feature is an unplastered, ovoid-shaped basin that measures 35 by 25 by 13 cm. Artifacts (FS 2227, FS 2228, FS 2230, and FS 2231) recovered in the ash pit included two retouched black translucent obsidian pieces, two chalcedony core flakes, a Pedernal chert core flake, and a black translucent obsidian core flake. A macrobotanical sample (FS 2233) taken from the ash pit produced the following taxa: mountain mahogany, unknown conifer, unidentified pine, piñon pine, ponderosa pine, oak, and maize. A single flotation sample was taken (FS 2234) and produced the following taxa: goosefoot, uncharred tobacco, maize, four-wing saltbush, mountain mahogany, unknown conifer, unidentified pine, piñon pine, ponderosa pine, and oak. The only pollen sample collected (FS 2232) produced the following taxa: maize, beeweed, pea family, sunflower family, ragweed/bursage, spurge family, piñon pine, juniper, buckthorn family, sagebrush, cheno-ams, Mormon tea, and unidentified grasses. Figure 24.43 shows Features 16, 18, and 19.

Figure 24.43. Room 9, Features 16, 17, and 19.

Feature 18 (Sipapu). Feature 18 is the circular sipapu in the kiva. It is in the same east-west line as the hearth, the ash pit, the holes and grooves, and the ventilator shaft, but is the furthest west of all the features. The sipapu is located on the kiva floor, and its dimensions are 13 by 11 by 20 cm. One pollen (FS 2225) and one flotation sample (FS 2226) were taken from the sipapu. The following charred taxa were identified in the flotation sample: goosefoot, purslane, maize, unknown conifer, unidentified pine, piñon pine, ponderosa pine, and oak. Taxa identified in the pollen sample included maize, beeweed, sunflower family, spurge family, pine, piñon pine, juniper, sagebrush, cheno-ams, and unidentified grasses.

Feature 19 (Holes and Groove). This feature consists of five round holes and a linear groove. As with Features 16 through 18 and Feature 20, the ash pit is aligned on the same east-west coordinate. Feature 19 is located just east of the ash pit and just west of the ventilator shaft. Three of the round depressions line up perpendicular to the ventilator shaft and are the most easterly of the depressions. The other two depressions are also situated perpendicular to the ventilator shaft, but are immediately adjacent to the ash pit. The two series of grooves are separated by a small groove that is parallel to the opening of the ventilator shaft. The overall size of the feature is 42 by 18 by 3 cm, and the round depressions are about 3 cm deep and 5 to 7 cm in diameter. The linear groove between the series of depressions is 18 by 2 by 2 cm. It is possible that this feature represents the footing for a deflector. Figures 24.34 and 24.38 show this feature and the ash pit and hearth. The depressions might also represent ladder holes, however, the entrance appears to have been located at the opposite end of the kiva.

Feature 20 (Wall Niche). This feature is a wall niche located on the western wall, 30 cm above the kiva floor. The feature dimensions are 50 by 38 by 28 cm and it is located approximately 50 cm north of Feature 15. The niche is medium-sized and remnants of a plastered lip remain (Figure 24.44). The niche was in decent condition, with patches of plaster present in most areas, especially around the base. It appears as though a natural fissure in the bedrock was exploited to create this niche. As with Feature 6, the fill from this feature was screened separately and produced artifacts, but was not given a different stratum designation because it was filled with the general kiva fill. Four smeared-indented corrugated sherds (FS 2237) were identified in the fill removed from the wall niche.

Figure 24.44. Room 9, Feature 20.

Area 3

Area 3 was distinguished from Areas 1 and 2 based on the fact that it had been disturbed (see Figure 24.4). The area parallels the northern boundary of the site and is located between 130-135N and 100-135E. Because of the disturbed nature of the area, not all the surface artifacts were collected. As already mentioned, two 3-m dogleash samples were placed in the area. The area consists of a linear two-track, which is approximately 10 to 15 m wide and heads off toward the edge of the mesa. It is possible that this two-track may have been a possible trail or road at some point in the past, but the disturbance (visible by lots of gravel and concrete blocks) makes this difficult to discern. No features were associated with Area 3, and no samples (other than the dogleash samples) were collected.

ARTIFACT AND SAMPLE ANALYSES

Over 26,000 total artifacts were recovered from excavations at LA 86534. Analyses of ceramics, lithics (chipped and ground stone), fauna, archaeobotanical materials, and pollen were all conducted and have been incorporated into the previous sections with regard to particular contexts. Chronometric analyses were also conducted and are summarized in the next section. General analytical results are summarized in the following pages.

Chronology

Radiocarbon Dating

Six radiocarbon samples were submitted to Beta Analytic for analysis. Each sample provided plenty of material for accurate measurements and each was conducted without problem. All analyses were conducted on maize (*Zea mays*) remains. Table 24.41 lists the results of the radiocarbon analyses submitted. Results support an Early-Middle Coalition period occupation at LA 86534 (ca. AD 1190–1280).

Table 24.41. Radiocarbon dates from LA 86534.

FS#	Context of sample	Laboratory (Beta)#	Conventional radiocarbon age	Intercept of radiocarbon age	2-sigma calibrated result
1272	Room 1 hearth	183760	860±40 BP	AD 1190	AD 1040–1260
1321	Room 2 hearth	183761	730±40 BP	AD 1280	AD 1240–1300
1389	Room 5 hearth	183762	800±40 BP	AD 1250	AD 1180–1280
1508	Room 4 floor (maize)	183763	850±40 BP	AD 1200	AD 1140–1270
2172	Room 7 hearth	183764	850±40 BP	AD 1200	AD 1140–1270
2202	Room 9 hearth	183765	790±40 BP	AD 1260	AD 1180–1290

Archaeomagnetic Dating

LA 86534 represents a relatively discrete occupation, with evidence of remodeling and structure longevity, but without evidence for distinct multiple components. Five sets of specimens were collected from burned features in four different structures (Rooms 1, 2, 5, and 9). The hearth in Room 1 showed clear evidence of remodeling, and two sets were collected from its linings. Apart from these two sets, there is no clear indication of stratigraphic sequencing between the samples. The four room hearth samples were subject to some post-burning disturbance from wetting and drying, freeze-thaw, and root invasion. All of the hearths were lined with a plaster composed of volcanic ash-rich soil that appears to have been derived from weathered tuff. The clay content of the plaster was sintered by the cooking and heating fires, consolidating the material to a weak ceramic consistency. However, the fires were not particularly hot, and the linings were fragile. The surface room hearth linings were cracked and subject to displacement, raising the risk of systematic error when multiple specimens were cut from single lining blocks. In addition to eliminating lining blocks from sampling consideration if there was any suggestion of movement, whenever possible, specimens were collected from multiple blocks so that any significant internal bias could be detected. Table 24.42 lists the dates associated with the archaeomagnetic samples taken at LA 86534. These present a range from circa AD 1170 to 1300 which is similar to that provided by the radiocarbon dates.

Table 24.42. LA 86534 archaeomagnetic set results.

Sample Number	Feature	VGP* Curves and Date Estimates (AD)	
		Wolfman	SWCV2000
1202	Room 1, Hearth 4 (Upper lining)	1170–1230	1110–1200
1203	Room 1, Hearth 4 (Lower lining)	1035–1140 (1065–1265)	1010–1315 1000–1390
1204	Room 2, Hearth 2	1280–1300	1175–1230
1205	Room 5, Hearth 5	1005–1035 1235–1270	1265–1325
1206	Room 9, Hearth 16	1020–1050 1220–1255	1185–1240 1250–1315

* VGP is Virtual Geomagnetic Pole

Thermoluminescence Dating

Three burned plaster samples were submitted for TL dating from LA 86534 (Table 24.43). All derived ages are given in years BP, which refers to years before 2003. Two of these are consistent with a 13th century Coalition period occupation, with the exception of UW1035, which is early.

Table 24.43. TL dates from burned plaster samples at LA 86534.

FS#	Lab #	Context	Burial depth (cm)	Years BP	% error	Years AD
1336	UW1034	Room 1 hearth	35	773±42	5.5	1230±42
1651	UW1035	Room 2 hearth	45	1085±180	16.6	918±180
2250	UW1036	Room 9 hearth	175	782±52	6.7	1221±52

Obsidian Hydration Dating

Fourteen obsidian artifacts from LA 86534 were submitted to the Diffusion Laboratory for age determination using the obsidian hydration dating method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rim, was measured. Second, the high temperature hydration rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site was estimated in order that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 24.44).

Table 24.44. Obsidian hydration dates for LA 86534.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
534	2003-1	Valle Grande	3.32	1716	14
706	2003-2	Valle Grande	3.29	1720	14
1052	2003-3	Cerro Toledo	3.30	1589	22
1237	2003-4	Valle Grande	2.64	-757	209
1238	2003-5	Valle Grande	2.16	161	169
1266	2003-6	Valle Grande	4.80	-44	84
1422	2003-7	Cerro Toledo	3.18	-1874	244
1457	2003-8	Cerro Toledo	5.22	471	57
1676	2003-9	Valle Grande	2.68	479	112
1745	2003-10	Valle Grande	3.48	-2790	276
1873	2003-11	Valle Grande	2.38	446	129
1984	2003-12:1	Valle Grande	n/a		
2183	2003-13	Valle Grande	2.81	-1079	219
2228	2003-14	Valle Grande	2.56	-609	204

Relative to other dating methods conducted at the site, the obsidian hydration dates seem to be the least accurate (Table 24.45; Figure 24.45). Radiocarbon and archaeomagnetic results are comparable and seem to have provided the most plausible results, while the TL dates seem to be slightly less plausible given the known occupation range of the sites, but still well within the acceptable limits. Table 24.45 presents all the dated materials from this site. TL, archaeomagnetic, radiocarbon, and obsidian hydration are presented where similar contexts were sampled. It reflects a mostly 13th century occupation for the site from circa AD 1170 to 1280.

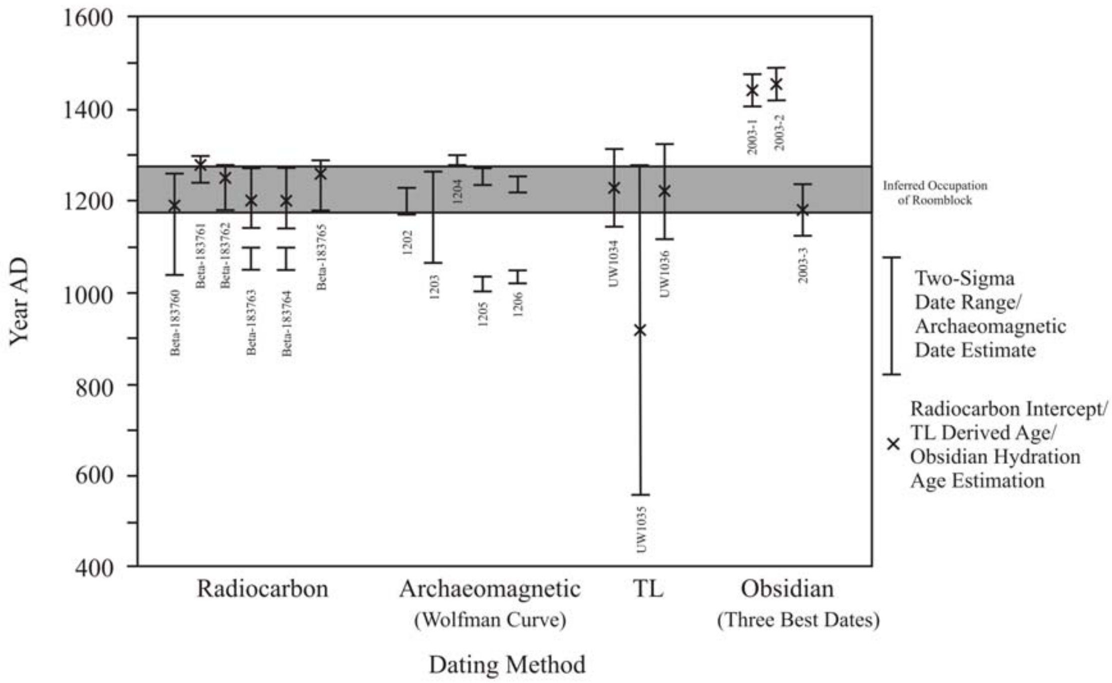

Figure 24.45. Comparison of dated materials from LA 86534.

Table 24.45. Comparison of dated materials from LA 86534.

Context	Radiocarbon Intercept	Archaeomag (Wolfman)	Archaeomag (SWCV2000)	TL	Obsidian Hydration
Room 1, upper hearth	1190*	1170–1230	1110–1200	1230±42**	--
Room 1 lower hearth	1190	1065–1265	1010–13315	1230±42	--
Room 2 hearth	1280	1280–1300	1175–1230	918±180	--
Room 5 hearth	1250	1235–1270	1265–1325	--	3854 BC***

Context	Radiocarbon Intercept	Archaeomag (Wolfman)	Archaeomag (SWCV2000)	TL	Obsidian Hydration
Room 7 hearth	1200	--	--	--	--
Room 9 hearth	1260	1220–1255	1185–1240 1250–1315	1221±52	1543 BC ****

*all dates are AD unless otherwise noted; **sample from wallfall context in Room 1; ***sample taken from floor of Room 5, just above hearth; ****samples taken from ash pit immediately east of hearth

Ceramic Artifacts (Dean Wilson)

All the ceramics from two 1- by 1-m units in each room at LA 86534 were analyzed, generating a complete analysis of stratigraphic columns from 18 units. In addition to these contexts, all the ceramics from room floors were analyzed. A sample of ceramics from the western portion of Area 2 and a sample of surface artifacts from Area 1 (106-108N/125-145E) were also analyzed. Analyses of ceramics from these contexts suggest that LA 86534 dates mainly to the Middle Coalition period, being dominated by Santa Fe Black-on-white and smeared-indented corrugated (Table 24.46). The majority of pottery from this site represents local Rio Grande decorated and utilityware (Wilson, Volume 3). Extremely low frequencies of Cibola, Middle Rio Grande, and White Mountain redwares were also noted.

Table 24.46. Ceramic types from all contexts at LA 86534.

Ceramic Type	Frequency	Percent
Indeterminate Tradition		
Indeterminate blackware	1	0.05
Northern Rio Grande Whiteware		
Unpainted undifferentiated	277	7.1
Unpainted white undifferentiated	3	0.1
Mineral paint undifferentiated	2	0.1
Kwahe’e Black-on-white	1	0.05
Indeterminate organic, Coalition period	4	0.1
Santa Fe Black-on-white	315	8.0
Wiyo Black-on-white	8	0.2
Galisteo Black-on-white	3	0.1
Biscuit A (Abiquiu Black-on-gray)	1	0.05
Red-slipped Black-on-white (organic)	1	0.05
Northern Rio Grande Utilityware		
Plain gray rim	17	9.4
Unknown gray rim	2	0.1
Plain gray body	174	4.4
Basket impression	8	0.2
Indented corrugated	621	15.8
Incised corrugated	30	0.8

Ceramic Type	Frequency	Percent
Plain corrugated	17	0.4
Smeared-indented corrugated	2408	61.4
Polished gray	6	0.2
Neck corrugated	1	0.05
Plain incised	1	0.05
Mudware	4	0.3
Middle Rio Grande		
Chupadero Black-on-white	7	0.2
Glaze yellow, body unpainted	1	0.05
San Juan Basin (Cibola)		
Gallup Black-on-white	1	0.05
White Mountain Redware (Cibola)		
White Mountain Redware unpainted	1	0.05
Total	**3925**	**100.0**

With the exception of the Gallup Black-on-white sherd, all the other whitewares exhibit forms of tuff temper, pastes, and styles indicative of Rio Grande (or Tewa) tradition types (Tables 24.47 and 24.48).

Table 24.47. Tradition by ware for ceramics from all contexts at LA 86534.

Tradition	Ware					Total
	Gray	White	Red	Brown	Glaze	
Indeterminate	--	--	--	1	--	1
Northern Rio Grande (Prehistoric)	3296	619	--	--	--	3914
Middle Rio Grande	--	7	--	--	1	8
Cibola (San Juan Basin)	--	1	--	--	--	1
Cibola (White Mountain Redware)	--	--	1	--	--	1
Total	**3296**	**627**	**1**	**1**	**1**	**3925**

Table 24.48. Temper by ware for ceramics from all contexts at LA 86534.

Temper	Ware					
	Gray	White	Red	Brown Plain	Glaze	Total
Indeterminate	26	0	0	0	0	26
Sand	4	2	0	0	0	6
Granitic (mica, quartz, and feldspar)	3	1	0	0	0	4
Sherd	0	6	1	0	0	7
Sherd and sand	0	3	0	0	0	3
Fine tuff or ash	31	474	0	0	0	505
Fine tuff and sand	0	17	0	1	1	19

Temper	Ware					
	Gray	White	Red	Brown Plain	Glaze	Total
Sand and mica	1	0	0	0	0	1
"Anthill" sand (tuff & phenocyrsts)	3227	2	0	0	0	3229
Mostly tuff with some phenocyrsts	1	112	0	0	0	113
Other	4	10	0	0	0	14
Total	**3295**	**627**	**1**	**1**	**1**	**3925**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 557 artifacts were analyzed from LA 86534, consisting of four cores, 489 pieces of debitage, 15 retouched tools, 40 ground stone artifacts, six hammerstones, two manuports, and a piece of fire-cracked rock. This represents an 18 percent sample of the 3090 total lithic artifacts recovered during the site excavations. Table 24.49 presents the data on lithic artifact type by material type. The majority of the debitage is made of chalcedony with lesser amounts of Pedernal chert, obsidian, and other materials. The presence of cortex on 11.2 percent of the debitage indicates that these materials were collected from waterworn (74.5%) and nodular (25.5%) sources. The chalcedony and Pedernal chert are available from local Rio Grande Valley gravel sources, the basalt from gravels and bedrock outcrops, and the obsidian from primary sources in the Jemez Mountains. Otherwise, the ground stone artifacts are primarily made from igneous materials, which are available both as bedrock outcrops and in stream gravels that cross-cut the Pajarito Plateau. Quartzite and silicified wood is, however, only available from the nearby Rio Grande Valley gravels. The source of other materials like orthoquartzite, greenstone, and hematite is difficult to determine, but they could be derived from gravel formations near Totavi or from more distant sources in the Santa Fe or Abiquiu areas.

Nine pieces of debitage and fifteen retouched tools were submitted for X-ray fluorescence analysis. Three of the projectile points were not included in the sample analysis from the site. Nonetheless, the majority of the artifacts were identified as being obtained from the Valle Grande source, with less from the Cerro Toledo and El Rechuelos sources (Table 24.50). The Valle Grande (Cerro del Medio) and Cerro Toledo (Rabbit Mountain/Obsidian Ridge) source areas are located about 18 km (11 miles) as the “crow flies” to the west and southwest of the site; whereas, the El Rechuelos (Polvadera Peak) source area is situated about 24 km (15 miles) to the northwest.

Table 24.49. LA 86534 lithic artifact type by material type.

Artifact Type		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Silicified Wood	Quartzite	Other	Total
Cores	Core	0	0	0	0	0	0	0	1	0	2	0	0	0	3
	Cobble biface	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	Subtotal	1	0	0	0	0	0	0	1	0	2	0	0	0	4
Debitage	Angular Debris	0	0	3	0	0	0	4	41	0	29	0	10	3	90
	Core Flake	7	0	5	1	2	0	14	148	4	61	0	13	5	260
	Biface Flake	2	0	0	0	0	0	7	8	0	1	2	0	0	20
	Notching flake	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Microdebitage	2	0	0	1	2	0	17	60	2	11	0	2	2	99
	Undetermined Flake	0	0	0	0	0	0	2	10	0	1	0	0	1	14
	Hammerstone Flake	0	0	0	0	0	0	0	0	0	0	0	3	0	3
	Ground Stone Flake	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Subtotal	11	0	8	2	5	0	45	267	6	104	2	28	11	489
Retouched Tools	Retouched Piece	0	0	0	0	0	0	3	0	0	1	0	0	0	4
	Denticulate	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Biface	0	0	0	0	0	0	2	1	0	0	0	0	0	3
	Projectile Point	0	0	0	0	0	0	1	3	0	1	0	0	0	5
	Uniface	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Graver	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Subtotal	0	0	0	0	0	0	6	4	0	5	0	0	0	15
Ground Stone	One-Hand Mano	1	0	0	0	5	1	0	0	0	0	0	3	0	10
	Undetermined Mano	1	0	1	1	0	1	0	0	0	0	0	0	0	4
	Millingstone	0	0	0	0	0	2	0	0	0	0	0	0	0	2
	Slab Metate	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Grinding Slab	0	1	0	0	1	3	0	0	0	0	0	0	0	5

Artifact Type		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Silicified Wood	Quartzite	Other	Total
	Undetermined Metate Fragment	0	0	0	1	1	3	0	0	0	0	0	0	0	5
	Polishing Stone	1	0	0	0	0	0	0	0	0	0	0	1	0	2
	Abrading Stone	0	0	0	0	2	0	0	0	0	0	0	0	0	2
	Axe	0	0	0	1	0	0	0	0	0	0	0	0	0	1
	Undetermined Ground Stone	0	0	1	0	1	1	0	0	0	0	0	3	2	8
	Subtotal	3	1	2	3	10	12	0	0	0	0	0	7	2	40
Other	Hammerstone	0	0	0	0	0	0	0	1	0	1	0	3	0	6
	Manuport	0	0	0	0	0	0	0	0	0	0	0	1	1	2
	Fire-cracked Rock	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Subtotal	0	0	0	0	0	2	0	1	0	1	0	5	0	9
Total		**15**	**1**	**10**	**5**	**15**	**14**	**51**	**273**	**6**	**112**	**2**	**40**	**13**	**557**

Table 24.50. Obsidian source samples.

FS #	Artifact	Color	Source
37	Tool	Translucent	Cerro Toledo rhyolite
534	Debitage	Translucent	Valle Grande rhyolite
706	Projectile point	Translucent	Valle Grande rhyolite
709	Debitage	Black dusty	El Rechuelos
897	Debitage	Black opaque	Cerro Toledo rhyolite
967	Debitage	Black opaque	Cerro Toledo rhyolite
1052	Debitage	Black opaque	Cerro Toledo rhyolite
1074	Debitage	Gray	Valle Grande rhyolite
1192	Debitage	Translucent	Valle Grande rhyolite
1204	Projectile point	Translucent	Valle Grande rhyolite
1237	Projectile point	Translucent	Valle Grande rhyolite
1238	Projectile point	Translucent	Valle Grande rhyolite
1266	Projectile point	Translucent	Valle Grande rhyolite
1422	Projectile point	Translucent	Cerro Toledo rhyolite
1431	Tool	Translucent	El Rechuelos
1457	Projectile point	Translucent	Cerro Toledo rhyolite
1676	Tool	Translucent	Valle Grande rhyolite
1745	Debitage	Translucent	Valle Grande rhyolite
1873	Tool	Translucent	Valle Grande rhyolite
1984-1	Tool	Translucent	Valle Grande rhyolite
1984-2	Debitage	Translucent	Valle Grande rhyolite
2183	Projectile point	Translucent	Valle Grande rhyolite
2228-1	Tool	Translucent	Valle Grande rhyolite
2228-2	Tool	Translucent	Cerro Toledo rhyolite

Lithic Reduction

The cores consist of a single-directional, a bidirectional, a bipolar core, and a cobble biface. The single-directional core was reduced using a multi-faces technique, the bidirectional core is a change-of-orientation (i.e., two oblique directions), and a piece of Pedernal chert was reduced using a bipolar technique. None of the cores exhibit any obvious evidence of platform preparation. The single-directional core was discarded due to material flaw fractures and the bi-directional core was exhausted. None of the cores were burned. Table 24.51 presents the metric information on the whole cores.

Table 24.51. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Single-directional	66	66	32	124
Bi-directional	34	25	13	14
Bipolar	43	45	26	50.8
Cobble biface	88	71	44	334.8

The debitage mainly consists of core flakes (53.1%), with some microdebitage (20.2%), angular debris (18.4%), and biface flakes (4.0%). Table 24.52 summarizes the various stages of reduction represented by the whole flakes. The debitage assemblage is primarily composed of secondary non-cortical (51.6%), with less tertiary and secondary cortical, and no primary flakes. The overall cortical:non-cortical ratio of 0.31 reflects this emphasis on the later stages of core reduction. The sample size is small, but chalcedony materials appear to be more fully reduced than the Pedernal chert.

Table 24.52. Debitage reduction stages.

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Basalt	0	0	1	1	---
Obsidian	0	0	1	4	---
Chalcedony	0	3	24	1	0.12
Pedernal chert	0	8	5	0	1.6
Quartzite	0	1	1	0	1.0
Total	0	12	32	6	0.31
Percentage	0	24.0	64.0	12.0	---

The majority of the flakes exhibit single-faceted platforms (61.9%; *n* = 65), with crushed (*n* = 13), collapsed (*n* = 12), cortical (*n* = 11), and multi-faceted (*n* = 4) platforms. The majority of the collapsed platforms are on chalcedony and Pedernal core flakes and the crushed platforms on chalcedony and obsidian core flakes. Twenty-one (20.0%) of the flake platforms exhibit evidence of preparation, with most of these being abraded/crushed (*n* = 17), with fewer retouched (*n* = 3), and ground (*n* = 1).

The majority of the core flakes consist of distal fragments (*n* = 117; 45.0%), with fewer whole (*n* = 63), proximal (*n* = 33), midsection (*n* = 39), lateral (*n* = 5), and undetermined fragments (*n* = 3). Most of the biface flakes are also distal fragments (*n* = 8; 40.0%), with fewer whole (*n* = 6), proximal (*n* = 3), midsection (*n* = 2), and lateral (*n* = 1) fragments. The whole core flakes have a mean length of 21.8 mm (*std* = 10.5) and weight of 2.5 g (*std* = 4.5), whereas the whole biface flakes exhibit a mean length of 15.4 mm (*std* = 5.1) and a mean weight of 0.4 g (*std* = 0.4). Lastly, angular debris have a mean weight of 2.8 g (*std* = 4.7).

The retouched tools consist of a mix of expedient flakes tools like retouched pieces, a denticulate and a graver versus formal tools like bifaces, projectile points, and unifaces (Figure 24.46). The retouched pieces primarily exhibit marginal retouch along a single edge (*n* = 3), with one piece retouched along two edges. Table 24.53 presents the information on retouch type by edge outline.

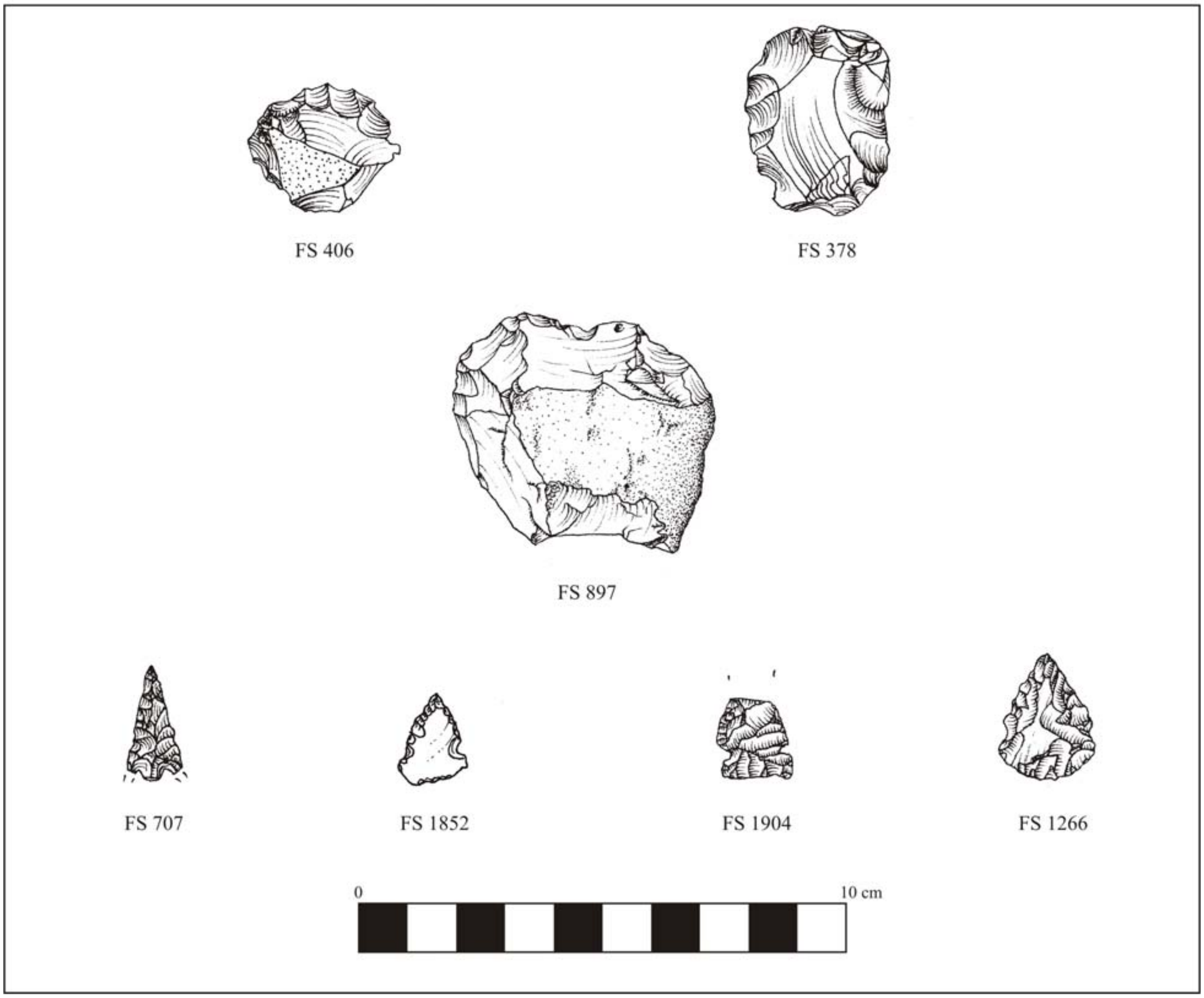

Figure 24.46. Retouched flake, denticulate, uniface, and projectile points.

Table 24.53. Retouched pieces from LA 86534.

Retouch Type	Edge Outline						
	Straight	Concave	Convex	Straight/ concave	Straight/ convex	Concave/ convex	Projection
Unidentified Ventral	1	0	0	0	0	0	0
Unidentified Dorsal	0	1	0	0	0	1	0
Bidirectional	0	0	1	0	0	0	0
Total	**1**	**1**	**1**	**0**	**0**	**1**	**4**

The four retouched edges exhibit a variety of edge outlines. The edge angles range from 30 to 70 degrees, with a mean of 52.5 degrees (*std* = 20.6). This presumably reflects a diversity of activities. The denticulate consists of a flake with a serrated lateral edge made by unidirectional ventral retouch. The graver is a flake fragment with marginally retouch (unidirectional dorsal) projection. The uniface is a large, roughly worked flake with unidirectional dorsal retouch and an edge angle of 60 degrees.

Only one of the bifaces is whole. It appears to be an ovate-shaped, late-stage biface with a thickness of 2 mm and edge angle of 35 degree. This biface was presumably broken while attempting to notch the preform. One of the other fragments could also be a late-stage biface with a thickness of 4 mm. It too could have been broken during manufacture while attempting to notch the point. The third biface is a small undetermined fragment.

Metrical and descriptive information on the two projectile points is presented in Table 24.54. One of these is a distal fragment of a corner-notched arrow point with a neck width of 4 mm, whereas the other is a whole stemmed lance/dart point with a neck width of 15 mm. The latter point has been resharpened.

Table 24.54. Projectile point metrical (mm) and descriptive data.

FS #	Material	Condition	Overall Length	Blade Length	Neck Width	Stem Length	Stem Width	Thickness	Weight (g)	Haft Type	Blade Shape	Base Shape
707	Chalce-dony	Distal	--	21	4	--	--	3	0.7	Corner-notched	Straight	Und.
1266	Obsidian	Whole	25	18	15	7	17	4	1.8	Stemmed	Straight	Con-vex

Tool Use

Only 6 flakes (1.2%) exhibit evidence of damage that could be attributed to use-wear. Most of the damage is located along the lateral edge of the flake (*n* = 4), with some at the end of the flake (*n* = 2). The former flakes have straight, concave, and convex outlines, whereas the latter consist of a convex-shaped edge and a utilized projection. Edge angles range from 35 to 65 degrees, with a mean of 49 degrees (*std* = 11.9). This is similar to the pattern exhibited by the retouched flakes. In contrast to the debitage, three of the retouched tools (20.0%) exhibit evidence of use-wear. These consist of two retouched flakes and the uniface.

Forty ground stone artifacts were identified during the analysis, including manos, metates, polishing stones, abrading stones, and other ground stone items. The manos are roughly evenly distributed between one and two-hand varieties. All 10 of the identifiable manos are one-handed. All of these are cobble manos with seven having single convex grinding surfaces, two having plano-convex grinding surfaces, and one that is an undetermined mano fragment.

Two generalized millingstones and a formal slab metate were also identified. The formal slab metate is well-worn, but consists of a broken fragment. The polishing stones are basalt and quartzite pebble with a finely ground surface, whereas the abrading stones are dacite pebbles with irregular ground surfaces.

The axe is an andesite cobble with flaked and worn edges and a battered butt. The artifact is whole and exhibits ground hafting notches (Figure 24.47).

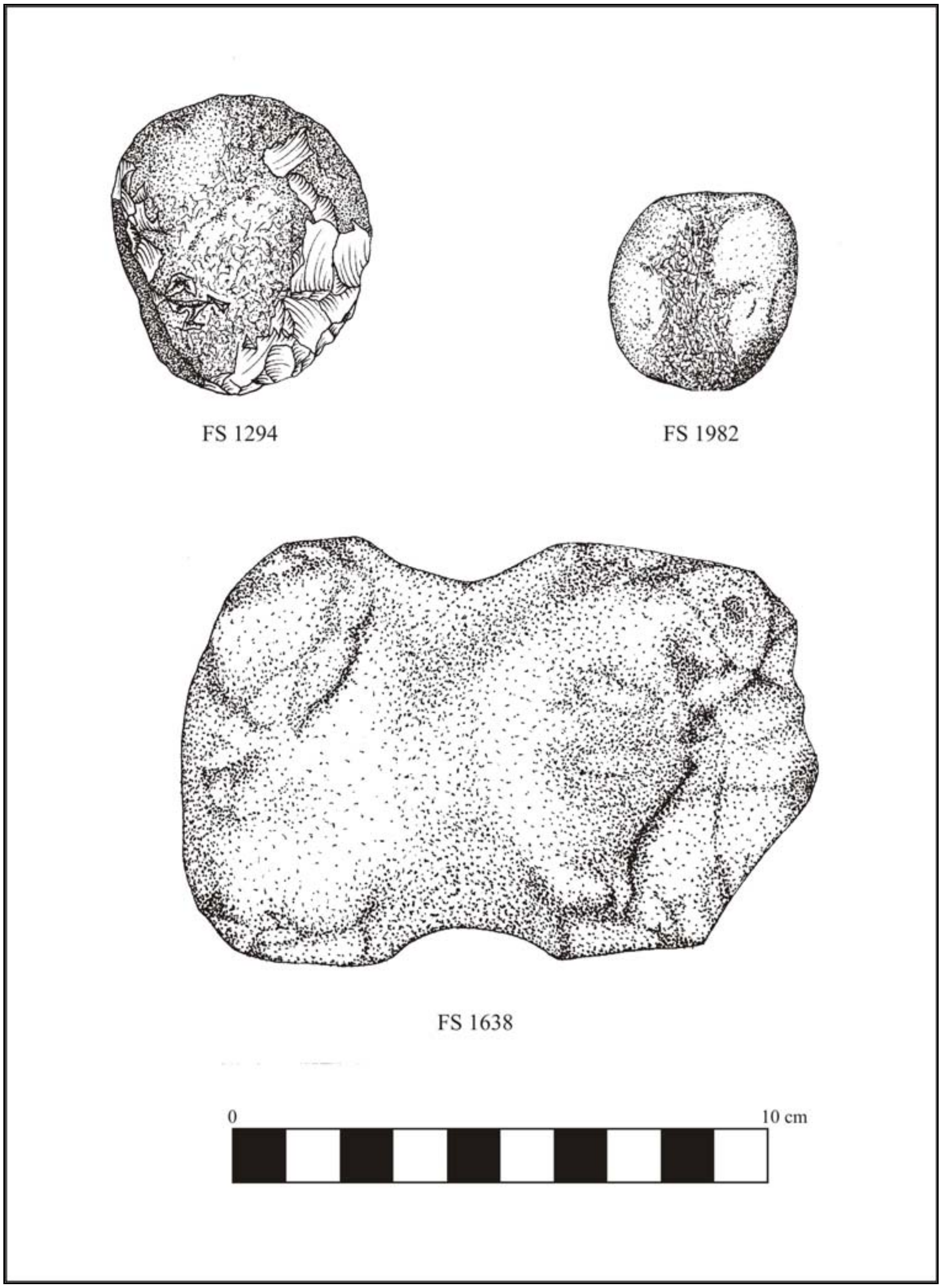

Figure 24.47. Axe and hammerstones.

Faunal Remains

In general, the overall preservation of the bones from LA 86534 was good. For the most part, bones tended to be in large fragments, and a number of complete elements were identified. Weathering on the faunal remains was present, although the frequency and severity was generally low, suggesting the remains may not have been exposed to the elements for a long period of time before deposition. The bones show minimal evidence of root-etching, and no evidence of rodent gnawing, carnivore gnawing, or carnivore-digestion. Modifications resulting from burning were present on 88 pieces of bone, constituting some 23 percent of the total assemblage. Two specimens recovered from LA 86534 were worked. Of the 388 faunal remains recovered from the excavations at LA 86534, 52 percent (*n* = 202) were identified to at least the level of class. The 202 identified remains were recovered from a variety of contexts. Table 24.55 shows all the taxa that were recovered from the site.

Table 24.55. Identified faunal remains from all contexts at LA 86534.

TAXON	TOTAL		
	NISP*	**MNI**	**Percent**
Bufonidae (Toads)	1	1	0.5
Pelobatidae (Spadefoot toads)	1	1	0.5
Perching birds (Passeriformes)	1	1	0.5
Piñon jay (*Gymnorhinus cyanocephalus*)	1	1	0.5
Turkey (*Meleagris gallopavo*)	4	1	2.0
Hawks (Accipitridae)	1	1	0.5
Red-tailed Hawk (*Buteo jamaicensis*)	10	1	5.0
Medium bird	1	1	0.5
Large bird	1	1	0.5
Indeterminate rodent (Rodentia)	8	1	4.0
Harvest mouse** (*Reithrodontomys* sp.)	1	1	0.5
Pocket mouse** (*Perognathus* sp.)	6	2	3.0
Deer mouse** (*Peromyscus* sp.)	1	1	0.5
Kangaroo rats (*Dipodomys* sp.)	8	3	4.0
Woodrats (*Neotoma* cf. *albigula*)	7	3	4.0
Pocket gopher** (*Thomomys* sp.)	58	11	29.0
Squirrels (Sciuridae)	2	1	1.0
Antelope squirrel (*Ammospermophilus* sp.)	1	1	0.5
Rock squirrels (*Spermophilus variegatus*)	11	2	5.0
Striped skunk (*Mephitis mephitis*)	2	1	1.0
Black-tailed jackrabbit (*Lepus californicus*)	6	2	3.0
cf. Desert cottontail (*Sylvilagus audubonii*)	33	4	16.0
Coyote (*Canis latrans*)	3	1	1.0
Artiodactyls (Artiodactyla)	1	1	0.5
Mule deer (*Odocoileus hemionus*)	18	1	9.0

TAXON	TOTAL		
	NISP*	MNI	Percent
Sm/med mammals	5	1	3.0
Medium mammals	1	1	0.5
Med/lg mammals	9	1	4.0
IDENTIFIED TOTAL (52.0%)	202	--	100.0
UNIDENTIFIED TOTAL (48.0%)	186	--	--
SITE TOTAL	388	--	--

* NISP is number of identified specimens; MNI is minimum number of individuals. **intrusive remains

Archaeobotanical Remains

Maize cupules were the most frequently recovered plant remains at LA 86534, followed by goosefoot seeds (Table 24.56). The only other plant parts that occurred with a percent presence over 20 percent were pine bark scales, piñon and ponderosa needles, and purslane seeds. Maize kernels were present in only 15 percent of samples at LA 86534. Relative to this, maize kernels were present in 52 percent of flotation samples at LA 12587, yet the percent presence of maize cupules is virtually equal between the sites. Several possible explanations for this are 1) maize was grown at or near LA 86534, but shelled corn was taken elsewhere for consumption or storage, 2) unlike LA 12587 (see Chapter 14) where maize was probably stored on the roof, maize was stored in a room or pits that were not encountered during excavation, or 3) differential preservation was a factor. However, the latter is probably not a factor because preservation seems to be fairly good at LA 86534 with 14 taxa present and more occurrences of the elusive piñon nutshell than at LA 12587.

Table 24.56. Ubiquity of flotation sample carbonized plant remains at LA 86534.

Common Name/Plant Part	Count*	Percent**
Cheno-am seed	6	11.0
Evening primrose seed	1	2.0
Four-wing saltbush fruit	6	11.0
Four-wing saltbush seed	1	2.0
Goosefoot family seed	2	4.0
Goosefoot seed	34	64.0
Grass family caryopsis	1	2.0
Grass family culm	1	2.0
Groundcherry seed	1	2.0
Juniper female cone	1	2.0
Juniper twig	1	2.0
Maize cupule	50	94.0
Maize cupule segment	1	2.0
Maize embryo	1	2.0
Maize glume	2	4.0
Maize kernel	8	15.0

Common Name/Plant Part	Count*	Percent**
Mint family seed	1	2.0
Monocot stem	1	2.0
Pigweed seed	7	13.0
Pine bark scale	15	28.0
Pine needle	1	2.0
Pine umbo	5	9.0
Piñon needle	23	43.0
Piñon nutshell	8	15.0
Piñon twig	1	2.0
Ponderosa pine needle	21	40.0
Purslane seed	12	23.0
Squash/coyote gourd rind	2	4.0
Sunflower family achene	1	2.0
Unidentifiable seed	2	4.0
Unidentifiable plant part	8	15.0
Unknown # 1 stem	1	2.0
Unknown # 1 plant part	3	6.0

*Count: Number of samples with common name/plant part present; **Percent: Number of samples with common name/plant part divided by total number of flotation samples with charred remains (53) × 100.

In contrast to LA 12587, along with unknown conifer, pine rather than juniper is the most common wood taxon in flotation samples (Table 24.57). In fact, oak and mountain mahogany occur in nearly the same frequency as juniper. Ponderosa pine was much more frequently encountered at LA 86534 (70% of samples) than at LA 12587 (23% of samples). The location of LA 86534 at over 7000 feet in elevation where stands of ponderosa grow along with piñon and juniper accounts for this disparity. Cottonwood/willow is absent from the flotation wood assemblage at LA 86534 along with several shrubby taxa found at LA 12587. Clearly, the inhabitants of both sites were exploiting species that were close at hand, a pattern that is repeated elsewhere on the Pajarito Plateau.

Table 24.57. Ubiquity of flotation sample wood charcoal taxa at LA 86534.

Common Name	Count	Percent
Juniper	14	26.0
Mountain mahogany	13	25.0
New Mexico locust	2	4.0
Oak	15	28.0
Pine	41	77.0
Piñon	31	58.0
Ponderosa pine	37	70.0
Rose family	1	2.0
Saltbush/greasewood	10	19.0
Unknown conifer	52	98.0
Unknown non-conifer	2	4.0

Pollen Remains (Susan J. Smith)

A total of 47 pollen samples were analyzed from LA 86534. Table 24.58 lists the frequency of identified pollen types. Cultigens identified in the assemblage included low numbers of squash with higher amounts of maize, maize aggregate pollen, and cholla. Economic resources identified in the pollen assemblage included prickly pear, cactus family, beeweed, sunflower type, lily family (which includes yucca, wild onion, and sego lily), nightshade family, parsley family, and purslane. A number of other potential economic resources were identified in the assemblage (Table 24.58), and these are described in detail in Smith's chapter in Volume 3 (Chapter 63).

Table 24.58. Pollen types identified by taxa and common names with sample frequency from LA 86534.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86534 (*n* = 47)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	2
	Zea mays	Maize	32
	Zea Aggregates	Maize Aggregates	11
	Opuntia (Cylindro)	Cholla	17
Economic Resources	*Opuntia* (Platy)	Prickly Pear	53
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	2
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	51
	cf. *Helianthus*	Sunflower type	13
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	4
	Solanaceae	Nightshade Family	4
	Apiaceae	Parsley Family	4
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	6
Other Potential Economic Resources	Rosaceae	Rose Family	21
	Eriogonum	Buckwheat	11
	Brassicaceae	Mustard Family	6
		Mustard Aggregates	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86534 (*n* = 47)
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	4
	Polygala type	Milkwort	0
	Poaceae	Grass Family	79
		Grass Aggregates	4
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	2
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs and Possible Subsistence Resources	Cheno-Am	Cheno-Am	89
		Cheno-Am Aggregates	40
	Fabaceae	Pea Family	9
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	91
		Sunflower Family Aggregates	19
	Ambrosia	Ragweed, Bursage	43
		Ragweed/Bursage Aggregates	
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	15
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	4
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	2
	Sphaeralcea	Globemallow	2
		Globemallow Aggregates	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86534 (*n* = 47)
	Euphorbiaceae	Spurge Family	45
	Scrophulariaceae	Penstemon Family	2
	Onagraceae	Evening Primrose	13
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	2
Regional to Extralocal Native Trees and Shrubs and Potential Subsistence Resources	*Pseudotsuga*	Douglas Fir	4
	Picea	Spruce	2
	Abies	Fir	6
	Pinus	Pine	79
		Pine Aggregates	4
	Pinus edulis type	Piñon	87
	Juniperus	Juniper	72
		Juniper Aggregates	0
	Quercus	Oak	30
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	2
	Ephedra	Mormon Tea	13
	Artemisia	Sagebrush	83
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	11
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	2
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

Summary of Artifacts and Samples from Hearths

Four well-defined hearths were excavated at LA 86534. Two additional partial hearths were identified, but very few remains were recovered because of their heavily deteriorated nature. Comparisons of the pollen, macrobotanical, and faunal remains that were recovered in each of the four intact hearths are presented in the next four tables. Table 24.59 lists the pollen remains from each of the hearths, Table 24.60 lists the wood charcoal remains that were identified in the flotation samples, Table 24.61 lists the macrobotanical remains that were recovered in the hearths, and Table 24.62 lists the faunal remains that were identified in each of the hearths. Comparisons of these materials do not demonstrate a significant difference between hearths in the roomblock and the single kiva hearth. In fact, among identified pollen remains, taxonomic diversity was much lower in the kiva hearth than in the roomblock hearths. This difference was not as pronounced among the macrobotanical and faunal remains where taxonomic diversity between the two samples was generally similar.

Table 24.59. Identified pollen remains from the four intact hearths at LA 86534.

Common Name	Scientific Name	Feature 2 (Room 2 hearth)	Feature 4 (Room 1 hearth)	Feature 9 (Room 7 hearth)	Feature 16 (Kiva hearth)
Maize	*Zea mays*	x		x	
Cholla	*Opuntia/Cylindro*			x	
Prickly pear	*Opuntia/Platy*		x		
Beeweed	*Cleome*	x	x	x	
Long spine	Sunflower	x			
Purslane	*Portulaca*		x		
Buckwheat	*Eriogonum*			x	
Mustard family	Brassicaceae			x	
Sunflower family	Asteraceae	x	x	x	x
Ragweed/bursage	*Ambrosia*	x	x	x	x
Unknown low spine	Marshelder?			x	
Spurge family	Euphorbiaceae	x	x	x	
Evening primrose	Onagraceae	x			
Douglas fir	*Pseudotsuga*		x		
Fir	*Abies*	x			
Pine	*Pinus*	x	x	x	x
Piñon pine	*Pinus edulis*	x	x	x	
Juniper	*Juniperus*	x	x	x	
Rose family	Rosaceae	x	x		
Sagebrush	*Artemisia*	x	x	x	
Cheno-am	Cheno-am	x	x	x	
Grass family	Poaceae	x	x	x	
Large grass family	Large Poaceae	x			

x = present. No pollen samples taken from Room 5 hearth because of significant disturbance.

Table 24.60. Identified wood charcoal from flotation remains from hearths at LA 86534.

Common Name	Scientific Name	Feature 2 (Room 2 hearth)	Feature 4 (Room 1 hearth)	Feature 5 (Room 5 hearth)	Feature 9 (Room 7 hearth)	Feature 16 (Kiva hearth)
Goosefoot	*Chenopodium*	x	x	x	x	x
Goosefoot family	Chenopodiaceae		x			
Cheno-ams	*Chenopodium/Amaranthus*	x	x		x	x
Amaranth	*Amaranthus*					x
Dropseed grass	*Sporobolus*	x		x	x	x
Maize	*Zea mays*	x	x	x	x	x
Prickly pear	*Opuntia/Platy*	x			x	
New Mexico locust	*Robinia*	x				
Tobacco	*Nicotiana*	x				x
Mountain mahogany	*Cercocarpus*	x	x			
Four-wing saltbush	*Atriplex canescens*					x
Saltbush/Greasewood	*Atriplex/Sarcobatus*	x		x		
Oak	*Quercus*	x		x	x	
Spurge	*Euphorbia*	x			x	x
Juniper	*Juniperus*	x	x	x	x	x
Piñon pine	*Pinus edulis*	x	x	x	x	x
Pine	*Pinus*	x	x		x	x
Ponderosa pine	*Pinus ponderosa*	x	x	x	x	x
Unknown conifer	Gymnospermae	x	x	x	x	x
Sunflower family	Compositae				x	
Sunflower	*Helianthus*		x			
Grass family	Germaine		x			
Knotwood family	Polygonaceae		x			
Snow-on-the-mountain	*Euphorbia marginata*		x			
Purslane	*Portulaca*		x			x
Evening primrose	*Oenothera*			x	x	
Unidentified bean	Fabacaea			x		
Mint family	Labiatae					x

x = present

Table 24.61. Identified macrobotanical remains from hearths at LA 86534.

Common Name	Scientific Name	Feature 9 (Room 7 hearth)	Feature 16 (Kiva hearth)
Juniper	*Juniperus*	x	
Piñon pine	*Pinus edulis*	x	
Pine	*Pinus*		x
Ponderosa pine	*Pinus ponderosa*	x	x
Unknown conifer	Gymnospermae		x

*No macrobotanical remains were recovered from Feature 2, Feature 4, or Feature 5

Table 24.62. Identified faunal remains in heavy fraction samples from hearths at LA 86534.*

Common Name	Scientific Name	Feature 2 (Room 2 hearth)	Feature 4 (Room 1 hearth)	Feature 5 (Room 5 hearth)	Feature 16 (Kiva hearth)
Spadefoot toads	Pelobatidae				x
Indet. rodent	Rodentia		x	x	x
Deer mouse**	*Peromyscus* sp.			x	
Pocket gopher**	*Thomomys* sp.	x	x		x
Desert cottontail	*Sylvilagus audubonii*		x		x
Sm mammals	Sm mammals	x	x		x
Sm/med mammals	Sm/med mammals		x		x
Unidentified	Unidentified	x	x	x	x

x = present. *No faunal remains were identified during excavation in any of the hearths; all remains were recovered in flotation samples. **intrusive.

SUMMARY OF SITE EXCAVATIONS

Nine rooms were excavated at the LA 86534 Middle Coalition period roomblock. Rooms 1 through 8 are rectangular habitation rooms and Room 9 is a subterranean circular kiva. In addition, limited testing was done in a sparse midden area located immediately east of the roomblock. Figure 24.48 is a reconstruction of the site by artist Dave Brewer. While the depiction is mostly accurate, the kiva (Room 9) shown in the bottom left of the photo was a subterranean room and would not have been flush with the rest of the roomblock. In addition, it is doubtful that access to the kiva and back storage rooms was through the roof. Nonetheless, no outside doorways were identified in the front roomblock (except to the kiva), with connecting doorways being present between the front and back rooms. There is no evidence of any architectural remodeling events that might reflect multiple occupations; however, the hearth in Room 1 does exhibit two separate use episodes.

LA 86534 does resemble other excavated Coalition period sites on the plateau, containing front habitation rooms with hearths and rear storage rooms with milling bin features. A range of botanical remains were identified from flotation samples recovered from the hearths, including maize, beans, cheno-ams, dropseed grass, and tobacco. In addition, squash rind, piñon nuts, groundcherry, and sunflower were also represented at the site. The faunal remains also include a variety of species like jackrabbit, cottontail, rock squirrel, mule deer, turkey, and red-tailed hawk.

The ceramic assemblage primarily consists of Santa Fe Black-on-white and smeared-indented corrugated ceramics. The dominance of these ceramics types, coupled with the paucity of Kwahe'e and Wiyo Black-on-white, reflects a Middle Coalition period of occupation. The accelerator mass spectrometry and archaeomagnetic dates overlap and cover a similar two-sigma range from AD 1190 to 1280 and 1170 to 1300, respectively.

The stone tool technology reflects an emphasis on core reduction of materials like chalcedony, Pedernal chert, and obsidian. Most of the obsidian appears to have been obtained from nearby sources in the Valles Caldera. The retouched tool assemblage includes a mix of expedient flake tools like retouched pieces and perforators and formal tools like bifaces, projectile points, and unifaces. The manos are represented by both one and two-hand varieties. The metates consist of undetermined fragments, which could represent millingstones or slab types. In addition, the presence of polishing stones, abrading stones, and an axe indicates that a variety of domestic activities were occurring at the site.

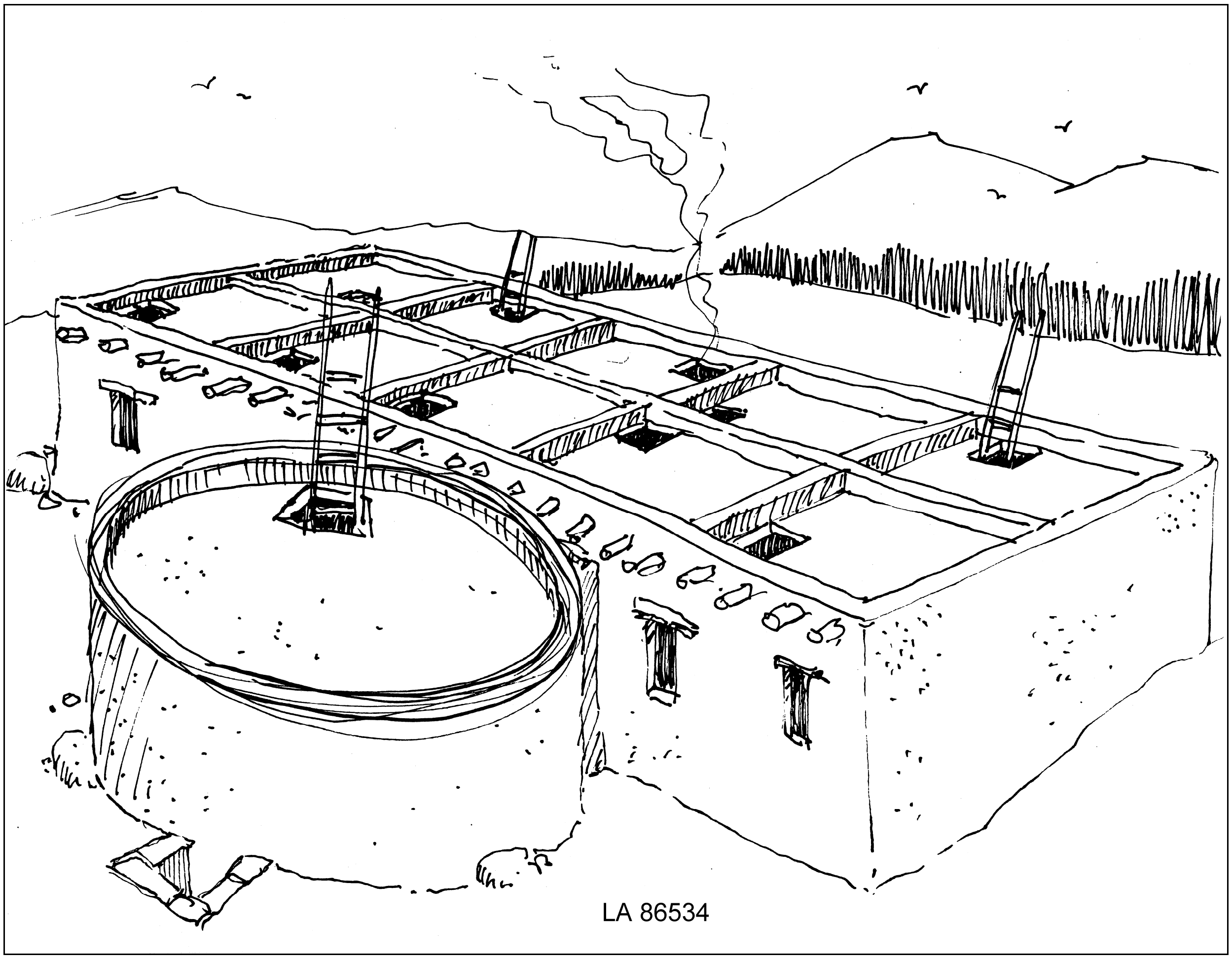

Figure 24.48. Reconstruction of LA 86534 after excavation.

CHAPTER 25
AIRPORT-CENTRAL TRACT (A-7): LA 135290

Bradley J. Vierra

INTRODUCTION AND SITE DESCRIPTION

LA 135290 is a small roomblock located on the Los Alamos town site mesa immediately north of New Mexico State Road 502. The mesa top is sparsely covered by piñon and juniper trees, with an understory including saltbush, snakeweed, yucca, and various grasses. The site is situated at an elevation of 2164 m (7100 ft) and has access to Pueblo Canyon to the north and to DP Canyon to the south.

Soils on the mesa top have been classified as a Hackroy sandy loam that have a good potential for agriculture (Nyhan et al. 1978). The site itself is underlain by a 1.5-m-thick layer of Holocene soils, with some late Pleistocene clay lying directly on the Tshirege member of the Bandelier Tuff. Soil depth is greatest in the central area of the mesa, but thins to exposed bedrock along its edges.

The original survey identified the presence of a roomblock that consisted of a north-south oriented mound that was 15 by 12 m in area and about 30 cm high (Figure 25.1a and b). The size of the mound and several probable tuff block wall alignments indicated that the mound could contain from six to 10 rooms. The associated surface artifact scatter included 300 to 400 sherds and 100 pieces of lithic debitage distributed in a 40- by 60-m area surrounding the mound. Most of these artifacts were distributed to the east of the roomblock, possibly reflecting the presence of a midden. One 2.5-m-diameter dogleash was located west of the pueblo and two 2-m-diameter dogleashes were located east of the pueblo. Analyzed ceramics include 12 decorated sherds and 94 utilityware sherds. The decorated ceramics consist of 11 Santa Fe Black-on-white and a single Wiyo Black-on-white sherd. The utilityware ceramics consist of 19 indented corrugated sherds, 49 smeared-indented corrugated sherds, 22 obliterated sherds, and four non-micaceous plainware sherds. The lithic debitage consists of a piece of angular debris, three core flakes, and three flake fragments made of Pedernal chert and one piece of angular debris and two core flakes made of basalt. Also noted within a dogleash was a basalt metate fragment. Based on the diagnostic ceramics, the site was dated to the Coalition period.

FIELD METHODS

Fieldwork began by delineating the extent of the mound and artifact scatter. A surface collection was made of all artifacts in the area of the mound and possible midden. Two east-west-oriented trenches were initially excavated across the mound. The northern trench was situated through grids 98N/106-114E (Figure 25.2) and the southern trench was located along grids 93N/105-113E. These trenches were excavated to define the walls within the roomblock and the stratigraphic sequence. After sections of the north-south walls were exposed, excavations proceeded to follow and expose the remaining wall segments, thereby identifying the presence of at least six rooms. Each room was given an individual number, and excavations continued by removing the room fill in natural stratigraphic layers and 1- by 1-m grids (Figure 25.1a and b).

Figure 25.1a. Photograph of the roomblock before it was excavated (looking north).

Figure 25.1b. Photograph of the roomblock after it was excavated (looking north).

Figure 25.2. Test trench profile of room stratigraphy.

After the main section of the roomblock was excavated, work began on the additional two front rooms located along the northeast side of the pueblo and two rock alignments situated to the immediate east of the roomblock. A block area including grids 90-96N/117-120E was excavated in this area to expose the rock alignments and identify any other features that might be present in the plaza. No other features were identified.

A series of test pits were placed in the area defined as the possible midden situated about 10 to 20 m east of the roomblock (Figure 25.3). Eight 1- by 1-m test pits were excavated (82N/121, 125, 129E; 85N/123,127,131E; 88N/129E, and 91N/131E) but no midden was identified. A few artifacts were recovered in the A horizon. Test pits were also placed to the north and west of the roomblock to identify the presence of any subsurface cultural deposits or features in these areas (91N/102E, 104N/112E, and 114N/94E). Again, no cultural deposits were identified, but a surface cluster of tuff blocks was excavated.

Ground-penetrating radar (GPR) was used to identify the presence of a kiva to the east of the roomblock (see Nisengard et al., Volume 3). A single possible buried feature was delineated to the northeast of the roomblock in the areas of grids 100-102N/116E. Seven backhoe trenches were excavated across the eastern area of the site to expose this possible feature and define the plaza area stratigraphy. The buried feature was determined to be an ancient channel or swale in the bedrock, and no other features were identified.

Figure 25.3. LA 135290 site excavation map.

The field supervisors at the site were Brad Vierra, Michael Dilley, and Jennifer Nisengard. Field crew members included Joseph Aguilar, Jennifer Boyd, Sandi Copeland, Rick Fitzgerald, Mark Hungerford, Greg Lockard, Todd Pitezel, Kari Schmidt, and Jeannine Wood. Timothy Martinez was the site monitor representing San Ildefonso Pueblo.

SITE GEOMORPHOLOGY (Paul Drakos and Steve Reneau)

Burial of an undulating Bandelier Tuff surface, and alternating periods of erosion and deposition, have resulted in variable thicknesses of the Pleistocene and Holocene sediments underlying LA 135290. The older (b2 and b3) soils of inferred Pleistocene age are present as remnant soils that were eroded and subsequently buried by swale fill and/or eolian deposits. Thickness of these buried Pleistocene deposits ranges from 0 to approximately 35 cm. The inferred mid-Holocene (b1) soil formed in fine-grained silty deposits of likely eolian origin. The 40- to 90-cm-thick mid-Holocene eolian deposit comprising the b1 soil was partially stripped (truncated) before occupation of LA 135290. The top of the mid-Holocene eolian deposit and the upper surface of Holocene swale fill deposits comprise the occupation surface for the site. The roomblock was apparently built on top of the b1 soil (either on top of the Bw1b1 or Btjb1 horizon). Soils formed in and surrounding the roomblock typically exhibit A-Bw1-Bw2 profile, which was developed in silty eolian sediment mixed with roomblock-derived colluvium. The A and Bw horizons include a variety of cultural artifacts.

SITE STRATIGRAPHY

Stratum 1 consists of the loose surface soil that covers the site area and is generally 3 to 5 cm thick (Table 25.1). Stratum 2 is a thin layer of post-occupational fill that overlies the roomblock. Underlying Stratum 2 are Strata 3 and 4. Stratum 3 is room fill with mostly adobe melt and no tuff blocks. Stratum 4 is room fill with pieces of tuff or tuff blocks. The sediment is similar between the strata, although Stratum 3 generally has more adobe, especially in Rooms 4 to 8 that contain adobe walls. For example, as one moves east to west from masonry to adobe walls, there is an increase in the amount of adobe in these sediments. There is adobe melt with a few chunks of adobe in Stratum 4, but it increases to large chunks of adobe with more melt in Stratum 3. The strata range from a silty loam to silty clay loam depending on how much adobe is present, and the colors range from brown to yellow brown.

Table 25.1. LA 135290 site stratigraphy descriptions.

Provenience	Stratum	Color	Texture	Thickness (cm)	Description
Area 1-4	0	--	--	0	Surface
Area 1	1	10 YR 5/3	Silty Loam	1–5	Unconsolidated surface soil
Area 1	2	7.5 YR 4/4	Silty clay loam	2–10	Post-occupational fill
Area 1	3	7.5 YR	Clay loam to	10–50	Room fill with adobe

Provenience	Stratum	Color	Texture	Thickness (cm)	Description
		5/4-6/3 to 10 YR 5/3	silty clay		melt
Area 1	4	7.5 YR 5/3 to 10 YR 5/3-6/3	Silty clay loam	10–40	Room fill with wallfall
Area 1	5	7.5 YR 5/4	Clay loam	0	Room 2, floor 1, surface
Area 1	6	10 YR 5/3	Clay loam	14	Room 3, subfloor soil
Area 1	7	10 YR 5/3	Silty clay loam	0	Room 4, floor 1, surface
Area 1	8	7.5 YR 3/1	Clay	0	Room 6, floor 3, surface
Area 1	9	7.5 YR 5/4	Clay	0	Room 1, floor 1, surface
Area 1	10	7.5 YR 5/3	Clay	4–8	Room 1, subfloor soil
Area 1	11	10 YR 5/4	Silty clay loam	0	Room 3, floor 1, surface
Area 1	12	7.5 YR 3/1	Clay	0	Room 6, floor 1, surface
Areas 2, 3, 4	13	10 YR 5.2-7.5	Silty loam	15–40	A, Bw and Bwb1 soil horizons
Area 1	14	7.5 YR 5/3	Silty clay loam	16	Room 6, feature 2 fill
Area 1	15	7.5 YR 5/3	Clay	1–7	Room 6, floor 1, matrix
	16				Omitted
Area 1	17	7.5 YR 5/4	Clay	0	Room 6, floor 2, surface
Area 1	18	7.5 YR 3/1	Clay	1–3	Room 6, floor 2, matrix
Area 1	19	10 YR 5/3	Silty clay loam	5–10	Room 2, rooffall
Area 1	20	7.5 YR 5/3	Silty clay loam	7–14	Room 6, feature 5 fill
Area 1	21	7.5 YR 5/3	Clay	0	Room 5, floor 1, surface
Area 1	22	7.5 YR 5/3	Silty clay loam	6	Room 5, feature 7
Area 1	23	10 YR 4/2	Silty clay	0	Room 8, floor 1, surface
Area 1	24	10 YR 4/4-5/4	Silty clay loam	10	Room 2, feature 4 fill
Area 1	25	10 YR 4/5-5/4	Silty clay loam	16	Room 2, feature 3 fill
Area 1	26	7.5 YR 4/4 to 10 YR 4/5	Silty clay loam	16	Room 2, feature 1 fill

Provenience	Stratum	Color	Texture	Thickness (cm)	Description
Area 1	27	7.5 YR 5/3	Silty clay loam	5–14	Room 5, feature 8 fill
Area 1	28	7.4 YR 5/3	Clay	6	Room 4, floor 1, matrix
Area 1	29	7.5 YR 3/1-5/3	Clay	0	Room 4, floor 2, surface
Area 1	30	7.5 YR 5/3	Silty clay loam	4–9	Room 4, feature 10 fill
Area 1	31	7.5 YR 4/4	Silty clay loam	4	Room 2, feature 6 fill
Area 1	32	10 YR 2/2, 3/3, 6/3	Clay loam	14	Room 2, feature 11 fill
Area 1	33	7.5 YR 5/3	Clay loam	0	Room 7, living surface
Area 1	34	7.5 YR 4/4	Silty clay loam	9–14	Room 2, feature 12 fill
Area 1	35	7.5 YR 3/1	Clay	2–5	Room 4, floor 2, matrix
Area 1	36	7.5 YR 3/1-5/3	Clay	0	Room 4, floor 3, surface
Area 1	37	10 YR 7/2	Ash with loamy clay	12–14	Room 8, feature 9 fill
Area 1	38	10 YR 5/4	Clay loam	0	Room 9A, living surface
Area 1	39	10 YR 5/4	Clay loam	0	Room 9B, living surface
Area 1	40	7.5 YR 4/3	Silty loam	26	Room 4, disturbed rodent fill
Area 1	41	7.5 YR 5/3	Clay	2–6	Room 5, floor 1, matrix
Area 1	42	7.5 YR 5/3	Clay	0	Room 5, floor 2
Area 1	43	10 YR 3/2	Clay loam	20	Room 2, subfloor
Area 1	44	10 YR 3/1	Silty clay	5	Room 6, floor 1, matrix
Area 1	45	10 YR 5/4	Sandy silt loam	8	Room 2, Feature 16 fill
Area 1	46	7.5 YR 4/4	Silty clay	8–11	Room 5 and 6, subfloor
Area 1	47	7.5 YR 6/4-7/1	Ash and clay	3	Room 8, feature 9, upper hearth base
Area 1	48	7.5 YR 6/3	Clay	6	Room 8, feature 9, lower hearth base
Area 1	49	7.5 YR 5/3	Silty clay	1–5	Room 5, floor 2, matrix
Area 1	50	10 YR 4/4	Silty clay loam	6	Room 2, floor (upper)
Area 1	51	7.5 YR 5/3	Silty clay	--	Room 4, masonry and adobe wall matrix

During the excavation, slight differences could be discerned between the upper and lower sections of Strata 3 and 4. The room fill situated about 20 cm above the room fill contains more charcoal, botanical remains, and artifacts and a few roof casts. Therefore, the upper sections of these strata were defined as Strata 3a/4a and lower sections as 3b/4b. Strata 3b/4b appear to exhibit more water laminations, indicating that these deposits were exposed to the rain. Otherwise, there is more rodent disturbance in Stratum 4 relative to Stratum 3. This probably relates to the paucity of adobe and the presence of tuff blocks that provided overburden that was easier to burrow through. Lastly, a dense layer of adobe melt was identified adjacent to some of the adobe walls. This layer was defined as Stratum 3c (silty clay).

The remaining strata within the roomblock consist of floor surfaces, floor matrix, and feature fill. A distinction was made between artifacts found lying directly on the floor surface and artifacts or samples removed from the matrix of the adobe floor. Subfloor deposits were also exposed within the rooms. These deposits range from a silty clay to clay to a clay loam and appear to be artificial sediments that were used to level the ancient surface upon which the floors were constructed. These sediments were about 10 to 20 cm thick and were situated on the Bwb1 soil horizon. Otherwise, the roomblock is underlain with a 1.40-m-thick series of Holocene soil horizons and a single Pleistocene soil lying directly on the Bandelier Tuff bedrock. A column of pollen samples (Field Specimen [FS] 2275 to FS 2280, top to bottom) were taken from this soil profile to provide some information on paleoenvironmental conditions. Taxa identified in FS 2275 include cheno-ams (*Chenopodium/Amaranthus*), sunflower family (Asteraceae), fir (*Abies*), unidentified pine (*Pinus* sp.), piñon pine (*Pinus edulis*), juniper (*Juniperus*), and oak (*Quercus*). Those identified in FS 2276 include cheno-ams, sunflower family, unidentified pine, piñon pine, juniper, sagebrush (*Artemesia*), and four o'clock family (Nyctaginaceae). Only unidentified pine was identified in FS 2777. Taxa identified in FS 2778 included sunflower family and juniper, while only unidentified pine was identified in FS 2779 and FS 2780.

Excavations in the areas around the roomblock exposed the upper section of this Holocene sequence. This consisted of the A, Bw, and Bwb1 soil horizons. The A horizon is generally about 2 to 10 cm thick and the Bw about 2 to 7 cm thick. Only a few artifacts were recovered in the upper 10 cm of this soil profile. The top of the Bwb1 horizon represented the ancient surface used by site occupants. Indeed, the top of the Bwb1 was much more compact in the area east of the roomblock (i.e., the plaza), indicating that the surface had been consolidated by trampling.

SURFACE COLLECTION

A surface artifact collection was conducted on the mound and in the surrounding area in 1- by 1-m grids (75-121N/93-133E). Figure 25.4 illustrates the surface distribution of artifacts across the site. As can be seen, most of the artifacts are distributed in two clusters to the east of the roomblock. A small cluster is present to the immediate northeast and a larger cluster to the southeast. This latter area may represent the remains of a trash midden.

SITE EXCAVATION

The site was divided into four separate proveniences or areas (see Figure 25.3). Area 1 consists of the rubble mound of the roomblock within grids 89-112N/105-116E. Area 2 is located to the immediate east of the roomblock, including the plaza area in grids 87-94N/116-120E and 95-110N/104-128E. Area 3 comprises that portion of the site located to the immediate west of the roomblock within grids 89-120N/93-104E. Lastly, Area 4 is situated in the southeastern section of the site, including the possible midden located in grids 75-93N/121-133E.

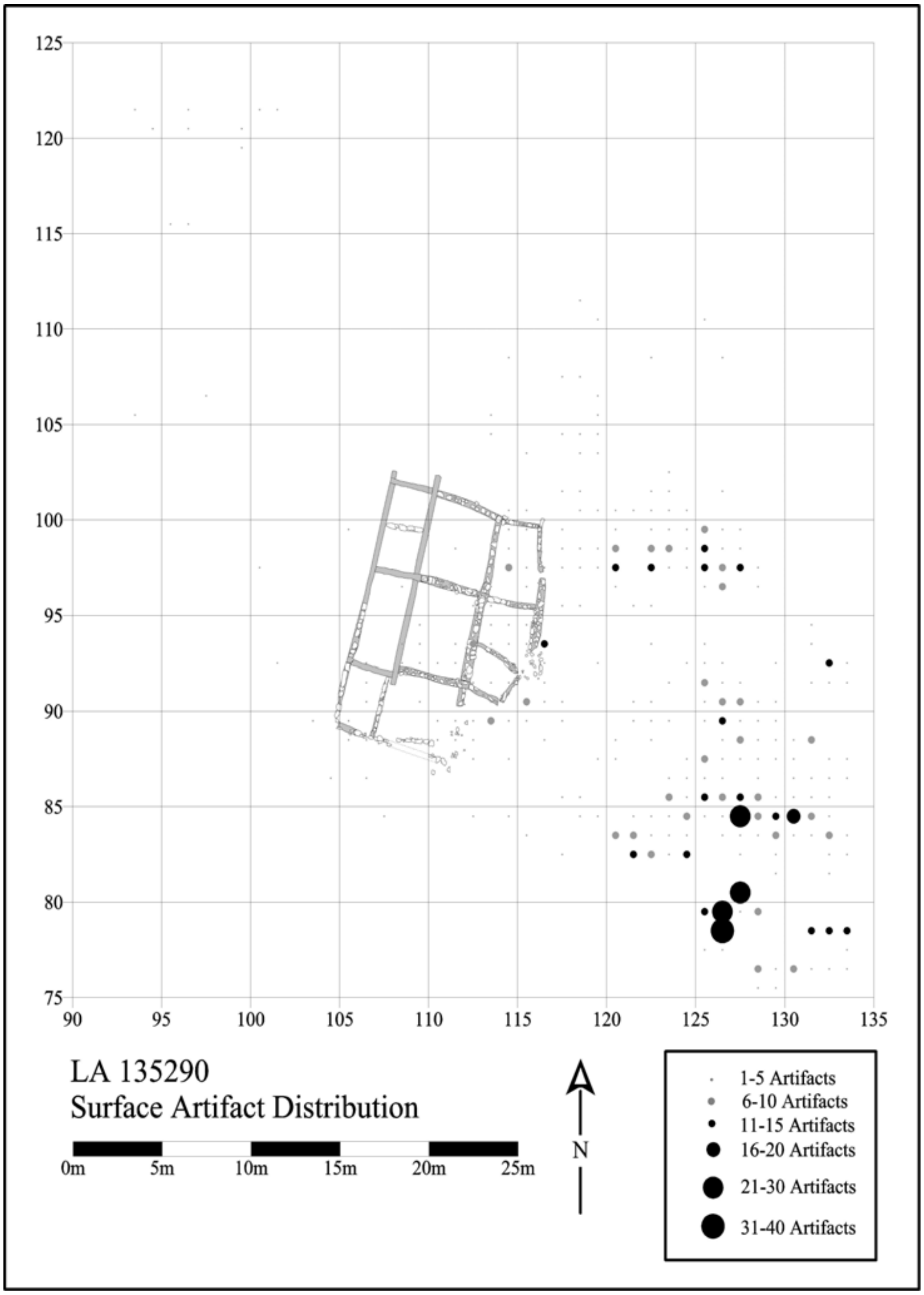

Figure 25.4. Surface artifact distribution.

Area 1 (Roomblock)

Room 1

Sequence of Excavation. Room 1 is located in the north-central part of the roomblock. The room measures 3.8 m north-south by 3.5 m east-west, with 13.30 m^2 of interior space. An east-west test trench (98N/110-113E) was initially excavated through the room to define site stratigraphy and the location of the floor. Excavations proceeded by excavating the room fill to the immediate south of the trench by grid and natural layer. Then, the majority of the room fill was removed to the north of the trench by grid and natural layer. After sections of the floor were exposed, several grids were excavated below this level. This was in part because of the disturbed nature of the floor and the exposure of subfloor deposits due to rodent activity.

Fill. After the removal of about 20 cm of post-occupational fill (Strata 1 and 2), the remainder of the room contained approximately 70 to 80 cm of Stratum 4. Stratum 4 was a silty clay loam soil mixed with wallfall and some adobe melt. Wallfall was generally present within 1 to 2 m of standing masonry walls and adobe melt adjacent to the adobe western wall. This differed from the center of the room, which contained a few small pieces of tuff with little adobe melt. The room fill was disturbed by rodent activity, although this disturbance appears to increase with depth. On the other hand, there were fewer tuff blocks with an increase in small tuff fragments and adobe melt with depth. The lower 20 cm of room fill (Stratum 4b) exhibited an increase in the amount of charcoal, charred maize kernels, and artifacts.

Flotation and pollen samples were taken from Strata 1, 2, 4a, and 4b (Table 25.4). Charred taxa identified in the flotation sample taken from Stratum 1 include piñon pine (*Pinus edulis*), ponderosa pine (*Pinus ponderosa*), cottonwood/willow (*Populus/Salix*), and maize (*Zea mays*). No charred taxa were identified in Stratum 2. Charred taxa identified in Stratum 4a include unknown conifer (Gymnospermae), piñon pine, ponderosa pine, and maize. The sample from Stratum 4b was not analyzed.

Taxa identified in the pollen sample from Stratum 1 include cholla (*Opuntia*), buckwheat (*Eriogonum*), cheno-am (*Chenopodium/Amaranthus*), grass family (Poaceae), sunflower family (Asteraceae), fir (*Abies*), unidentified pine, piñon pine, juniper, oak (*Quercus*), rose family (Rosaceae), and sagebrush (*Artemesia*). Taxa identified in Stratum 2 include maize, cheno-ams, sunflower family, unidentified pine, piñon pine, juniper, and sagebrush. Taxa identified in Stratum 4a include prickly pear (*Opuntia*), beeweed (*Cleome*), cheno-ams, grass family, mustard family (Brassicaceae), sunflower family, unidentified pine, piñon pine, juniper, and sagebrush. Taxa identified in Stratum 4b include cheno-ams, grass family, sunflower family, unidentified pine, juniper, oak, rose family, and sagebrush.

A series of macrobotanical specimens from levels 4 to 9 were also selected from Strata 4a and 4b (see Table 25.4). Taxa identified in the Stratum 4a samples (FS 1047, FS 1201, and FS 1326) include pine, ponderosa pine, cottonwood/willow, oak, bean, and maize. Taxa identified in Stratum 4b (FS 1450, FS 1550, and FS 1767) include mountain mahogany, beeweed, unknown conifer, unidentified pine, ponderosa pine, cottonwood/willow, oak, and maize.

Floor. The floor (Stratum 9) was heavily disturbed by rodent activity, with only about 10 percent of the surface being intact (Figures 25.5 and 25.6). These small intact sections were primarily situated in the northern areas of the room, consisting of a 5- to 7-cm-thick layer of adobe. The floor was defined by the presence of a burned and/or prepared adobe surface. Several pockets of ash were noted on or immediately above the level of the floor. A flotation (FS 1705) and pollen sample (FS 1706) were taken from grid 98N/111E. Taxa identified in the flotation sample include goosefoot, cheno-ams, squash/coyote gourd (*Cucurbita*), unknown conifer, juniper, bean (*Phaseolus*), ponderosa pine, cottonwood/willow, and maize. Taxa identified in the pollen sample include squash, maize, prickly pear, cheno-ams, grass family, sunflower family, ragweed/bursage (*Ambrosia*), evening primrose (Onagraceae), unidentified pine, piñon pine, juniper, oak, and sagebrush.

Flotation samples were also taken on the floor in the center of the room (FS 1896) and in the northwest corner of the room (FS 1837). Charred taxa identified in the center of the room include pigweed (*Amaranthus*), goosefoot, juniper, piñon pine, ponderosa pine, oak, and maize. Charred taxa identified in the sample taken from the northwestern corner of the room include goosefoot, cheno-ams, juniper, ponderosa pine, and maize.

Figure 25.5. Photograph of Room 1 (west).

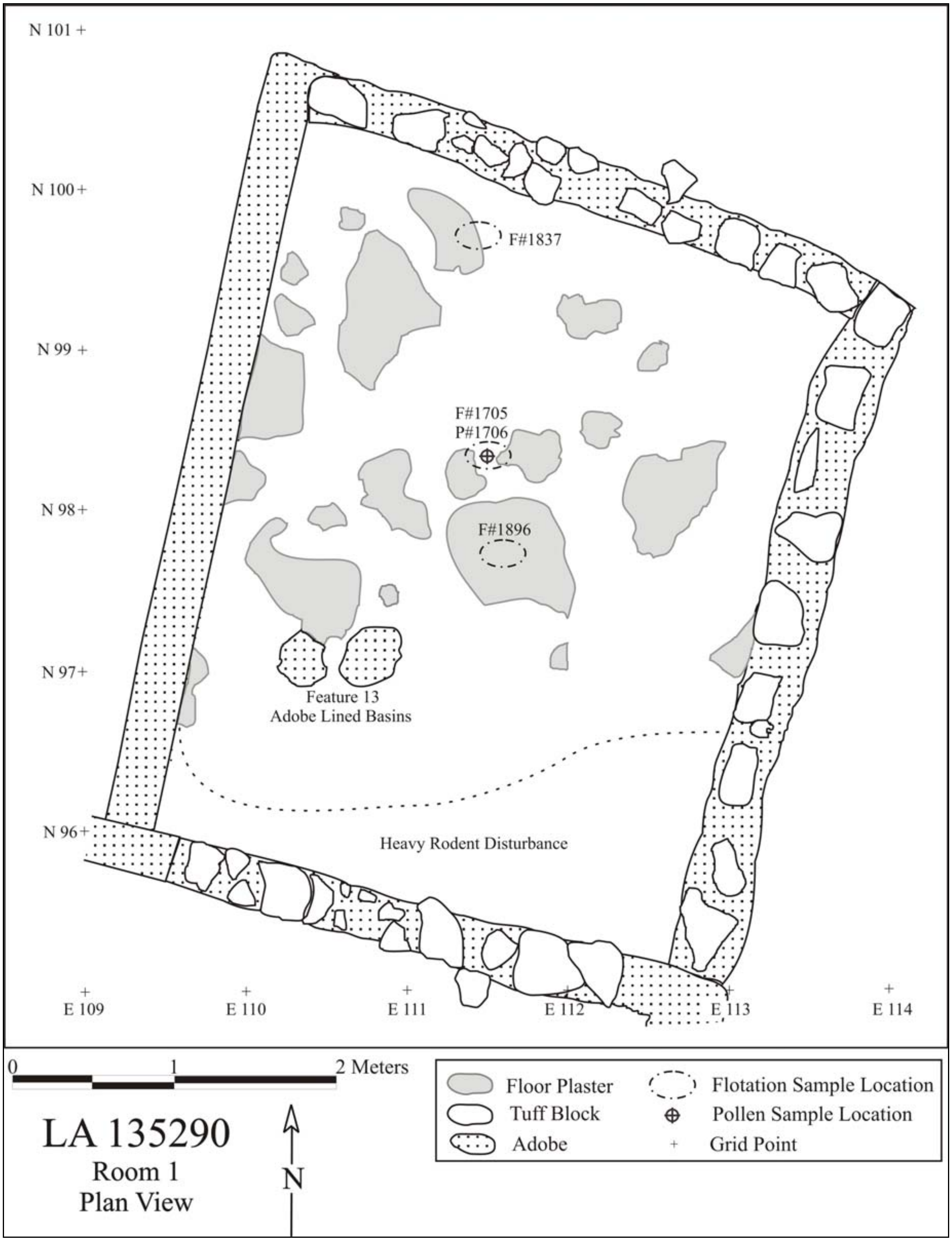

Figure 25.6. Room 1 floor map.

No artifacts were uncovered lying directly on the intact sections of the floor. But a single feature (Feature 13) was identified in the southwestern area of the room. Feature 13 consists of two heavily disturbed adobe lined basins. The basins are contiguous with each other, but only consist of the bottom portions of the basins. The features are 40 to 42 cm long, 33 to 38 cm wide, and 3 to 5 cm in depth and are situated slightly below the floor level. Although they do not articulate with the existing sections of the floor, the features are presumably associated with the original floor in Room 1.

Several grids were excavated below the level of the floor (96-97N/112E, 98N/110E, and 98-99N/111E). The soil underlying this level consisted of a clay or clay loam (Stratum 10) with a blocky structure. The sediment appears to be artificial fill that is about 15 to 20 cm thick and was situated directly on top of the Bwb1 soil horizon. Seventeen sherds and five pieces of debitage were recovered from these deposits. The artifacts were presumably derived from the upper room deposits.

Wall Construction. The northern, eastern, and southern walls of the room were constructed of masonry, with wallfall situated within about 2 m of each wall. The lower section of the west wall was constructed of adobe and the upper section was composed of masonry. The majority of the north, east, and west (masonry) walls collapsed into the room, while most of the south wall had collapsed into Room 2. Approximately 60 to 90 cm of standing walls remained, with the west wall solely consisting of adobe that was 60 cm high. There were no discernable doorways in any of the walls. Room 1 wall measurements are listed in Table 25.2.

Table 25.2. Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	# Courses
North	3.6	0.77	0.30	3
South	3.55	0.90	0.30	4
East	3.8	0.70	0.30	3
West	4.1	0.60	0.25	Adobe

Wall construction is quite different between the north and south walls. The lower section of the north wall is constructed of a series of unshaped upright tuff blocks with adobe mortar, while the upper section consists of horizontally placed blocks (Figure 25.7). The uprights range from 40 to 45 cm high by 15 to 20 cm wide. They are staggered at 20- to 40-cm intervals and are interspersed with adobe mortar and smaller pieces of tuff that are about 10 to 20 cm in size. Overall, the lower wall section is approximately 55 cm high. The upper section is composed of horizontally placed tuff blocks that range from 25 to 50 cm long by 10 to 20 cm wide. Only a single course of stones is still standing. The wall is covered by a 10-cm-thick layer of adobe.

Figure 25.7. Room 1, north wall.

The south wall is constructed quite differently from the north wall. There are no large upright blocks in the lower section of the wall. Instead, the lower section is composed of a single course of large unshaped tuff blocks that are situated contiguous to each other (Figure 25.8). The blocks range from 20 to 30 cm high by 10 to 30 cm wide. The upper section consists of 1 to 2 courses of horizontally placed tuff blocks with adobe mortar. These blocks range from 20 to 40 cm wide by 10 to 15 cm high. About 10 cm of adobe also covers the face of this wall.

Subfloor adobe footings about 15 to 20 cm thick are present under the east, west, and south walls of the room. In contrast, there is no adobe footing under the north wall. The upright tuff blocks (basal stones) were set directly into adobe about 10 cm thick. The bottom of this adobe is located at the level of the floor.

Figure 25.8. Room 1, south wall.

Artifacts and Samples. Artifacts and pollen, flotation, and macrobotanical samples were selected from grids 97N/111-112E and 98N/111E. In addition, samples were selected from floor contexts. Tables 25.3 and 25.4 provide summary information on artifacts by stratigraphic unit and samples selected for analysis, respectively.

Table 25.3. Room 1 artifact counts by stratigraphic unit.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
1	26	2	0	0	0	28
2	44	14	3	0	0	61
3	9	1	5	0	1	16
4	309	58	13	4	10	394
9	0	0	0	0	0	0
10	30	7	0	0	0	37
51	3	0	2	0	0	5
Mixed	6	0	0	0	0	6
Total	**427**	**82**	**23**	**4**	**11**	**547**

Table 25.4. Samples selected for analysis in Room 1.

Stratum	Sample Type		
	Pollen	Flotation	Macrobotanical
1	1272	1271	0
2	1301	1302	1303
4a	1330	1329	1326, 1047, 1201
4b	1446	1420	1450, 1767, 1559,
9	1706	1705, 1837, 1896	0

Room 2

Sequence of Excavation. Room 2 is located in the east-central section of the roomblock. The room measures 4.4 m north-south by 3.56 m east-west and has 15.66 m^2 of interior space. An east-west test trench (93N/108-112E) was also excavated through the room to define site stratigraphy and the location of the floor.

Fill. After the removal of the post-occupational fill (Strata 1 and 2), the remainder of the room contained a mix of Strata 3 and 4 that was 50 to 70 cm thick. Stratum 3 was a clay loam soil that was mostly identified in the western area of the room adjacent to the adobe wall. Stratum 4 was a silty clay loam mixed with wall, some adobe melt, and possible roofing material (Stratum 19). The wallfall was primarily located adjacent to the masonry northern and eastern walls, with little near the adobe western and masonry southern walls. There was a notable increase in the density of ceramics in the northeastern area of the room. Flotation, pollen, and macrobotanical samples were taken from Strata 2, 4a, and 4b (see Table 25.7).

Taxa identified in the flotation sample collected from the fill levels (Stratum 2) include unknown conifer, piñon pine, oak, and maize. Taxa identified in Stratum 4a include cheno-ams, ponderosa pine, and maize. Taxa identified in Stratum 4b include goosefoot, cheno-ams, unknown conifer, piñon pine, ponderosa pine, and maize.

Taxa identified in the pollen samples from the fill levels (Stratum 2, post-occupational fill) include cheno-ams, grass family, sunflower family, ragweed/bursage, unidentified pine, piñon pine, juniper, oak, rose family, and sagebrush. Taxa identified in Stratum 4a include cheno-ams, sunflower family, spurge family (Euphorbiaceae), unidentified pine, piñon pine, juniper, and sagebrush. Taxa identified in Stratum 4b include maize, cholla, prickly pear, beeweed, cheno-ams, grass family, sunflower family, ragweed/bursage, unidentified pine, piñon pine, juniper, and sagebrush.

Macrobotanical samples (FS 1102, FS 1167, FS 1703, FS 1741, FS 1902, and FS 1938) from the fill levels include the following taxa: mountain mahogany, unknown conifer, ponderosa pine, juniper, unidentified pine, piñon pine, cottonwood/willow, unknown non-conifer, and maize.

Stratum 19 was identified in the central area of the room. The deposit was 5 to 10 cm thick and consisted of burned chunks of adobe mixed with charcoal in grids 93N/110-112E. This material was located on the floor and had burned this section of the floor. It presumably represents burned roofing material. Three flotation samples (FS 1897, FS 1898, and FS 2034) were taken from this deposit and included the following charred taxa: goosefoot, cheno-ams, unknown conifer, juniper, bean (*Phaseolus*), unidentified pine, piñon pine, ponderosa pine, cottonwood/willow (*Populus/Salix*), plantain (*Plantago*), purslane (*Portulaca*), oak, dropseed grass (*Sporobolus*), and maize. A macrobotanical (FS 2046) sample was also collected from the deposit and includes the following taxa: mountain mahogany, unknown conifer, juniper, unidentified pine, ponderosa pine, and oak. In addition, six smeared-indented, three indented, and four plain corrugated sherds were recovered from this stratum.

Floor. Floor 1 (Stratum 5) was first encountered in the southeastern corner of the room where there was obvious coping to the wall (Figures 25.9 and 25.10).

Figure 25.9. Photograph of Room 2 (north).

The floor was very patchy due to extensive rodent disturbance, but does cover about two-thirds of the room. Most of the floor is not burned, although there is extensive burning in the central area of the room where the floor plaster is ashy and sooted in some spots. Although the floor consists of a relatively thick 3- to 5-cm layer of adobe, it has collapsed in many sections of the room due to rodent burrows. Manganese staining is also present in some parts of the floor adjacent to the walls. Adobe coping can be found in about 90 percent of areas where the walls articulate with the floor.

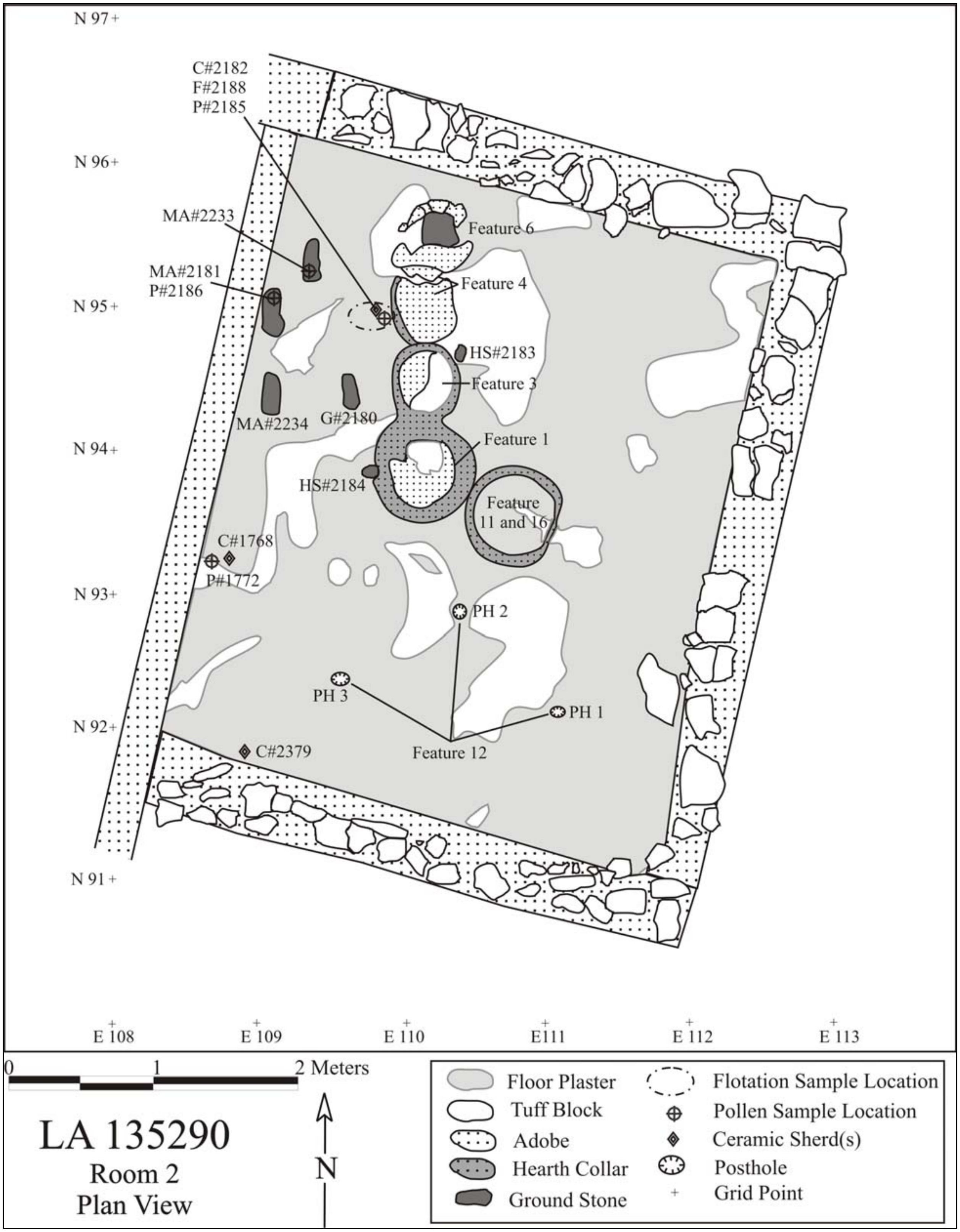

Figure 25.10. Room 2 floor map.

Several artifacts were present on Floor 1 (Stratum 5). Most of these were situated in the northwestern area of the room, to the west of Features 1, 3, 4, and 6. Eight smeared-indented corrugated sherds from the same utility jar vessel (FS 2182) were found immediately to the west of Feature 4. A pollen (FS 2185) and flotation (FS 2188) sample were taken from under the vessel. The pollen sample contained the following taxa: squash (*Cucurbita*), maize, cholla, prickly pear, cheno-ams, grass family, sunflower family, evening primrose (Onagraceae), unidentified pine, piñon pine, juniper, oak, cottonwood (*Populus*), and sagebrush. The flotation sample included the following charred taxa: unknown conifer and ponderosa pine.

A maul (FS 2180), three two-hand manos (FS 2181, FS 2233, and FS 2234), and two hammerstones (FS 2183 and FS 2184) were also found on the floor. A pollen sample was taken from under the maul (FS 2186) near the west wall, and a mano was submitted for pollen wash (FS 2234). The following taxa were identified in the pollen sample: squash, maize, cholla, prickly pear, grass family, sunflower family, evening primrose, unidentified pine, piñon pine, juniper, and sagebrush. Taxa identified in the pollen wash included squash, maize, and unidentified pine. In addition, hammerstones were present to the northeast of Feature 3 (FS 2183) and immediately west of Feature 1 (FS 2184). A very large sherd from a smeared-indented corrugated vessel (FS 1768) was also present near the west wall in the southwestern section of the room. A pollen sample (FS 1772) was taken from several centimeters of fill under the sherd and on top of the floor. Identified taxa include prickly pear, cheno-ams, grass family, sunflower family, unidentified pine, piñon pine, juniper, and sagebrush. A smeared-indented corrugated sherd (FS 2379) yielded a thermoluminescence (TL) date of AD 816±133.

Nine features were identified on the floor of Room 2. These consist of a collared hearth, three adobe-lined pits, two adjacent hearths, and three post holes. Features 1, 3, 4, and 6 comprise an interconnected complex with a collared hearth and three adobe-lined pits (Figures 25.11 and 25.12). The feature complex is situated in the northwestern area of the room and is oriented north-south. The collared hearth (Feature 1) is circular in plan view, is basin-shaped in cross-section, and measures 70 cm in diameter and 16 cm in depth. The adobe collar is approximately 10 to 15 cm thick and rises to a height of about 10 cm above the floor. When the collar was removed during excavation, the original floor plaster was exposed, indicating that the feature was a later addition. The other three pits are all directly connected to the original floor. There was no evidence of burning and the pit fill (Stratum 26) was quite similar to the Stratum 4 sediments surrounding the feature.

A chalcedony core (FS 2102), charred maize kernels, and a maize cob (FS 2103) were recovered from the fill. Flotation (FS 2099 and FS 2138) and pollen (FS 2100 and FS 2137) samples were taken. Taxa identified in the flotation samples include pigweed (*Amaranthus*), saltbush/greasewood (*Atriplex/Sarcobatus*), mountain mahogany (*Cercocarpus*), goosefoot, cheno-ams, grass family, unknown conifer, juniper, mint family (Labiatae), unidentified pine, piñon pine, ponderosa pine, cottonwood/willow, purslane, oak, and maize. Taxa identified in the pollen samples include squash, maize, cholla, cheno-ams, grass family, mint family, purslane, mustard family (Brassicaceae), sunflower family, ragweed/bursage, evening primrose (Onagraceae), fir (*Abies*), unidentified pine, piñon pine, juniper, oak, polygala type, rose family, Mormon tea (*Ephedra*), and sagebrush. It may be that Feature 1 was constructed, but never used as a hearth. The maize kernels recovered in FS 2103 were submitted for radiocarbon analysis.

This sample yielded an age of 870±40 BP (Beta-199386) and a date of cal AD 1180 with a two-sigma date range of cal AD 1040–1260.

Figure 25.11. Photograph of Features 1, 3, 4, and 6 (north).

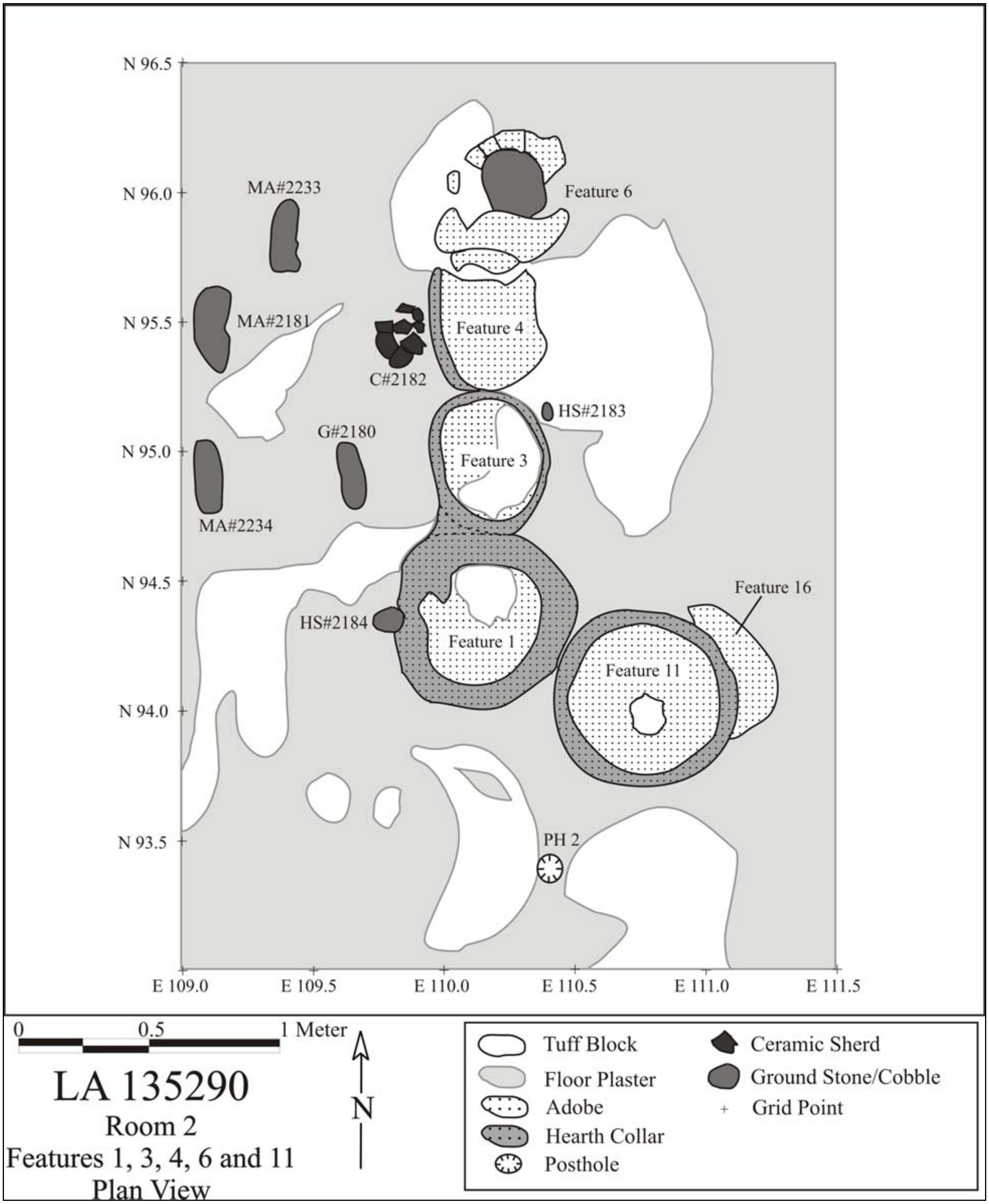

Figure 25.12. Features 1, 3, 4, 6, and 11 plan view.

Features 3, 4, and 6 all consist of adobe-lined pits running south to north, respectively. Although the area has been disturbed by rodent activity, the three features were probably connected by adobe collars. Feature 3 has been heavily disturbed by rodent burrowing and only the northern and western portions were still intact. The pit is circular-shaped in plan view and is 50 cm in diameter and 16 cm deep. There is no evidence of burning and the fill (Stratum 25) is similar to that encountered in the sediments surrounding the feature (Stratum 4). The collar around Feature 3 appeared to have been remodeled during the construction of Feature 1. When the Feature 3 collar was removed, it was determined that the feature originally had no collar and was directly connected to the floor.

A flotation and pollen sample were both collected from Feature 3. The flotation sample (FS 2083) contained the following charred taxa: pigweed, mountain mahogany, goosefoot, unknown conifer, mint family, piñon pine, ponderosa pine, oak, and maize. The pollen sample (FS 2084) contained the following taxa: squash, maize, cholla, prickly pear, beeweed, plantain, cheno-ams, grass family, sunflower family, evening primrose, fir, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

Feature 4 is a relatively shallow pit. It is oval-shaped in plan view, measuring 34 by 51 cm and is 10 cm deep. This feature has also been heavily disturbed by rodent burrowing, but the western side of the pit is partially intact with a slight collar. Again, the fill (Stratum 24) is similar to the surrounding sediments, with no evidence of burning. One flotation sample (FS 2069) was collected and the following carbonized taxa were identified: pigweed, saltbush/greasewood, goosefoot, cheno-ams, unknown conifer, mint family, bean, unidentified pine, piñon pine, ponderosa pine, purslane, and maize. One pollen sample (FS 2068) was collected from Feature 4 and the following taxa were identified: cotton (*Gossypium*), maize, prickly pear, beeweed, cheno-ams, grass family, sunflower family, evening primrose, and sagebrush.

Feature 6 is also a shallow oval-shaped pit. It measures 40 by 47 cm and is 2 to 10 cm deep. The feature has also been disturbed by rodent activity, but most of the bottom of the pit is intact. The bottom has a single flat dacite cobble that was set into the adobe plaster. The cobble is 20 cm wide. No burning was evident inside the pit or on the cobble.

Features 11 and 16 are hearths that were partially superimposed over each other. Both features are located immediately southeast of Feature 1. Feature 11 consists of an adobe-lined collared hearth that was capped with an ash lens (Figures 25.13 and 25.14). It is circular in plan view and somewhat basin-shaped in cross-section and measures 64 cm in diameter by 14 cm deep. The eastern portion of the hearth was destroyed by rodent activity, but the remainder of the feature was intact. The collar of the hearth was about 6 cm thick and raised approximately 5 cm above the floor. The pit fill (Stratum 32) is quite distinct from that encountered in the other pit features. The sides of the pit are burned and the fill is very ashy with lots of adobe and charcoal mixed with soil. The fill was separated into three parts: 1) upper fill with ash, charcoal, and silty loam soil ranging from pale to dark-yellow-brown in color; 2) middle fill with adobe and charcoal bits in a dark-yellow-brown clay loam soil matrix; and 3) lower fill consisting of a dark brown silty clay loam mixed with some of the adobe lining.

Flotation (FS 2253, FS 2254, FS 2255, FS 2256, FS 2257, and FS 2258) and pollen (FS 2252 and FS 2348) samples were taken from the upper fill. The flotation samples from the upper fill include the following taxa: mountain mahogany, goosefoot, cheno-ams, unknown conifers, juniper, mint family, tobacco (*Nicotiana*), bean, piñon pine, ponderosa pine, prickly pear, purslane, purslane family, cottonwood/willow, oak, and maize. Taxa identified in the pollen samples from the upper fill include maize, prickly pear, beeweed, buckwheat (*Eriogonum*), cheno-ams, grass family, sunflower family, unidentified pine, piñon pine, juniper, oak, spurge family, penstemon family (Scrophulariaceae), Mormon tea, and sagebrush. Flotation samples were also taken from the middle-lower fill (FS 2330, FS 2331, FS 2332, and FS 2350) of the pit. Taxa identified in these samples include goosefoot, cheno-ams, grass family (Graminae), winged pigweed (*Cycloloma*), unknown conifer, juniper, uncharred tobacco, unidentified pine, piñon pine, ponderosa pine, purslane, oak, and maize.

Figure 25.13. Photograph of Feature 11.

In addition, maize (FS 2333), piñon pine and ponderosa pine wood charcoal (FS 2346), three smeared-indented corrugated sherds, and two cottontail (*Sylvilagus audobonii*) and ground squirrel (*Spermophilus* sp.) bones were recovered from the pit fill. The maize kernels recovered in FS 2333 were submitted for radiocarbon analysis (Beta-199387), but the sample was too small to yield a reliable result. One of the smeared-indented corrugated sherds (FS 2259) yielded a TL date of AD 1050±90. An archaeomagnetic sample (set 1229) was taken from the burned bottom of the hearth. The error ellipse overlaps two segments of the Wolfman calibration curve in the AD 1000–1300 time period, but a pre-AD 1125 date possibility is unlikely given the Santa Fe Black-on-white pottery associations of the site. The most probable date range based on the result and the Wolfman curve is AD 1200–1270. The large range is due to the imprecise pole location estimate; the centerpoint of the result is closest to the curve at about AD 1235. The relevant date range based on the SWCV2000 curve is AD 1175–1325, encompassing the Wolfman curve date range.

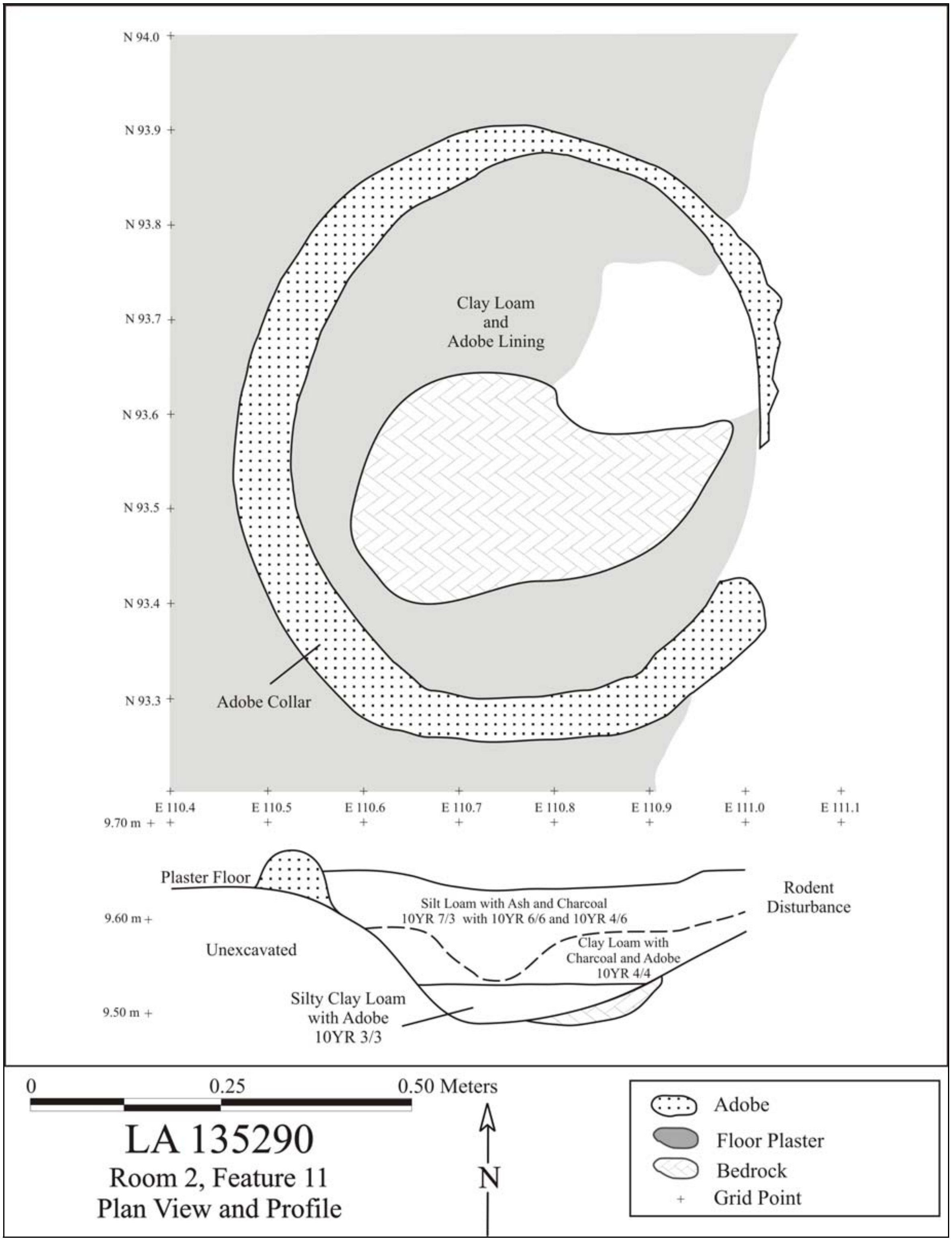

Figure 25.14. Feature 11 plan view and cross section.

Feature 16 is situated underneath the eastern section of Feature 11 and was partially destroyed by the construction of the upper hearth. Feature 16 is also an adobe-lined hearth with only slight evidence of a collar. It was probably circular in shape, but all that remains is a section that is 48 cm in length, 26 cm wide, and 8 cm deep. The sides of the pit and the collar are heavily burned, but the floor is only slightly charred with ash staining. The fill (Stratum 45) contains charcoal and ash. Flotation (FS 2563 and FS 2564) and pollen (FS 2579) samples were taken from Feature 16. Taxa identified in the flotation samples include goosefoot, unknown conifer, juniper, uncharred tobacco, piñon pine, ponderosa pine, oak, and maize. Taxa identified in the pollen sample include squash, maize, cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, and sagebrush.

An archaeomagnetic sample was taken from the floor of the hearth (set 1231). Eight specimens were collected from the lower hearth. The error ellipse overlaps two segments of the Wolfman curve within the AD 1100–1300 time span, resulting in two possible date ranges. The earlier and less likely range is AD 1105–1150, while the later range of AD 1155–1210 is a more probable date interpretation for the last burning of the hearth. The date range based on the SWCV2000 curve is AD 1035–1165, but this range is too early given contextual information, and it is believed that the SWCV2000 curve does not accurately reflect virtual geomagnetic pole (VGP) movement at this time period (see Cox and Blinman 1999 for a discussion of sources of systematic distortion in SWCV VGP curves). Maize kernels recovered in FS 2564 were submitted for radiocarbon analysis. This sample yielded an age of 860±40 BP (Beta-199389) and a date of cal AD 1190 with a two-sigma date range of cal AD 1040–1260.

Three postholes (Feature 12; Stratum 34) were identified south of Features 1 and 11. They are 4 to 6 cm in diameter and 9 to 14 cm deep. Flotation samples were taken from posthole 1 (FS 2376) and posthole 3 (FS 2378). Carbonized taxa identified in posthole 1 included unknown conifer and maize, and those identified in posthole 3 included unknown conifer, unidentified pine, and maize.

There appears to be three separate remodeling episodes represented by the construction of the floor features. Feature 16 was constructed first and is overlain by a thin layer of sandy fill between it and Floor 1. Feature 11 was built over Feature 16 and Features 3, 4, and 6 were constructed on Floor 1. Feature 1 was constructed last and was connected to Feature 3.

A subfloor test pit (93N/110E) identified the presence of about 25 cm of artificial fill (Stratum 43) overlying the Bwb1 soil horizon. This material was presumably brought in to create a level and stable surface for the construction of the room. Seven sherds, three pieces of debitage, and six bones were recovered from these deposits. A pollen and flotation sample were taken (FS 2550 and FS 2549, respectively). Taxa identified in the pollen sample include cheno-ams, grass family, sunflower family, ragweed/bursage, spruce (*Picea*), unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush. Charred taxa identified in the flotation sample include unknown conifer, piñon pine, ponderosa pine, and maize.

Wall Construction. The walls in Room 2 are in relatively good condition. The three masonry walls are constructed of mostly unshaped tuff blocks with adobe mortar. The northern masonry wall is almost 1 m high and still exhibited some intact wall plaster along the base (Figure 25.15).

Figure 25.15. Rooms 1 and 2 north walls.

The detail of the wall construction was described in Room 1. The east masonry wall is similar to the north wall, and there is intact wall plaster along the base of the wall. The south wall is the most deteriorated of the masonry walls and is two to four courses high. This was likely the original exterior wall to the room until Room 3 was added to the roomblock. The west wall was made of adobe and was in very good condition. None of the walls exhibited any evidence of burning, and there was no evidence for doorways in any of the walls. Room 2 wall measurements are listed in Table 25.5.

Table 25.5. Room 2 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	# Courses
North	3.52	0.82	0.34	3-6
South	3.60	0.33	0.35	2-3
East	4.51	0.62	0.41	2-5
West	4.40	0.48	0.38	adobe

Sub-floor adobe footings about 18 to 20 cm thick were present under the north, west, and east walls. However, the large tuff blocks (basal stones) in the south wall were set horizontally into depressions that were lined with adobe below the floor. The depressions were about 20 cm deep. Two of these large blocks measured about 50 by 40 by 20 cm in size. Otherwise, adobe footings were noted under the south wall.

Artifacts and Samples. Artifacts and pollen, flotation, and macrobotanical samples were selected from grids 93N/110-111E and 94N/111E. In addition, samples were selected from floor contexts in Room 2. Tables 25.6 and 25.7 provide summary information on artifacts by stratigraphic unit and samples selected for analysis in Room 2.

Table 25.6. Room 2 artifact counts by stratigraphic unit.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
1	105	18	0	0	0	123
2	82	8	1	0	0	91
3	124	12	2	0	2	140
4	1230	141	8	18	16	1413
5	22	0	4	0	0	26
19	13	0	0	0	0	13
24	0	0	0	0	0	0
25	0	0	0	0	0	0
26	0	0	1	0	0	1
31	0	0	1	0	0	1
32	3	0	1	2	0	6
34	0	0	0	0	0	0
43	7	3	0	6	0	16
45	0	0	0	0	0	0
46	0	0	0	0	0	0
50	0	0	0	0	0	0
Mixed	105	14	2	3	1	125
Total	**1691**	**196**	**22**	**29**	**19**	**1957**

Table 25.7. Samples selected for analysis in Room 2.

Stratum	Sample Type				
	Pollen	**Flotation**	**Macrobotanical**	**TL**	**Archaeomagnetic**
2	1068	1067	0	0	0
3,4	0	0	1786	0	0
4a	1099	1098	1102	0	0
4b	1164	1163	1167, 1703, 1741, 1902, 1938	0	0

Stratum	Sample Type				
	Pollen	Flotation	Macrobotanical	TL	Archaeomagnetic
5	1772, 2185, 2186, 2234	2188	2345	2379	0
19	0	1897, 1898, 2034	2046	0	0
24	2068	2069	0	0	0
25	2084	2083	0	0	0
26	2100, 2137	2099, 2138	2103	0	0
32	2251, 2252, 2348	2253, 2254, 2255, 2256, 2257, 2258; 2330, 2331, 2332, 2350	2346	2259	9904
34	0	2376, 2378	0	0	0
43	2550	2549	2591	0	0
45	2579	2563, 2564	0	0	9906

Room 3

Sequence of Excavation. Room 3 is located at the southeastern corner of the roomblock. It measures 4.0 m north-south by 3.15 m east-west, with 12.60 m^2 of interior space. Excavations proceeded from north to south in the room by grid and natural layer. The floor was exposed and a subfloor test pit (87N/110E) was excavated in the southeastern area of the room.

Fill. After the removal of a 5- to 15-cm layer of post-occupational fill (Strata 1 and 2), most of the room fill consisted of Stratum 4a deposits. This layer consisted primarily of wallfall mixed with a little charcoal. In the northern part of the room it was about 30 to 40 cm thick, whereas, in the southern section of the room it was only 10 to 15 cm thick. Most of the rubble was situated in the south-central part of the room, although a small amount was located along the north and west walls. Stratum 3b was a 5- to 10-cm-thick layer overlying the fill. This deposit exhibited a marked increase in the presence of artifacts and charcoal, but lacked tuff rubble. Pollen, flotation, and macrobotanical samples (FS 1456, FS 1572, and FS 1831) were taken from Strata 2, 4a, and 3b (see Table 25.10).

Taxa identified in the pollen samples taken from Stratum 2 include maize, cheno-ams, grass family, sunflower family, unidentified pine, piñon pine, juniper, and sagebrush. Taxa identified in Stratum 4a include cheno-ams, grass family, sunflower family, fir (*Abies*), unidentified pine, piñon pine, juniper, oak, and sagebrush. Taxa identified in Stratum 3b include maize, beeweed, cheno-ams, grass family, sunflower family, mustard family, unidentified pine, and sagebrush.

Carbonized taxa identified in the flotation samples from Stratum 2 include juniper, ponderosa pine, and maize. Maize was the only carbonized remains identified in Stratum 4a. Taxa identified in Stratum 3b include pigweed, goosefoot, cheno-ams, grass family, piñon pine, ponderosa pine, purslane, and maize.

Taxa identified in the macrobotanical samples include juniper, piñon pine, ponderosa pine, oak, unknown non-conifer, and maize.

Floor. The floor in Room 3 (Stratum 11) is poorly preserved. Indeed, it is not a plastered surface as in Rooms 1 and 2, but rather a compacted living surface (Figures 25.16 and 25.17).

Figure 25.16. Photograph of Room 3 (looking north).

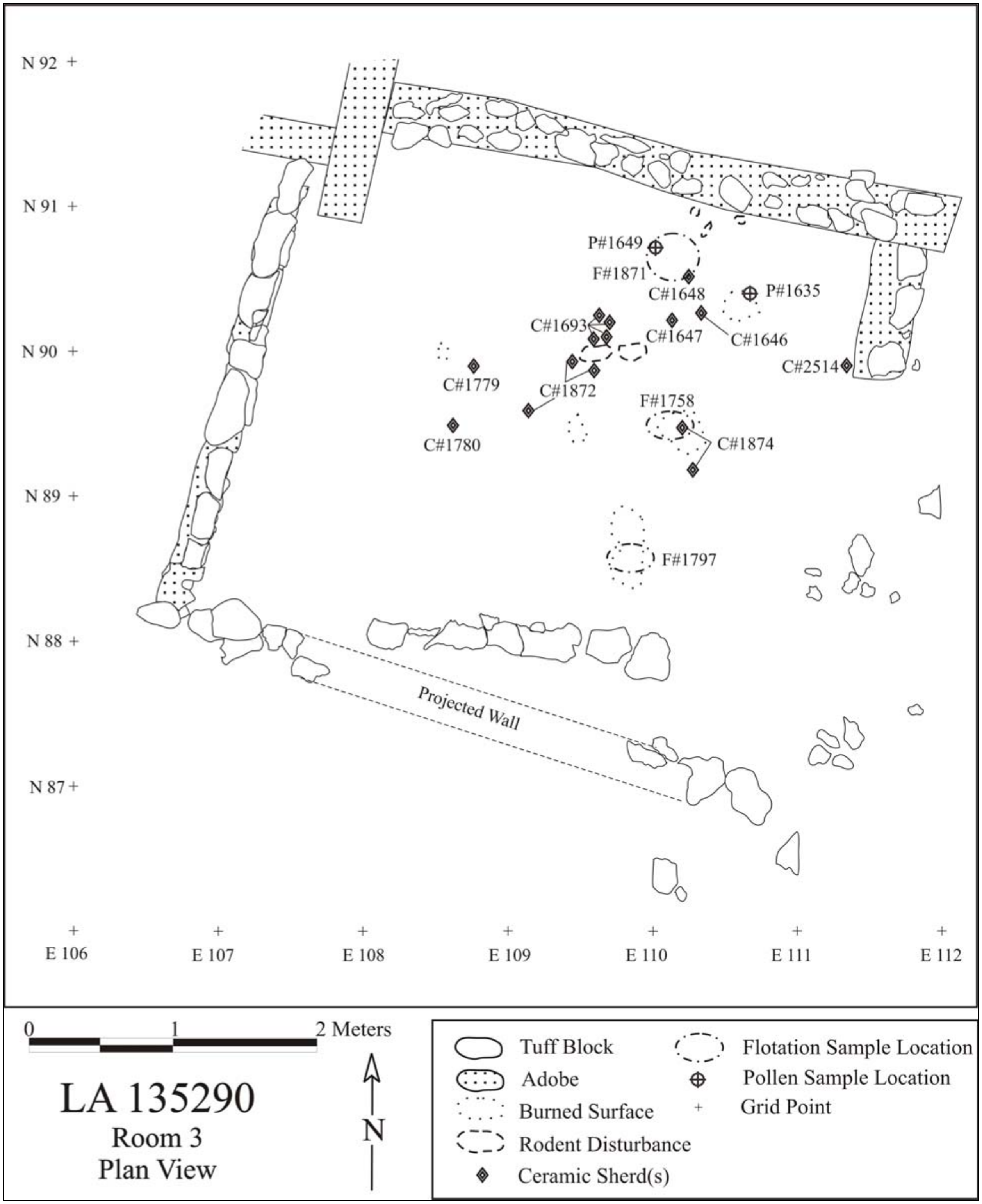

Figure 25.17. Room 3 plan view.

The floor was defined as the surface directly underlying Stratum 4a/3b. In some areas, this stratum had small burned patches. In the northern area of the room there were some sections where horizontal layers flaked off fairly easily to reveal the surface. However, these layers were continuous in other areas of the room, possibly reflecting multiple fine clay lenses of washed adobe from the nearby walls. There is no evidence of the floor being coped to the walls.

No features were identified in the room, but there were five distinct patches of burned sediment with charcoal found on the floor surface (Stratum 3b). These small patches are roughly oriented along a north-south line in the eastern side of the room and could represent rooffall. A couple of the patches contained burned maize cobs and kernels. Flotation (FS 1758 and FS 1797) and pollen (FS 1635) samples were taken from these patches. Carbonized taxa identified in the flotation samples include cheno-ams, grass family, unknown conifer, juniper, unidentified pine, piñon pine, ponderosa pine, and maize. Taxa identified in the pollen sample include maize, unidentified pine, and sagebrush.

Twenty sherds were found at or near the level of the floor surface. These consist of 12 smeared-indented corrugated, five indented corrugated, and three unpainted undetermined sherds. A flotation (FS 1871) and pollen sample (FS 1649) were taken in the northeastern area of the room where the floor was well-preserved (Stratum 11). Taxa identified in the flotation sample include juniper, unidentified pine, piñon pine, and maize. Taxa identified in the pollen sample include prickly pear, cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, rose family (Rosaceae), and sagebrush.

A subfloor test pit (87N/110E) identified the presence of about 15 cm of artificial fill (Stratum 6) overlying the Bwb1 soil horizon. This clay loam with a blocky structure was presumably brought in to create a level and stable surface for the construction of the room. No artifacts were recovered from this deposit.

Wall Construction. The walls in Room 3 are not as well preserved as those described in Rooms 1 and 2. The north and west wall are masonry with one to two courses of mostly unshaped tuff blocks. The west wall is offset about 35 cm to the west from the main north-south wall along Rooms 1 and 2 (Figure 25.18). It appears to be abutted up against the east-west wall that forms the north wall of the room. Therefore, the west wall represents a later addition. This is also supported by the fact that the north-south wall from Rooms 1 and 2 continues into Room 3 for an additional 60 cm immediately adjacent to the west wall of the room.

The east wall of Room 3 is barely visible, consisting solely of four upright tuff rocks. Two of these are situated at the northeastern intersection with Rooms 2, 3, and 9, while the other two are located in the central section of the wall. The blocks are about 25 cm high and were sunk into the floor about 10 to 15 cm. It is unclear if this was originally a continuous upright wall, since there was little or no wallfall in the area.

The south wall consists of seven upright tuff blocks situated in the south-central section of the room. The tuff blocks are about 20 cm high and are sunk approximately 20 cm below the level of the floor. At least some of the wallfall present in the central area of the room was derived from this wall. However, there is no evidence of the western and eastern sections of the wall, either as uprights or wallfall. On the other hand, there are western and eastern sections of a possible wall that aligns with the southern wall in Room 7. It is unclear how these two possible wall segments relate to each other. Room 3 wall measurements are provided in Table 25.8.

There is no evidence of doorways in the north and west walls. It is unclear as to whether there were doorways in the east and south walls.

Figure 25.18 Northwest corner of Room 3 with offset walls in foreground (north).

Table 25.8. Room 3 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	# Courses
North	3.60	0.40	0.40	2
South	4.20	0.20	0.25	1
East	3.20	0.25	0.20	1
West	3.50	0.37	0.23	2

Artifacts and Samples. Artifacts and pollen, flotation, and macrobotanical samples were selected from grids 89N/109E, 90N/108E, and 90N/109-110E. In addition, samples were selected from floor contexts. Tables 25.9 and 25.10 provide summary information on artifacts by stratigraphic unit and samples selected for analysis in Room 3.

Table 25.9. Room 3 artifact counts by stratigraphic unit.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
1	131	12	1	0	2	146
2	3	2	0	0	0	5
3	318	27	1	3	1	350
4	249	26	6	3	6	290
11	20	0	0	0	0	21
Total	**721**	**67**	**8**	**6**	**9**	**812**

Table 25.10. Samples selected for analysis in Room 3.

Stratum	Sample Type		
	Pollen	Flotation	Macrobotanical
2	1416	1417	0
4a	1457	1458	1456
3b	1719	1720	1752, 1831
3b (burned)	1635	1758, 1797	0
11	1649	1871	0

Room 4

Sequence of Excavation. Room 4 is located at the northwestern corner of the roomblock. It measures 1.85 m north-south by 2.10 m east-west, with 3.89 m^2 of interior space. Excavations proceeded from south to north in the room by grid and natural layer.

Fill. After the removal of a 10-cm layer of post-occupational fill (Strata 1 and 2), most of the room fill consisted of Stratum 3 with some Stratum 4 adjacent to the west wall. This fill was about 40 to 50 cm thick. Pollen, flotation, and macrobotanical samples were taken from Strata 3b and 4a (see Table 25.13). Taxa identified in the pollen samples taken from the room fill include maize, prickly pear, sunflower family, cheno-ams, grass family, ragweed/bursage, evening primrose (Onagraceae), fir (*Abies*), unidentified pine, piñon pine, juniper, squawbush (*Rhus* type), and sagebrush. Taxa identified in the flotation samples include goosefoot, cheno-ams, unknown conifer, ponderosa pine, and maize. Taxa identified in the macrobotanical samples (FS 1135, FS 1465, and FS 1515) include mountain mahogany, unknown conifer, juniper, unidentified pine, piñon pine, ponderosa pine, and oak.

Floor. Three separate floors were identified in Room 4. Floor 3 (Stratum 35) is the lowest or original floor surface and the most disturbed of the three floors (Figures 25.19 and 25.20). An archaeomagnetic sample (Set 1232) was taken from Floor 3. Floor 3 yielded 7 specimens and two proved to be outliers and were eliminated from the final best result. Intercepts of the result provide an estimated date range of AD 1170–1265. Compared with the SWCV2000 curve, this result produces a date range of 1010–1310, encompassing the more precise interpretation based on the Wolfman curve.

Floor 3 consists of a thin wash of plaster about 1 cm thick. It was burned in the eastern third of the room and is best preserved in this area. The western two-thirds of the room was not burned and was in poor condition. Two pollen samples (FS 2449 and FS 2460) were taken from the east side of the room. Taxa identified in these samples include maize, prickly pear, beeweed, buckwheat (*Eriogonum*), cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, rose family, Mormon tea, and sagebrush. No features or artifacts were identified on the floor. However, Floor 3 in Room 4 appears to underlie the southern wall of the room and is contiguous with Floor 2 in Room 5. Therefore, the wall dividing Rooms 4 and 5 was constructed with Floor 2 in Room 4 and Floor 1 in Room 5. During a period of room abandonment, rodent burrowing (Stratum 40) destroyed sections of the floor. These holes were subsequently repaired before the construction of Floor 2. That is, the rodent burrows were filled in with either adobe and/or small pieces of tuff and then covered with Floor 2.

Figure 25.19. Photograph of Room 4, Floor 3, and Room 5, Floor 2 (south).

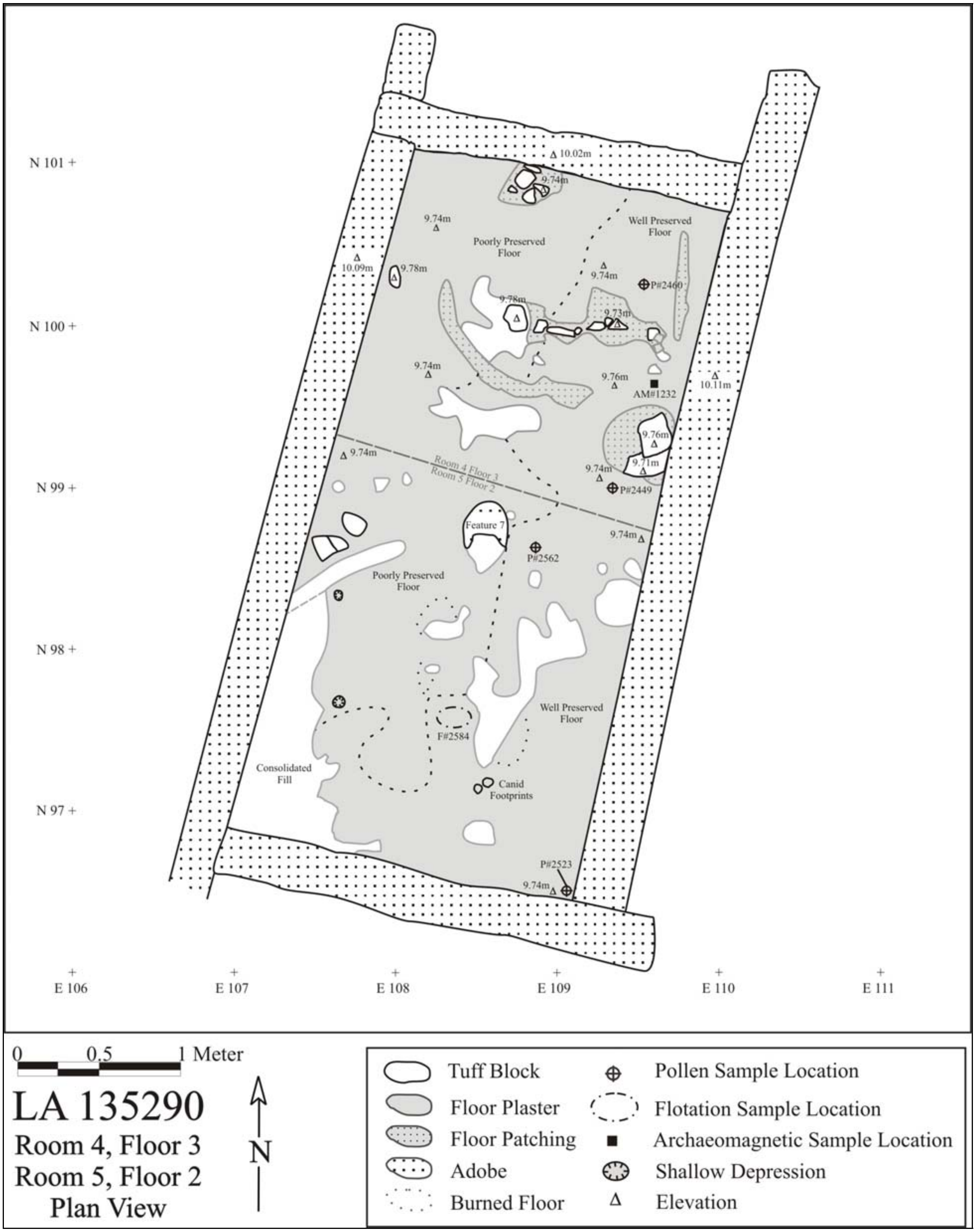

Figure 25.20. Room 4, Floor 3, and Room 5, Floor 2, plan view.

Floor 2 (Stratum 29) is the best-preserved floor in the room (Figures 25.21 and 25.22). It was constructed of clean adobe that was 3 to 4 cm thick. This floor is also partially burned, including the eastern and west-central floor areas. There are numerous small depressions in the well-preserved eastern section of the room. These depressions appear to be partial prints of the front heal of the foot, although most are indistinct. Other depressions are clear footprints, including the one located in grid N100/E109. All five toes and the arch and heel are clearly defined. A plaster caste was taken of the footprint (FS 2431), and pollen (FS 2161 and 2179) and flotation (FS 2219) samples were taken from Floor 2. Taxa identified in the pollen samples include cheno-ams, sunflower family, ragweed/bursage, pine, piñon pine, juniper, Mormon tea, and sagebrush. Carbonized taxa identified in the flotation sample include pigweed, goosefoot, grass family (Gramineae), juniper, mint family (Labiatae), and ponderosa pine.

Although no artifacts were found on the surface of the floor, three smeared-indented corrugated sherds and some charcoal (FS 2466, FS 2481, and FS 2483) were recovered from the floor matrix (Stratum 35). Taxa identified in the macrobotanical samples include juniper, piñon pine, unidentified pine, saltbush/greasewood, ponderosa pine, cottonwood/willow, and maize. Archaeomagnetic (set 1227) and TL (FS 2458) samples were taken from the floor. The burned adobe sample yielded a date of AD 888±62. The archaeomagnetic sample collected from Floor 2 consisted of seven specimens, and all were included in the calculation of the final result. The date range interpretation is AD 1180 to 1205. Comparison with the SWCV2000 curve yields a date range of AD 1125–1165, but it is believed that the SWCV2000 curve is inaccurate for this time period.

Figure 25.21. Photograph of Room 4, Floor 2 (east).

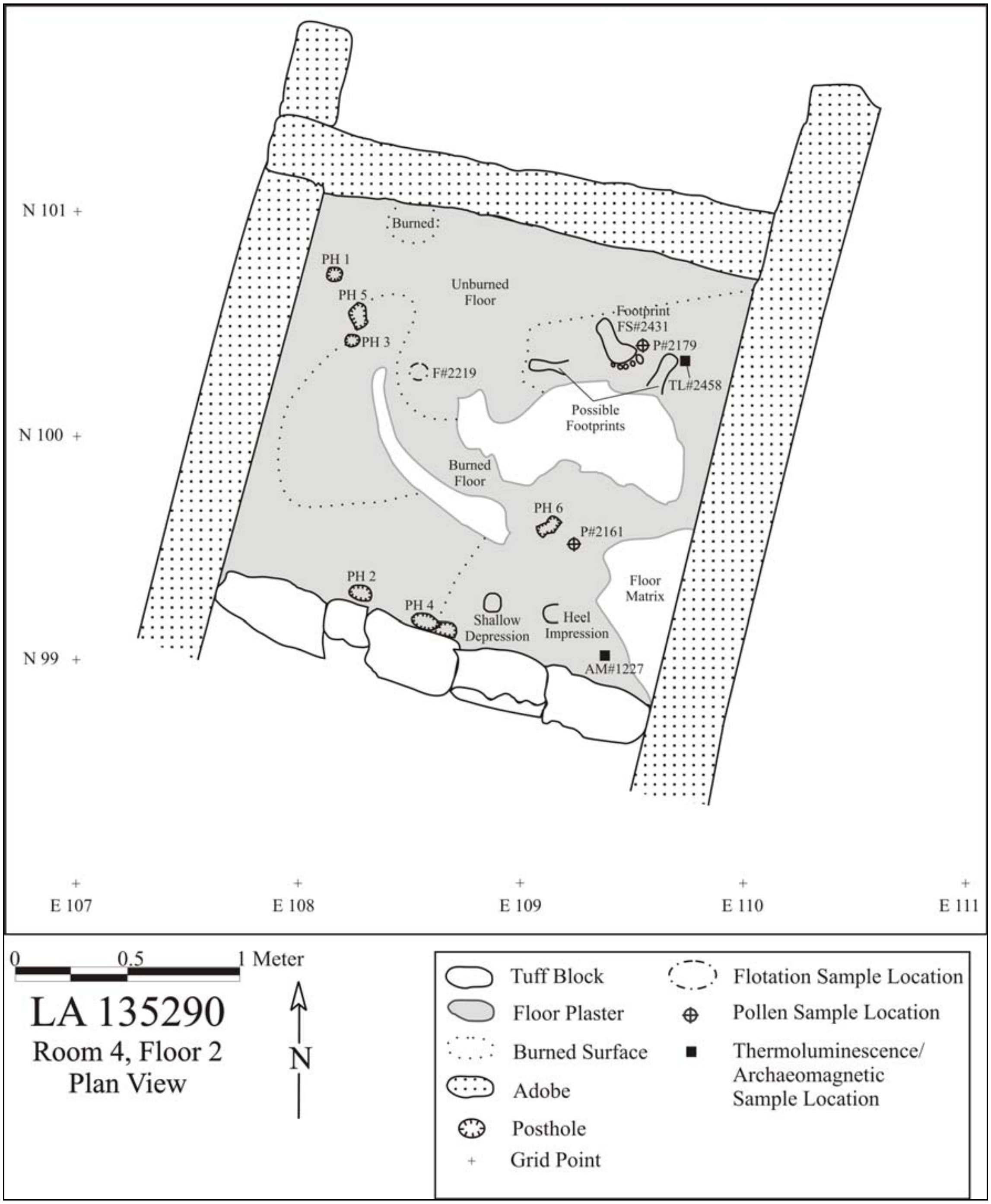

Figure 25.22. Room 4, Floor 2, plan view.

There are also a series of six postholes (Feature 10) present on Floor 2. Postholes 1 to 3 are circular in cross-section, with well-defined walls and vary from 4 to 9 cm in depth. In contrast, Postholes 4 to 6 are more irregular in shape and vary from 4 to 6 cm in depth. The latter holes are more ambiguous and may not be features. Pollen samples were taken from the fill (Stratum 30) of Postholes 1 (FS 2248) and 2 (FS 2249). Taxa identified in Posthole 1 include prickly pear, cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, evening primrose, fir, unidentified pine, piñon pine, juniper, and sagebrush. Taxa identified in Posthole 2 include maize, prickly pear, beeweed, lily family (Liliaceae), cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, evening primrose, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

As previously noted, the southern wall of Room 4 was constructed with Floor 2, thereby dividing Room 4 from Room 5. However, a small doorway was left at the eastern end of the wall, thereby allowing access between the rooms. The floor and adjacent wall where the doorway was located were burned, indicating that this access was open between the rooms. This doorway is visible in the Floor 3 photograph, but had not yet been identified when the Floor 2 photograph was taken. Room 4 was abandoned a second time, with rodent burrows (Stratum 40) removing sections of the floor. These holes were also filled with adobe and/or small pieces of tuff and then covered with Floor 1.

Floor 1 (Stratum 7) is the upper or most recent floor in the room (Figures 25.23 and 25.24). It consists of a two- to 4-cm-thick layer of adobe that covered the entire area of the room.

Figure 25.23. Photograph of Room 4, Floor 1 (looking east).

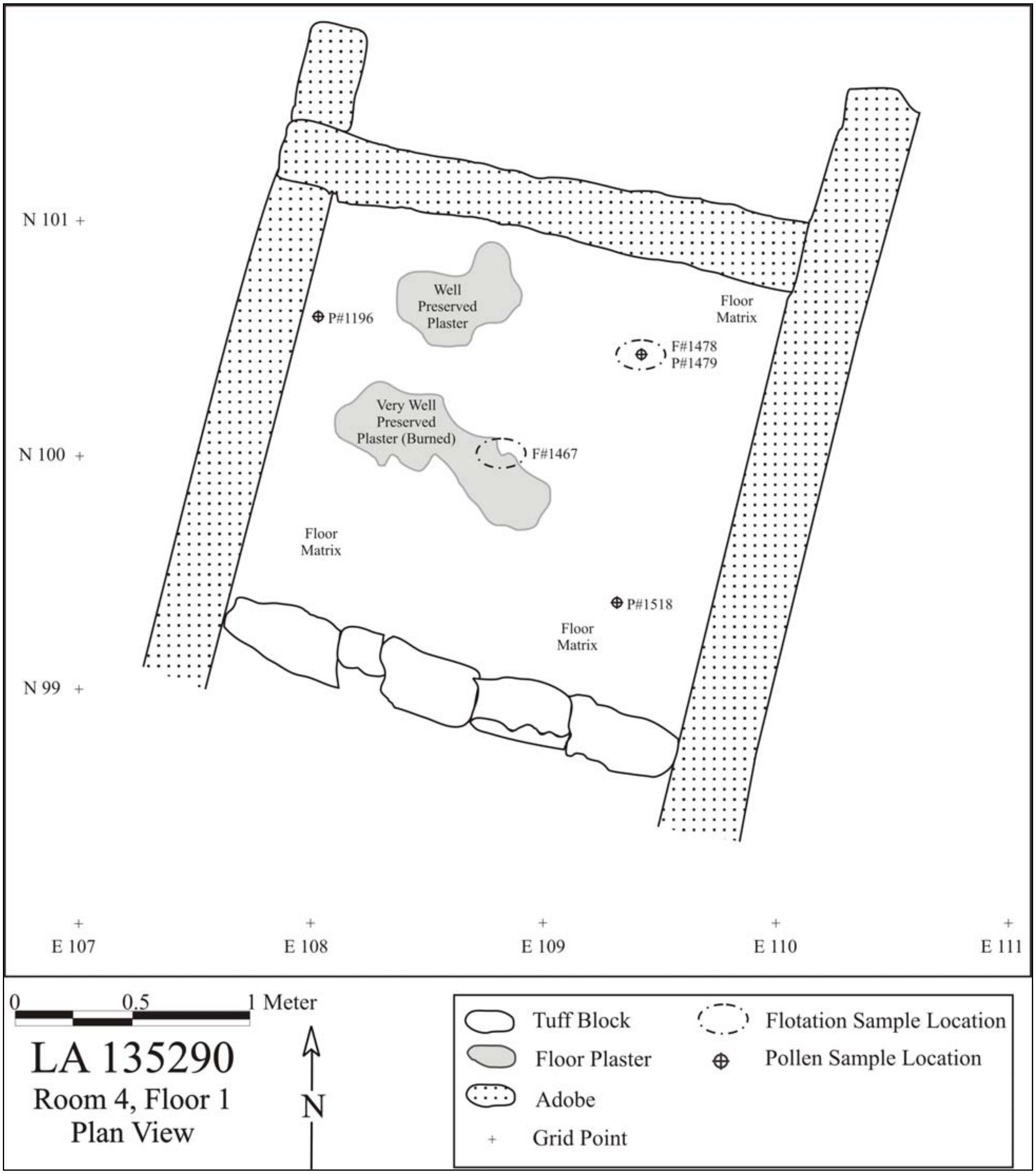

Figure 25.24. Room 4, Floor 1, plan view.

The floor was mostly unburned, except for a small heavily burned section in the middle of the floor. A small concentration of ash (Stratum 3b) was present on the floor and one pollen sample (FS 1479) was collected. Taxa identified in the pollen sample include prickly pear, cheno-ams, grass family, sunflower family, ragweed/bursage, fir, unidentified pine, piñon pine, juniper, squawbush (*Rhus* type), and sagebrush.

The rest of the floor surface is partially eroded, but the floor matrix was clearly distinguishable from the fill and underlying Floor 2 surface. Two pollen samples were taken from the eastern and western section of the floor (FS 1196 and FS 1518). Identified taxa include cheno-ams, grass family, sunflower family, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush. There are several unidentifiable impressions visible in the Floor 1 surface, including possible finger impressions. Otherwise, no features or floor artifacts were identified on the floor; although three smeared-indented and two indented corrugated sherds**,** a chalcedony core flake, and some charcoal (FS 2165, FS 2178, and FS 2199) were recovered from the matrix of the floor (Stratum 28). Identified macrobotanical taxa include saltbush/greasewood, unknown conifer, ponderosa pine, and maize. The doorway between Rooms 4 and 5 was sealed, separating the two rooms for the first time. Although Floor 1 articulates with most of the surrounding walls, it does not continue into adjacent Room 5 where the highest floor surface is situated several centimeters below Floor 1 in Room 4. This indicates that when Floor 1 was constructed in Room 4, no similar floor was constructed in Room 5. Room 4 was eventually abandoned for the last time.

Wall Construction. The east, west, and north walls of Room 4 are constructed of puddle adobe (Figure 25.25), while the south wall is constructed of masonry. The east wall is part of the central wall of the roomblock and is thicker than the other adobe walls surrounding the room. A TL sample (FS 1424) taken from a burned section of this wall yielded a date of AD 1035±77. As noted above, the south wall is a later addition that subdivided Room 4 from Room 5. There was a small doorway connecting the rooms. Otherwise, there is no evidence of any other doorways.

The east and west walls extend outside the north wall for about 50 to 90 cm. These sections appear to reflect some form of buttress. Subfloor adobe footings about 20 cm thick are present under the north, west, and east walls. Room 4 wall measurements are provided in Table 25.11.

Table 25.11. Room 4 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	# Courses
North	2.08	0.28	0.22	Adobe
South	2.15	0.46	0.24	4
East	1.87	0.38	0.30	Adobe
West	1.69	0.35	0.24	Adobe

Figure 25.25. Room 4, north wall.

Artifacts and Samples. Artifacts and pollen, flotation, and macrobotanical samples were selected from grids 99N/108E and 100N/108-109E. In addition, samples were selected from floor contexts. Tables 25.12 and 25.13 provide summary information on artifacts by stratigraphic unit and samples selected for analysis in Room 4.

Table 25.12. Room 4 artifact counts by stratigraphic unit.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
3	23	13	2	0	1	29
4	5	3	0	0	0	8
7	0	0	0	0	0	0
28	5	1	0	0	0	11
29	0	0	0	0	0	0
30	0	0	0	0	0	0
35	4	0	0	0	0	4
36	0	0	0	0	0	0
40	0	0	0	0	0	0
Total	**37**	**17**	**2**	**0**	**1**	**62**

Table 25.13. Samples selected for analysis in Room 4.

Stratum	Sample Type				
	Pollen	Flotation	Macrobotanical	TL	Archaeomag.
4a	1181	1179	1135	0	0
3b	1479	0	1465, 1515	0	0
7	1196, 1518	0	0	0	0
28	0	0	2178	0	0
29	2161, 2179	2219	0	0	0
30	2248, 2249	0	0	0	0
35	0	0	2481	2458	9902
36	2449, 2460	0	0	0	0
East Wall	0	0	0	1424	0

Room 5

Sequence of Excavation. Room 5 is located in the northwestern area of the roomblock. It measures 2.25 m north-south by 2.15 m east-west, with 4.84 m^2 of interior space. An east-west test trench (98N/107-109E) was excavated through the room to define site stratigraphy and the location of the floor. The excavation proceeded by removing the room fill by grid and natural layer to the south of the trench.

Fill. After the removal of a 10-cm-thick layer of post-occupational fill (Strata 1 and 2), most of the room fill consisted of 40 to 50 cm of Stratum 3, with some Stratum 4. Stratum 4a/4b were situated adjacent to the east wall of the room. In contrast, Stratum 3a was situated in the western area of the room and Stratum 3c was adjacent to the base of the walls. Pollen, flotation, and macrobotanical samples were taken from Strata 2 and 3 (see Table 25.16). Taxa identified in the pollen samples include prickly pear, grass family, cheno-ams, mustard family, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, oak, rose family, Mormon tea, and sagebrush. Only one taxon (goosefoot) was identified in the flotation sample. Taxa identified in the macrobotanical samples include maize, mountain mahogany, juniper, bean, ponderosa pine, and cottonwood/willow. One of the macrobotanical samples (FS 902) includes a section of a burned juniper branch from Stratum 3.

Floor. Two separate floors were identified in Room 5. Floor 2 (Strata 42 and 49) is the lowest and original floor and is equivalent to Floor 3 in Room 4 (Figures 25.20 and 25.26). Both rooms were connected as a single room during this period, measuring 4.40 by 2.15 m in size and containing 9.46 m^2 in area. This is similar to the adjacent back room (Room 6) that contains 9.78 m^2 of space. Floor 2 was constructed by placing down a layer of adobe that had a thin layer of plaster on top. This contrasts with the upper floor in Room 5 and upper floors in Room 4 (Floors 1 and 2), which were solely constructed of a single thick layer of adobe that was used to fill the rodent holes. Floor 2 is only burned in a few small patches in the center of the room and has been heavily disturbed by rodent activity. However, unlike Room 4, most of this disturbance appears to postdate the site occupation as is evidenced by rodent holes that were filled with loose sediment and modern plant remains (e.g., pine nut shells). The only exception to this is the large rodent disturbance located in the southwest corner of the room. This disturbance was cleaned out and filled in before the construction of Floor 1. Again, unlike Room 4, it was filled in with normal sediment rather than hardened adobe. It is possible that sediment rather than adobe was used because of the large size of the area to be filled in.

Figure 25.26. Photograph of Room 5, Floor 2 (east).

A single feature was identified on Floor 2. The feature consists of an adobe-lined pit (Feature 7) located in the west-central area of the room. The pit measures 30 by 36 cm in diameter and is 11 cm deep. The plaster lining is still intact in the northern section of the pit and exhibits no evidence of burning or a collar. A set of dog or coyote footprints were present on the south-central section of the floor, but no other artifacts were identified. Pollen samples (FS 2523 and FS 2562) were taken from the southeast and north-central sections of the floor, respectively. FS 2523 included maize, prickly pear, cheno-ams, grass family, pea family (Fabaceae), sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, oak, rose family, and sagebrush. FS 2562 included prickly pear, grass family, cheno-ams, sunflower family, spurge family, fir (*Abies*), unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush. The single flotation sample (FS 2584), which was taken from the central area of the floor, included goosefoot, sunflower family, unknown conifer, and evening primrose (*Oenothera*).

Floor 1 (Strata 21 and 41) is very well preserved and covers the entire room, although the surface is eroded (Figures 25.27 and 25.28). It is mostly unburned but does exhibit some burning in the central, west-central, and northeast sections of the room. The northern dividing wall was built during this period, thereby separating Rooms 4 and 5. However, Floor 1 does extend under the eastern end of the wall, thereby connecting with Floor 2 in Room 4. A doorway appears to have existed in this location. Pollen (FS 1991 and FS 2043) and flotation (FS 1999, FS 2023, and FS 2057) samples were taken from the surface of Floor 1 (Stratum 21), and two flotation samples (FS 2526 and FS 2561) were taken from the floor matrix (Stratum 41). Taxa identified in the Floor 1 pollen samples include maize, prickly pear, beeweed, cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, oak, rose family, and sagebrush. Taxa identified in the Floor 1 flotation samples include pigweed, saltbush/greasewood, mountain mahogany, goosefoot, cheno-ams, squash/coyote gourd (*Cucurbita*), juniper, pincushion cactus (*Mammillaria*), unidentified pine, piñon pine, ponderosa pine, cottonwood/willow, purslane, knotweed family (Polygonaceae), oak, dropseed grass, and maize.

Figure 25.27. Photograph of Room 5, Floor 1 (east).

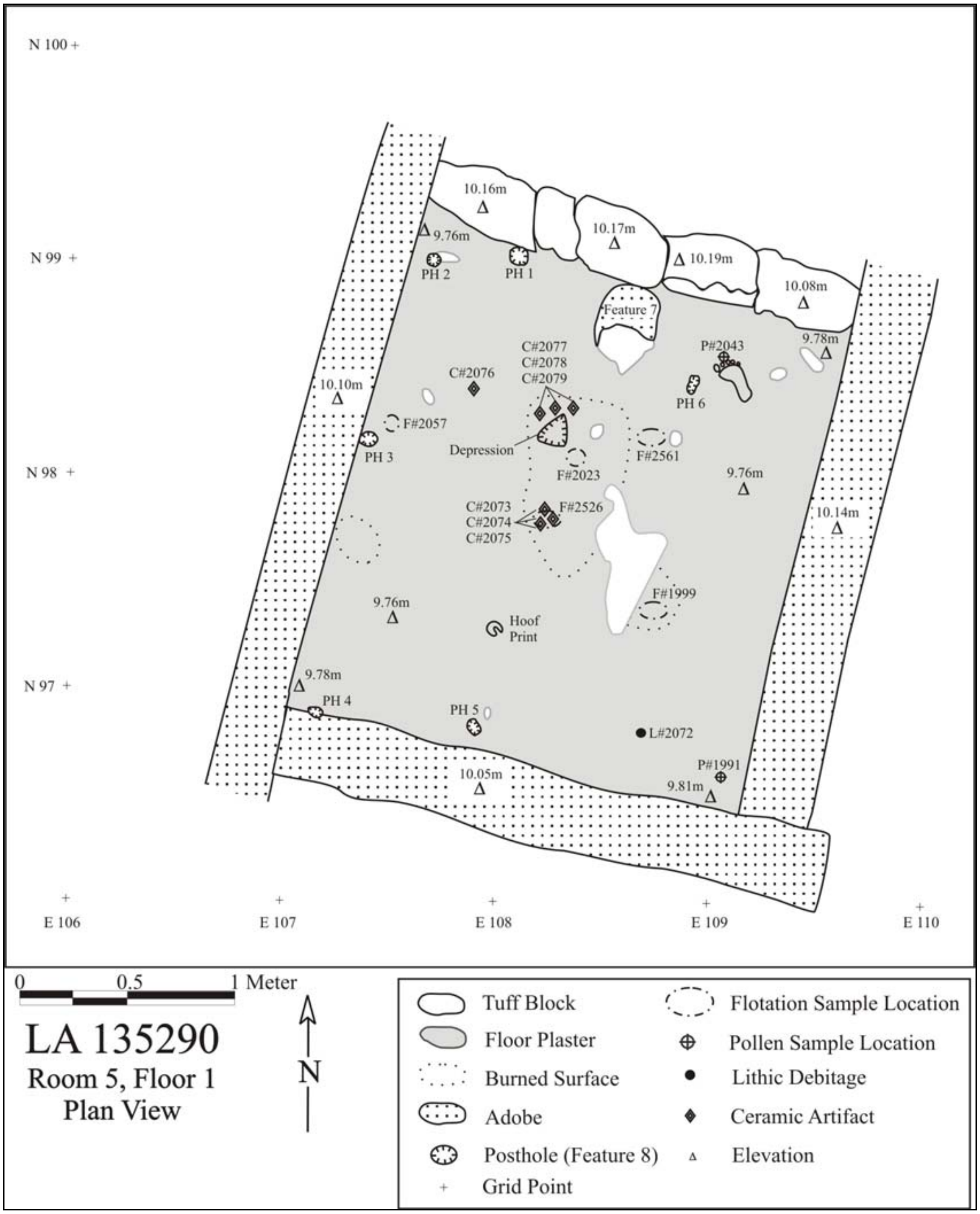

Figure 25.28. Room 5, Floor 1, plan view.

Two features were identified on Floor 1. Feature 7 continued to be used during the occupation of Floor 1, with the sides of the pit being coped to this upper floor. The fill (Stratum 22) consisted of a silty loam mixed with bits of charcoal and burned adobe. A flotation (FS 2027) and pollen (FS 2028) sample were both taken. Carbonized taxa identified in the flotation sample included pigweed, saltbush/greasewood, goosefoot, cheno-ams, sunflower family, unknown conifer, mint family (Labiatae), pincushion cactus, ponderosa pine, purslane, dropseed grass, and maize. Taxa identified in the pollen sample included prickly pear, beeweed, cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, and sagebrush.

Feature 8 consists of six possible postholes. The postholes are distributed in a westward-facing arc across the western half of the room. This is similar to the posthole pattern observed in adjacent Room 6. The single exception is Posthole 6, which is located in the northeast corner of the room near Feature 7. The postholes were generally circular in cross-section with well-defined sides and bottoms. The postholes measured about 5 to 7 cm wide and 5 to 14 cm deep. Pollen samples were taken from the fill (Stratum 27) of Posthole 1 (FS 2104) and Posthole 3 (FS 2105). This fill was identical to sediment present immediately above the floor surface. Taxa identified in Posthole 1 included maize, prickly pear, cactus family (Cactaceae), beeweed, cheno-ams, grass family, pea family, sunflower family, ragweed/bursage, penstemon family (Scrophulariaceae), unidentified pine, piñon pine, juniper, oak, rose family, Mormon tea, and sagebrush. Taxa identified in Posthole 3 included maize, cheno-ams, grass family, sunflower family, ragweed/bursage, evening primrose family (Onagraceae), fir, unidentified pine, piñon pine, juniper, oak, and sagebrush.

Three Santa Fe Black-on-white sherds, a smeared-indented corrugated sherd, three plainware body sherds (FS 2073 to FS 2079), and a chalcedony core flake (FS 2072) were found lying directly on the floor. In addition, three Santa Fe Black-on-white sherds, six smeared-indented corrugated sherds, three plainware body sherds, and two clay balls were recovered from the floor matrix. Besides these artifacts, a human footprint was present in the northeast corner of the room and a deer footprint was identified in the south-central section of the floor.

Wall Construction. The south, east, and west walls of Room 5 were constructed of adobe (Figure 25.29). These walls are about 30 to 40 cm high and 25 to 30 cm wide. In contrast, the north wall is constructed of tuff block masonry that is three courses high (40 cm) and about 25 cm wide (Figure 25.30). This wall does not fit the original roomblock design and represents a later addition that divided a single large room into two separate rooms (4 and 5). This event was associated with the construction of Floor 2 in Room 4 and Floor 1 in Room 5. The foundation of the wall consisted of the basal stones that were set into the original floor of the room. A narrow 50 cm wide entryway was left at the eastern end of the north wall, which left access between the two rooms. Both sides of the wall that were adjacent to the doorway were burned, which indicated that the doorway was open during this period. A TL sample (FS 1424) was taken from the burned section of the wall. The sample dated to 977±75. The doorway was subsequently sealed during the construction of Floor 1 in Room 4. No other doorways were identified in the roomblock.

Figure 25.29. Photograph of Room 5, south wall.

Room 5 wall measurements are provided in Table 25.14. Subfloor adobe footings about 20 cm thick are present under the east, west, and south walls.

Table 25.14. Room 5 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	# Courses
North	2.15	0.46	0.24	4
South	2.20	0.30	0.30	Adobe
East	2.25	0.40	0.25	Adobe
West	2.40	0.38	0.25	Adobe

Artifacts and Samples. Artifacts and pollen, flotation, and macrobotanical samples were selected from grids 97N/108-109E. In addition, samples were selected from floor contexts. Tables 25.15 and 25.16 provide summary information on artifacts by stratigraphic unit and samples selected for analysis in Room 5, respectively.

Figure 25.30. Photograph of Room 5, north wall.

Table 25.15. Room 5 artifact counts by stratigraphic unit.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
2	3	0	0	0	0	3
3	86	20	0	6	0	112
4	2	3	0	0	1	6
21	7	1	0	0	0	8
22	0	0	0	0	0	0
27	0	0	0	0	0	0
41	15	0	0	1	2	18
42	0	0	0	0	0	0
46	0	0	0	0	0	0
49	0	0	0	0	0	0
Total	**110**	**24**	**0**	**7**	**3**	**144**

Table 25.16. Samples selected for analysis in Room 5.

Stratum	Sample Type			
	Pollen	Flotation	Macrobotanical	TL
2	983	0	0	0
3	988	985	902, 912	0
4	0	0	1080	0
21	1991, 2043	1999, 2023, 2057	0	0
22	2028	2027	0	0
27	2104, 2105	0	0	0
41	0	2526, 2561	2513	0
42	2523, 2562	0	0	0
49	0	2584	0	0

Room 6

Sequence of Excavation. Room 6 is located in the southwest area of the roomblock. The room measures 1.75 m north-south by 1.75 m east-west, with 3.06 m^2 of interior space. An east-west test trench (93N/106-108E) was also excavated through the room to define site stratigraphy and the location of the floor. The excavation proceeded by first removing the fill to the north of the trench and then to the south by grid and natural layer.

Fill. After 10 cm of post-occupational fill (Strata 1 and 2) was removed, most of the remaining room fill consisted of 30 to 40 cm of Stratum 3. Stratum 4 was only defined in a small area in the south part of the room. Pollen, flotation, and macrobotanical samples were taken from Strata 2, 3a, and 3b (see Table 25.19). Taxa identified in the pollen samples collected from the fill levels include beeweed, grass family, cheno-ams, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, rose family, and sagebrush. Taxa identified in the fill flotation samples include saltbush/greasewood, goosefoot, juniper, unidentified pine, unknown conifer (Gymnospermae), piñon pine, ponderosa pine, and maize. Taxa identified in the macrobotanical samples include mountain mahogany, unknown conifer, bean, unidentified pine, piñon pine, ponderosa pine, cottonwood/willow, oak, and maize.

Floor. Three distinct floors were identified in Room 6. Floor 3 (Stratum 8) is the lowest and the original floor that covers the entire area of Room 6 (Figures 25.31 and 25.32). It consists of a 3- to 4-cm-thick layer of adobe that has been hardened and blackened by burning in most areas, with a few rodent-disturbed spots. There are, however, some unburned areas situated adjacent to the walls in the southern area of the room. A human handprint is visible in the northwest corner of the room. Pollen (FS 1899) and flotation (FS 1890) samples were taken from the surface of Floor 3. Taxa identified in the pollen sample include prickly pear, cheno-ams, grass family, sunflower family, ragweed/bursage, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush. Carbonized taxa identified in the flotation sample taken on Floor 3 include cheno-ams and dropseed grass. A pollen (FS 1432) and flotation (FS 1589) sample were also taken from ashy sediment and a charcoal concentration present on the north-central section of the floor. Taxa identified in the pollen sample include maize, cheno-ams, grass family, sunflower family, penstemon family, fir, unidentified pine, piñon pine, juniper, rose family, Mormon tea, and sagebrush. Charred taxa identified in the flotation sample in the ashy concentration include piñon pine, ponderosa pine, Douglas fir (*Pseudotsuga menziesii*), oak, and maize. Portions of a small, burned ponderosa pine roof beam (FS 1587) were found in the central area of the floor where the area was extremely burned. Taxa identified in the other macrobotanical samples include unknown conifer, bean, unidentified pine, ponderosa pine, oak, cottonwood/willow, and maize.

Figure 25.31. Photograph of Room 6, Floor 3 (east).

Two archaeomagnetic samples were taken from Room 6 (sets 1226 and 1228). Results show that Room 6 experienced multiple burning incidents. Floor 3 was the original floor of the room. After a period of use, the room burned, burning the floor and littering the floor with charcoal and other structural debris (set 1226). Floor 2 was constructed on top of this debris, and it also was burned after a period of use. No archaeomagnetic samples were collected from Floor 2, but a set was collected from the east wall of the room, above the level of Floor 2 (1228). This wall would have been affected by the burning incidents associated with both Floors 3 and 2, but the Floor 2 incident would have erased the magnetic orientation created by the Floor 3 burn if the original burning reached equivalent or higher temperatures. Evidence of a final floor (Floor 1) was preserved as a large unburned adobe patch in the fill above Floor 2. Floor 1 was not visibly burned. The eight specimens collected from Floor 3 (1226 yielded a date range estimate of AD 1170–1210. The date range based on the SWCV2000 curve again appears to be too early (AD 1125–1175). The six specimens collected from the wall of the room (1228) were collected between 16 and 25 cm above Floor 3, and at that elevation they would have been affected by the fire that is associated with Floor 2 as well as that of Floor 3. Assuming that the Floor 2 fire generated a similar or greater heat than the Floor 3 fire, the magnetic orientation of this set would have been determined by the Floor 2 fire alone. The date range estimate from the Wolfman curve is AD 1185–1230. The corresponding date estimate based on the SWCV2000 curve is AD 1020–1110, which is an unlikely calibration for this time period.

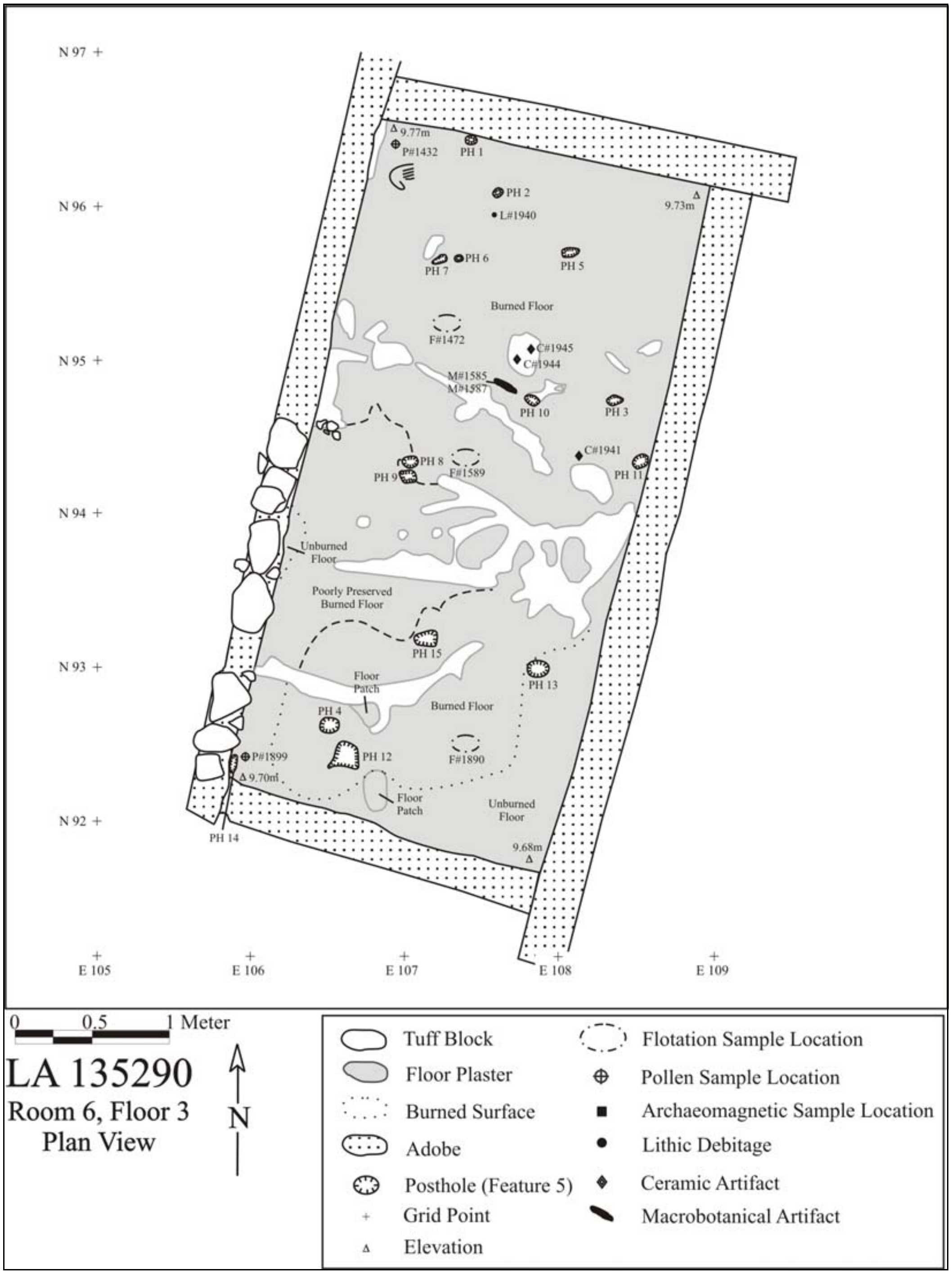

Figure 25.32. Room 6, Floor 3, plan view.

Eleven possible postholes (Feature 5) were identified on Floor 3 (Figure 25.33). The postholes were circular to oval in cross-section and were 5 to 10 cm in diameter and 7 to 14 cm in depth. Most of the posthole fill was similar to the sediments overlying the floor, but Posthole 4 contained a lot of charcoal and ash (Stratum 20).

Figure 25.33. Room 6 postholes (northeast).

A single posthole (15) was patched with adobe. A smeared-indented corrugated sherd was recovered from the fill of Posthole 14 and a chalcedony core flake (FS 1940) and three smeared-indented corrugated sherds (FS 1941, FS 1944, and FS 1945) were recovered from the floor. Pollen samples were taken from Postholes 1 (FS 1920) and 4 (FS 1923). Taxa identified in

Posthole 1 included maize, cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, oak, rose family, Mormon tea, and sagebrush. Taxa identified in Posthole 4 included maize, cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

Floor 2 (Strata 17 and 18) is the middle floor of Room 6 (Figure 25.34). Like Floor 3, Floor 2 is also in very good condition, having been heavily burned. However, the floor represents a large adobe patch to Floor 3 situated in the south side of the room.

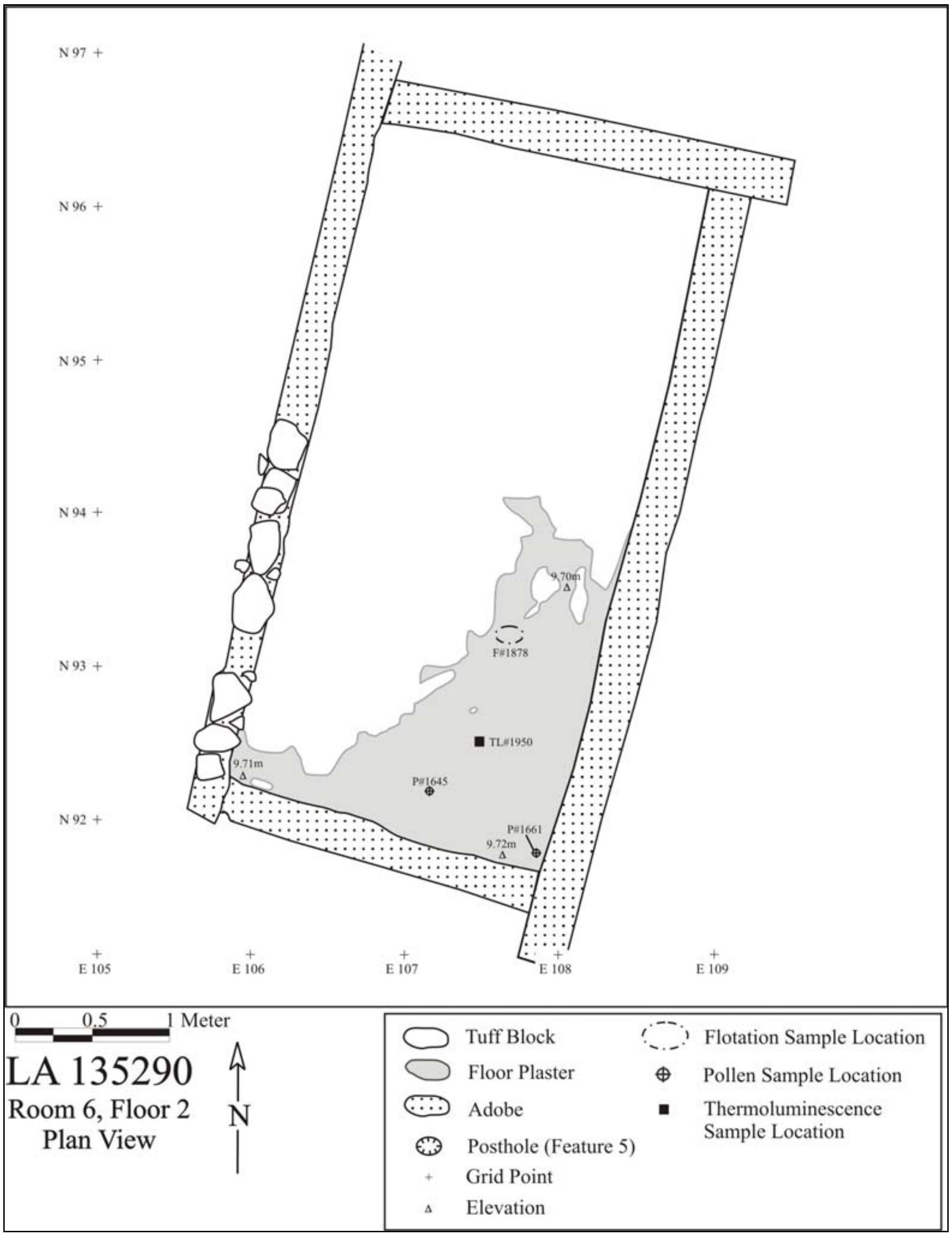

Figure 25.34. Room 6, Floor 2, plan view.

The area was presumably patched due to rodent disturbance or heavy burning. No features or artifacts were associated with this section of the floor. Pollen (FS 1645 and FS 1661) and flotation (FS 1878) samples were taken from the floor. Taxa identified in the pollen samples included maize, prickly pear, beeweed, cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, fir, unidentified pine, piñon pine, juniper, rose family, Mormon tea, and sagebrush. No carbonized taxa were identified in the flotation sample collected from Floor 2. A TL sample (FS 1950) taken from the burned floor yielded a date of AD 1134±79.

Floor 1 (Strata 12 and 15) is the uppermost floor in Room 6 (Figures 25.35 and 25.36). This floor exhibits a large adobe patch in the central part of the room that could have been used to fill some rodent disturbance or burned area, but it is not burned. Pollen (FS 1852) and flotation (FS 1851) samples were taken from the floor. Taxa identified in the pollen sample included squash (*Cucurbita*), maize, cholla (*Opuntia*), prickly pear, parsley family (Apiaceae), cheno-ams, grass family, sunflower family, ragweed/bursage, evening primrose, unidentified pine, piñon pine, juniper, and sagebrush. Carbonized taxa identified in the flotation sample included pigweed, cheno-ams, juniper, and ponderosa pine. Silicified wood and obsidian flakes were present on the floor.

Figure 25.35. Photograph of Floors 1 and 3.

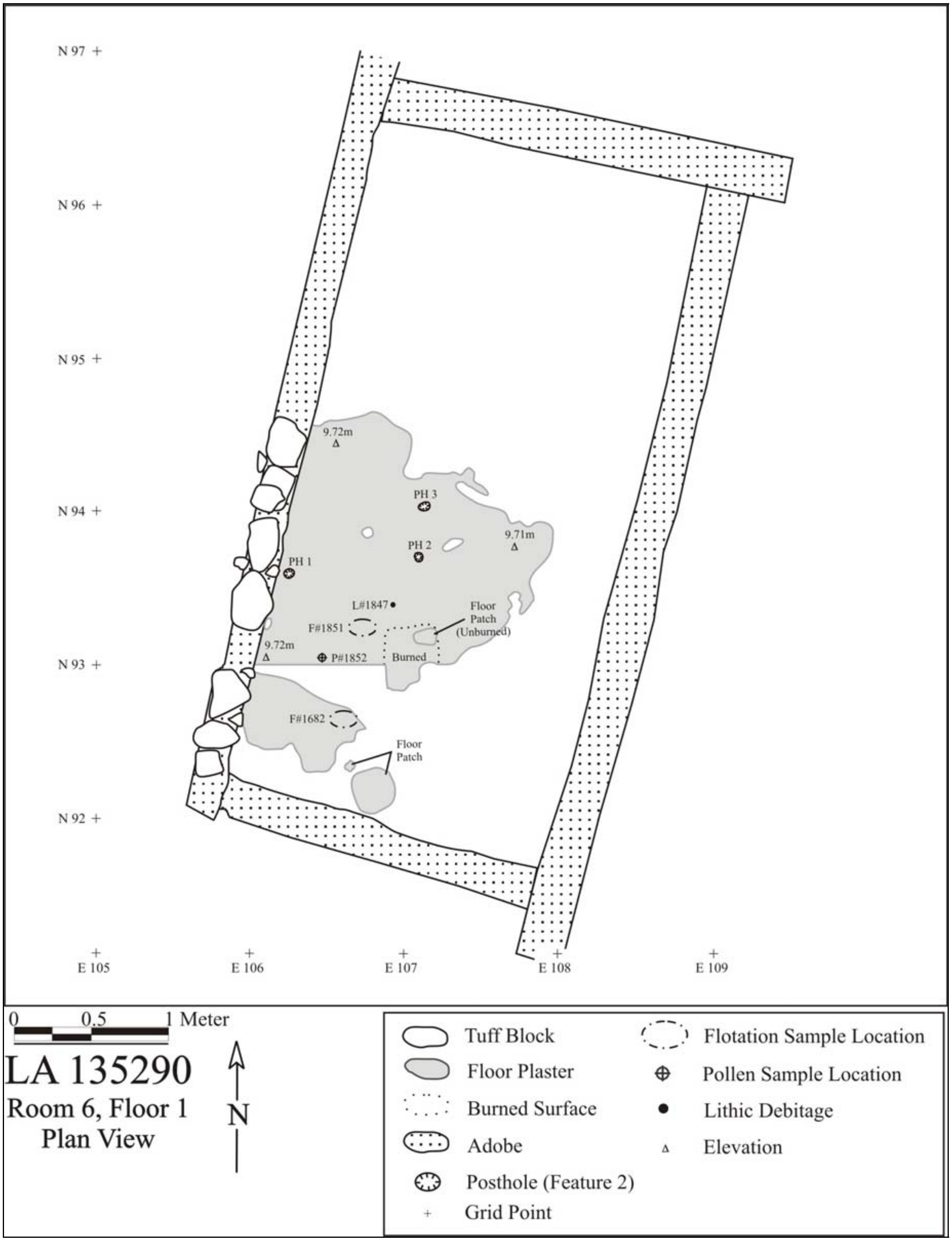

Figure 25.36. Room 6, Floor 1, plan view.

A single feature (Feature 2, three postholes) and a silicified wood core flake (FS 1847) were associated with the floor (Figure 25.37). All three postholes were circular-shaped and were approximately 5 cm in diameter and 10 cm deep. Pollen samples were taken from the fill (Stratum 14) of two postholes (FS 1820 and FS 1821). Identified taxa included prickly pear, beeweed, cheno-ams, grass family, sunflower family, spurge family, evening primrose (*Oenothera*), fir, unidentified pine, piñon pine, juniper, oak, cottonwood/willow, rose family, Mormon tea, and sagebrush.

Figure 25.37. Room 6, Floor 1, Feature 2 postholes (west).

The sub-floor deposit (Stratum 46) was a silty clay layer that was 15 to 20 cm thick, which was situated on top of the Bwb1 soil horizon. This stratum represents artificial fill that was brought to the site to level the area where the roomblock was constructed.

Wall Construction. All four walls of Room 6 are constructed of adobe and stand to a height of about 30 to 50 cm. The west wall also has two courses of unshaped tuff capping the adobe wall, as well as some wallfall outside of the wall. At least some of the wall was constructed with an adobe lower section and masonry upper section. Much of the surface of these walls was heavily burned, including the northeast corner, the northwest corner, and the southern one-third of the room (especially the east wall, but some on the south and west walls). A TL (FS 1738) and archaeomagnetic (set 1228) sample were taken from the west wall (Figure 25.38). The TL sample yielded a date of AD 1114±85 and the archaeomagnetic sample yielded a date of AD 1185 to 1230.

Figure 25.38. Burned west wall in Room 6.

Room 6 wall measurements are provided in Table 25.17. There is no evidence of doorways in any of the walls. Subfloor adobe footings about 20 cm thick are present under the north, south, east, and west walls.

Table 25.17. Room 6 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	# Courses
North	2.15	0.40	0.25	Adobe
South	2.15	0.30	0.25	Adobe
East	4.65	0.48	0.30	Adobe
West	4.50	0.52	0.30	Adobe

Artifacts and Samples. Artifacts and pollen, flotation, and macrobotanical samples were selected from grids 92-94N/107E. In addition, samples were selected from floor contexts. Tables 25.18 and 25.19 provide summary information on artifacts by stratigraphic unit and samples selected for analysis in Room 6, respectively.

Table 25.18. Room 6 artifact counts by stratigraphic unit.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
1	23	6	0	0	0	29
2	20	6	0	0	0	26
3	258	88	10	2	8	366
4	24	4	1	0	0	29
8	3	1	0	0	0	4
12	0	1	0	0	0	1
14	0	0	0	0	0	0
15	0	1	0	0	0	1
17	0	0	0	0	0	0
18	0	0	0	0	0	0
20	1	0	0	0	0	1
44	1	0	0	0	0	1
46	1	0	0	0	0	1
Total	331	107	11	2	8	459

Table 25.19. Samples selected for analysis in Room 6.

Stratum	Sample Type				
	Pollen	Flotation	Macrobotanical	TL	Archaeomag.
2	1084	1083	0	0	0
3a	1097	1096	1095	0	0
3b	1132	1131	1130, 1471	0	0
4	0	0	968	0	0
8	1432, 1899	1472, 1589, 1890	1585, 1587	0	1226
12	0	1682	0	0	0
14	1820, 1821	0	0	0	0
17	1645, 1661	0	0	0	0
18	0	1878	0	1950	0
West Wall	0	0	0	1738	1288

Room 7

Sequence of Excavation. Room 7 is located in the southwestern corner of the roomblock. It measures 4.55 m north-south by 2.20 m east-west, with 10.01 m^2 of interior space. The excavation proceeded from north to south by grid and natural layer.

Fill. Deposits in Room 7 were quite shallow, in part reflecting the lack of wallfall in the room fill. Post-occupational deposits (Strata 1 and 2) were only 5 to 10 cm thick, with the room fill primarily consisting of 20 to 30 cm of Stratum 3, with some Stratum 4. The limited amount of wallfall was situated in the northwest and east-central sections of the room adjacent to masonry walls. Pollen, flotation, and macrobotanical samples were taken from Strata 3 and 4 (see Table 25.22). Taxa identified in the pollen samples included maize, beeweed, cheno-ams, grass family, mustard family, pea family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, oak, birch (*Betula*), sedge (Cyperaceae), and sagebrush. Charred taxa identified in the flotation samples included saltbush/greasewood, piñon pine, ponderosa pine, oak, and maize. Taxa identified in the macrobotanical samples included mountain mahogany, unidentified pine, piñon pine, ponderosa pine, cottonwood/willow, bean, and maize.

Floor. There is no prepared floor in Room 7 (Figures 25.39 and 25.40). The floor (Stratum 33) simply consists of a compact living surface situated at the same level as Floors 1 and 2 in Room 6. The surface is generally in poor condition, but is best-preserved in the northern part of the room and in a small section in the southeast corner of the room. Otherwise, both erosion and root disturbance have greatly impacted the southern area of Room 7.

Figure 25.39. Photograph of Room 7 (east).

No floor features were identified, however, several artifacts were found lying directly on or embedded into it. These artifacts consist of a red burned shale bead (FS 2317), a grinding slab (FS 2396), dacite and quartzite pebbles with ground surfaces (FS 2397 and FS 2399), and two Wiyo Black-on-white sherds (FS 2400 and FS 2401). One of these sherds was submitted for TL dating and provided a date of AD 1217±56. Pollen samples were taken from underneath the grinding slab (FS 2398**)** and the two sherds. Identified taxa included squash, maize, cholla, cheno-ams, grass family, mustard family, sunflower family, ragweed/bursage, unidentified pine, juniper, and sagebrush.

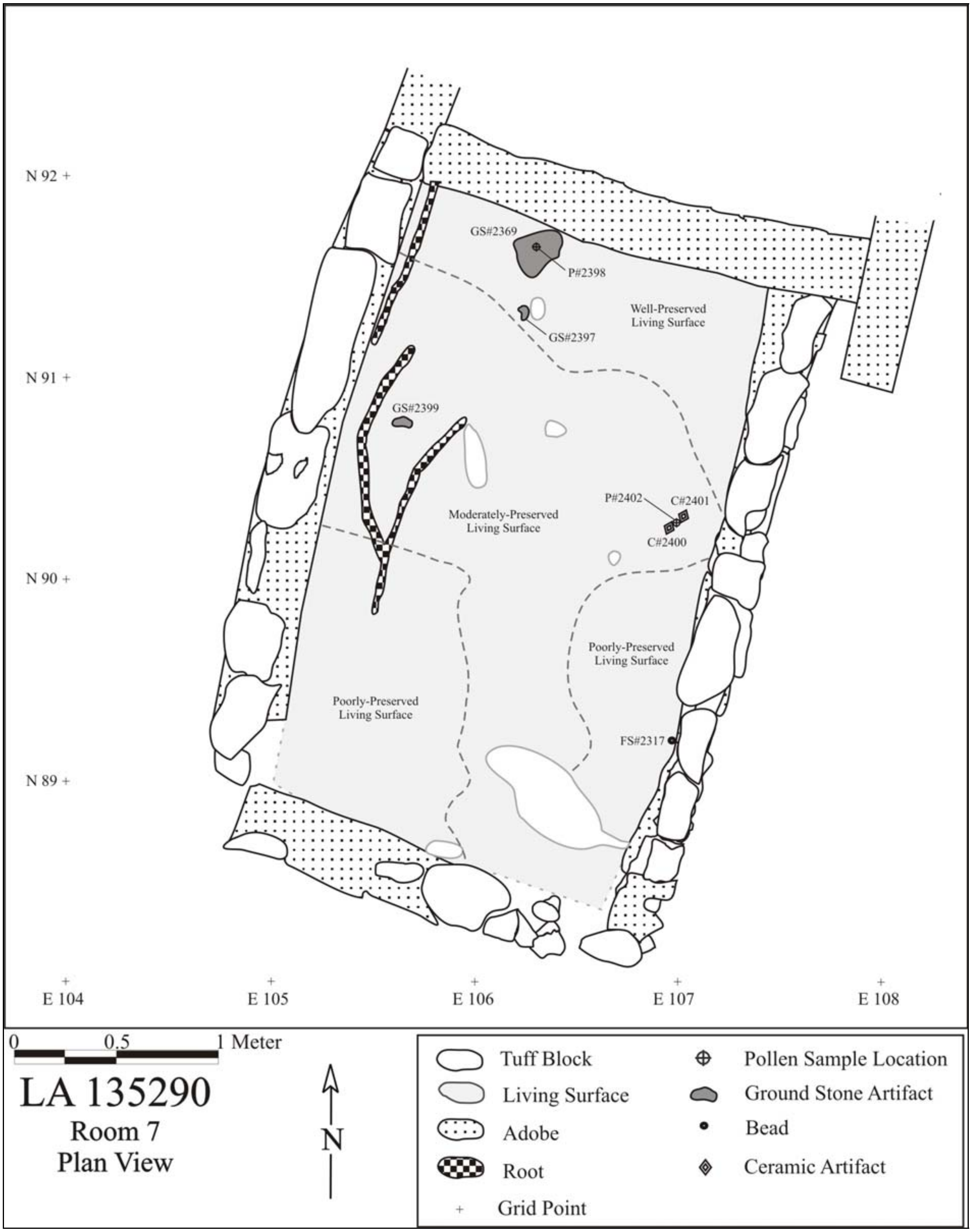

Figure 25.40. Room 7 plan view.

Wall Construction. The north wall of Room 7 is constructed of adobe. This wall is presumably the original southern wall to the roomblock. Both Rooms 3 and 7 appear to be later additions. For example, the eastern wall of Room 7 is offset with the east wall of Rooms 4 to 6, with the former being constructed of tuff blocks and the latter of adobe. The west wall of Room 7 is also constructed of tuff blocks with a shallow adobe foundation in its northern section. This wall does line up with the west wall of Rooms 4 to 6. The southern wall of the Room 7 is constructed of tuff blocks, but is in very poor condition, especially in the southwest corner of the room. The low wall height (10 cm) and paucity of wallfall may indicate that the south wall was not a full standing wall.

Room 6 wall measurements are presented in Table 25.20. There is no evidence of doorways in any of the walls. Subfloor adobe footings that are about 20 to 25 cm thick are present in the north, east, and west walls.

Table 25.20. Room 7 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	# Courses
North	1.78	0.25	0.30	Adobe
South	1.85	0.10	0.25	1
East	3.17	0.30	0.25	2
West	3.05	0.35	0.23	1

Artifacts and Samples. Artifacts and pollen, flotation, and macrobotanical samples were selected from grids 89-91N/106E. In addition, samples were selected from floor contexts. Tables 25.21 and 25.22 provide summary information on artifacts by stratigraphic unit and samples selected for analysis in Room 7, respectively.

Table 25.21. Room 7 artifact counts by stratigraphic unit.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
1	12	1	0	0	0	13
2	6	0	0	0	0	6
3	24	2	1	0	0	27
4	11	8	0	0	0	19
33	2	0	3	0	1	6
Total	55	11	4	0	1	71

Table 25.22. Samples selected for analysis in Room 7.

Stratum	Sample Type			
	Pollen	Flotation	Macrobotanical	TL
3	1276	1277	2281, 2303	0
4	2316	2315	2314	0
33	2398, 2402	0	0	2400

Room 8

Sequence of Excavation. Room 8 is located in the northeastern corner of the roomblock. It measures 4.10 m north-south by 2.80 m east-west, with 11.48 m^2 of interior space. The excavation proceeded north to south by grid and natural layer.

Fill. Deposits in Room 8 were somewhat shallower, since the room is situated at the eastern edge of the mound. Stratum 1 is only about 5 cm thick, with 20 cm of Stratum 4 mostly situated adjacent to the west wall and a similar thick layer of silty loam (Stratum 13) present in the northern area of the room near a tree stump. These deposits were underlain with approximately 10 cm of Stratum 3. No wallfall was identified adjacent to the east wall. Pollen, flotation, and macrobotanical samples were taken from Strata 3 and 4 (see Table 25.25). Taxa identified in the pollen samples included maize, prickly pear, parsley family, cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, rose family, Mormon tea, and sagebrush. Taxa identified in the flotation samples included unknown conifer, juniper, piñon pine, ponderosa pine, maize, and oak. Taxa identified in the macrobotanical samples included unidentified pine, ponderosa pine, and cottonwood/willow.

Floor. The floor (Stratum 23) is poorly preserved in Room 8, having been disturbed by rodent activity and roots (Figures 25.41 and 25.42). However, there are several small intact sections that consist of 6 to 7 cm of adobe with a thin plaster wash. These small patches are preserved in the area of the west and north walls. There were a few tiny burned spots on the floor, but it is unclear as to whether these are related to a burned roof or the presence of a nearby hearth. A cluster of three smeared-indented corrugated sherds was found in the north-central area of the floor, and a flotation sample (FS 2528) was taken nearby. Taxa identified in the flotation sample included goosefoot, cheno-ams, juniper, unidentified pine, piñon pine, ponderosa pine, and maize.

A hearth (Feature 9) is located in the middle of the room. The feature is an adobe-lined pit with heavily oxidized sides, but no collar (Figures 25.43 and 25.44). It is circular in shape, with straight side walls and a mostly flat bottom. The pit is about 65 cm in diameter and 20 cm deep. The fill of the hearth consists of an ashy soil mixed with pockets of charcoal with solid pieces of ash (Stratum 37). All of the hearth fill was taken as flotation samples (FS 2473, FS 2474, FS 2475, FS 2477, FS 2488, FS 2489, FS 2490, FS 2491, and FS 2492). Carbonized taxa identified in these samples included saltbush/greasewood, mountain mahogany, goosefoot, cheno-ams, unknown conifer, unidentified pine, juniper, piñon pine, ponderosa pine, cottonwood/willow, oak, and maize.

Two pollen samples (FS 2486 and FS 2487) and a macrobotanical sample (FS 2485) were also taken. Taxa identified in the pollen samples included maize, beeweed, cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, fir, unidentified pine, piñon pine, juniper, oak, rose family, Mormon tea, and sagebrush. Taxa identified in the macrobotanical sample include unidentified pine, piñon pine, ponderosa pine, and cottonwood/willow. Eight smeared-indented corrugated sherds were recovered from the fill. Maize kernels and cupules (FS 2475) recovered from the hearth fill yielded an accelerator mass spectrometer (AMS) date of 830±40

BP (Beta-199388) and a date of cal AD 1220 with a two-sigma date range of cal AD 1160–1270. An archaeomagnetic (set 1230) and TL sample (FS 2595) were taken from the rim of the hearth and another TL sample (FS 2574) was taken from the base of the hearth (Stratum 47). The archaeomagnetic sample yielded a date of AD 1035 to 1070 or AD 1195 to 1240, and the TL samples dated to AD 1073±135 and 851±125, respectively.

Figure 25.41. Photograph of Room 8 (south).

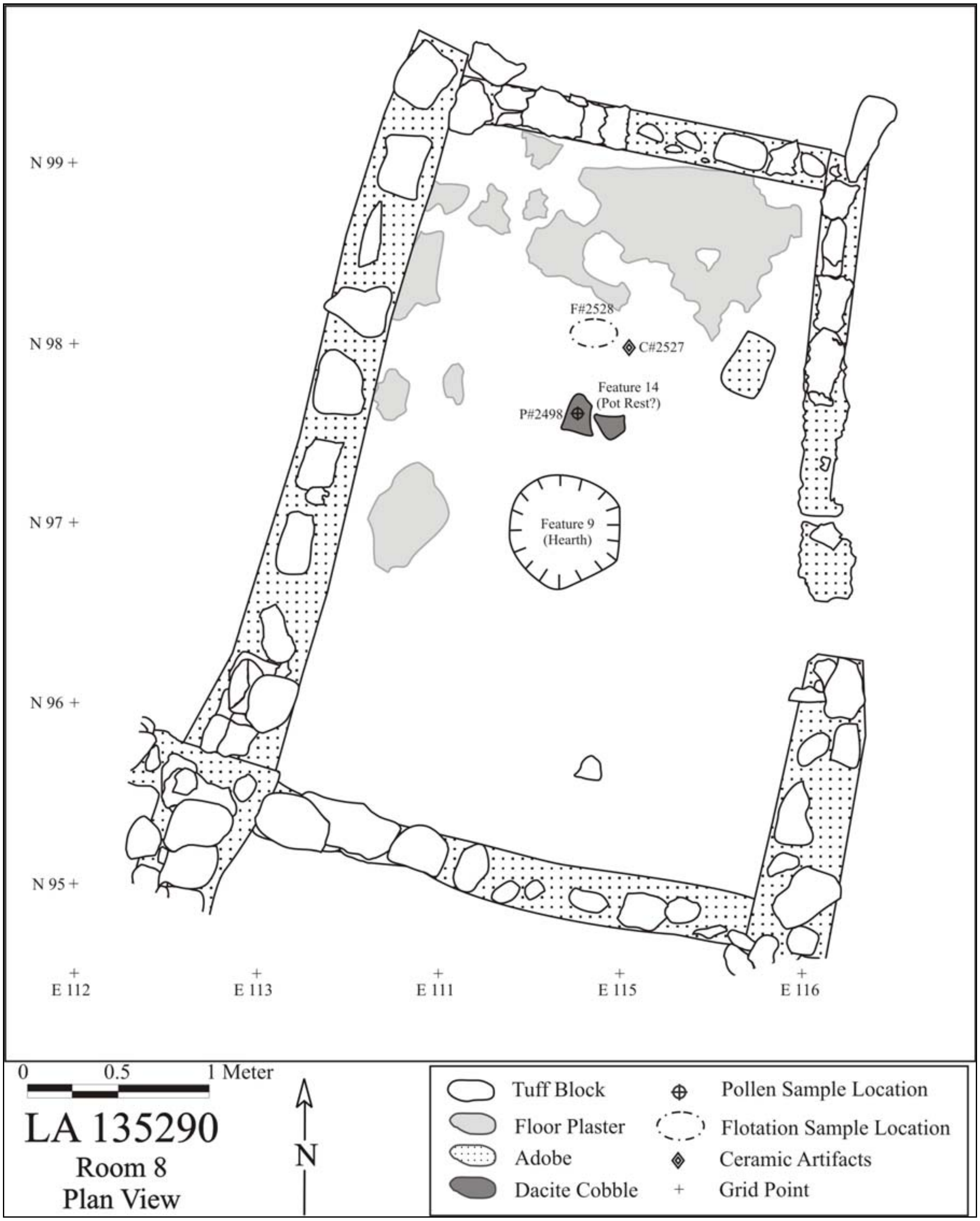

Figure 25.42. Room 8 plan view.

Figure 25.43. Photograph of Feature 9.

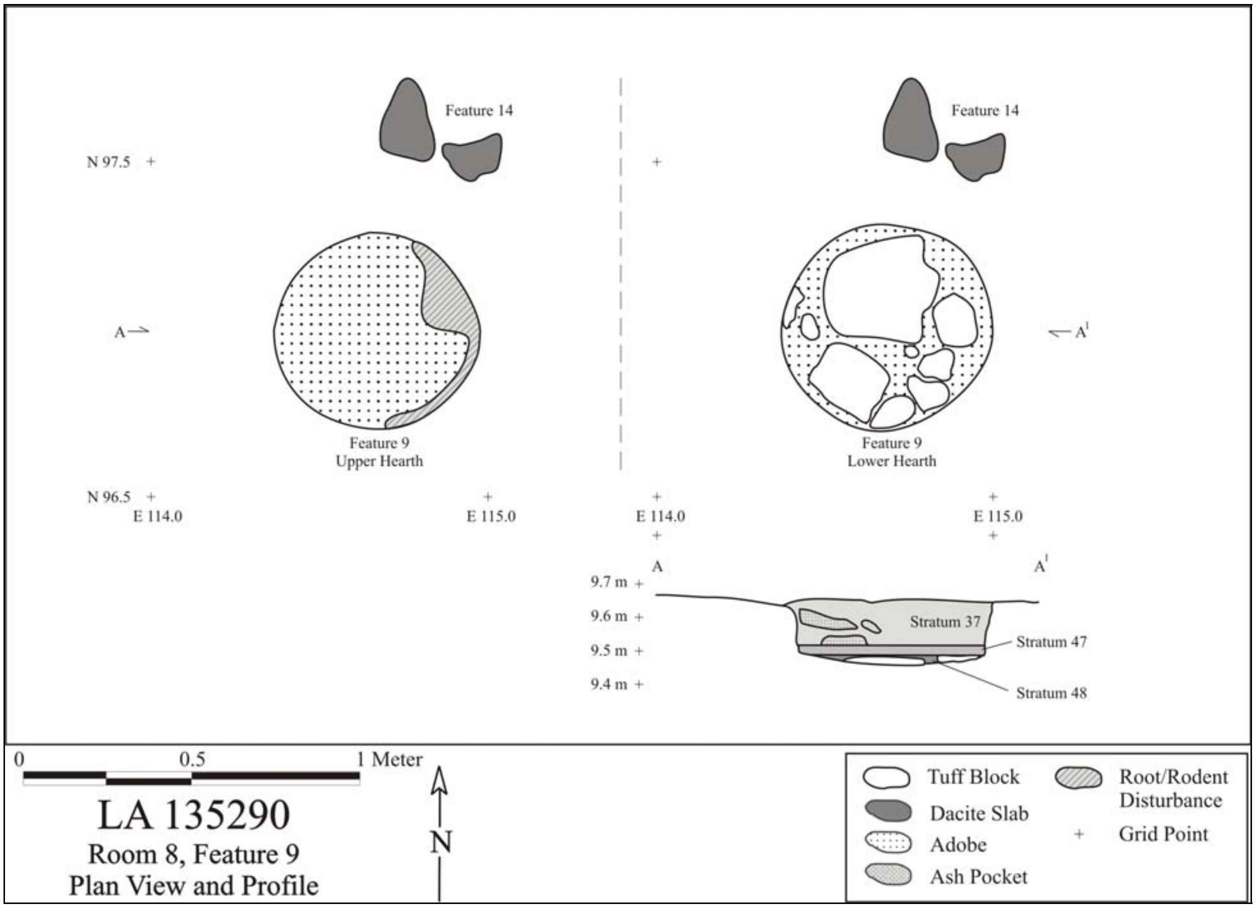

Figure 25.44. Feature 9 plan view and cross section.

After the fill was removed from the hearth, it was determined that the bottom of the hearth had been remodeled. It appears that the upper 3 to 4 cm of adobe lining the bottom of the hearth (Stratum 47) had been directly laid over a lower and older base to the hearth (Stratum 48; Figure 25.45). This lower section consisted of several pieces of tuff set in adobe mortar that was lightly oxidized with some ash staining. A pollen sample (FS 2586) was taken from this lower portion of the hearth. Taxa identified in this sample included maize, prickly pear, cheno-ams, grass family, sunflower family, evening primrose, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush.

A set of dacite cobbles (Feature 14) had been set into adobe about 20 cm to the north of the hearth. This feature may represent a pot rest. A pollen sample (FS 2498) was taken from underneath one of the cobbles. Taxa identified in this sample included maize, parsley family, cheno-ams, grass family, sunflower family, unidentified pine, piñon pine, juniper, oak, and sagebrush.

Figure 25.45. Feature 9, upper and lower hearth.

Wall Construction. The northern and western walls in Room 8 are well preserved compared to the poorly preserved east and south walls (Figures 25.46 and 25.47). All four walls were composed of tuff block masonry and had adobe mortar. The north and south walls are continuations of the east-west-running walls through Rooms 1 and 4/5. Therefore, Room 8 was constructed at the same time and does not reflect a later addition like Rooms 3 and 7. However, the upper section of the southern wall was constructed of tuff blocks, while the lower section is composed of adobe about 10 to 20 cm high. The eastern wall of Room 8 consists solely of a single course of stones. Since no wallfall was present in this area, it is unclear as to whether this was originally a full-standing wall, or whether the stone was scavenged to build the nearby rock alignments in the plaza. At any rate, there is a gap in the wall that could represent a doorway. A single Wiyo Black-on-white sherd was recovered from the east wall.

Figure 25.46. Room 8, west wall.

Figure 25.47. Room 8, south wall.

Room 8 wall measurements are provided in Table 25.23. Subfloor adobe footings about 15 cm thick were present under the north, west, and south walls. No footings were present under the east wall.

Table 25.23. Room 8 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	# Courses
North	2.10	0.65	0.30	3
South	2.80	0.50	0.26	3
East	4.10	0.29	0.32	1
West	3.90	0.54	0.30	3

Artifacts and Samples. Artifacts and pollen, flotation, and macrobotanical samples were selected from grids 96N/115E and 97N/114-115. In addition, samples were selected from floor contexts. Tables 25.24 and 25.25 provide summary information on artifacts by stratigraphic unit and samples selected for analysis in Room 7, respectively.

Table 25.24. Room 8 artifact counts by stratigraphic unit.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
1	41	7	0	0	0	48
2	2	1	0	0	0	3
3	262	17	3	0	1	283
4	105	10	1	0	0	116
13	50	4	0	0	0	54
23	3	0	0	0	0	3
37	8	0	2	0	0	10
Total	**471**	**39**	**6**	**0**	**1**	**517**

Table 25.25. Samples selected for analysis in Room 8.

Stratum	Sample Type				
	Pollen	Flotation	Macrobotanical	TL	Archaeomag.
3	2051, 2498	2496	2108	0	0
4	2231	2232	2213, 2263	0	0
23	2498	2528	0	0	0
37	2486, 2487	2473, 2474, 2475, 2477, 2488, 2489, 2490, 2491, 2492	2485	0	0
47	0	0	0	2574, 2595	9905
48	2586	0	0	0	0

Room 9

Sequence of Excavation. Room 9 is located in the southeastern corner of the roomblock. It is divided into northern (9A) and southern (9B) halves. The entire room measures 4.6 m north-south by 2.8 m east-west, with 12.88 m^2 of interior space. However, a dividing wall separates the room into two small areas with 7.28 m^2 and 3.96 m^2 of floor space, respectively. The excavation proceeded from east to west in Rooms 9A and 9B by removing the room fill by grid and natural layer.

Fill. The fill consists of a thin 5-cm layer of Stratum 1, with 10 to 20 cm of Stratum 4 underlain with 5 to 15 cm of Stratum 3. In Room 9A the lower 10 cm contained a large amount of charcoal. This concentration of charcoal was missing from Room 9B. Pollen, flotation, and macrobotanical samples were taken from Strata 3 and 4 in Rooms 9A and 9B (see Tables 25.29 and 25.31). Taxa identified in the pollen samples from the fill in Room 9A included prickly pear, cheno-ams, grass family, mustard family, sunflower family, globemallow (*Sphaeralcea*), spurge family, unidentified pine, piñon pine, juniper, rose family, and sagebrush. Taxa identified in the pollen samples from the fill in Room 9B included prickly pear, beeweed, cheno-ams, grass family, sunflower family, unidentified pine, juniper, oak, and sagebrush. Taxa identified in the flotation samples from the fill in Room 9A included mountain mahogany, goosefoot, unknown conifer, juniper, piñon pine, ponderosa pine, and maize. Taxa identified in the flotation samples from the fill in Room 9B included pigweed, goosefoot, cheno-ams, unknown conifer, juniper, mint family (Labiatae), unidentified pine, piñon pine, ponderosa pine, and maize. Taxa identified in the macrobotanical samples from the fill in Room 9A included mountain mahogany, unknown conifer, bean, unidentified pine, piñon pine, ponderosa pine, Douglas fir, oak, and maize. Taxa identified in the macrobotanical samples from the fill in Room 9B included unknown conifer, ponderosa pine, and maize.

Floor. There is no prepared adobe floor in Room 9. The floor consists of a compacted living surface in both Rooms 9A (Stratum 38) and 9B (Stratum 39; Figures 25.48 and 25.49). The living surface was identified as a partially preserved layer of hardened adobe/sediment. In some places, like the northwestern corner of 9A and the southwest part of 9B, the surface is thinly laminated, which is similar to Room 3. Room 9A is, however, different from 9B in that 9A contains a dense concentration of charcoal in the 5 to 10 cm layer just above the floor, especially in the western half of 9A. This charcoal lens did not occur in Room 9B.

Figure 25.48. Photograph of Rooms 9A and 9B (north).

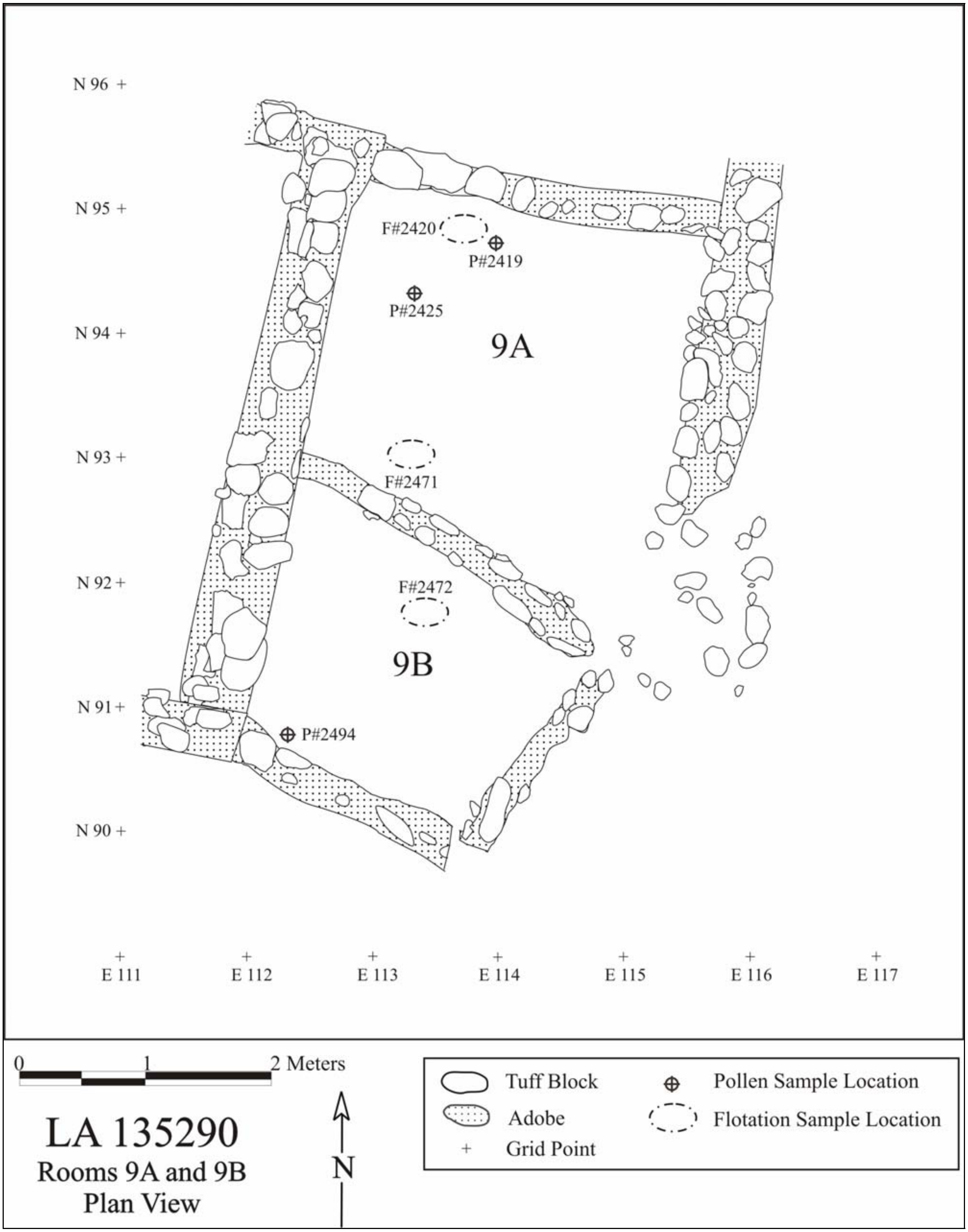

Figure 25.49. Rooms 9A and 9B plan view.

There are at least three areas of burned soil and charcoal on the living surface in Room 9A. Pollen and flotation samples were taken from this deposit (FS 2419 and FS 2420 and FS 2471, respectively). Taxa identified in the pollen sample included cheno-ams, sunflower family, unidentified pine, piñon pine, juniper, and sagebrush. Charred taxa identified in the flotation sample included goosefoot, juniper, piñon pine, ponderosa pine, purslane family, and maize. There is also a small concentration of white ash on the floor in the northwestern corner of the room and an ash concentration just below the level of the surface in the southwestern corner of Room 9A. A pollen sample (FS 2425) was taken in the northwestern corner and the identified taxa included lily family (Liliaceae), cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, oak, and sagebrush. The presence of this burned soil, charcoal, and ash clearly distinguishes Room 9A from Room 9B. However, there was a small ashy area present in the northwestern corner of Room 9B. A pollen (FS 2494) and flotation (FS 2472) sample were collected from this area of the floor. Taxa identified in the pollen sample included cheno-ams, grass family, mustard family, sunflower family, spurge family, evening primrose, unidentified pine, piñon pine, juniper, oak, rose family, and sagebrush. Charred taxa identified in the flotation sample included pigweed, cheno-ams, juniper, ponderosa pine, oak, and maize.

No floor features or artifacts were identified in the rooms.

Wall Construction. The west wall of Room 9 is a standing masonry wall that was part of the original roomblock (Figure 25.50). The upper section of the north wall of Room 9A was constructed from tuff blocks, while the lower section was composed of adobe that was 10 to 20 cm high. Although the north wall abuts against the west wall, it appears to be an extension of the east-west-running wall through the roomblock. The eastern wall of Room 9A was never a standing wall and it appears to be more similar to a berm or linear pile of rocks with soil and not adobe. The eastern wall is about 60 cm wide and is constructed of two parallel rows of flat-lying stones with dirt and smaller pieces of tuff in between. There is a gap at the southern end of the east wall that may have represented an entryway into the area of Room 9A. The south wall of Room 9A was constructed somewhat differently as it had a double row of uprights that formed the base to the wall.

The three walls that formed the north, east, and south sides of Room 9B were probably built later and all at the same time as is evidenced by the fact that they are oriented at a slightly southerly angle off the main roomblock. There is very little wallfall in the area so it is not clear as to whether these walls were ever full standing. The east wall simply consists of a single course of blocks with some adobe. The southern wall is also short and does not appear to be well made, consisting of a jumble of adobe with small tuff rocks.

Figure 25.50. West wall of Rooms 9A and B.

Rooms 9A and 9B wall measurements are provided in Tables 25.26 and 25.27.

Table 25.26. Room 9A wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	# Courses
North	2.8	0.60	0.30	2
South	2.7	0.31	0.28	1
East	2.5	0.32	0.70	1
West	2.3	0.65	0.38	3

Table 25.27. Room 9B wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	# Courses
North	2.7	0.31	0.28	1
South	2.0	0.17	0.34	1
East	1.6	0.18	0.28	1
West	2.0	0.54	0.38	3

Artifacts and Samples. Artifacts and pollen, flotation, and macrobotanical samples were selected from grids 92-94N/113E. In addition, samples were selected from floor contexts. Tables 25.28 to 25.31 provide summary information on artifacts by stratigraphic unit and samples selected for analysis in Rooms 9A and 9B, respectively.

Table 25.28. Room 9A artifact counts by stratigraphic unit.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
1	22	2	0	0	0	24
3	198	25	1	2	6	232
4	62	12	1	0	0	75
38	0	0	0	0	0	0
39	0	0	0	0	0	0
51	7	1	0	0	0	8
Total	**289**	**40**	**2**	**2**	**6**	**339**

Table 25.29. Samples selected for analysis in Room 9A.

Stratum	Sample Type		
	Pollen	Flotation	Macrobotanical
3	2325	2326	2353, 2268
4	2298	2299	2097, 2098
38	2419, 2425	2420, 2471	0

Table 25.30. Room 9B artifact counts by stratigraphic unit.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
3	0	1	1	0	1	3
4	201	19	4	11	1	236
Total	201	20	5	11	2	239

Table 25.31. Samples selected for analysis in Room 9B.

Stratum	Sample Type		
	Pollen	Flotation	Macrobotanical
3	0	0	2118
4	2134	2133	2132
39	2494	2472	0

Area 2 (Plaza Area)

Area 2 is the area to the east of the roomblock. Two north-south-oriented rock alignments (Feature 15) were visible on the surface to the immediate east of Rooms 9A and 9B (Figures 25.51 and 25.52). The eastern wall of Rooms 9A and 9B creates the western boundary of the feature. This alignment is about 7.50 m long and 0.50 m wide. The northern 5.0 m of the alignment is linear-shaped and is two to three unshaped tuff blocks wide and two blocks high (0.25 m). The blocks range in size from 15 to 35 cm in length. Soil is present in between the stones, which makes the alignment a linear berm as opposed to a wall. The southern 2.50 m of the alignment, which is located in front of Room 9B, is more of a jumble of tuff stones that connects with an east-west cluster of tuff rocks. This section of the alignment is 1.70 m long and abuts against the east wall of Room 9B. The rocks are smaller (about 10 cm in diameter) in this area.

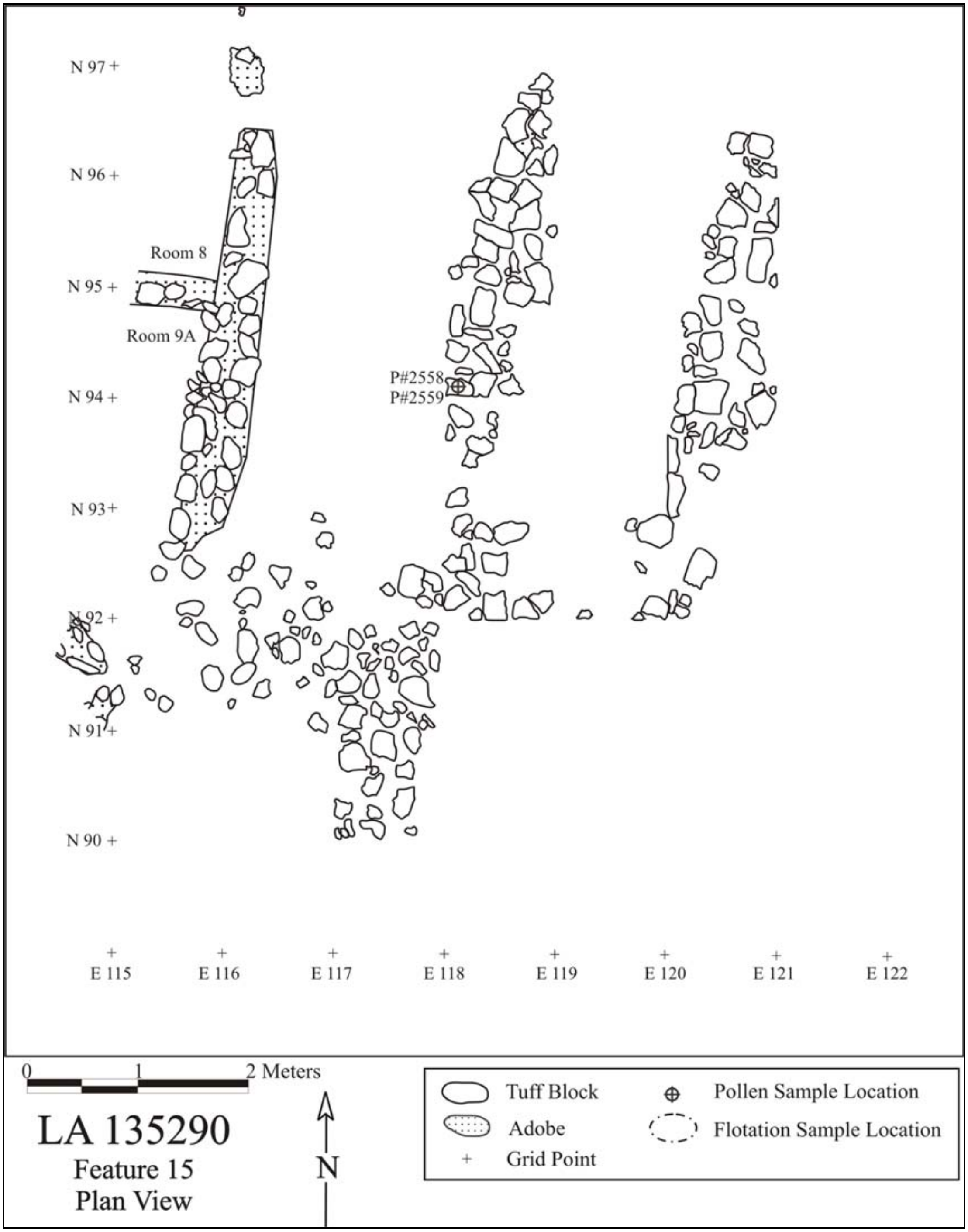

Figure 25.51. Feature 15 plan view.

Figure 25.52. Photograph of Feature 15 (west).

The eastern alignments are situated about 2.00 and 1.50 m apart. They are approximately 4.0 m long and 0.60 m wide. They appear to be a single stone high (10 to 15 cm) and two to three stones wide and have soil in between the stones. All three alignments are situated directly on top of the Bwb1 soil horizon and form two rectangular-shaped grids that open towards the north (upslope). The Bwb1 soil horizon represents the ancient surface that was present during the time the pueblo was occupied. The project geomorphologists noted that the top of the Bwb1 soil horizon is much more compact in the area of the plaza than underneath the roomblock. This presumably is due to trampling and foot traffic within the plaza. Pollen samples (FS 2558 and FS 2559) were taken from underneath an upper and lower block in the northern section of the Feature 15 alignment. Taxa identified in the alignment included prickly pear, cheno-ams, grass family, mustard family, sunflower family, ragweed/bursage, spruce (*Picea*), fir, unidentified pine, piñon pine, juniper, oak, rose family, and sagebrush.

A GPR survey was conducted of Area 2. A single anomaly was identified in the area of grid 101N/116E. As a result, a series of four backhoe trenches was excavated in the northern section of Area 2 to identify the presence of subsurface cultural deposits, features, and a kiva. Backhoe trench #1 was located at 98N/116E-98N/126E, backhoe trench #2 at 100-104N/116E, backhoe trench #3 at 100-102N/122E, and backhoe trench #4 at 100-108N/126E. The trenches were excavated down to bedrock, exposing up to 1.40 m of Holocene deposits (A, Bw, Bwb1, Btb1, Btkb1) situated on top of a late Pleistocene soil (Btkb2) and Bandelier Tuff bedrock. The soils appear to decrease in depth from south to north (1.0 to 0.50 m), with a shallow swale or gully cut into the bedrock through grids 101N/116E to 100N/122E to 98N/126E. This gully is the anomaly identified by the GPR survey and did not turn out to be a kiva. Otherwise, no cultural deposits or features were identified in the trenches.

Three other backhoe trenches were excavated to the east of the roomblock in the southern section of Area 2: backhoe trench #5 was located at 86N/114-120E, backhoe trench #6 was located at 90N/118-123E, and backhoe trench #7 was located at 94N/121-125E. Bedrock was also exposed about 1 m below the surface and no cultural deposits or features being identified.

Artifacts and Samples. Artifacts and pollen, flotation, and macrobotanical samples were selected from grids 90-96N/117-120E. Tables 25.32 and 25.33 provide summary information on artifacts by stratigraphic unit and samples selected for analysis in Area 2, respectively.

Table 25.32. Area 2 artifact counts by stratigraphic unit.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
0	228	22	1	0	0	251
1	59	8	0	0	0	67
13	574	58	3	0	0	635
Total	861	88	4	0	0	953

Table 25.33. Samples selected for analysis in Area 2.

Stratum	Sample Type			
	Pollen	Pollen Wash	Flotation	Macrobotanical
13	2558, 2559	0	0	0

Area 3 (North and East of the Roomblock)

Area 3 is the area located immediately west of the roomblock. Three 1- by 1-m test pits were excavated in this area. Two test pits were located near the southwestern (91N/102E) and northwestern (104N/112E) corners of the roomblock. Both grids were excavated down to a depth of about 40 to 50 cm below the surface and to the top of the Bwb1 soil horizon. One Santa Fe Black-on-white sherd, 16 smeared-indented corrugated sherds, one indented corrugated sherd, two chalcedony core flakes, and one piece of angular debris were recovered from the excavation of the southwestern test pit. Four smeared-indented sherds, two plainware body sherds, one chalcedony core flake, and one piece of microdebitage were recovered in the northwestern test pit. The northwestern test pit was also placed to cross-cut a surface cluster of tuff rocks (Figure 25.53). The cluster included about 10 rocks and was distributed across grids 105N/110-112E. It was determined that the cluster was mostly surficial, with the bottom of some rocks located about 10 cm below the surface. A pollen sample (FS 2482) was taken from under one of the rocks. Taxa identified in the sample include cheno-ams, grass family, sunflower family, ragweed/bursage, fir, unidentified pine, piñon pine, juniper, rose family, and sagebrush.

Figure 25.53. Photograph of tuff rocks surface cluster (north).

One test pit was located in the area of a small sparse artifact scatter situated to the northwest of the roomblock at grid 114N/94E. The pit was excavated 11 cm down to the top of Bwb1 soil horizon. Three plainware body sherds were the only artifacts recovered.

Artifacts and Samples. All the artifacts recovered from the three test pits and a single pollen sample were analyzed from Area 3. Tables 25.34 to 25.35 provide summary information on artifacts by stratigraphic unit and samples selected for analysis in Area 3, respectively.

Table 25.34. Area 3 artifact counts by stratigraphic unit.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
0	14	2	0	0	0	16
1	3	0	0	0	0	3
Total	17	2	0	0	0	19

Table 25.35. Samples selected for analysis in Area 3.

Stratum	Sample Type			
	Pollen	Pollen Wash	Flotation	Macrobotanical
13	2482	0	0	0

Area 4 (Midden East of the Roomblock)

Area 4 is a possible midden located to the east of the roomblock and Area 2. A surface collection was made in grids 75-93N/121-133/E. Subsequently, a series of eight 1- by 1-m test pits were placed across the area defined by a surface scatter of artifacts (82N/121E, 82N/125E, 82N/129E, 85N/123E, 85N/127E, 85N/131E, 88N/129E, and 91N/131E). The excavations revealed that there were very few artifacts present in the area. Most of these were limited to the upper 10 cm of the soil profile, including the A and Bw soil horizons. The sherds were often small fragments, indicating that they had probably washed down from the area of the roomblock. This corresponds with the site geomorphic study that shows a fan of colluvium sloping down towards the east from the rubble mound and indicates that this area was not a midden area.

A small (20 by 30 cm) charcoal-stained deposit was, however, exposed about 15 cm below the surface in grid 82N/125E. The deposit was situated at the break between the Bw and Bwb1 soil horizons. Pollen (FS 2149), flotation (FS 2150), and macrobotanical (FS 2145 and FS 2148) samples were taken. Taxa identified in the pollen sample included maize, lily family, cheno-ams, grass family, unidentified pine, piñon pine, juniper, and sagebrush. Charred taxa identified in the flotation sample included saltbush/greasewood, goosefoot, unknown conifer, mint family, unidentified pine, piñon pine, ponderosa pine, and maize. Taxa identified in the macrobotanical samples include piñon pine, ponderosa pine, and maize.

Artifacts and Samples. All the artifacts and pollen, flotation, and two macrobotanical samples were analyzed from Area 4. These samples include materials from surface collected grids (75-93N/121-133E) and excavated test pits. Tables 25.36 and 25.37 provide summary information on artifacts by stratigraphic unit and samples selected for analysis in Area 4, respectively.

Table 25.36. Area 4 artifact counts by stratigraphic unit.

Stratum #	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
0	446	67	0	0	0	513
1	182	26	0	0	0	208
13	326	28	0	0	0	354
Total	954	121	0	0	0	1075

Table 25.37. Samples selected for analysis in Area 4.

Stratum	Sample Type			
	Pollen	Pollen Wash	Flotation	Macrobotanical
13	2149	0	2150	2145, 2148

General Summary of Architecture

The front rooms of the roomblock were typically slightly larger than those in the back, with the exception of Room 4/5. If Room 4/5 was broken into the two smaller rooms instead of being one larger room, then all the back rooms would be smaller, which fits the general pattern visible on the Pajarito Plateau. Table 25.38 shows the room dimensions and floor area for each of the rooms. A histogram was generated based on the surface area of the floors in the rooms (Figure 25.54). The figure groups the front rooms (light blue), the back rooms (blue-gray), and the plaza rooms (dark blue).

Table 25.38. Room dimensions and floor area.

Room Number	Location	Length (m)	Width (m)	Floor Area (m^2)
1	Front room	3.8	3.5	13.30
2	Front room	4.4	3.56	15.66
3	Front room	4.0	3.15	12.60
4/5	Back room	4.1	4.15	17.02
6	Back room	1.75	1.75	3.06
7	Back room	3.1	1.9	5.89
8	Plaza room	4.1	2.8	11.48
9A/B	Plaza room	4.6	2.8	12.88

ARTIFACT AND SAMPLE ANALYSIS

A total of 10,152 pieces of pottery, 1318 chipped stone items, 127 ground stone artifacts, two ornaments, 17 minerals, and 78 faunal remains were recovered during the excavation of LA 135290. In addition, 117 flotation, 458 macrobotanical, and 134 pollen samples were collected. Given the large number of artifacts and samples recovered, the majority of the artifact classes were sampled during analysis.

Ceramic, chipped stone, and ground stone artifacts were sampled by analyzing the artifacts recovered from one, two, or three 1- by 1-m grid units in each room. Those units with the highest artifacts densities in the room fill layers were selected for analysis. In addition, all floor and feature fill artifacts were analyzed, as were all the artifacts recovered from Areas 3 and 4 and all the faunal remains. However, a sample of artifacts was also selected from surface collections in grids 89-112N/105-116E in Area 1, excavated grids 90-96N/117-120E in Area 2, surface collections in grids 75-93N/121-133E in Area 4, and the excavated test pits in Area 4.

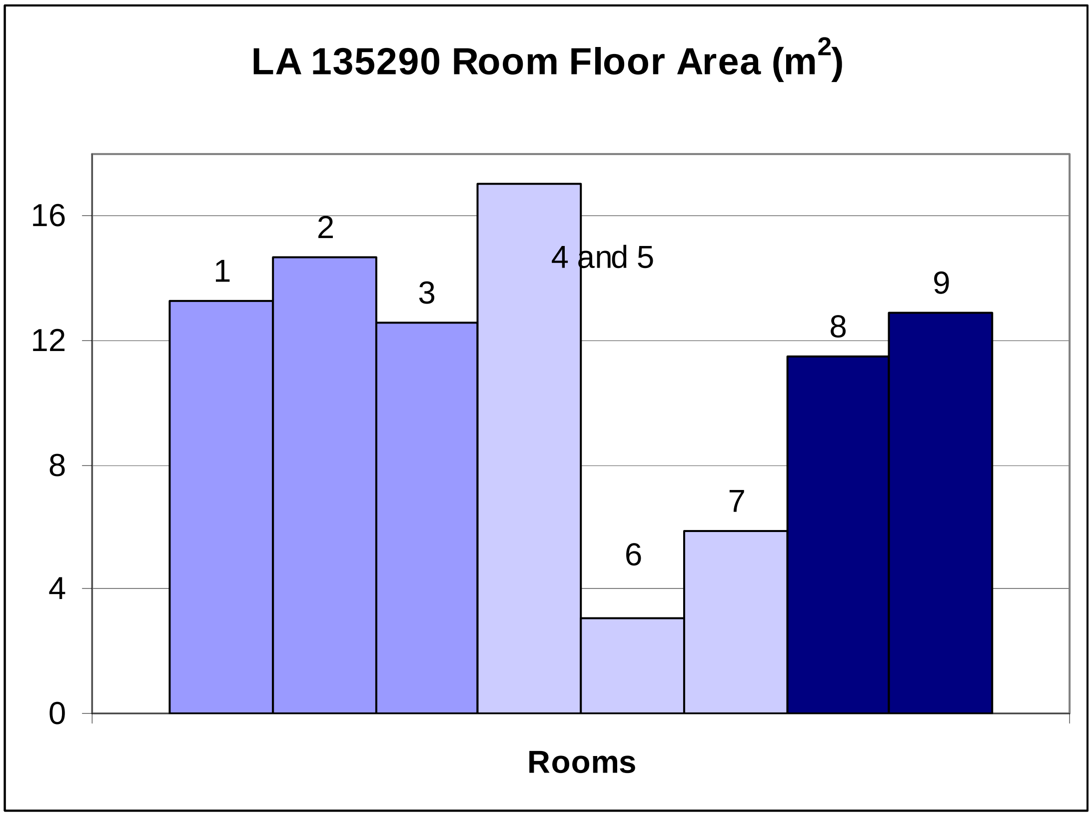

Figure 25.54. Histogram showing room size at LA 135290.

A set of archaeobotanical and pollen samples were selected from a stratigraphic sequence within each of the rooms, including the floors and features. The selected samples were listed in the previous room summaries. Maize recovered from features was also submitted for AMS radiocarbon dating. Archaeomagnetic and TL samples were taken from burned features, floors, and walls, with three sherds submitted for TL dating. Lastly, obsidian hydration dating was conducted on a sample of obsidian artifacts from the site.

Chronology

Radiocarbon Dating

Three radiocarbon samples were submitted to Beta Analytic for analysis, with each providing sufficient carbon for accurate measurements. All analyses were conducted on maize (*Zea mays*) remains. Table 25.39 lists the results of the radiocarbon analyses submitted. The results support the presence of an Early to Middle Coalition period occupation at LA 135290, with intercepts ranging from AD 1180 to 1220 and a two-sigma overlap of AD 1160 to 1260.

Table 25.39. Radiocarbon dates from LA 135290.

FS#	Material	Laboratory (Beta) #	Conventional radiocarbon age	Intercept of radiocarbon age	2-sigma calibrated result
2103	Maize kernels and cupules	199386	870±40 BP	AD 1180	AD 1040–1260
2475	Maize kernels and cupules	199388	830±40 BP	AD 1220	AD 1160–1270
2564	Maize cupules	199389	860±40 BP	AD 1190	AD 1040–1260

Archaeomagnetic Dating (Eric Blinman)

Despite the lack of formal midden accumulations at LA 135290, the rooms revealed a complex remodeling sequence, with multiple floors and hearths. This complexity suggests a long and relatively continuous, if not intense, occupation of the site. In addition to three cooking or heating hearths, at least three burning incidents occurred in the rooms, affecting both floors and walls. Stratigraphic relationships between archaeomagnetic sets are relatively clearly defined, increasing the interpretive potential of the results.

The suite of samples conservatively places the occupation of the roomblock within the AD 1155–1270 time range, but the more precise suite of results narrows that range slightly to AD 1170–1240, which corresponds with the ceramic dates from the site. The archaeomagnetic date ranges are based on the Wolfman calibration curve, and its calibration is relatively robust but not absolute. Calendric implications of the Wolfman VGP curve may be off by a decade or two, but the pole positions of the LA 135290 results are consistent with those of other early Coalition period samples from the northern Rio Grande region. To the south in the Cochiti Pueblo areas, the VGP positions for sets that document the transition between Late Developmental and Coalition pottery assemblages are slightly later along the Wolfman curve than these results from the LA 135290 roomblock. This suggests that the roomblock occupation is part of the initial establishment of Santa Fe Black-on-white as a marker of Coalition occupations in the northern Rio Grande Valley, and that the spread of Santa Fe Black-on-white technology (at least southward) lags by a generation or two. Table 25.40 lists the dates associated with the archaeomagnetic samples taken at LA 135290.

Table 25.40. Archaeomagnetic dates from LA 135290.

Sample	Feature	AM Date ranges (AD)	
		Wolfman or DuBois	SWCV2000
1226	Room 6, Floor 3	1170–1210	1125–1175
1227	Room 4, Floor 2	1180–1205	1125–1165
1228	Room 6, West wall	1185–1230	1020–1110
1229	Room 2, Hearth	1010–1070 1200–1270 1345–1390	1005–1045 1175–1325
1230	Room 8, Hearth 9	1195–1240	1015–1050

Sample	Feature	AM Date ranges (AD)	
		Wolfman or DuBois	SWCV2000
		1035–1070	
1231	Room 2, Hearth 16 (below and to the east of Hearth 11)	1155–1210 1105–1150	1035–1165
1232	Room 4, Floor 3	1170–1270	1010–1310

Thermoluminescence Dating

Three adobe samples (including a hearth rim and hearth base from Room 8), two floor samples, a wall sample, and three sherds were submitted for TL dating. All derived ages are given in years BP, which refers to years before 2003 (Table 25.41). Only the sample from Room 7 yielded a date within the range defined by the AMS and archaeomagnetic dating techniques; however, two other samples can be included within the standard deviation range and six others are much earlier.

Table 25.41. Thermoluminescence dates from LA 135290.

UW Lab #	Type	Room/feature	Burial depth (cm)	% error	Years AD
UW1236	Adobe	4	32	7.4	1035 ± 73
UW1237	Floor	6	35	9.1	1134 ± 79
UW1238	Wall	6	38	9.6	1114± 85
UW1239	Wiyo B/w	7	30	7.0	1217 ± 56
UW1240	Sherd*	2/11	65	9.4	1050 ± 90
UW1241	Sherd*	2	57	11.2	816 ± 133
UW1242	Floor	4	50	5.6	888 ± 62
UW1243	Hearth rim	8/9	44	14.5	1073 ± 135
UW1244	Hearth base	8/9	44	10.8	851 ± 125

* smeared-indented corrugated sherd.

Obsidian Hydration Dating

Seven obsidian artifacts were submitted to the Diffusion Laboratory for age determination using the obsidian hydration dating method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rim, was measured. Second, the high temperature hydration rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site were estimated in order that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 25.42).

Table 25.42. Obsidian hydration dates for LA 135290.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
1018	2006-41	Valle Grande	2.78	-1036	219
1055	2006-42	Valle Grande	2.69	1015	71
1255	2006-43	Valle Grande	4.72	-6500	362
1385	2006-44	Valle Grande	4.34	-5277	337
2141	2006-45	Valle Grande	2.46	1805	12
2142	2006-46	Valle Grande	2.57	1614	27
2174	2006-47	Valle Grande	2.27	-64	182

Relative to other dating methods conducted at the site, the obsidian hydration dates seem to be the least accurate (Figure 25.55; Table 25.43). Radiocarbon and archaeomagnetic results are comparable and seem to have provided the most plausible results, while the TL dates seem to be slightly less plausible given the known occupation range of the sites, but still well within the acceptable limits. Overall, the dates reflect an Early to Middle Coalition period occupation circa AD 1160 to 1260. Table 25.43 presents all the dated materials from the site. TL, archaeomagnetic, radiocarbon, and obsidian hydration are presented where similar contexts were sampled.

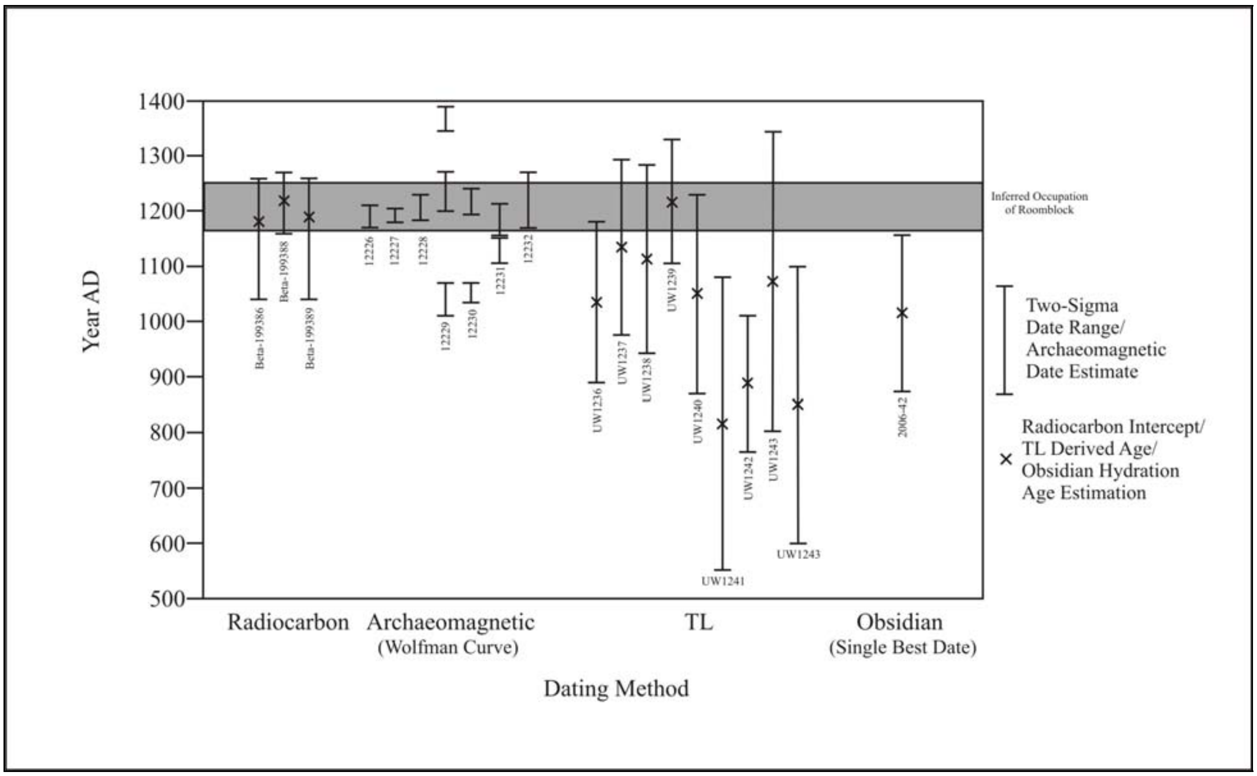

Figure 25.55. Comparison of dated materials from LA 135290.

Table 25.43. Comparison of dated materials from LA 135290.

Context	Radiocarbon Intercept	Archaeomag (Wolfman)	Archaeomag (SWCV2000)	TL	Obsidian Hydration
Room 8, Feature 9	AD 1220	1195–1240 1035–1070	1015–1050	1073 ± 135 (rim) 851 ± 125 (base)	--
Room 2, Feature 16	AD 1190	1155–1210 1105–1150	1035–1165	--	--

*all dates are AD unless otherwise noted

Ceramic Artifacts (Dean Wilson)

A total of 4021 sherds were analyzed from LA 135290. Most of these consist of Santa Fe Black-on-white and smeared-indented corrugated, which indicate a Middle Coalition period (13th century) occupation. The majority (83.7%) of the pottery from the site consists of gray utilityware types, while 16.3 percent consists of whiteware types, and redwares are represented by a single sherd (Table 25.44). The majority (55.2%) of whitewares were classified as Santa Fe Black-on-white. Most of the other whitewares (41.3%) were assigned to the unpainted undifferentiated type, and most of these appear to be represented by the unpainted portions of Santa Fe Black-on-white vessels. Types present in very low frequencies include Wiyo Black-on-white (0.5% of all whitewares), Galisteo Black-on-white (0.3%), Kwahe'e Black-on-white (1.7%), mineral-painted undifferentiated, indeterminate Cibola whiteware (0.4%), and Socorro Black-on-white (0.2%).

In addition to Coalition period whiteware types, Biscuit B (Bandelier Black-on-gray) sherds were present in low frequencies (0.3% of all whitewares) and probably reflect contaminants from a nearby Classic period pueblo. Utilitywares were exclusively represented by Northern Rio Grande grayware types. Graywares were dominated by smeared-indented corrugated sherds, and represent 83.5 percent of all graywares. Other grayware types included plain gray (2.3% of all graywares), unknown gray (trace), wiped scored gray (0.1 %), basket impressed gray (trace), indented corrugated (13.8%), incised corrugated (0.1%), plain corrugated (0.1%), smeared plain corrugated (0.1%), patterned corrugated (trace), plain incised (trace), and mudware (0.1%). The ceramics at LA 135290 were very similar to those identified at LA 86534, and both date to the Middle Coalition period.

Table 25.44. Ceramic types from all contexts at LA 135290.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	271	6.7
Mineral paint undifferentiated	1	0.1
Kwahe'e Black-on-white	11	0.3
Santa Fe Black-on-white	362	9.0
Wiyo Black-on-white	3	0.1

Ceramic Type	Frequency	Percent
Galisteo Black-on-white	2	0.1
Biscuit B (Bandelier Black-on-gray)	2	0.1
Northern Rio Grande Utilityware		
Plain gray rim	14	0.3
Unknown gray rim	1	0.1
Plain gray body	64	1.6
Wiped scored gray	4	0.1
Basket impressed gray	1	0.1
Indented corrugated	465	11.4
Incised corrugated	3	0.1
Plain corrugated	4	0.1
Smeared plain corrugated	2	0.1
Smeared-indented corrugated	2802	69.0
Patterned corrugated	1	0.1
Plain incised	1	0.1
Mudware	3	0.1
Cibola Whiteware		
Unpainted polished whiteware	1	0.1
Mineral paint undifferentiated	1	0.1
White Mountain Redware (Cibola)		
White Mountain Redware unpainted	1	0.1
Eastern Mogollon Whiteware		
Socorro Black-on-white	1	0.1
Total	**4021**	**100.0**

Pottery distributions noted at LA 135290 most closely resemble those noted from LA 86534, which is located approximately 500 m to the east (Volume 2, Chapter 24; Wilson, Volume 3). Similarities in whitewares include the overwhelming dominance of Santa Fe Black-on-white within the whiteware assemblages along with extremely low frequencies of Kwahe'e Black-on-white, Wiyo Black-on-white, and Galisteo Black-on-white. Another characteristic shared by the ceramic assemblages is that the majority (73.4%) of whiteware bowls exhibit unpolished and unslipped exteriors. Similarities in gray utilitywares include the dominance of smeared corrugated sherds along with small but significant amounts of indented corrugated.

Temper found in Santa Fe Black-on-white sherds from LA 135290 was dominated by rounded clay fragments that were recorded as oblate shale with tuff (Table 25.45). The identification of this temper reflects a rare case in which the easy visual recognition of a temper distinct to the whitewares from a specific site was possible. A total of 52 percent of the whiteware sherds contained this temper type, which was very rare in whitewares from LA 86534 (Table 25.46). All six of the Santa Fe Black-on-white sherds from LA 135290 submitted for petrographic analysis were tempered with anthill sand with clay lumps, indicating the use of a distinct paste source in the production of whitewares at LA 135290. This lends support to other studies that suggest that Santa Fe Black-on-white ceramics were produced locally at various sites in Pajarito

Plateau and elsewhere in the Northern Rio Grande region during the Coalition period (Habicht-Mauche 1993; Powell 2002; Vint 1999).

Table 25.45. Distribution of temper by ware at LA 135290.

Temper	Gray		White		Red		Total	
Indeterminate	1	0.0	--	--	--	--	1	0.0
Granite with mica	23	0.7	--	--	--	--	23	0.6
Highly micaceous (residual) paste	1	0.0	--	--	--	--	1	0.0
Sherd	--	--	3	0.5	1	100	4	0.1
Sherd and sand	1	0.0	2	0.3	--	--	3	0.1
Fine tuff or ash	6	0.2	285	43.4	--	--	291	7.2
Large tuff fragments Vitric tuff	--	--	2	0.3	--	--	2	0.0
Fine tuff and sand	2	0.1	12	1.8	--	--	14	0.3
Fine sandstone	1	0.0	--	--	--	--	1	0.0
Tuff and phenocrysts (anthill sand)	1261	37.5	1	0.2	--	--	1262	31.4
Fine Jornada sherd	2	0.1	--	--	--	--	2	0.0
Mica and tuff	--	--	2	0.3	--	--	2	0.0
Mostly tuff with some phenocrysts	2065	61.4	6	1.1	--	--	2071	51.5
Oblate shale and tuff	2	0.1	341	52.0	--	--	343	8.5
Large tuff predominate with anthill sand	--	--	1	0.2	--	--	1	0.0
Total	**3365**	**100.0**	**655**	**100.0**	**1**	**100**	**4021**	**100.0**

The majority of the grayware sherds from LA 135290 were tempered with some form of anthill sand. All of the nine thin-sectioned grayware sherds were tempered with anthill sand, except one that contained sanidine and quartz as the dominant particles. Samples from LA 135290, while also dominated by sanidine and quartz, show much more varied subordinate and minor temper components than utilitywares than LA 86534. In addition to sanidine felsite and minor plagioclase, these include tuff and vitric felsites, intermediate volcanics, and K-feldspar. Quantitatively, the proportion of plagioclase is lower on average and much more variable than in the samples from LA 86534.

Distributions of ware and form categories from LA 135290 are very similar to those noted at other Coalition period sites on the Pajarito Plateau (Table 25.46). Graywares are overwhelmingly represented by jar sherds (Table 25.47), while whitewares are dominated by bowl sherds, which represent over 70 percent of this ware. These distributions closely match patterns noted at other Coalition period site.

Table 25.46. Distribution of wares at LA 135290.

Ware	Count	Percent
Gray	3365	83.7
White	655	16.3
Red	1	0.0

Glaze	--	--
Total	**4021**	**100.0**

Table 25.47. Distribution of vessel form by ware at LA 135290.

Vessel Form	Gray		White		Red		Group Total	
Indeterminate	35	1.0	120	18.29	--	--	155	3.9
Bowl rim	19	0.6	75	11.43	--	--	94	2.3
Bowl body	15	0.4	398	60.67	--	--	413	10.3
Jar neck	350	10.4	2	0.30	--	--	352	8.8
Jar rim	88	2.6	--	--	--	--	88	2.2
Jar body	2848	84.6	4	8.38	1	100	2903	72.2
Jar body with strap or coil handle	--	--	1	0.15	--	--	1	0.0
Jar body with lug handle	2	0.1	1	0.15	--	--	3	0.1
Indeterminate coil, strap handle	8	0.2	--	--	--	--	8	0.2
Canteen rim	--	--	1	0.15	--	--	1	0.0
Miniature jar	--	--	1	0.15	--	--	1	0.0
Seed jar rim	--	--	2	0.30	--	--	2	0.0
Total	**3365**	**100.0**	**655**	**100.00**	**1**	**100**	**4021**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 540 artifacts were analyzed from LA 135290. The sampled assemblage consisted of nine cores, 496 pieces of debitage, 16 retouched tools, 16 ground stone artifacts, three hammerstones, and four pieces of fire-cracked rock, which represented a 35 percent sample of the 1530 total lithic artifacts recovered. Table 25.48 presents the data on lithic artifact type by material type. The majority of the debitage is made of chalcedony with lesser amounts of Pedernal chert, obsidian, and other materials. The presence of cortex on 16.5 percent of the debitage indicates that these materials were collected from waterworn sources. Nodule cortex was not identified on any of the items exhibiting cortex. The chalcedony and Pedernal chert are available from local Rio Grande Valley gravel sources and the basalt from gravels and bedrock outcrops. Although obsidian is present at nearby primary sources in the Jemez Mountains, a single obsidian flake also exhibited waterworn cortex, indicating that it was possibly obtained from gravel sources. Quartzite and silicified wood is, however, only available from the nearby Rio Grande Valley gravels. Otherwise, the ground stone artifacts are primarily made from igneous materials that are available both as bedrock outcrops and in stream gravels that cross-cut the Pajarito Plateau. The source of the sandstone is difficult to determine, but it could be derived from gravel formations near Totavi or from more distant sources in the Santa Fe or Abiquiu areas.

Table 25.48. LA 135290 lithic artifact type by material type.

Artifact Type		Material Type														
		Basalt	Vesicular Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Silicified Wood	Sandstone	Quartzite	Other	Total
Cores	Core	0	0	1	0	1	0	1	4	0	2	0	0	0	0	9
	Subtotal	1	0	1	0	1	0	1	4	0	2	0	0	0	0	9
Debitage	Angular debris	3	0	1	0	2	0	3	44	0	30	0	0	0	0	83
	Core flake	9	0	9	1	9	0	15	221	1	74	2	1	0	1	343
	Biface flake	1	0	0	0	0	0	7	2	0	1	0	0	0	0	11
	Microdebitage	1	0	1	0	0	0	2	29	0	7	0	0	0	0	43
	Undetermined flake	0	0	0	0	0	0	1	7	0	5	1	0	0	0	14
	Hammerstone flake	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
	Ground stone flake	0	0	0	2	1	0	0	0	0	0	0	0	0	0	3
	Subtotal	14	0	11	3	12	0	28	303	1	117	3	1	2	1	496
Retouched Tools	Retouched piece	0	0	0	0	1	0	0	1	0	2	0	0	0	0	4
	Biface	0	0	0	0	0	0	2	0	0	1	0	0	0	0	3
	Projectile point	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
	Uniface	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
	Perforator	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
	Perforator/notch	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
	Subtotal	0	0	0	0	1	0	9	1	0	5	0	0	0	0	16
Ground Stone	One-hand mano	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Two-hand mano	0	2	0	0	0	0	0	0	0	0	0	1	0	0	3
	Undetermined mano Fragment	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
	Grinding slab	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2

Artifact Type		**Material Type**														
		Basalt	**Vesicular Basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Silicified Wood**	**Sandstone**	**Quartzite**	**Other**	**Total**
	Undetermined metate fragment	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4
	Polishing stone	0	0	0	1	2	0	0	0	0	0	0	0	1	0	4
	Pestle	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
	Abrading stone	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Maul	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2
	Ornament	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Miscellaneous ground stone	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Undetermined ground stone	0	0	0	0	4	0	0	0	0	0	0	1	1	0	6
	Subtotal	0	2	0	1	14	1	0	0	1	0	0	2	6	1	28
Other	Hammerstone	0	0	0	0	0	0	0	2	0	0	0	0	1	0	3
	Fire-cracked rock	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	1	0	0	0	2	0	0	0	0	1	0	4
Total		**15**	**2**	**12**	**4**	**28**	**1**	**38**	**310**	**2**	**124**	**3**	**2**	**8**	**2**	**553**

Six pieces of debitage, a core, a retouched tool, and a projectile were submitted for X-ray fluorescence analysis. All but one of the artifacts were obtained from the Valle Grande source, with a single piece of debitage obtained from the Cerro Toledo source area (Table 25.49). The Valle Grande (Cerro del Medio) and Cerro Toledo (Rabbit Mountain/Obsidian Ridge) source areas are located about 17 km (11 miles) as the "crow flies" to the west and southwest of the site. In addition, four pieces of basalt debitage were also submitted for analysis. Three of these were made from dacite from local sources and the other was basalt.

Table 25.49. Obsidian source samples.

FS #	Artifact	Color	Source
240	Tool	Translucent	Valle Grande rhyolite
704	Projectile point	Translucent	Valle Grande rhyolite
1018	Debitage	Translucent	Valle Grande rhyolite
1055	Debitage	Translucent	Valle Grande rhyolite
1385	Debitage	Translucent	Valle Grande rhyolite
1470	Core	Black opaque	Cerro Toledo rhyolite
2141	Debitage	Translucent	Valle Grande rhyolite
2142	Debitage	Translucent	Valle Grande rhyolite
2174	Debitage	Translucent	Valle Grande rhyolite

Lithic Reduction

The cores consist of three single-directional, five bidirectional, and a core fragment. The single-directional cores were reduced using a multi-faces technique, whereas, the bidirectional cores were reduced using bifacial, opposed-same-face, opposed-different-face, and 90 degrees techniques (Figure 25.56). None of the cores exhibit any obvious evidence of platform preparation. Most of the cores were discarded due to exhaustion (*n* = 4), with one due to extensive hinging and another due to extensive edge battering. Otherwise, the remaining two cores were considered still useable. None of the cores were burned. Table 25.50 presents the metric information on the whole cores.

Table 25.50. Core type dimensions (mm) and weight (gm).

Core Type	Length	Width	Thickness	Weight
Single-directional	32	42	27	39.0
Single-directional	49	73	44	189.5
Single-directional	59	65	48	172.3
Bi-directional	81	86	68	462.7
Bi-directional	33	31	17	15.4
Bi-directional	20	25	10	5.4
Bi-directional	38	40	17	30.3
Bi-directional	30	20	16	10.3

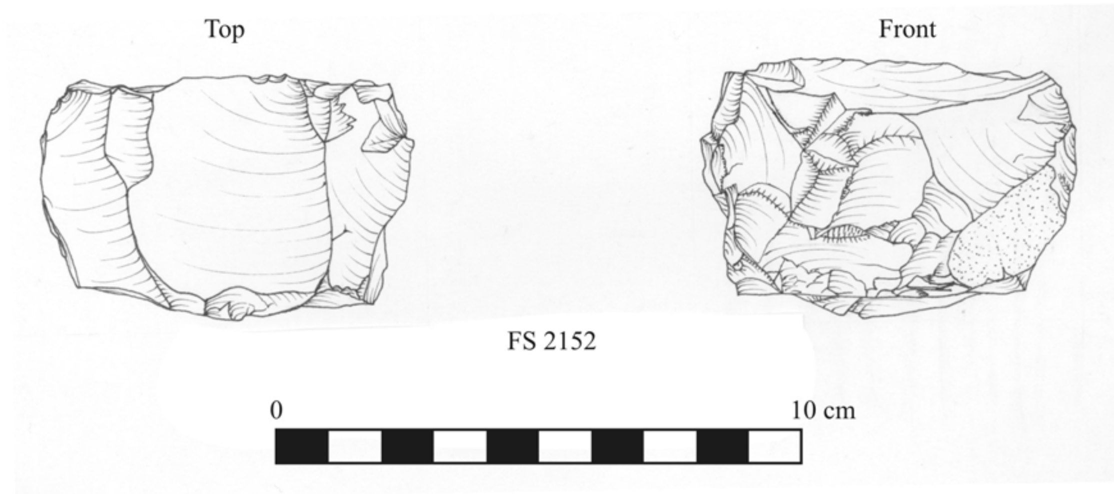

Figure 25.56. Single-directional, multi-face core (top and front).

The debitage consists mainly of core flakes (69.1%), with lesser amounts of angular debris (16.7%), microdebitage (8.6%), biface flakes (2.2%), and undetermined flake fragments (2.8%). Table 25.51 summarizes the various stages of reduction represented by the whole core and biface (tertiary) flakes. The debitage assemblage is primarily composed of secondary noncortical flakes, with lesser amounts of secondary cortical, tertiary, and primary flakes. The overall cortical:non-cortical ratio of 0.48 reflects an emphasis on the later stages of core reduction. The sample size is small, but chalcedony materials appear to be more fully reduced than the Pedernal chert.

Table 25.51. Debitage reduction stages.

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Basalt	0	0	1	0	---
Obsidian	0	0	2	2	---
Chalcedony	1	14	37	1	0.36
Pedernal chert	0	12	13	0	0.92
Total	1	26	53	3	0.48
Percentage	1.2	31.3	63.8	3.6	---

The majority of the flakes exhibit single-faceted platforms (38.5%; n = 57), with cortical (n = 30), collapsed (n = 36), crushed (n = 22), multi-faceted (n = 2), and dihedral (n = 1) platforms. The majority of the collapsed and crushed platforms are on chalcedony and core flakes. Only five (3.3%) of the flake platforms exhibit evidence of preparation and all of these were abraded/crushed.

The majority of the core flakes consist of distal fragments (*n* = 179; 52.2%), with fewer whole (*n* = 96), proximal (*n* = 41), and midsection (*n* = 27) fragments. Most of the biface flakes are also distal fragments (*n* = 4; 36.4%), with fewer whole (*n* =3), proximal (*n* = 3), and midsection (*n* = 1) fragments. The whole core flakes have a mean length of 23.8 mm (*std* = 12.5), whereas the whole biface flakes exhibit a mean length of 30.0 mm (*std* = 10.5). Lastly, angular debris have a mean weight of 3.9 g (*std* = 5.5).

The retouched tools consist of a mix of expedient flakes tools like retouched pieces and perforators, with fewer formal tools such as bifaces, projectile points, and unifaces (Figure 25.57). All of the retouched pieces exhibit a single marginally retouched edge. Table 25.52 presents the information on retouch type by edge outline.

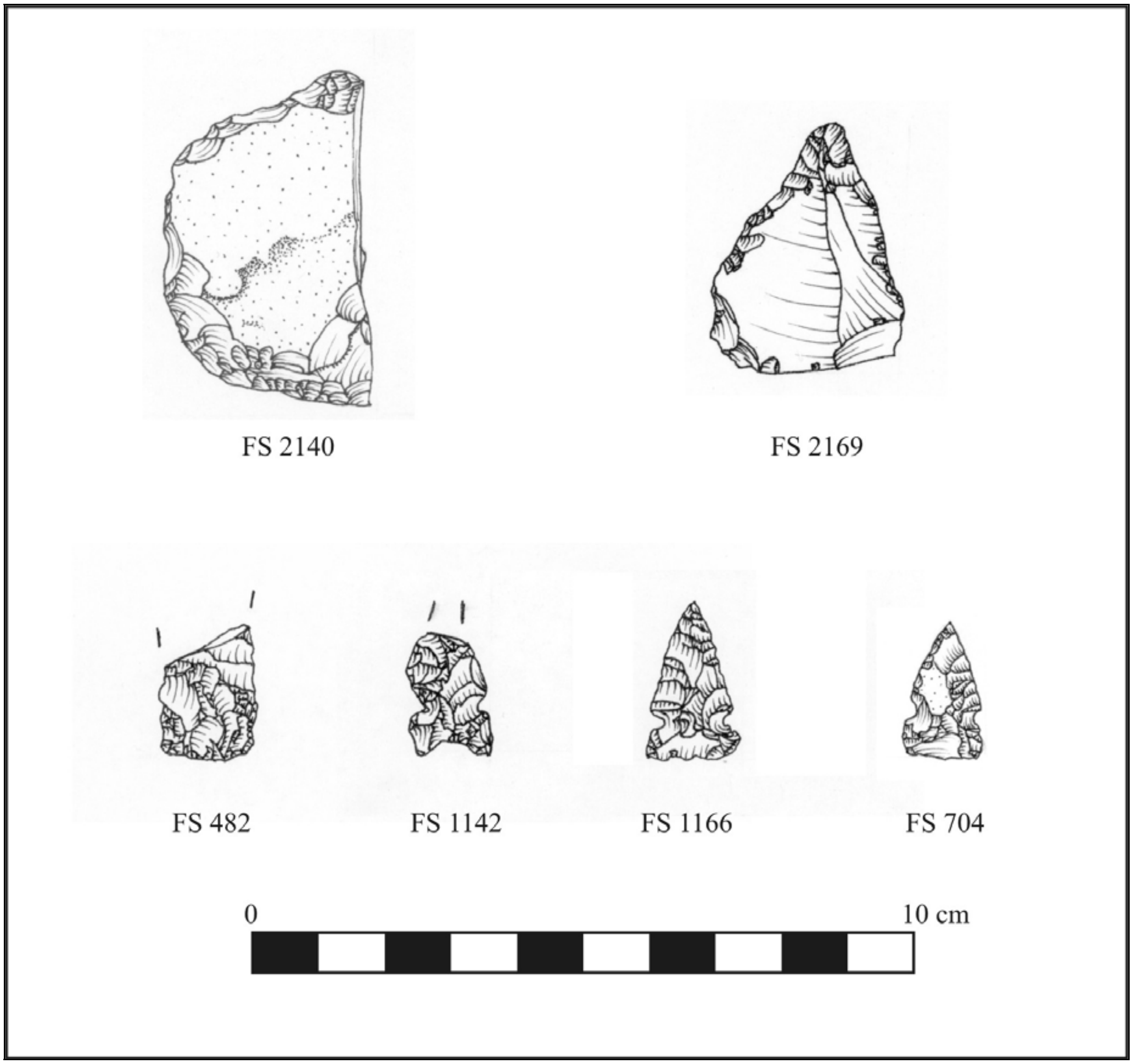

Figure 25.57. Retouched flake, perforator, biface, and projectile points.

Table 25.52. Retouched pieces.

Retouch Type	Edge Outline						
	Straight	Concave	Convex	Straight/ concave	Straight/ convex	Concave/ convex	Projection
Unidentified ventral	1	0	0	0	0	0	0
Unidentified dorsal	2	0	1	0	0	0	0
Total	3	0	1	0	0	0	0

The retouched edges primarily exhibit a straight outline. The edge angles range from 55 to 75 degrees, with a mean of 53.7 degrees (*std* = 8.5**).** This reflects an emphasis on the use of steeper edge angles. Two of the perforators are small triangular-shaped flakes that have been bifacially retouched. The third perforator is a bifacially retouched projection on a large flake. The uniface is a large roughly worked flake with unidirectional dorsal retouch and an edge angle of 75 degrees. It is a proximal fragment that might have been broken during manufacturing.

All three bifaces are fragments. One is a midsection with an edge angle of 45 degrees and the other two are proximal fragments with edge angles of 50 and 60 degrees. They may be middle stage fragments that were broken during manufacturing. Metrical and descriptive information on the four projectile points is presented in Table 25.53. They consist of three corner-notched and one side-notched arrow points with neck widths between 7 and 9 mm.

Table 25.53. Projectile point metrical (mm) and descriptive data.

FS #	Material	Condition	Overall Length	Blade Length	Neck Width	Stem Length	Stem Width	Thickness	Weight (gm)	Haft Type	Blade Shape	Base Shape
704	Obsidian	Whole	19	13	8	7	11	3	0.7	Side-notched	Straight	Straight
1142	Obsidian	Proximal	--	--	7	6	12	2	0.7	Corner-notched	Straight	Concave
1166	Obsidian	Whole	23	16	9	7	14	3	0.9	Corner-notched	Straight	Straight
1983	Obsidian	Proximal	--	--	--	--	--	--	0.1	Corner-notched	Und.	Und.

Tool Use

Only 13 flakes (2.6%) exhibit evidence of damage that could be attributed to use-wear. Most of the damage is located at the end of the flake (*n* = 6), with some along the lateral edge (*n* = 4), and the dorsal surface (*n* = 3). The former flakes have mostly straight outlines, with one convex outline and three utilized projections, while the latter are ground stone flakes. Edge angles range from 50 to 70 degrees, with a mean of 59 degrees (*std* = 8.6). This is similar to the pattern exhibited by the retouched flakes. In contrast to the debitage, eight of the retouched tools (50.0%) exhibit evidence of use-wear. These consist of four retouched flakes, three perforators, and one perforator/notch.

Twenty-eight ground stone artifacts were identified during the analysis. These included manos, metates, a polishing stone, a pestle, an abrading stone, and other unidentified ground stone items. The manos consist of one- and two-hand varieties with several undetermined fragments. The one-hand mano is a cobble with two heavily ground opposing flat surfaces, while the two-hand manos are made of vesicular basalt and sandstone and have a plano-convex and a wedge-shaped cross-section (Figure 25.58). One of these has finger impressions along a single side. The mano fragments are both cobbles with two opposing ground surfaces that are plano-convex and bi-plano in cross-section.

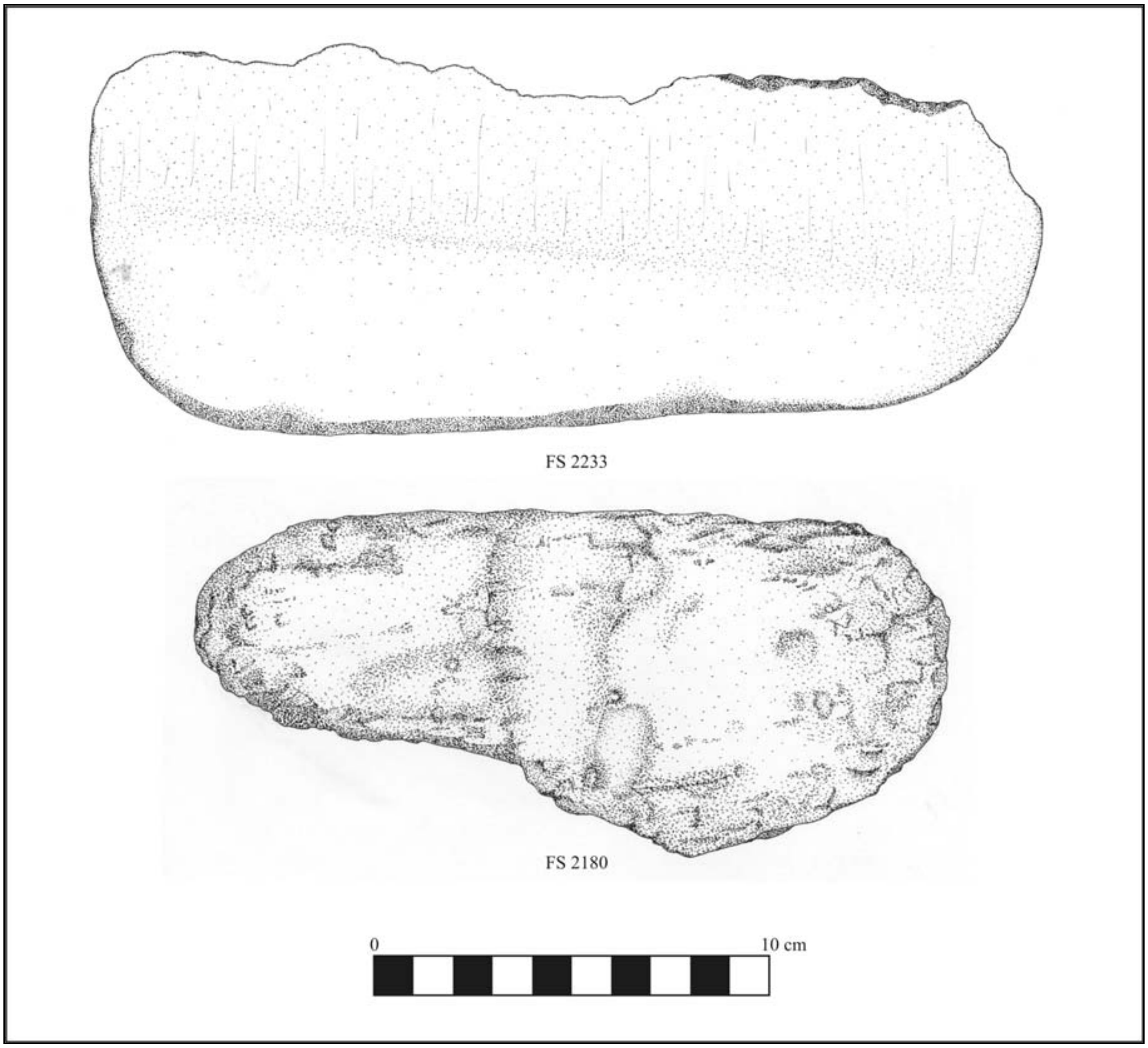

Figure 25.58. Two-hand mano and maul.

Four undetermined metate fragments were identified during the analysis. These were all dacite slab fragments with a single heavily ground flat surface. The grinding slabs are also tabular pieces of dacite with one or two flat ground surfaces. The polishing stones are andesite and dacite pebbles with a finely ground surface. The abrading stone is a quartzite pebble with irregular ground surfaces. The pestle is a dacite cobble with one narrow end that exhibits some crushing and grinding wear. One item classified as miscellaneous ground stone consists of a shaped piece of soft tuff that is circular in cross-section and pointed at one end. There are striations that run the length of the artifact (Figure 25.59).

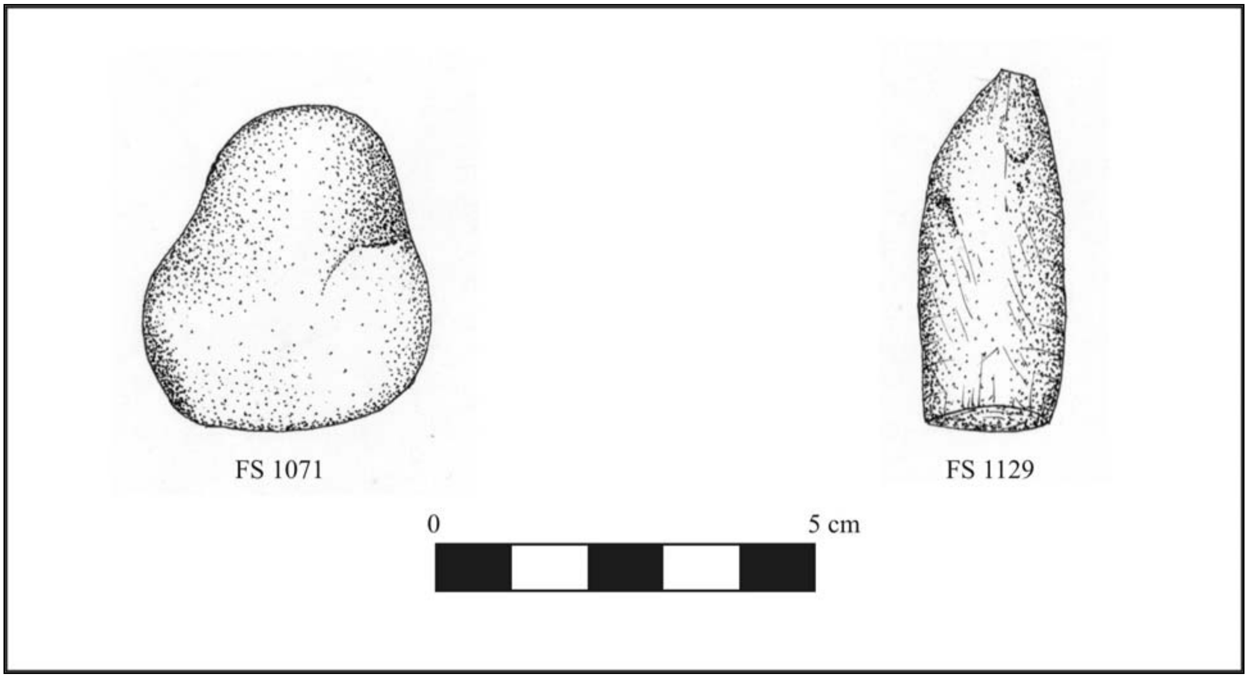

Figure 25.59. Polishing stone and miscellaneous ground stone.

The maul is a chert cobble with flaked and worn edges and a battered butt. The artifact is whole and exhibits abrasion indicative of hafting. The flaking is presumably due to use-wear and not intentional retouch. The other maul is an oblong dacite cobble that is fully grooved and exhibits some battering wear along the end (see Figure 25.58). The ornament is a red baked shale bead.

Faunal Remains (Kari Schmidt)

In general, the overall preservation of the bones from LA 135290 is good. For the most part, bones tended to be in large fragments, and a number of complete elements were identified. Weathering on the faunal remains was present, although the frequency and severity were low (n = 2), suggesting the remains may not have been exposed to the elements for a long period of time before deposition. The bones show minimal evidence of root-etching and rodent gnawing, but no evidence of carnivore gnawing or carnivore digestion. Modifications resulting from burning were present on 23 pieces of bone, constituting some 35 percent of the total assemblage. One piece of bone recovered at LA 135290 was heavily polished.

Of the 65 faunal remains recovered from the excavations at LA 135290, 52 percent (*n* = 34) were identified to at least the level of class. The 34 identified remains were recovered from a variety of contexts. Table 25.54. shows all the taxa that were recovered from the site. Because the most abundant taxa represented in the assemblage were intrusive pocket gophers (*Thomomys* sp.), Table 25.55 presents the same data with this taxon removed. Pocket gopher burrows were extensive in the immediate site area, and the visual appearance of their bones was quite distinct from the vast majority of the other bones recovered from the site.

Table 25.54. Identified faunal remains from all contexts at LA 135290.

Taxon	Total			Burned		
	NISP*	MNI	Percent	NISP	Percent	Percent of Taxon
Bullfrog (*Rana catesbeiana*)	1	1	3.0	0	0	0
Western box turtle (*Terrapene ornata*)	1	1	3.0	1	9.0	100.0
Turkey (*Meleagris gallopavo*)	3	1	9.0	0	0	0
Woodrats (*Neotoma* cf. *albigula*)	1	1	3.0	0	0	0
Pocket gopher** (*Thomomys* sp.)	12	2	36.0	0	0	0
Rock squirrels (*Spermophilus variegatus*)	3	1	9.0	2	18.0	66.0
Raccoon (*Procyon lotor*)	1	1	3.0	0	0	0
Black-tailed jackrabbit (*Lepus californicus*)	3	1	9.0	2	18.0	66.0
Desert cottontail (*Sylvilagus audubonii*)	4	1	11.0	4	36.0	100.0
Canids (Canidae)	1	1	3.0	0	0	0
Mule deer (*Odocoileus hemionus*)	4	1	11.0	2	18.0	50.0
Identified Total (52.0%)	34	--	100.0	11	100.0	--
Unidentified Total (48.0%)	31	--	--	12	--	--
Site Total	**65**	**--**	**--**	**23**	**--**	**--**

*NISP is number of identified specimens; MNI is minimum number of individuals. **intrusive taxon

Table25.55. Identified faunal remains, minus pocket gophers, from LA 135290.

Taxon	Total			Burned		
	NISP	MNI	Percent	NISP	Percent	Percent of Taxon
Bullfrog (*Rana catesbeiana*)	1	1	5.0	0	0	0
Western box turtle (*Terrapene ornata*)	1	1	5.0	1	10.0	100.0
Turkey (*Meleagris gallopavo*)	3	1	13.0	0	0	0
Woodrats (*Neotoma* cf. *albigula*)	1	1	5.0	0	0	0
Rock squirrels (*Spermophilus variegatus*)	3	1	13.0	2	18.0	66.0
Raccoon (*Procyon lotor*)	1	1	5.0	0	0	0

Taxon	Total			Burned		
	NISP	MNI	Percent	NISP	Percent	Percent of Taxon
Black-tailed jackrabbit (*Lepus californicus*)	3	1	13.0	2	18.0	66.0
Desert cottontail (*Sylvilagus audubonii*)	4	1	18.0	4	36.0	100.0
Canids (Canidae)	1	1	5.0	0	0	0
Mule deer (*Odocoileus hemionus*)	4	1	18.0	2	18.0	50.0
Identified Total (52.0%)	22	--	100.0	11	100.0	--
Unidentified Total (48.0%)	31	--	--	31	--	--
Site Total	**53**	**--**	**--**	**42**	**--**	**--**

With the intrusive pocket gopher remains removed from calculations made for Table 25.54, Table 25.55 shows that the highest percentage of the identified fauna (18%) at LA 135290 is from both cottontail (*Sylvilagus* sp.) and mule deer (*Odocoileus hemionus*). After these taxa, turkeys (*Meleagris gallopavo*), rock squirrels (*Spermophilus variegatus*), and black-tailed jackrabbit (*Lepus californicus*) each comprise 13 percent of the identified assemblage. The remainder of the assemblage consists of a wide variety of taxa, including amphibians, reptiles, rodents, and carnivores. The variation present in the assemblage attests to its location near a number of distinct biomes.

Archaeobotanical Remains (Pamela McBride)

Flotation

Evidence for the triad of maize, beans, and possible squash was present in flotation samples from LA 135290. Maize cupules were the most common plant remains recovered, followed by goosefoot and cheno-am seeds and maize kernels (Table 25.56). Beans were found on the floor of Room 1, in Room 2 rooffall, and in the fill of Features 4 and 11 in Room 2. Possible squash rind also occurred on the floor of Room 1 and on the floor surface of the doorway between Rooms 4 and 5. The most interesting phenomenon is the presence of tobacco seeds solely in an adobe-lined collared hearth (Feature 11) in Room 2. An ash lens sealed the feature and seeds were identified in both the upper and lower fill, indicating sequestered use of this important ceremonial plant.

Table 25.56. Ubiquity of flotation sample carbonized plant remains from LA 135290.

Common Name/Plant Part	Count*	Percent**
Bean cotyledon	4	5
Beeweed embryo	1	1
Cheno-am seed	37	49
Dropseed grass caryopsis	8	11
Evening primrose seed	1	1
Goosefoot seed	39	52

Common Name/Plant Part	Count*	Percent**
Grass family caryopsis	4	5
Grass family culm	5	7
Juniper female cone	1	1
Juniper seed	2	3
Juniper twig	3	4
Juniper twigscale	1	1
Knotweed family seed	1	1
Maize cob	2	3
Maize cupule	61	81
Maize cupule segment	8	11
Maize embryo	5	7
Maize glume	13	17
Maize kernel	31	41
Maize shank	1	1
Mint family seed	10	13
Pigweed seed	14	19
Pincushion cactus seed	2	3
Pine bark scale	10	13
Pine umbo	4	5
Piñon pine needle	21	28
Piñon pine nutshell	1	1
Plantain seed	1	1
Ponderosa pine needle	29	39
Purslane family seed	2	3
Purslane seed	21	28
Squash/coyote gourd rind	2	3
Sunflower family achene	5	7
Tobacco seed	5	7
Unidentifiable embryo	1	1
Unidentifiable seed	7	9
Unidentifiable plant part	14	19
Unknown # 1 seed	1	1
Unknown # 2 seed	1	1
Winged pigweed seed	1	1

*Number of samples with common name/plant part present; **Number of samples with common name/plant part divided by total number of flotation samples with charred remains (75) × 100.

Grasses had a low percent presence and the only perennial genera with a percent presence above 10 are those that are most likely an artifact of fuelwood use like piñon and ponderosa pine needles. Piñon nutshell in particular is extremely scarce, limited to one sample only. Ponderosa pine was the most common wood taxon encountered in flotation samples (Table 25.57). Piñon and unknown conifer were the next most prevalent taxa. Riparian resources were represented by cottonwood/willow, and several shrubby species were present, including mountain mahogany, oak, and saltbush/greasewood. Douglas fir, recovered in a single sample, is generally from slightly higher elevations or canyons and could have been brought from Pueblo Canyon or DP Canyon.

Table 25.57. Ubiquity of flotation sample wood charcoal taxa from LA 135290.

Common Name/Plant Part	Count	Percent
Cottonwood/willow wood	16	23
Douglas fir wood	1	1
Juniper wood	34	48
Mountain mahogany wood	6	8
Oak wood	27	38
Pine wood	23	32
Piñon pine wood	43	61
Ponderosa pine wood	58	82
Saltbush/greasewood wood	9	13
Unknown conifer wood	41	58
Unknown non-conifer wood	5	7

Vegetal Samples

Maize kernels had the highest percent presence of non-wood plant remains in vegetal samples (Table 25.58). Although maize kernels were found in every room except 8 and 9A, the majority of kernels were from the fill of Rooms 1 and 6. Because the kernels are from fill, this pattern is probably related more closely to deposition after abandonment than to delineation of special activity areas. Upon first inspection of the average measurements of 122 kernels from LA 135290 (Appendix V), it would appear that kernels from the site are wider and thicker than those from LA 12587, but 11 percent more of the LA 135290 kernels are missing embryos and 5 percent more are swollen. This probably accounts for the differences in width and thickness.

Table 25.58. Ubiquity of vegetal sample carbonized plant remains from LA 135290.

Common Name	Count*	Percent**
Bean cotyledon	6	9
Bean seed	1	2
Beeweed stem	1	2
Cottonwood/ willow wood	22	34
Douglas fir wood	5	8
Juniper wood	16	25
Maize cob	10	16
Maize cupule	3	5
Maize cupule segment	10	16
Maize fused kernel mass	1	2
Maize kernel	26	41
Maize shank	2	3

Common Name	Count*	Percent**
Mountain mahogany wood	12	19
Oak wood	12	19
Pine bark scale	1	2
Pine wood	25	39
Piñon pine wood	22	34
Ponderosa pine wood	53	83
Saltbush/greasewood wood	2	3
Unknown conifer wood	18	28
Unknown non-conifer wood	2	3

*Number of samples with common name/plant part present; **number of samples with common name/plant part divided by total number of flotation samples with carbonized plant remains (64) × 100.

Maize cobs (17) from Rooms 1, 2, 3, and 5 were measured and had an average rachis diameter of 11.9 mm and an average cupule width of 5.6 mm (Table 25.59). The average row number was 11.4. Comparing these measurements to those from LA 12587 and LA 86534, it appears as if the cobs from LA 135290 are slightly more robust, with wider cupules, more rows, and larger diameters. However, the percentages of 12-row cobs are nearly equal in both cob assemblages (40% and 41%, respectively).

Table 25.59. *Zea mays* cob morphometrics from LA 12587, LA 86534, and LA 135290.

Site	FS No.	Row #	Type	Length	Rachis Segment Length (mm)	Rachis Diameter (mm)	Cupule Width (mm)
12587	965	12	ST	27.7	2.9	14.2	6.4
12587	1094	12	ST, U	18.4	3.4	11.6	5.8
12587	1306	8	ST	12.8	2.9	5.6	4.1
12587	1401	8	ST	12.9	2.6	6.9	4.4
12587	1567	12	ST	26.0	3.9	13.5	5.3
12587	1939	10	ST	18.9	2.5	7.5	3.7
12587	2555	10	ST	19.7	3.8	14.3	7.0
12587	2555	12	ST, T	22.9	3.1	10.5	4.0
12587	2639	8	ST	14.5	4.0	12.1	7.0
12587	2639	8	ST	17.7	3.4	9.1	6.9
12587	2831	8*	ST	19.5	4.0	8.6	7.5
12587	2831	12	ST	13.8	3.4	9.1	4.1
12587	2831	12	ST	10.8	3.5	8.7	3.7
12587	2831	10	ST	21.1	3.8	10.7	5.8
12587	2831	12	ST	22.5	4.2	12.6	5.2
12587	2832	12	ST	16.6	3.1	10.2	3.9
12587	2832	10	ST	41.9	3.6	14.7	6.6
12587	2888	12	ST	13.1	3.1	9.5	4.0
12587	2888	8	ST	14.5	3.4	7.3	3.8
12587	5141	10	ST	20.2	2.8	10.0	5.5

Site	FS No.	Row #	Type	Length	Rachis Segment Length (mm)	Rachis Diameter (mm)	Cupule Width (mm)
86534	1677	12	ST	14.5	3.4	8.3	4.2
86534	1866	10	ST	13.1	3.4	8.7	4.0
86534	1869	10	ST	36.5	3.3	12.8	6.4
86534	1869	10	ST	17.6	2.7	7.8	4.5
86534	1869	10	ST	25.5	3.4	9.7	5.0
Averages	-	10	All straight	19.7	3.3	10.2	5.2
135290	869	10	ST	7.3	3.0	6.8	4.6
135290	874	12	ST	39.0	3.0	15.8	6.3
135290	912	14	ST	24.4	3.4	13.6	4.9
135290	912	10 ?	IR	16.8	3.8	9.1	5.5
135290	970	12	ST	67.1	3.9	15.8	7.3
135290	1047	14	ST	38.3	3.4	13.7	6.0
135290	1065	14	ST	27.9	3.7	17.6	6.2
135290	1324	12	ST	31.0	3.7	10.0	5.5
135290	1559	8 ?**	ST	24.7	3.2	12.2	7.1
135290	1703	12	ST	19.0	3.7	12.2	5.9
135290	1703	12	ST	13.1	3.7	13.0	5.7
135290	1703	12	ST	25.1	3.2	11.7	5.5
135290	1752	12	ST, F	11.6	3.5	11.4	4.5
135290	1752	10	ST	18.5	3.8	12.1	6.6
135290	1752	12	ST, F	37.1	2.9	10.7	5.1
135290	1898	8	ST	7.3	3.0	6.8	4.6
135290	2099	10	ST	7.8	0.6	6.2	2.5
Averages	-	11.4	6% IR 94% ST	25.8	3.3	11.9	5.6

*2 rows of cob have kernels; ** a few kernels present; F = flattened, T = tip, U = undeveloped row present.

Beans were fairly widespread and were found in Rooms 1, 5, 6, 7, and 9A, primarily in room fill. Two beans were measurable from the site. One whole bean from a vegetal sample (FS 1201) was 11.6 mm in height, 6.5 mm in width, and 4.9 mm thick, and a single cotyledon from flotation sample FS 2353 was 10.8 mm in height, 6.2 mm in width, and 2.6 mm thick. Height and width measurements fall around the middle of the range given by Kaplan (1956: Table III) for the common bean (P*haseolus vulgaris)*. These also fit in the range of dimensions given for tepary beans, but the shape of the two species is quite different.

A possible beeweed stem (from vegetal sample FS 1450) and embryo (from FS 1897 flotation sample) mark the only archeobotanical evidence for the potential use of this resource for the project.

As in flotation samples, ponderosa pine was the most common wood taxon in vegetal samples. A partially burned roof beam fragment is probably ponderosa pine. Cottonwood/willow, pine, and piñon occur in nearly equal percentages of samples (34% to 39%), while juniper was found in 25 percent of samples. Douglas fir is slightly more abundant than in flotation samples, present in 5 of the 64 samples analyzed. The same shrubby species encountered in flotation samples (mountain mahogany, saltbush/greasewood, and oak) were also identified in vegetal samples.

Corn, beans, and squash were probably grown nearby, and weedy annuals that either volunteered in agricultural fields or thrived in the disturbed ground around the site were harvested for their seeds and edible greens. At least two grass taxa, beeweed, pincushion cactus, knotweed family, evening primrose, and piñon could have been used for food, dye, or medicine. The recovery of tobacco suggests this plant was part of the ceremonial life of the people who inhabited LA 135290 during the Middle Coalition period. Wood for construction and fuel was harvested from local sources.

Pollen Samples (Susan J. Smith)

A total of 83 pollen samples were analyzed from LA 135290. Table 25.60 lists the frequency of identified pollen types. Cultigens identified in the assemblage included low numbers of cotton and squash with higher amounts of maize, maize aggregate pollen, and cholla. Economic resources identified in the pollen assemblage included prickly pear, cactus family, beeweed, sunflower type, lily family (which includes yucca, wild onion, and sego lily), parsley family, sedge, mint family, and purslane. A number of other potential economic resources were identified in the assemblage (Table 25.60), and these are described in detail in Smith's chapter in Volume 3 (Chapter 63).

Table 25.60. Pollen types identified by taxa and common names with sample frequency from LA 135290.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 135290 (*n* = 83)
Cultigens	*Gossypium*	Cotton	1
	Cucurbita	Squash	13
	Zea mays	Maize	46
	Zea Aggregates	Maize Aggregates	11
	Opuntia (Cylindro)	Cholla	11
Economic Resources	*Opuntia* (Platy)	Prickly Pear	41
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	1
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	24
	cf. *Helianthus*	Sunflower type	1
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	4

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 135290 (*n* = 83)**
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	2
	Typha	Cattail	0
	Cyperaceae	Sedge	2
	Lamiaceae	Mint Family	1
	Portulaca	Purslane	1
Other Potential Economic Resources	Rosaceae	Rose Family	31
	Eriogonum	Buckwheat	5
	Brassicaceae	Mustard Family	13
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	1
	Polygala type	Milkwort	1
	Poaceae	Grass Family	80
		Grass Aggregates	1
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	5
Riparian Types	*Populus*	Cottonwood, Aspen	4
	Juglans	Walnut	0
	Betula	Birch	1
	Alnus	Alder	0
	Salix	Willow	1
Native Weeds, Herbs, and Shrubs and Possible Subsistence Resources	Cheno-Am	Cheno-Am	92
		Cheno-Am Aggregates	13
	Fabaceae	Pea Family	4
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	92
		Sunflower Family Aggregates	1
	Ambrosia	Ragweed, Bursage	34
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 135290 (*n* = 83)**
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	5
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	1
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	33
	Scrophulariaceae	Penstemon Family	4
	Onagraceae	Evening Primrose	18
	Unknown cf. Brassicaceae (prolate, semitectate)	Unknown Mustard type	1
	Nyctaginaceae	Four O'Clock Family	1
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	2
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Potential Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	2
	Abies	Fir	20
	Pinus	Pine	90
		Pine Aggregates	0
	Pinus edulis type	Piñon	82
	Juniperus	Juniper	83
		Juniper Aggregates	1
	Quercus	Oak	35
	Rhus type	Squawbush type	1
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	30
	Artemisia	Sagebrush	93
		Sagebrush Aggregates	4
	Unknown Small *Artemisia*	Unknown Small Sagebrush	33
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 135290 (*n* = 83)
	Erodium	Crane's Bill (exotic)	1
	Carya	Pecan (exotic)	0

SITE OCCUPATIONAL HISTORY

As was discussed in the previous room summary sections, there appears to be at least two major construction episodes and three remodeling events that occurred at the roomblock. A detailed review of the bonding and abutment pattern of the walls within the roomblock reveals the overall construction history of the roomblock (Figures 25.60 and 25.61). The first construction phase at the site is represented by three separate events. Rooms 4/5 and 6 were built first. The west wall of these rooms is contiguous, with the north-south walls being abutted to the west wall and the east walls abutting to the north-south walls. There are small adobe buttresses in the northwest and northeast corners of Room 4 and the southeast corner of Room 6. These buttresses extended out about 50 cm outside of the cross-walls. Rooms 1 and 2 were added next. The north wall of Room 6 partially extends into Rooms 1 and 2. The north wall of Room 2 abuts to this wall extension and then forms a bonded corner at the intersection of the north and east walls of the room. The remainder of the corners in Rooms 1 and 2 are abutted. Room 8 appears to be the last room constructed during the initial construction phase of the roomblock. The west wall of Room 8 was constructed and then the north walls of Rooms 1 and 8 abutted to this wall. Otherwise, the remaining wall corners are all abutted. There is a single upright tuff block in the northeast corner of the room that extends north from the eastern wall, acting as a small buttress.

The second construction phase is represented by the addition of Rooms 3, 7, and 9B. The east-west walls of Rooms 3 and 7 abut with the south walls of Rooms 2 and 6. The adobe buttress in the northwest corner of Room 3 forced the west wall of the room to be offset further to the west. The southern walls of Rooms 3 and 7 and the eastern wall of Room 3 are not clearly defined and it is unclear as to whether they ever represented full standing walls. The east-west walls of Room 9B abut with the east wall of Room 2. In addition, the walls are set at a northwest-southeast orientation while the other walls in the roomblock are oriented east-west. Again, the east walls of Rooms 9A and 9B are not clearly defined and it is unclear as to whether these walls were ever full standing. It is also unclear as to whether Feature 15 was constructed during this later phase; however, it is situated on the same ancient surface and therefore may be associated with this occupation.

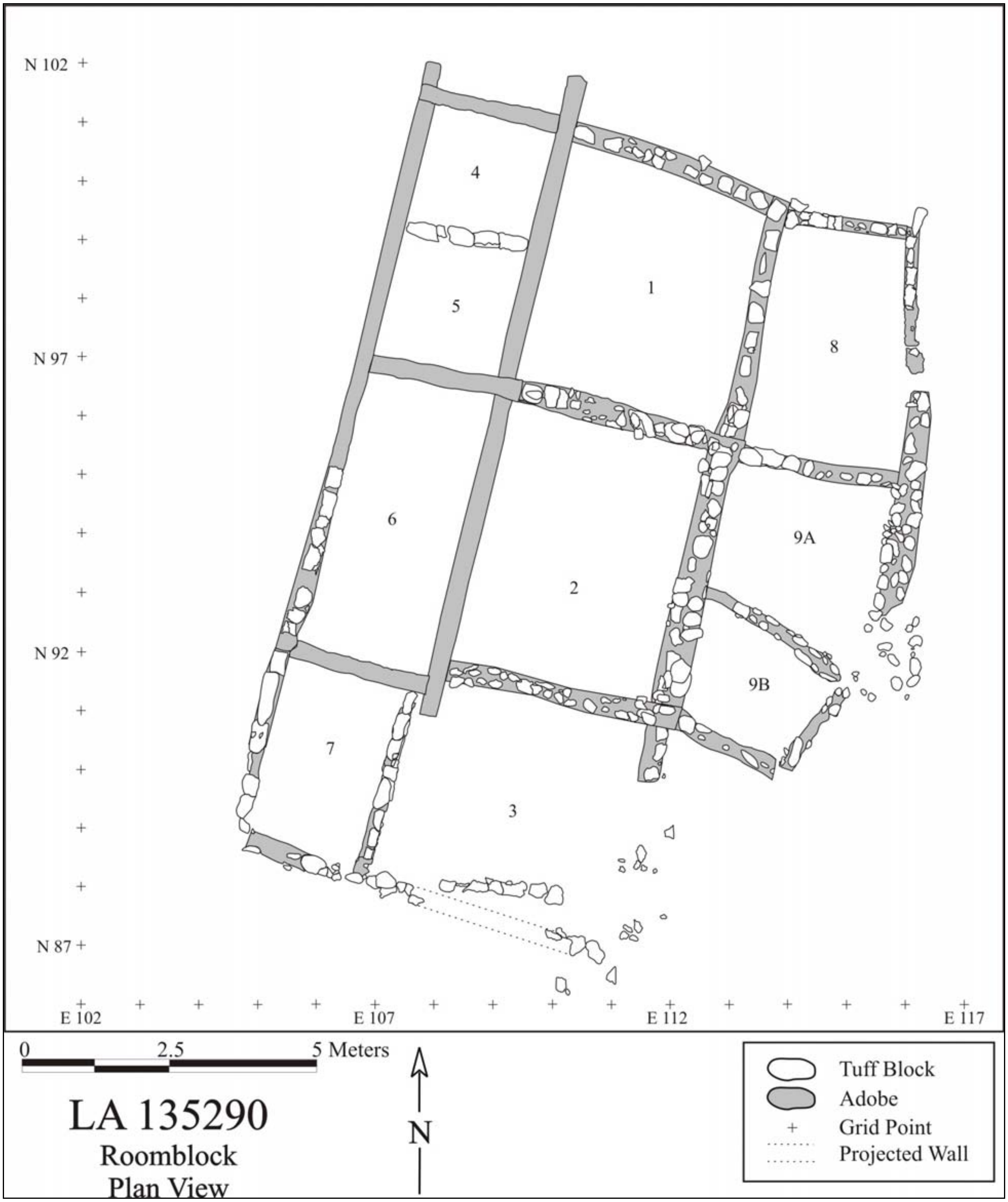

Figure 25.60. Plan view of roomblock.

Figure 25.61. Photograph of roomblock (south).

There appears to be at least three remodeling events associated with the occupation of the first construction phase of the roomblock. This is best represented in the three floors present in Rooms 4 and 6. These back rooms were presumably used for storage, and the successive burning and remodeling of these floors would seem to reflect the abandonment and later reuse of the roomblock. In contrast to the front rooms, the rear rooms are constructed of adobe and were burned on several occasions. Floors 2 and 3 in Rooms 4 and 6 are burned and Floor 1 is unburned in Room 6 and mostly unburned in Room 4. Since this burning is primarily limited to the rear rooms and the initial two floors, it may represent an intentional decision to fire-harden the rooms, making it difficult for rodents to burrow into the rooms. Nonetheless, the rooms were abandoned on several occasions with the floors being disturbed by rodent activity. These holes were subsequently repaired and a new floor was laid down over the repairs.

These three remodeling events are also represented in Room 2. Feature 16 (hearth) was constructed first and is overlain by a thin layer of sandy fill between it and Floor 1. Feature 11 (hearth) was built over Feature 16 and Features 3, 4, and 6 were constructed on Floor 1. Feature 1 (unused hearth?) was constructed last, being connected to Feature 3. The hearth (Feature 9) in Room 8 reflects only two remodeling events in this room. Additionally, the paucity of midden artifacts in the area would appear to indicate that the site was not occupied for an extended period of time, even though its construction history reflects two construction episodes and three remodeling events.

SUMMARY

LA 135290 consists of a Coalition period roomblock with a series of three front rooms, four back rooms, and three partial rooms (covered space or ramadas) that front the plaza. There is no evidence for the presence of a kiva at the site, and the midden is limited to a light surface scatter situated to the east of the roomblock. The initial occupation involved the construction of Rooms 1, 2, 4, 5, 6, 8, and 9A. The four front rooms were mostly constructed of masonry blocks, whereas the backrooms were constructed of adobe. This presumably reflects the functional differences between the use of the front rooms as domestic space and the back rooms as storage space. Three separate remodeling episodes are evident by the presence of multiple floors in Rooms 4/5 and 6, multiple features in Room 2, and a remodeled hearth in Room 8. The rear room floors were repaired during each subsequent occupation due to rodent disturbance. In addition, these floors were also fire hardened, probably as an attempt to protect food stores. It appears that the roof may have been removed during these periods of abandonment, since several of the preserved adobe floors in Rooms 4/5 and 6 exhibit both animal and human footprints. These prints were presumably made in the moist adobe that had been exposed to rainfall. Lastly, Rooms 3, 7, and 9B were added on to the existing roomblock with mostly unprepared floors. All remaining roof beams were removed from the site once the roomblock was finally abandoned.

The ceramic assemblage primarily consists of Santa Fe Black-on-white and smeared-indented corrugated, with some indented corrugated and other ceramics. The paucity of Kwahe'e and Wiyo Black-on-white reflects a Middle Coalition period of occupation. The AMS and archaeomagnetic dates overlap and cover a similar two-sigma range from AD 1160 to 1260 and 1170 to 1240, respectively.

A range of botanical remains were identified from flotation samples recovered from the hearths, including maize, beans, cheno-ams, dropseed grass, and tobacco. In addition, squash rind, piñon nuts, groundcherry, and sunflower were also represented at the site. The faunal remains also include a variety of species like jackrabbit, cottontail, rock squirrel, mule deer, turkey, and red-tailed hawk.

The stone tool technology reflects an emphasis on core reduction of materials like chalcedony, Pedernal chert, and obsidian. Most of the obsidian appears to have been obtained from nearby sources in the Valles Caldera. The retouched tool assemblage includes a mix of expedient flake tools like retouched pieces and perforators with lesser amounts of formal tools like bifaces, projectile points, and unifaces. Three of the four projectile points are corner-notched, indicating that this point type was still the dominant form being used. The manos are represented by both one- and two-hand varieties, with at least one example of the latter reflecting intensive use due to its wedge-shaped cross-section. The metates consist of undetermined fragments, which could represent millingstones or slab types. Polishing stones, abrading stones, a pestle, and mauls were also recovered, which indicates that a variety of domestic activities occurred at the site.

CHAPTER 26
AIRPORT-CENTRAL TRACT (A-7): LA 141505

Bradley J. Vierra

INTRODUCTION AND SITE SETTING

LA 141505 is a Classic period fieldhouse located on the Los Alamos town site mesa just north of New Mexico State Road 502 (Figure 26.1). The mesa top is sparsely covered by piñon and juniper trees and has an understory that is comprised primarily of saltbush, snakeweed, yucca, and various grasses. The site is situated at an elevation of 2164 m (7100 ft), but is accessible by Pueblo Canyon to the north and DP Canyon to the south.

Soils on the mesa top have been classified as a Hackroy sandy loam that have a good potential for agriculture (Nyhan et al. 1978). The site itself is underlain with about 1.50 m thick layer of Holocene soils, with some late Pleistocene clay lying directly on the Tshirege member of the Bandelier Tuff. Soil depth is greatest in the central area of the mesa, but thins to exposed bedrock along its edges.

The original survey identified the presence of several small tuff rock alignments within a 10 by 10 m area. The alignments were situated underneath a cluster of trees, so the duff obscured the nature and extent of the site. No artifacts were observed.

FIELD METHODS

Fieldwork at LA 141505 began by delineating the extent of the rock feature. The trees were cut down and the surface duff was removed. These activities exposed a small mound within the area defined by the rock alignments. Otherwise, no artifacts were observed on the surface. An east-west-oriented trench was initially excavated across the area through grids 107N/104E to 109E. This trench was excavated to define the walls within the structure and the stratigraphic sequence. After sections of the north-south walls were exposed, excavations proceeded to follow and expose the remaining wall segments thereby identifying the presence of at least two rooms. Each room was given an individual number, and excavations continued by removing the room fill in natural stratigraphic layers and 1- by 1-m grids. A block excavation including grids 104 to 110N/102E to 109E was excavated around the rooms. This area mostly contained the rock alignments situated to the east of the two rooms. The field supervisors at the site were Brad Vierra and Michael Dilley. Field crew members included Woody Aguilar, Sandi Copeland, and Greg Lockard. Timothy Martinez was the site monitor representing San Ildefonso Pueblo.

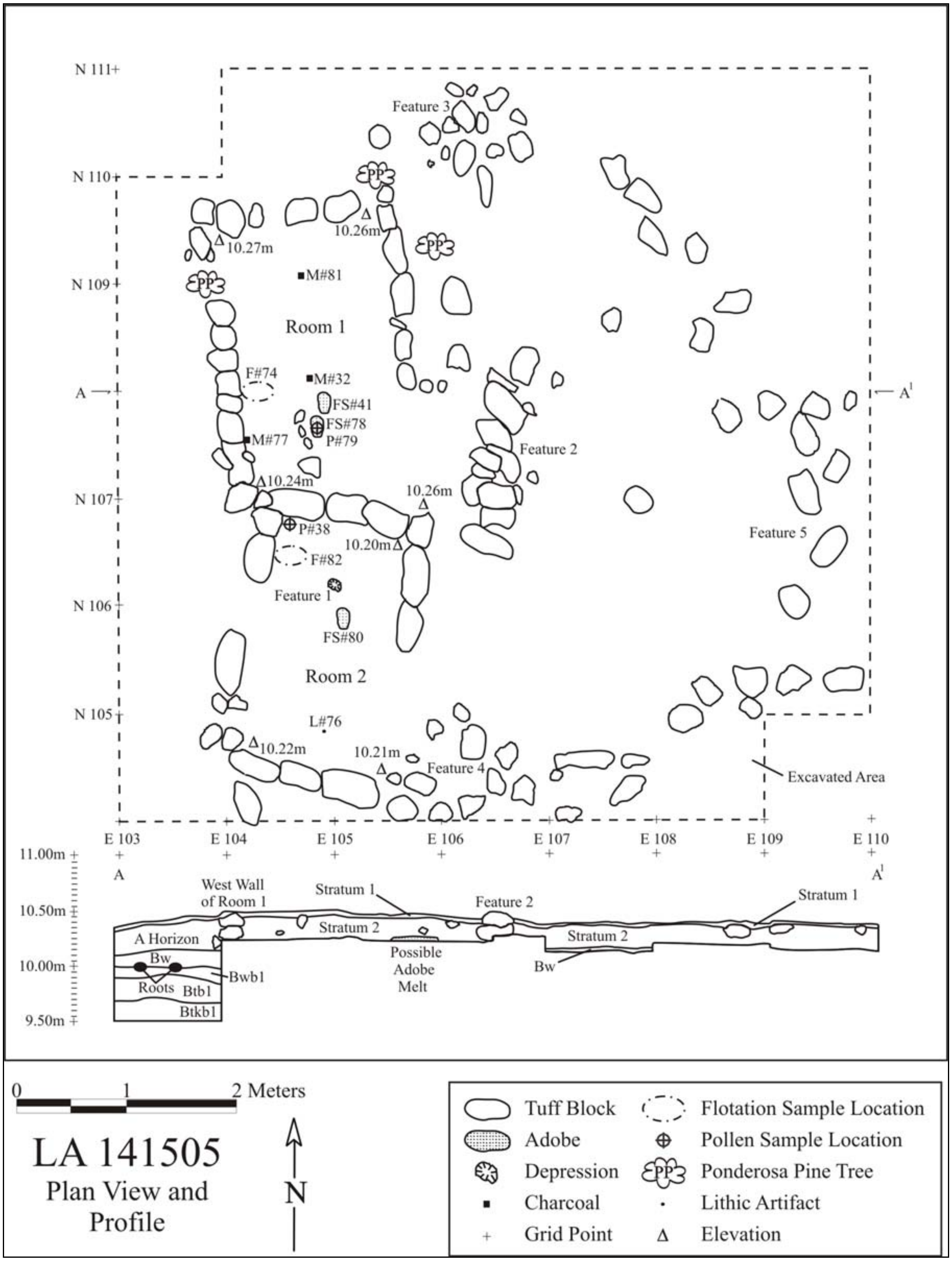

Figure 26.1. Plan view and profile maps of LA 141505.

STRATIGRAPHY

Stratum 1 consists of the loose surface soil that covers the site area and is generally 3 to 5 cm thick (Table 26.1). Stratum 2 is a thin layer of post-occupational fill that is about 5 to 10 cm thick and consists of the A and Bw soil horizons. Stratum 3 underlies Stratum 2, which is a compact silty loam that represents the Bwb1 soil horizon. This stratum was only exposed in grids 107N/103E and 107N/106E, which were excavated to lower depths. Otherwise, Stratum 2 was consistently removed across the excavation area. Strata 4 and 6 are the floors from Room 1 and 2, respectively. Stratum 5 is the fill from a rodent hole in grid 107N/103E that consisted of modern organic material. Lastly, Stratum 7 is the sediment from a single posthole (Feature 1) associated with the floor in Room 2. Table 26.2 shows the artifact counts by stratigraphic unit.

Table 26.1. Stratigraphy descriptions for LA 141505.

Stratum	Color	Texture	Thickness (cm)	Description
0	--	--	0	Surface
1	10YR 5/4	Silty loam	3–5	Unconsolidated surface soil
2	7.5 YR 4/4	Silty loam	5–10	Post-occupational fill
3	7.5 YR	Silty loam	30	Compact Bwb1 and Btb1 soil horizons
4	7.5 YR 5/4	Silty loam	0	Room 1, Floor
5	7.5 YR 2.5/2	Organic material		Rodent hole fill
6	7.5 YR 5/4	Silty loam	0	Room 2, floor
7	7.7 YR 4/4	Silty loam	17	Feature 1, posthole fill

Table 26.2. Artifact counts by stratigraphic unit from LA 141505.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Other	Total
1	6	3	0	0	0	9
2	27	20	1	1	2	51
3	0	0	0	0	0	0
4	0	0	0	0	2	2
5	0	0	0	0	0	0
6	0	1	0	0	0	1
7	0	0	0	0	0	0
Total	**33**	**24**	**1**	**1**	**4**	**63**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is the northern room in the two-room structure (Figure 26.2). The room measures 2.5 m north-south by1.5 m east-west, with 3.75 m^2 of interior space. An east-west test trench (107N/103-106E) was initially excavated through the room to define site stratigraphy and the location of the floor. Excavations proceeded by removing the room fill to the immediate north of the trench by grid and natural layer.

Figure 26.2. Room 1 after excavation.

Fill. The room contained about 20 cm of post-occupational fill (Strata 1 and 2). This sediment consisted of a silty loam mixed with some fist-sized pieces of tuff, a few tuff blocks (wallfall), some bits of charcoal, and a few artifacts. The northern half of the room was extremely disturbed by both rodent activity and the intrusion of roots from two pine trees located just outside the northeastern corner of the room. A pollen (Field Specimen [FS] 21) and flotation (FS 22) sample were taken from the southeastern corner of the room. Taxa identified in the pollen sample include prickly pear (*Opuntia*), cheno-ams (*Chenopodium/Amaranthus*), grass family (Poaceae), sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), unidentified pine (*Pinus* sp.), piñon pine (*Pinus edulis*), juniper (*Juniperus*), Mormon tea (*Ephedra*), and sagebrush (*Artemesia*). No charred remains were identified in the flotation sample. Only a single macrobotanical sample (FS 73) was collected. Identified taxa included mountain mahogany (*Cercocarpus*) and unknown conifer (Gymnospermae).

Floor. The floor (Stratum 4) consists of an unprepared living surface. It is somewhat compacted, but was defined by a horizontal level situated at the base of the walls with bits of charcoal and roots situated on its surface. The northern area of the floor is heavily disturbed by roots and rodent activity. There is no coping between the walls and the floor.

No features or artifacts were associated with the floor. However, three large pieces of charcoal were collected from the floor in the north, south, and west parts of the room (FS 32, FS 77, and FS 81). No taxa were identified in FS 32, but Douglas fir (*Pseudotsuga menziesii*), mountain mahogany, and unknown conifer fragments were identified in the other two samples. Two large pieces of adobe were also present in the southern part of the room. A pollen sample (FS 79) was taken from underneath one of these pieces and taxa identified in the sample included maize (*Zea mays*), prickly pear, beeweed (*Cleome*), cheno-ams, grass family, sunflower family, spurge family (Euphorbiaceae), unidentified pine, piñon pine, juniper, walnut (*Juglans*), and sagebrush. These are two of only three chunks of adobe found in Rooms 1 and 2. A flotation sample (FS 74) was taken from grid 107N/105E in an area where the living surface was best preserved. Charred taxa included mountain mahogany and Douglas fir. The location where this sample was collected is also located near a possible entryway in the east wall.

Wall Construction. Table 26.3 shows the general wall measurements for Room 1. The four walls of the room are made of shaped tuff blocks that are horizontally laid with chinking stones. The blocks were about 35 by 25 by 15 cm in size and the chinking stones are fist-sized. The latter presumably reflect the isolated pieces of tuff found in the room fill. The north, west, and east walls are two courses high, whereas the southern wall is only one course high. The south wall is oriented with the walls constructing Room 2. In addition, the west wall of Room 1 abuts the northeastern corner of Room 2. Therefore, it appears that Room 1 was added after the construction of Room 2. The eastern wall of Room 1 does not connect to the south wall, leaving a 1-m-wide gap in the wall. This gap presumably reflects an entryway into the room. Given the lack of wallfall in the area, it would appear that all four walls were never full-standing walls. There was no evidence of any wall foundations or adobe footings under the walls. The base of the walls was situated near the top of the Bw soil horizon.

Table 26.3. Wall measurements for Room 1.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.45	0.10	0.25	2
South	1.66	0.30	0.27	1
East	1.75	0.35	0.22	2
West	2.45	0.35	0.30	2

Room 2

Sequence of Excavation. Room 2 is the southern room in the two-room structure (Figure 26.3). The room measures 2.34 m north-south by 1.35 m east-west, with 3.16 m^2 of interior space.

Excavations proceeded by removing the room fill in a north to south direction by grid and natural layer from the edge of the test trench that originally exposed the north wall of the room.

Fill. The room contained about 20 cm of post-occupational fill (Strata 1 and 2). This sediment was the same as in Room 1 with some fist-sized pieces of tuff, a few tuff blocks (wallfall), some bits of charcoal, and a few artifacts. However, most of the loose tuff blocks were situated adjacent to the west wall.

Figure 26.3. Room 2 after excavation.

Floor. The floor (Stratum 6) is also an unprepared living surface that represents the compacted top of the Bw soil horizon. A pollen sample (FS 38) and a flotation sample (FS 82) were taken from the surface in the northwestern corner of the room. Taxa identified in the pollen sample included beeweed, cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, oak (*Quercus*), and sagebrush. Taxa identified in the flotation sample included maize, unknown conifer, and unidentified pine.

A single feature (Feature 1) and a chalcedony core flake were associated with the floor. The feature consists of a small circular hole situated in the center of the room. It is 9 cm wide and 17 cm deep. The fill (Stratum 7) is composed of an unconsolidated silty loam with no charcoal or artifacts. Although there was no prepared floor in the room, there appeared to be an adobe cap over the feature. However, the presence of a few tuff blocks with adobe in the area may actually indicate that the adobe is simply melt derived from these items rather than being a formal "cap." A large chunk of adobe was also present to the immediate south of the feature. A pollen sample (FS 75) was taken from the pit fill and identified taxa included beeweed, cheno-ams, grass family, sunflower family, fir (*Abies*), unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush.

Wall Construction. Table 26.4 shows the general wall measurements for Room 2. The walls consist of a single course of shaped tuff blocks with some chinking stones. The east wall only consists of two blocks in the northeastern corner of the room, leaving a 1.30-m gap on this side of the room. The west wall also has a small (35 cm) opening in the middle; however, there is evidence that this gap may be due to a block falling outside of the room. Although some wall was present along the west wall, the amount of material was insufficient within the room to account for full-standing walls. No foundations or adobe footings were present under the walls. The base of the walls was, however, set into the Bw soil horizon.

Table 26.4. Wall measurements for Room 2.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.40	0.14	0.24	1
South	1.37	0.11	0.25	1
East	1.25	0.17	0.22	1
West	2.38	0.09	0.24	1

Rock Piles and Rock Alignments

Two rock piles and two rock alignments are situated to the immediate east of the structure. Feature 2 consists of a small linear rock alignment located 50 cm east of the entryway into Room 1. The alignment is 1.90 m long and is constructed from approximately 10 shaped and unshaped tuff blocks that are two courses high. It is dry-laid with no adobe mortar. Although the alignment is oriented roughly north-south, the blocks are stacked perpendicular to the long-axis of the alignment. The blocks are about 25 to 30 cm long and 20 cm wide. The base of the rock alignment is located just above the break between the A and Bw soil horizons. A pollen sample

(FS 83) was taken at the base near the center of the feature (Stratum 2). Taxa identified included sunflower family, cheno-ams, mustard family (Brassicaceae), ragweed/bursage, unidentified pine, piñon pine, juniper, oak, and sagebrush. It is unclear what the function of the alignment might have been, but it could have acted as a wind break for the entryway into Room 1 if other construction material was piled above the rock base.

Features 3 and 4 are rock piles located outside of the northeastern and southeastern corners of Rooms 1 and 2, respectively. Feature 3 is composed of a circular pile of tuff blocks about 1 m in diameter and 0.20 m high (Figure 26.4).

Figure 26.4. Feature 3 after excavation.

Feature 3 is 1 to 2 courses high and constructed of about 15 blocks. Four of the blocks are 30 to 40 cm long and 20 cm wide and the rest are 20 to 30 cm long and 10 to 15 cm wide. A pollen sample (FS 84) was taken from under a rock near the center of the pile (Stratum 2). Taxa identified in this sample included lily family (Liliaceae), cheno-ams, grass family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, alder (*Alnus*), rose family (Rosaceae), and sagebrush. Feature 4 is similar to Feature 3, consisting of about 12 shaped and unshaped tuff blocks in a 1-m-diameter area. However, it is only one course high (Figure 26.5).

Figure 26.5. Feature 4 after excavation.

Feature 5 is a semi-circular arc of tuff blocks that opens towards the structure. The arc encloses about 15 m^2 of space to the immediate east of Rooms 1 and 2. The feature is composed of unshaped and shaped tuff blocks situated in a general alignment that is one course high. It measures about 6 m north-south and 3 m east-west. Feature 3 is located at the northwest end of the alignment and Feature 4 at the southwest end of the alignment. Otherwise, no features were observed within the enclosed space.

Features 3, 4, and 5 are all situated about 5 to 10 cm above the top of the Bw soil horizon and within the A horizon. This is the same stratigraphic context as Room 1. Therefore, it appears Room 2 was built first, with Room 1 and Features 3 to 5 being subsequently added on to the structure.

Test Pit

A single test pit (108N/103E) was excavated to a depth of 9.50 m (Figure 26.6), which was about 1 m below the ground surface. The profile exposed a soil sequence consisting, from top to bottom, of the A, Bw, Bwb1, Btb1, and Btkb1 soil horizons. A geomorphologic study of the site indicates that the blocks for Room 2 are set into the Bw horizon, whereas the blocks for Room 1 are set on top of the Bw horizon (see Drakos and Reneau, Volume 3). Tuff clasts that are inferred to be derived from Room 2 also lie underneath Room 1. The soil stratigraphic sequence, therefore, indicates that Room 2 is older than Room 1. The sequence also indicates that Features 2, 3, 4, and 5 are associated with the more recent occupation. Since the walls of the nearby Coalition period pueblos are associated with the top of the underlying Bwb1 soil horizon, it is assumed that the LA 141505 occupations date to the succeeding Classic period.

Figure 26.6. Photo of LA 141505 after excavation with test pit in foreground.

SITE CHRONOLOGY AND ASSEMBLAGE

Approximately 55 artifacts were recovered from excavations at LA 141505. All the artifacts were analyzed and a sample of pollen, flotation, and macrobotanical samples were selected for analysis (Table 26.5). Analysis results of the ceramics, lithics (chipped and ground stone), archaeobotanical, and pollen materials are presented in the following pages. No faunal remains were recovered from the site.

Table 26.5. Samples from LA 141505 selected for analysis.

Stratum	Sample Type		
	Pollen	Flotation	Macrobotanical
2	21, 83, 84	22	73
4	79	74	33, 77, 81
5		44	

Stratum	Sample Type		
	Pollen	Flotation	Macrobotanical
6	38	82	
7	75		

Ceramics (Dean Wilson)

While only 29 sherds were recovered from the fieldhouse at LA 141505, they included a range of types including Kwahe'e Black-on-white, Santa Fe Black-on-white, smeared-indented corrugated, Sapawe Micaceous, and glazewares (Table 26.6). This combination of pottery could reflect a Coalition or Classic period occupation; however, all these artifacts were recovered from post-occupational fill and none were recovered from the floor. Therefore, the earlier ceramics may be derived from the nearby roomblock at LA 135290. If so, the Classic period ceramics would support the geomorphic interpretation that the site dates to the later time period. Tables 26.7 through 2.9 show the summary ceramic data for the site, including general type, types by tradition, temper material by ware type, and ware by vessel form.

Table 26.6. Distribution of ceramic types from LA 141505.

Ceramic Types	Frequency	Percent
Northern Rio Grande Whitewares		
Unpainted undifferentiated	5	17.2
Mineral paint undifferentiated	2	6.9
Kwahe'e Black-on-white	1	3.4
Santa Fe Black-on-white	4	13.8
Northern Rio Grande Utilitywares		
Plain gray body	2	6.9
Smeared-indented corrugated	12	41.4
Sapawe Micaceous	2	6.9
Middle Rio Grande Glazewares		
Glaze unslipped body	1	3.4
Total	**29**	**100.0**

Table 26.7. Tradition by ware for LA 141505 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	12	100.0	12	100.0	0	0.0	0	0.0	24	82.7
Rio Grande (Tewa Micaceous)	0	0.0	0	0.0	0	0.0	4	100.0	4	13.7
Middle Rio Grande	0	0.0	0	0.0	1	100.0	0	0.0	1	3.4
Total	**12**	**100.0**	**12**	**100.0**	**1**	**100.0**	**4**	**100.0**	**29**	**100.0**

Table 26.8. Temper by ware for LA 141505 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Granite with mica	0	0.0	0	0.0	0	0.0	1	25.0	1	3.4
Granite with abundant mica	0	0.0	0	0.0	0	0.0	3	75.0	3	10.3
Fine tuff or ash	0	0.0	3	25.0	0	0.0	0	0.0	3	10.3
Fine tuff and sand	0	0.0	9	75.0	0	0.0	0	0.0	9	31.0
Gray crystalline basalt	0	0.0	0	0.0	1	100.0	0	0.0	1	3.4
"Anthill" sand	12	100.0	0	0.0	0	0.0	0	0.0	12	41.3
Total	**12**	**100.0**	**12**	**100.0**	**1**	**100.0**	**4**	**100.0**	**29**	**100.0**

Table 26.9. Form by ware for LA 141505 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	0	0.0	2	16.6	1	100.0	1	25.0	4	13.7
Bowl body	0	0.0	8	66.6	0	0.0	0	0.0	8	27.5
Jar neck	2	16.6	0	0.0	0	0.0	0	0.0	2	6.8
Jar body	10	83.3	2	16.6	0	0.0	3	75.0	15	51.7
Total	**12**	**100.0**	**12**	**100.0**	**1**	**100.0**	**4**	**100.0**	**29**	**100.0**

Lithic Analysis (Bradley Vierra and Michael Dilley)

Material Selection

A total of 26 chipped stone artifacts were analyzed from LA 141505. The assemblage consisted of a core, 19 pieces of debitage, three retouched tools, and three pieces of undetermined ground stone. This represents a 100 percent sample of the lithic artifacts recovered during the site excavations. Table 26.10 presents the data on lithic artifact type by material type from LA 141505. The majority of the debitage is made of chalcedony with lesser amounts of other materials. The presence of cortex on 42.1 percent of the debitage indicates that these materials were collected from waterworn (100.0%) sources. The chalcedony, Pedernal chert. and chert are available from local Rio Grande Valley gravel sources. Otherwise, the single ground stone artifact is made of dacite, which is available both as bedrock outcrops and in stream gravels that cross-cut the Pajarito Plateau.

Table 26.10. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	Vesicular Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Silicified wood	Quartzite	Other	Total
Cores	Core	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Debitage	Angular debris	0	0	0	0	1	0	0	1	0	0	0	0	0	2
	Core flake	0	0	0	0	1	0	0	10	1	4	0	0	0	16
	Biface flake	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Microdebitage	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Undetermined flake	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hammerstone flake	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ground stone flake	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	0	2	1	0	11	1	4	0	0	0	19
Retouched Tools	Retouched piece	0	0	0	0	0	0	0	1	0	2	0	0	0	3
	Biface	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Projectile point	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Uniface	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Subtotal	0	0	0	0	0	0	0	1	0	2	0	0	0	3
Ground Stone	Undetermined ground stone	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	0	3	0	0	0	0	0	0	0	0	3
	Fire-cracked rock	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Subtotal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**5**	**1**	**0**	**13**	**1**	**6**	**0**	**0**	**0**	**26**

Lithic Reduction

The single core recovered from the site was reduced using a single-directional, single-face technique. It was discarded as a result of a break along a material flaw. Table 26.11 presents the metric information on the core.

Table 26.11. Core type dimensions (mm) and weight (g).

Core Type	*n*	Length (*std*)	Width (*std*)	Thickness (*std*)	Weight (*std*)
Single-directional	1	28	47	39	59.4

The debitage mainly consists of core flakes (84.2%), with some angular debris and a single flake that was removed from a ground stone artifact. The majority of the flakes exhibit collapsed platforms (*n* = 4), with a cortical, a single-faceted, and a crushed platform. None of the platforms exhibit any evidence of preparation.

The majority of the core flakes consist of distal fragments (*n* = 7), with fewer whole (*n* = 5), proximal (*n* = 2), and midsection (*n* = 2) fragments. The whole core flakes have a mean length of 36.0 mm (*std* = 6.8) and the angular debris a mean weight of 34.7 g (*std* = 48.5).

The retouched tools consist solely of three retouched pieces. Each has a bi-directionally retouched edge, with straight, concave, and convex edges and edge angles of 70, 45, and 65 degrees, respectively.

Tool Use

Four flakes (21.0%) exhibit evidence of damage that could be attributed to use-wear. Most of the damage is located along the lateral edge of the flake (*n* = 3), with one on the dorsal surface (i.e., ground stone flake). The lateral edges are all straight with edge angles ranging from 45 to 60 degrees.

The three pieces of undetermined ground stone consist of dacite cobble fragments with ground surfaces. All three of these artifacts are burned.

Archaeobotanical Remains (Pamela McBride)

A possible corn cupule fragment from the northwestern corner of the Room 2 floor was the only cultural plant part recovered from flotation samples besides wood charcoal (Table 26.12). Modern intrusive material comprised the balance of the flotation plant record. These included uncarbonized weedy annual seeds, juniper twigs, pine umbos, and piñon needles.

Table 26.12. Flotation sample plant remains from LA 141505.

FS No.	22	74	82
Feature	**Room 1 fill, SE corner**	**Room 1 floor**	**Room 2 floor, NW corner**

FS No.	22	74	82
Cultural Cultigens			
Maize			Possible 1(0) c
Non-Cultural Annuals			
Goosefoot	+		+
Other			
Purslane family			+
Perennials			
Juniper		+, twig +	twig +
Pine		umbo +	
Piñon		needle +	needle +

+1-10/liter.

Mountain mahogany and possible Douglas fir charcoal were found on the floor of Room 1 while pine and unknown conifer were identified from the Room 2 floor (Table 26.13).

Table 26.13. Flotation sample wood charcoal taxa by count and weight in grams from LA 141505.

FS No.	74	82
Context	**Room 1 floor**	**Room 2 floor, NW corner**
Conifers		
cf. Douglas fir	6/<0.1 g	
Pine		1/<0.1 g
Unknown conifer		6/<0.1 g
Non-Conifers		
Mountain mahogany	14/0.4 g	
Totals	**20/0.4 g**	**7/<0.1 g**

A sample from the fill of a rodent hole was taken as a control sample and, indeed, this sample was quite different from others, resembling a cache of rodent edibles that included large numbers of unburned juniper seeds and twigs, pine umbos, piñon seeds, and prickly pear cactus seeds (absent in all other samples; Table 26.14). Vegetal sample wood was similar to flotation with possible Douglas fir, mountain mahogany, and unknown conifer identified in the fill and floor of Room 1.

Table 26.14. Vegetal sample plant remains by count and weight in grams from LA 141505.

FS No.	44	73	77	81
Feature	Rodent hole fill control sample	Room 1 fill	Room 1 floor, south	Room 1 floor, west
Cultural Remains				
Wood conifers				
cf. Douglas fir			12/1.2 g	6/0.6 g
Unknown conifer		9/0.2 g	9/1.1 g	

FS No.	44	73	77	81
Non-Conifers				
Mountain mahogany		3/0.2 g	7/1.2 g	
Non-Cultural Remains				
Perennials				
Juniper	99(93)/2.3 g, 2(0) t/<0.1 g			
Pine	8(8) u/0.2 g			
Piñon	17(12)/2.5 g			
Prickly pear cactus	9(8)/<0.1 g			
Total Wood	-	12/0.4 g	28/3.5 g	6/0.6 g

+1–10/liter, t twig, u umbo.

The possible corn cupule fragment on the Room 2 floor could indicate that corn was processed or burned for fuel in the room. Pine and mountain mahogany are readily available today at LA 141505, but Douglas fir may have come from Pueblo Canyon to the north or DP Canyon to the south of the site. It is also possible that during the time the site was occupied Douglas fir grew closer, as this species has a range of 6500 feet to nearly tree line and the site is at an elevation of 7100 feet.

Pollen (Susan J. Smith)

A total of six pollen samples were analyzed from various contexts at LA 141505. Table 26.15 lists the frequency of identified pollen types from the site. Maize was the only cultigen identified in the assemblage. Economic resources identified in the pollen assemblage included prickly pear, beeweed, sunflower type, and lily family (which includes yucca, wild onion, and sego lily). A number of other potential economic resources were identified in the assemblage and are listed in Table 26.15. Pollen types and resources are described further in Volume 3 (Chapter 63).

Table 26.15. Pollen types identified by taxa and common names with sample frequency from LA 141505.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 141505 (*n* = 6)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	2
		Prickly Pear Aggregates	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 141505 (*n* = 6)
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	3
	cf. *Helianthus*	Sunflower type	1
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	1
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	1
		Mustard Aggregates	1
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	5
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	1
	Juglans	Walnut	1
	Betula	Birch	0
	Alnus	Alder	1
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs and Possible Subsistence	Cheno-Am	Cheno-Am	6
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 141505 (*n* = 6)**
Resources	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	6
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	2
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	6
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	3
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	1
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Potential Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	0
	Abies	Fir	1
	Pinus	Pine	6
		Pine Aggregates	2
	Pinus edulis type	Piñon	6
	Juniperus	Juniper	6
		Juniper Aggregates	0
	Quercus	Oak	3

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 141505 (*n* = 6)**
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	2
	Artemisia	Sagebrush	5
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	1
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 141505 is a two-room Classic period fieldhouse that was constructed from both shaped and unshaped tuff blocks. The site is located near LA 135290, a Middle Coalition period roomblock, which is located several hundred meters to the west. The small size of the structure indicates that it was unlikely to have been used for even short-term habitation, as it would have been too small to offer much comfort. However, its location near areas suitable for farming and the presence of maize indicate that the site did play a role in agricultural activities.

CHAPTER 27
AIRPORT TRACT: AIRPORT SITES 1 AND 2

Charlie Steen and Bradley J. Vierra

INTRODUCTION

Excavations were conducted at two archaeological sites situated in the area of the Los Alamos airport in 1951. The exact location of these sites is undetermined, but they are presumed to be situated where the current standing buildings of the airport are located. The airport is also situated on the Los Alamos town site mesa, with the site area being over 1000 m west of LA 135290 (Chapter 25, this volume). The airport sites were denoted as Airport 1 and 2 and were excavated by Frederick Worman of Los Alamos Scientific Laboratory. The only information available on these excavations is presented in simple summary form by Steen (1977:65–66). This information is presented here, with additional data collected from the analysis of collections curated at the Laboratory of Anthropology and photographs curated at the Los Alamos Historical Society.

SITE DESCRIPTIONS

Airport 1 probably had five rooms with walls of unshaped tuff blocks. There is no ground plan available for the site. The ceramics were described as including Santa Fe Black-on-white, with a flaked axe and a broken mano also being identified.

Airport 2 contained nine rooms with walls of large unshaped tuff blocks (Figures 27.1 and 27.2). It is unclear as to whether there was no kiva present at the site, or whether Worman simply failed to excavate in the area to the east (in front) of the roomblock to determine if one was present. Although no features were noted, many charred maize cobs and kernels were recovered from Room 3. Santa Fe Black-on-white is also identified as the main pottery type being present, with no lithic artifacts being noted. Figure 27.3 shows Worman during the excavation of one of the sites. As can be seen, a large formal slab metate, two two-hand manos, and a vent plug are visible in the photograph. In addition, the excavation method is clearly evident. That is, the fill was removed by shovel and discarded directly into a truck.

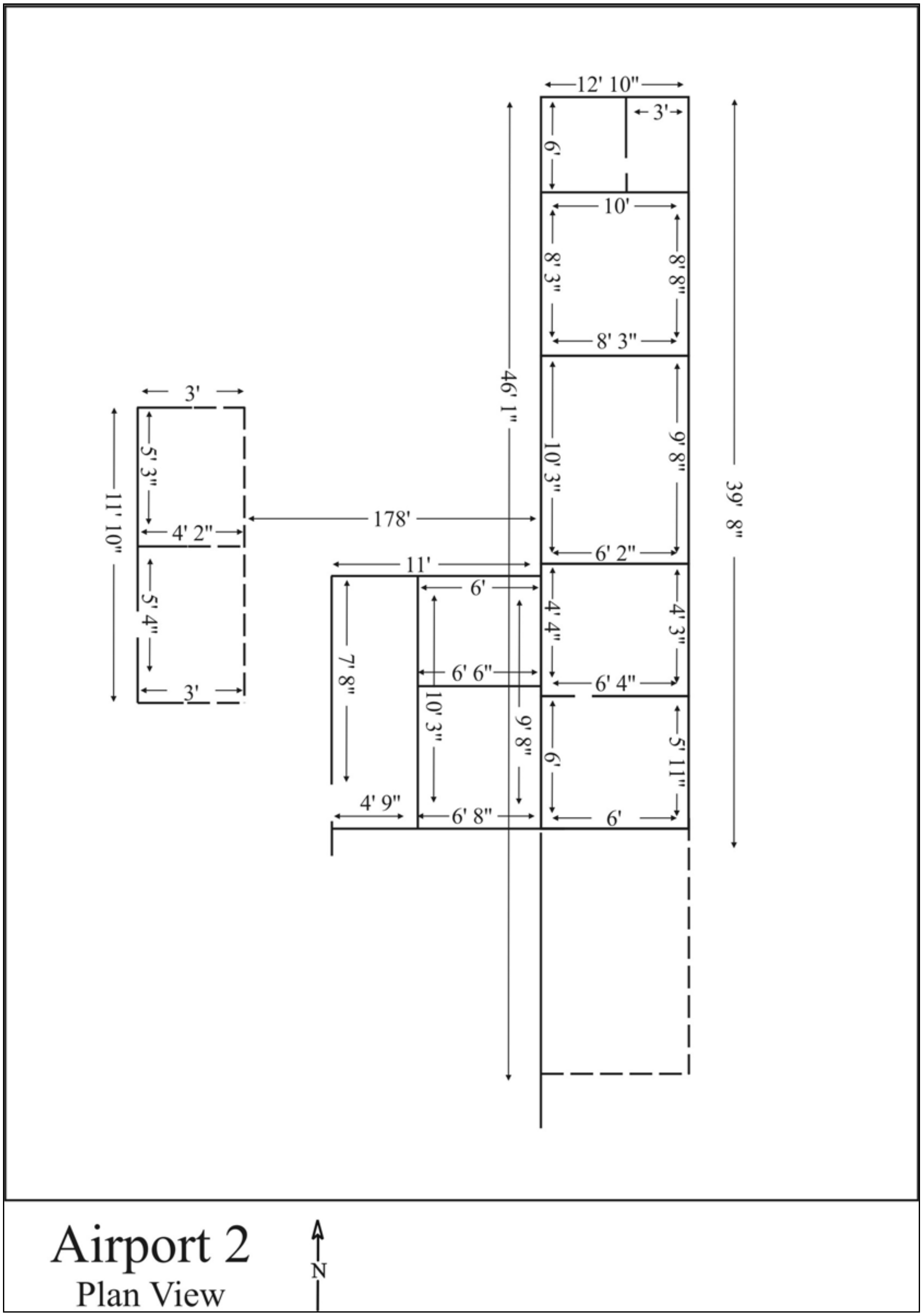

Figure 27.1. Plan map of Airport Site 2 (after Steen 1977, Figure A-46).

Figure 27.2. Airport Site 2 excavations (looking northeast?).
Photo provided courtesy of Los Alamos Historical Museum Photo Archives.

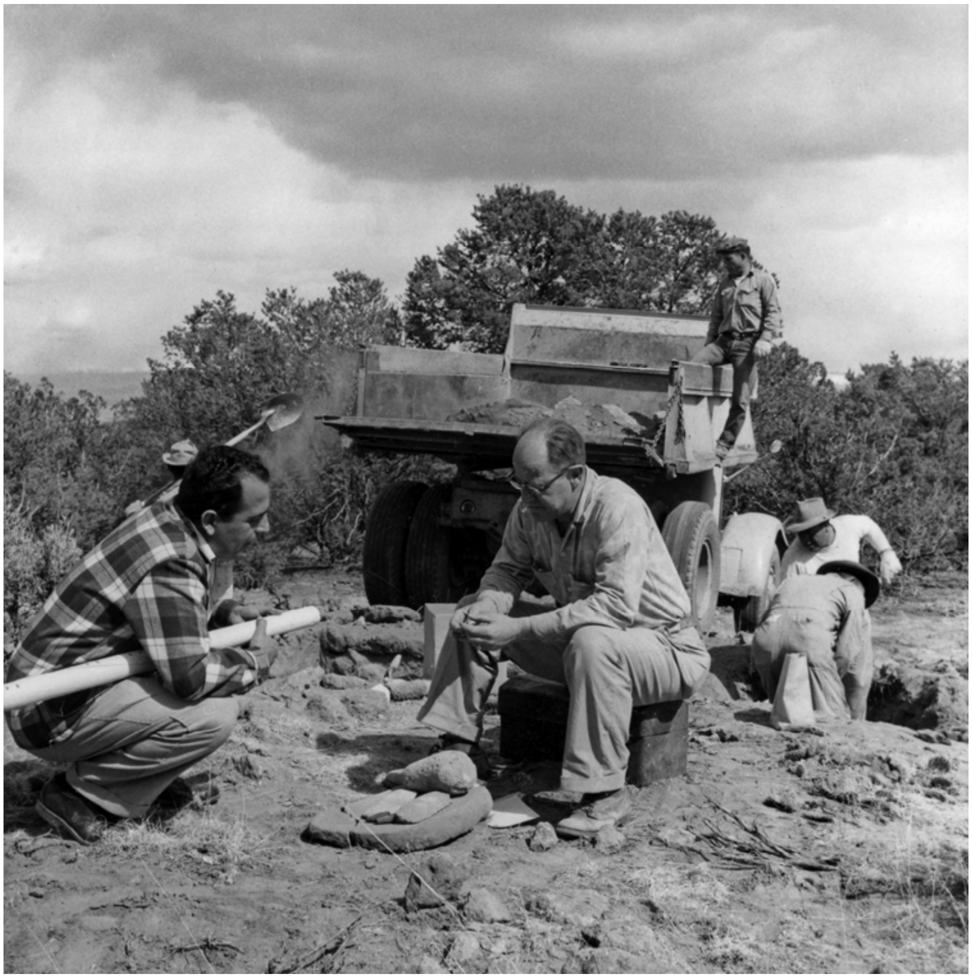

Figure 27.3. Frederick Worman at airport site excavations. Photo provided courtesy of Los Alamos Historical Museum Photo Archives.

A total of 148 sherds were analyzed by Dean Wilson (see Volume 3, Chapter 58) from the collections curated at the Laboratory of Anthropology. Most of these sherds, however, were recovered from the Airport 2 site (Tables 27.1, 27.2, and 27.3). The analyzed sherds likely represent a biased collection from the excavations, but they do indicate that both the Airport 1 and Airport 2 sites date to the Late Coalition period and include Santa Fe, Wiyo, and Galisteo Black-on-white ceramics.

Table 27.1. Ceramic types from Airport 1 site.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Undetermined organic paint	3	15.8
Santa Fe Black-on-white	6	31.6
Wiyo Black-on-white	5	26.3
Northern Rio Grande Utilityware		
Smeared plain corrugated	2	0.1

Ceramic Type	Frequency	Percent
Smeared-indented corrugated	4	21.1
Alternating corrugated	1	5.3
Total	**19**	**100.0**

Table 27.2. Ceramic types from Airport 2 site.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Mineral paint undifferentiated	2	1.6
Santa Fe Black-on-white	45	34.9
Wiyo Black-on-white	15	11.6
Galisteo Black-on-white	1	0.8
Northern Rio Grande Utilityware		
Wide neckbanded	1	0.8
Smeared-indented corrugated	56	43.4
Patterned corrugated	1	0.8
Middle Rio Grande Glazeware		
Glaze red body	3	2.3
Total	**129**	**100.0**

Table 27.3. Distribution of temper by ware at the Airport 2 site.

Temper	Gray		White		Glaze		Total	
Fine tuff or ash	0	0.0	47	74.6	0	0.0	47	36.4
Large tuff fragments Vitric tuff	0	0.0	1	1.5	0	0.0	1	0.7
Fine tuff and sand	0	0.0	7	11.1	0	0.0	7	5.4
Anthill sand	62	98.4	0	0.0	0	0.0	62	48.0
Oblate shale and tuff	0	0.0	4	6.3	0	0.0	4	3.1
Shale	0	0.0	1	1.5	0	0.0	1	0.7
Mostly tuff with some phenocrysts	1	5.6	3	4.7	0	0.0	4	3.1
Scoria	0	0.0	0	0.0	3	100.0	3	2.3
Total	**63**	**100.0**	**63**	**100.0**	**3**	**100**	**129**	**100.0**

McBride's (see Volume 3, Chapter 62) analysis of the burned maize from Room 3 at Airport Site 2 indicated that several masses of kernels were present and that the regular arrangement of the kernels for many of these indicates that maize was being stored on the cob and stacked in very orderly rows that were multiple layers high. The cob rachis was burned away and ears were probably husked before storage (kernels were fused "head to head" with no husk remnants between and no space where a husk might have been). A similar pattern was identified at the Late Coalition period roomblock at LA 12587. Table 27.4 provides information on maize kernel size measurements for the Airport 2 site, LA 12587 (see Chapter 14), and LA 135290 (see Chapter 25). The kernels from LA 135290 are slightly thicker and wider than those from Airport 2 and LA 12587, and may, therefore, have been treated with lime or had a higher moisture content when burned, causing slightly more swelling and loss of embryos (King 1987; Stewart and Robertson 1971).

Table 27.4. Comparison of average *Zea mays* kernel measurements (mm) at Airport 2, LA 12587, and LA 135290.

Site	*n*	Height	Width	Thickness
Airport 2	50	7.4	6.6	4.1
LA 12587	330	7.3	6.6	4.0
LA 135290	122	7.6	7.2	4.4

Two pieces of bone were identified in the collections from the Airport 2 site that are curated at the Laboratory of Anthropology in Santa Fe. Both pieces of bone were in Catalog number 20116 and both pieces were recovered from Trench 1. The fragments were identified as being unidentified medium/large-sized mammal long bones. Neither of the bones showed evidence for burning and no other identifying marks were present.

CHAPTER 28
RENDIJA TRACT (A-14): LA 15116

Gregory D. Lockard

INTRODUCTION AND SITE SETTING

LA 15116 is a small structure located on the north-facing slope on the south side of Rendija Canyon that dates to the Middle Classic period. The site is located a few hundred m to the northeast of the entrance to the Los Alamos Sportsmen's Club in the western half of the Rendija Tract. Vegetation on the site consists of ponderosa pine trees, which were severely burned during the Cerro Grande fire, as well as some piñon and juniper trees and a predominantly grass understory. The site is situated at an elevation of 2116 m (6944 ft).

The site was first surveyed on November 1, 1976, by Charlie Steen and given the temporary site number T233. Steen believed the site was a one-room fieldhouse. The site was re-recorded on April 23, 1999, by Los Alamos National Laboratory cultural resources personnel and given the temporary site number K138. It was noted by personnel on this visit that "the fieldhouse was constructed primarily of unshaped tuff cobbles stacked against large boulders which [sic] form part of the southern section of the structure." No surface artifacts were detected during the site visit because of a thick layer of pine duff that covered the site and likely obscured any artifacts that were on the surface.

FIELD METHODS

Before excavation, the site and surrounding area were cleared of trees and large undergrowth. The site was then visible as a ring of rubble with interior dimensions of 3 by 3.5 m. An arbitrary site datum (designated 100N/100E, 10.0 elevation) was set up in the southwest corner of the site. The site was then covered with a 1- by 1-m grid system that extended 6 m north and 8 m east of the site datum. Two subdata (A and B) were set up for taking elevations. The site was then photographed and surface collected. Two ceramic sherds were the only artifacts encountered in the surface collection.

A 6- by 1-m east-west trench was initially excavated across the middle of the ring of rubble (103N/101E to 106E). The purpose of this trench was to expose a profile of the site stratigraphy, as well as to determine the location of the structure's east and west walls. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. Within the structure, the trench units were excavated down to a compact surface thought to be the room's living surface. Outside of the structure, the trench units were excavated down to the top of the sterile Btb1 horizon. The westernmost unit in the trench (103N/101E) was chosen to serve as a test pit for geological analysis. Excavation in this unit therefore continued through the Btb1 horizon down to the Otowi Member of Bandelier Tuff (bedrock). The southern profile of the trench was then drawn and photographed. The rest of the site was subsequently excavated, again by strata and arbitrary levels for thicker strata.

In all, 28 units were excavated. Within the structure, excavation proceeded down to the living surface encountered while excavating the trench. Outside of the structure, excavation proceeded down to the top of the sterile Btb1 horizon. Excavation focused on defining the structure's walls, removing wallfall, and locating features. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended approximately 1 m beyond the structure in all directions to locate any associated external features and/or outdoor activity areas. The area to the east of the structure contained the highest concentration of artifacts, as well as a short, external wall. The excavation area was therefore extended 2 m to the east of the structure to fully define the external wall and to sample more of this area of concentrated artifacts. The site was then photographed (Figure 28.1) and mapped (Figure 28.2).

Figure 28.1. Post-excavation photograph of Room 1 at LA 15116.

The excavation of the site was supervised by Greg Lockard. The field crew included Joseph Aguilar, Brandon Gabler, and Kari Schmidt. Aaron Gonzalez and Michael Chavarria served as site monitors, representing San Ildefonso and Santa Clara pueblos, respectively.

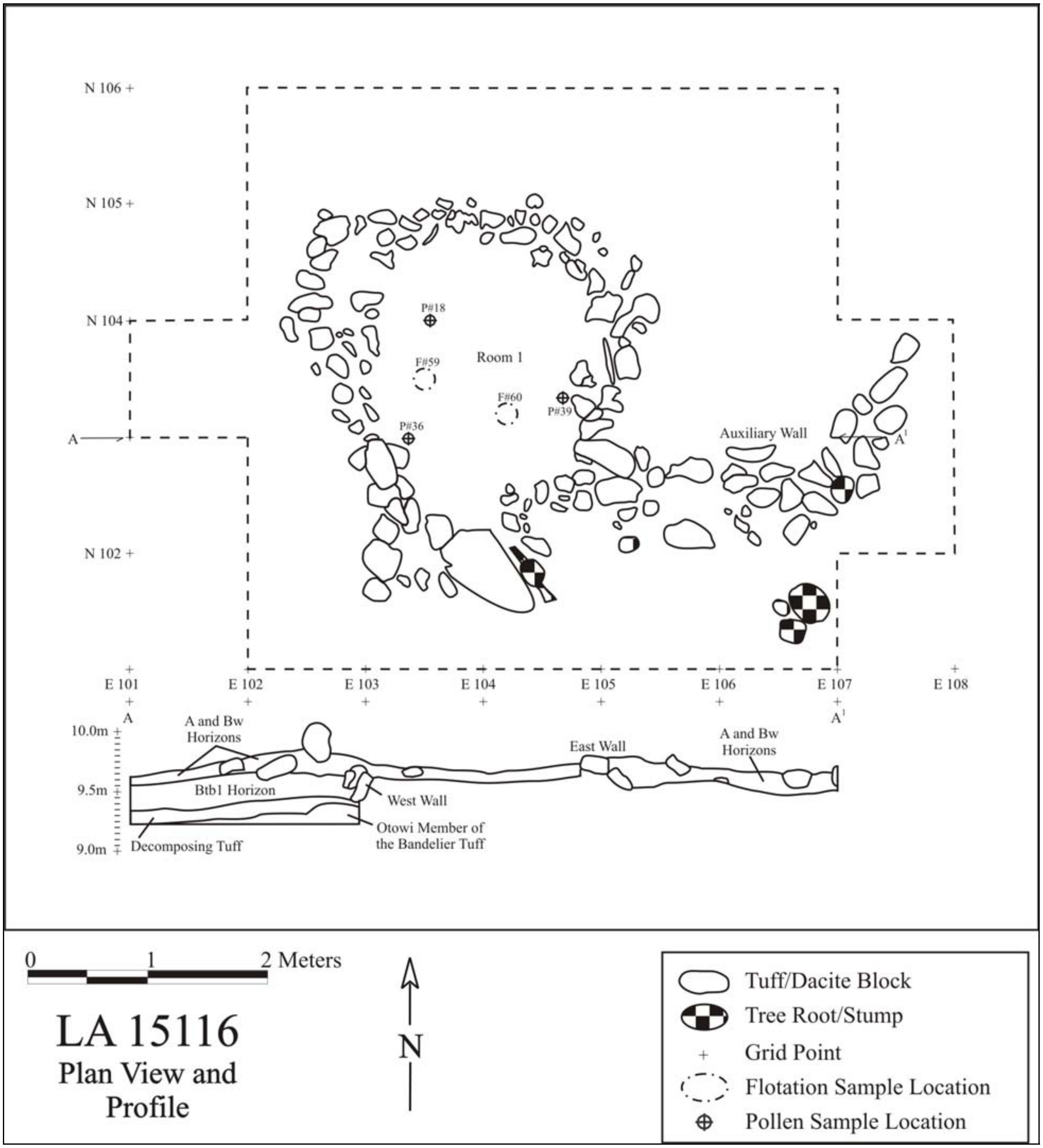

Figure 28.2. Plan view and profile drawings of Room 1 at LA 15116.

STRATIGRAPHY

Stratum 1 is composed of loose surface sediment (Tables 28.1 and 28.2). It is uniformly 2 to 5 cm thick across the site and is roughly equivalent to the top half of the A horizon (topsoil). Stratum 2 is post-occupational fill and ranges from 2 to 20 cm thick in the area excavated. The fill was thickest in and around the collapsed walls of the structure and thinned away from the walls and towards the center of the room. Stratum 2 includes the lower half of the A horizon and the Bw horizon. Stratum 3 is the Room 1 living surface, and Stratum 4 is the sterile Btb1 horizon. Artifact counts from each stratum are shown in Table 28.3. The Btb1 horizon rests on top of the Otowi Member of Bandelier Tuff (bedrock).

Table 28.1. LA 15116 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 5/3	Loamy sand	2–5	Surface sediment
2	10YR 6/3	Loamy sand	2–20	Post-occupational fill
3	10YR 6/3	Loamy sand	-	Room 1 living surface
4	7.5YR 5/4	Loamy sand	35	Early-middle Holocene soil

Table 28.2. LA 15116 soil horizon descriptions from the north profile of the geological test pit (grid unit 103N/101E).

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 5/3	Loamy sand	0–10	Topsoil
Bw	10YR 6/3	Loamy sand	10–20	Late-Holocene soil
Btb1	7.5YR 5/4	Loamy sand	20–40	Early/middle-Holocene soil
R	-	-	40+	Otowi Member of Bandelier Tuff (bedrock)

Table 28.3. LA 15116 artifact counts (ceramics, chipped stone, ground stone, and faunal remains) by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	3	0	0	0	**3**
1	12	15	0	0	**27**
2	68	25	0	0	**93**
3	0	0	0	0	**0**
4	0	0	0	0	**0**
Total	**83**	**40**	**0**	**0**	**123**

SITE EXCAVATION

Room 1

Sequence of Excavation. LA 15116 is a one-room (Room 1) structure that probably functioned as a fieldhouse. Due to the fact that the walls were poorly constructed and poorly preserved, the exact shape of the room could not be determined. Some of the walls defined through excavation were quite straight, while others curved significantly outwards. The room does not appear to be D-shaped, however, and can be best described as elliptical. The room measures 2.50 m north-south by 1.90 m east-west, with approximately 4.75 m^2 of interior space. Excavation of the room began with an east-west trench that extended across the site (103N/101-106E). The excavation of this trench served to define the stratigraphy and locate the east and west walls and living surface of the room. After the excavation of the trench, the rest of the room was excavated down to the presumed living surface encountered in the trench. After the entire room was excavated and its living surface photographed, a small test pit was excavated below the living surface in grid 103N/103E. The purpose of this test pit was to determine whether or not there were any floors or additional living surfaces below, as well as to ascertain how deep the foundation of the west wall extends in that location. No additional living surfaces were encountered, and the wall foundation was found to extend approximately 20 cm into the Btb1 horizon.

Fill. The room was filled with 2 to 5 cm of surface sediment on top of 4 to 15 cm of post-occupational fill. The fill was thickest in and around the collapsed walls, and thinned away from the walls and towards the center of the room. Flotation (Field Specimen [FS] 31) and pollen (FS 32) samples were taken from the Room 1 fill. Charred taxa identified in the flotation sample included sunflower family (Compositae), piñon pine (*Pinus edulis*), and ponderosa pine (*Pinus ponderosa*). Taxa identified in the pollen sample included cheno-ams (*Chenopodium/Amaranthus*), grass family, sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), chicory tribe (Liguliflorae), unidentified pine (*Pinus* sp.), piñon pine, juniper (*Juniperus*), oak (*Quercus*), and sagebrush (*Artemesia*).

Floor. No formal, prepared floor was encountered during the excavation of Room 1. Nevertheless, an informal living surface was identified. This surface was distinguishable from the post-occupational fill above (Stratum 2) and the sterile Btb1 horizon below (Stratum 4) in a number of ways. First, it was more compact than the fill above and relatively devoid of rocks. The few rocks that were embedded in the surface were generally large. These rocks appear to be wallfall that fell onto the living surface when it was wet, and thus became embedded in the surface. The living surface is also slightly darker in some locations than both the fill above and sterile Btb1 horizon below. These darker areas appear to be ash stains. The living surface also differs from the sterile Btb1 horizon in that the former lacks the ped structure of the latter. The location of the living surface directly on top of the Btb1 horizon suggests that the surface was constructed by clearing the loose sediment from on top of this harder, subsurface soil. This harder surface then appears to have been leveled, as indicated by the fact that although the site was constructed on a slope, the living surface is almost completely level. The living surface was therefore purposefully constructed. There is no evidence, however, that the surface was ever covered with a formal, prepared floor composed of adobe and/or plaster.

No artifacts were encountered in direct association with the living surface. Pollen samples were taken from beneath rocks lying directly on top of the living surface in the northwest (FS 18) and southwest (FS 36) quadrants of the room. Taxa identified in FS 18 included maize (*Zea mays*), cheno-ams, grass family, mustard family (Brassicaceae), sunflower family, ragweed/bursage, spruce (*Picea*), fir (*Abies*), unidentified pine, piñon pine, juniper, oak, Mormon tea (*Ephedra*), and sagebrush. Taxa identified in FS 36 included cholla (*Opuntia*), cheno-ams, grass family, sunflower family, spruce, fir, unidentified pine, piñon pine, juniper, oak, knotweed (*Polygonum* frilly type), rose family (Rosaceae), Mormon tea, and sagebrush. A third pollen sample (FS 39) was taken from directly on top of the living surface in the east-central portion of the room. Taxa identified in this sample included cheno-ams, grass family, sunflower family, ragweed/bursage, unidentified pine, piñon pine, juniper, oak, rose family, Mormon tea, and sagebrush. Two flotation samples (FS 59 and FS 60) were taken of the living surface matrix in the center of the room. Taxa identified in these samples included ponderosa pine, unknown conifer (Gymnospermae), and mountain mahogany (*Cercocarpus*).

Wall Construction. As mentioned above, Room 1 appears to have been more elliptical than rectangular. As a result, it is impossible to clearly differentiate between the north, south, east, and west walls. In addition, the wall was poorly constructed and poorly preserved. Consequently, it was often difficult when excavating the room to differentiate between *in situ* portions of the wall and wallfall. The wall does appear, however, to have been composed of a single row of unshaped dacite and tuff cobbles. A large number of rocks were encountered directly outside of this wall, many of which are firmly embedded in the Btb1 horizon. These rocks may have formed a second, exterior ring of rocks that functioned to give the wall added support. It is more likely, however, that they were wallfall.

In some locations, the wall foundation was composed of two long, thin, parallel upright slabs. This type of wall foundation has been encountered at several Coalition period (AD 1200–1325) roomblocks on the Pajarito Plateau, including LA 12587 in the White Rock Tract. In most places, however, either a single row of large rocks or several small, unaligned rocks formed the wall foundation. Much of the southern portion of the wall was formed by a very large rock that is too large to have been brought to the site. This indicates that the people who constructed Room 1 incorporated a naturally occurring rock into the wall. The presence of this large rock may in fact have been the reason that the structure was built in that location. In general, dacite cobbles were utilized in the wall foundation, and tuff blocks were reserved for upper courses of the walls. These rocks range in size from very large, immovable boulders to small, fist-sized cobbles. None of the rocks were shaped, although rectangular rocks and rocks with flat surfaces appear to have been selected when readily available.

Judging from the amount of wallfall removed during the excavation of the area in and around Room 1, the masonry portion of the room's walls were originally considerably higher than they were at the time of excavation. In order to estimate the original height of the walls, all of the rocks removed as wallfall during the site's excavation were placed in one stack, which was then measured. The stack measured 3.70 by 0.60 by 0.60 m, for a total of approximately 1.33 m^3 of wallfall. Based on this volume of wallfall and the overall length, average thickness, and average height of the extant portions of the wall, the masonry portion of the room's walls were originally approximately 0.69 m in height. The upper portion of the wall and ceiling, if it ever had them, were most likely composed of vegetal material and adobe. These materials are rarely preserved at archaeological sites on the Pajarito Plateau. In fact, only two small pieces of burned adobe were recovered from the site (FS 35 and FS 37).

Auxiliary Wall

During the excavation of the area to the east of Room 1, an alignment of rocks was encountered. The alignment, which is most likely the remains of a short wall, extends eastward from the southeast portion of Room 1 and then curves to the north. This wall probably served to define the southern and eastern boundaries of a small, outdoor work area or patio. In fact, the area to the east of Room 1 and north of the wall contained the highest concentration of artifacts at the site. This "auxiliary" wall is about 2.90 m long and appears to have been constructed of either a double row of rocks that was one course high or, more likely, a single row of rocks that was two courses high. The general wall measurements for Room 1 and the auxiliary wall are provided in Table 28.4. Because Room 1 was more elliptical than rectangular and the auxiliary wall was curved, the lengths provided below are approximations.

Table 28.4. LA 15116 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	2.00	0.04–0.16	0.14–0.45	1
South	1.70	0.08–0.60	0.15–0.90	1 to 2
East	1.75	0.05–0.30	0.15–0.58	1 to 2
West	2.35	0.05–0.44	0.16–0.34	1 to 2
Auxiliary	2.90	0.07–0.24	0.22–0.55	1

Geological Test Pit

A single unit (103N/101E) was excavated below the top surface of the Btb1 horizon to serve as a geological test pit. The north profile of this unit, which was analyzed by geologists Paul Drakos and Steven Reneau, contained a soil sequence consisting of an A horizon (topsoil), and Bw horizon (a late-Holocene soil), and a Btb1 horizon (an early/middle-Holocene soil). Below the Btb1 horizon was a thin layer of decomposing tuff on top of the Otowi Member of Bandelier Tuff (bedrock). After the site was completely excavated and photographed, the southernmost portion of the test pit was extended eastward to the west wall of Room 1 in order to determine the depth of the wall's foundation. The excavation revealed that the foundation of this section of the wall extended about 20 cm into the Btb1 horizon, just a few cm above bedrock.

Artifact Distribution

As Table 28.5 demonstrates, the majority of artifacts recovered from LA 15116 are from the area just east of Room 1 and just north of the auxiliary wall (103-105N/105-106E). In addition, more artifacts were encountered in the northern half than in the southern half of the excavated area. No entryway was encountered during the excavation of Room 1. A number of factors, however, suggest that it was located to the east. First, the auxiliary wall is located to the east and would have served to funnel anyone approaching the room from this direction to the east-central portion of the room's wall. Secondly, the increased artifact density to the east of the structure most likely represents an activity area or patio to the east of the structure. Activity areas associated with Rendija Canyon fieldhouses excavated during the Conveyance and Transfer Project tend to be located just outside the entryway. An alternative explanation for the increased artifact density to the east of the room is that the artifacts were swept from inside the room through the entryway and into this area. This again would indicate that the room's entryway was located to the east.

The increased artifact density to the east of the structure is therefore the result of cultural formation processes (i.e., an activity area or the result of cleaning the interior of the room). The increased artifact density in the northern, downhill half as opposed to the southern, uphill half of the excavated area, on the other hand, is most likely due to natural formation processes (i.e., erosion).

Table 28.5. LA 15116 artifact counts by grid unit.

	101E	102E	103E	104E	105E	106E	107E
105N	--	1	4	3	5	16	--
104N	--	**1**	**1**	**2**	11	7	--
103N	2	**1**	**2**	**0**	8	25	6
102N	--	0	**2**	**0**	0	14	7
101N	--	0	0	0	3	0	--

Note: counts do not include two artifacts found outside of the excavated area during surface collection; bold numbers indicate grid units that are located completely or partially within Room 1.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 124 artifacts were analyzed from excavations at LA 15116. Analyses of the ceramics, lithics, pollen, and archaeobotanical materials were conducted (Table 28.6). No faunal remains or ground stone items were recovered from the excavations. The results of these analyses are presented in the following pages.

Table 28.6. Samples selected for analysis from LA 15116.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1	0	0	--	
2	31	32	--	----
3	59, 60	18, 36, 39	--	--
4	0	0	--	--

*thermoluminescence

Ceramic Artifacts (Dean Wilson)

Eighty-five sherds were recovered from LA 15116. Most of these are Biscuit B/C body sherds, with Biscuit B and Sapawe Micaceous. Assuming that the Biscuit B/C sherds actually represent Biscuit B, then the site would date to the Middle Classic period (15th century). This corresponds with the presence of glazeware ceramics, which also indicate a Classic period occupation. Tables 28.7 through 28.10 show the summary ceramic data for the site, including general type, types by tradition, temper material by ware type, and ware by vessel form. Most of the grayware and whiteware ceramics are made from local anthill sand or tuff temper; however, a single plain gray body and the Sapawe Micaceous sherds are tempered with non-local granite with mica, and the three glazeware sherds with non-local basalt. All of the utilitywares, glazewares, and micaceous wares are broken fragments from jars. In contrast, most of the whitewares are bowls, with some jar vessel forms.

Table 28.7. Distribution of ceramics types from LA 15116.

Ceramic Types	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	2	2.4
Biscuitware slipped both sides	1	1.2
Biscuitware painted unspecified	21	24.7
Biscuitware slipped one side	4	4.7
Biscuitware slip and paint absent	3	3.5
Biscuit B rim	1	1.2
Biscuit B/C body	31	36.5
Northern Rio Grande Utilityware		
Plain gray body	2	2.4
Smeared-indented corrugated	4	4.7
Sapawe Micaceous	13	15.3
Middle Rio Grande Glazeware		
Glaze red body unpainted	2	2.4
Glaze yellow body unpainted	1	1.2
TOTAL	**85**	**100.0**

Table 28.8. Tradition by ware for LA 15116 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	4	100.0	63	0.0	0	0.0	0	0.0	67	78.8
Rio Grande (Tewa Micaceous)	0	0.0	0	0.0	0	0.0	15	100.0	15	17.6
Middle Rio Grande	0	0.0	0	0.0	3	100.0	0	0.0	3	3.5
Total	**4**	**0.0**	**63**	**0.0**	**3**	**100.0**	**15**	**100.0**	**85**	**100.0**

Table 28.9. Temper by ware for LA 15116 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Granite with mica	1	25.0	0	0.0	0	0.0	0	0.0	1	1.1
Fine tuff and sand	0	0.0	62	98.4	0	0.0	0	0.0	62	72.9
"Anthill" sand	3	75.0	1	1.6	0	0.0	0	0.0	4	4.7
Basalt	0	0.0	0	0.0	3	100.0	0	0.0	3	3.5
Sapawe Micaceous	0	0.0	0	0.0	0	0.0	15	100.0	15	17.6
Total	**4**	**100.0**	**63**	**100.0**	**3**	**100.0**	**15**	**100.0**	**85**	**100.0**

Table 28.10. Vessel form by ware for LA 15116 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	0	0.0	22	34.9	0	0.0	0	0.0	22	25.8
Bowl body	0	0.0	14	22.2	0	0.0	0	0.0	14	16.4
Jar neck	0	0.0	2	3.1	1	33.3	0	0.0	3	3.5
Jar body	4	100.0	8	12.6	2	66.6	15	100.0	29	34.1
Miniature jar	0	0.0	16	25.3	0	0.0	0	0.0	16	18.8
Flared bowl rim	0	0.0	1	1.5	0	0.0	0	0.0	1	1.1
Total	**4**	**100.0**	**63**	**100.0**	**3**	**100.0**	**15**	**100.0**	**85**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 39 artifacts were analyzed from LA 15116, consisting of a core and 38 pieces of debitage. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 28.11 presents the data on lithic artifact type by material type. The majority of the debitage is made of chalcedony and Pedernal chert with lesser amounts of other materials. The presence of cortex on 18.4 percent of the debitage indicates that these materials were collected from waterworn (n = 7) sources. The chalcedony, Pedernal chert, and general chert are available from local Rio Grande Valley gravel sources. Otherwise, the rhyolite is available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 28.11. LA 15116 lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	**Vesic. basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal chert**	**Sil.icified wood**	**Quartzite**	**Sandstone**	**Total**
Cores	Core	0	0	0	0	0	0	0	0	1	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Debitage	Angular debris	0	0	0	0	0	0	0	3	0	0	0	0	0	3
	Core flake	0	0	5	0	0	0	0	15	0	12	0	0	0	32
	Microdebi-tage	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Undeter-mined flake	0	0	0	0	0	0	0	2	0	0	0	0	0	2

Artifact Type		Basalt	Vesic. basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal chert	Sil.icified wood	Quartzite	Sandstone	Total
	Subtotal	0	0	5	0	0	0	0	20	1	13	0	0	0	38
Total		**0**	**0**	**5**	**0**	**0**	**0**	**0**	**20**	**2**	**13**	**0**	**0**	**0**	**39**

Lithic Reduction

The single core was reduced using a single-directional, multi-face technique (Figure 28.3). It was classified as still useable when discarded. Table 28.12 presents the metric information on this core.

Table 28.12. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Single-directional	41	61	83	298.7

The debitage mainly consists of core flakes with a few pieces of angular debris and a microdebitage. The overall cortical:non-cortical ratio of 0.20 reflects an emphasis on the later stages of core reduction.

The majority of the flakes exhibit single-faceted platforms (*n* = 10), with cortical (*n* = 1), collapsed (*n* = 3), and crushed (*n* = 4) platforms. None of the flake platforms exhibit evidence of preparation. Most of the core flakes consist of whole flakes (*n* = 18), with fewer proximal (*n* = 3), midsection (*n* = 2), and distal (*n* = 9) fragments. The whole core flakes have a mean length of 25.8 mm (*std* = 8.9) and the angular debris have a mean weight of 1.2 g (*std* = 1.2).

Tool Use

None of the flakes exhibit any obvious evidence of edge damage that could be attributed to use.

Archaeobotanical Remains (Pamela McBride)

The majority of plant remains from this Middle Classic period one-room circular fieldhouse consisted of burned and unburned conifer needles (Table 28.13). Aside from the piñon and ponderosa pine needles, cultural material was limited to single occurrences of burned seeds that compared favorably to dock, as well as grass family seeds and unidentifiable plant parts. The conifer needles are probably part of conifer fuel wood residue. Although young dock leaves can be eaten like spinach (Harrington 1967:90), basing use of the plant on the recovery of a single seed is dubious. Unburned seeds of this taxon were recovered from all three samples as well, making it even more difficult to say with any certainty that the seed represents economic use.

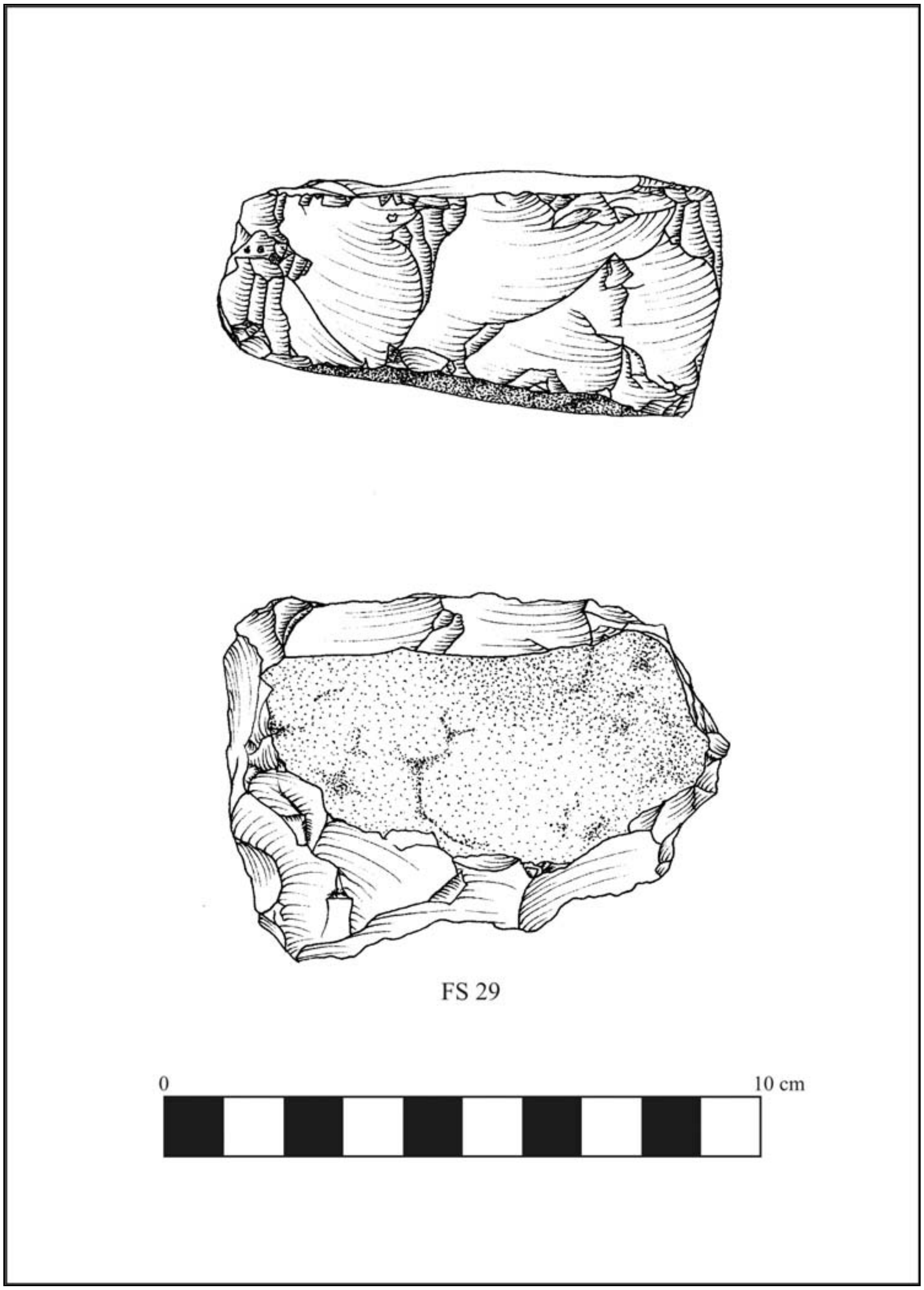

Figure 28.3. Single-face core.

Table 28.13. Flotation sample plant remains, count, and abundance per liter from LA 15116.

FS No.	**31**	**59**	**60**
Feature	Fill on top of Living surface	Living surface	Living surface
Cultural			
Grasses			
cf. Grass family	1(1)		
Other			
Unidentifiable	1(0) pp		1(0) pp
Perennials			
cf. Dock	1(1)		
Piñon	+ needle		
Ponderosa pine	+ needle	+ needle	+ needle
Non-Cultural			
Annuals			
Goosefoot		+	
Grasses			
Grass family	+ floret		
Other			
Composite family	+		
Perennials			
cf. Dock	+	+	+
Piñon	+ needle		+ needle
Ponderosa pine	+ needle		

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter, cf. compares favorably, pp plant part.

Ponderosa pine dominated the wood assemblage, but oak, piñon, sagebrush, and unknown conifer were also present (Table 28.14). The most that can be said about subsistence at LA 15116 is that local wood resources were used for fuel or construction.

Table 28.14. Flotation sample wood charcoal by count and weight in grams.

FS No.	**31**	**59**	**60**
Feature	Fill on top of living surface	Living surface	Living surface
Conifers			
Piñon	3/0.1 g		
Ponderosa pine	4/0.1 g	2/<0.1 g	3/<0.1 g
Unknown conifer		3/<0.1 g	
Non-Conifers			
Mountain mahogany			2/<0.1 g
Totals	**7/0.2 g**	**5/<0.1 g**	**5/<0.1 g**

Pollen Remains (Susan J. Smith)

A total of four pollen samples were analyzed from LA 15116. Table 28.15 lists the frequency of identified pollen types. Cultigens identified in the assemblage included maize and cholla. A number of potential economic resources were identified in the assemblage (Table 28.15), and these are described in detail in Smith's chapter in Volume 3 (Chapter 63).

Table 28.15. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 15116 (*n* = 4)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	1
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	2
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	1
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	1
	Plantago	Plantain	0
	Polygala type	Milkwort	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 15116 (*n* = 4)
	Poaceae	Grass Family	4
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs and Possible Subsistence Resources	Cheno-Am	Cheno-Am	4
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	4
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	3
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	1
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	0
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 15116 (*n* = 4)
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	2
	Abies	Fir	2
	Pinus	Pine	4
		Pine Aggregates	1
	Pinus edulis type	Piñon	4
	Juniperus	Juniper	4
		Juniper Aggregates	0
	Quercus	Oak	4
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	4
	Artemisia	Sagebrush	4
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 15116 is a one-room Middle Classic period fieldhouse that was constructed from both shaped and unshaped tuff blocks. The site is located in Rendija Canyon on a terrace overlooking the creek. Maize pollen was recovered from the site excavation, therefore, the one-room structure was presumably occupied during the growing season.

CHAPTER 29
RENDIJA TRACT (A-14): LA 70025

Michael J. Dilley and Bradley J. Vierra

INTRODUCTION

LA 70025 is a small structure located on an eroding east-west-trending finger ridge that extends into Cabra Canyon and that dates to the Early/Middle Classic period. The site is located approximately 40 m to the west of the canyon bottom. Vegetation on the site consists of a few scattered junipers and various wild grasses and low shrubs. Vegetation in the surrounding area consists of ponderosa pine trees, many of which were severely burned during the Cerro Grande fire, as well as piñon pine and juniper trees. The site is situated at an elevation of 2122 m (6960 ft).

The site was first surveyed on June 23, 1988, and given a temporary site number of L-53. It was revisited by Los Alamos National Laboratory cultural resources personnel on March 16, 1992, and given a temporary site number of B-18. The site was initially recorded as two one-room structures, both of which were probable fieldhouses and that were constructed of roughly coursed tuff blocks. Two surface artifacts were recorded: a Wiyo/Biscuit A (Abiquiu Black-on-gray) sherd, which was worked on one edge, and one Pedernal chert flake.

FIELD METHODS

Before excavation proceeded, the area was cleared of fallen trees and undergrowth to ensure safe working conditions and to expose the extent of the structure (Area 1). An arbitrary site datum (designated 100N/100E) was established in the southwest corner of the site. A 1- by 1-m grid system was then established, covering the site and extending 2 m north, 2 m south, and 6 m east of the site datum. Two subdata (A and B) were set up for taking elevations. Pre-excavation photographs were taken and the site was surveyed for surface artifacts (Figure 29.1).

A 5- by 1-m trench was initially excavated across the middle of the site (grids 100N/102-106E) to determine extent of the structure and stratigraphy and to locate the east and west walls of the structure. Units were excavated by strata and thicker strata were excavated in arbitrary 10-cm levels. Within the structure, the trench units were excavated to a compact surface thought to be the living surface. Outside the structure, the trench units were excavated to the top of the sterile soil horizon. The westernmost unit of the trench (100N/101E) was selected for a test pit for geomorphologic analysis. This unit was excavated through the Btjb 1 (sandy clay loam) horizon to the sterile BC horizon (silty loam). The southern profile of the trench was then drawn and photographed.

Figure 29.1. Pre-excavation photo of LA 70025.

The rest of the site was then excavated by grid and strata, with arbitrary levels for thicker strata. A total of 17 units were excavated in and around the structure. Inside the structure, units were excavated to the living surface determined during the excavation of the trench. Outside the structure, units were excavated to the sterile Btjb 1 horizon. Excavation of the structure focused on defining walls, removing wallfall, and locating any features. Soil and pollen samples were taken from selected locations and all other soil was screened through 1/8-in. mesh to recover any artifacts. The excavation extended approximately 1 m around the perimeter of the structure in all directions to locate any associated external features and/or outside activity areas. No artifact concentrations were noted, but the remains of a nearly complete Sapawe Micaceous jar were recovered from the living surface in the southwest corner of the structure. Pollen samples and a flotation sample were taken from inside the vessel and underneath it.

Additionally, a small rubble mound (Area 2) was located approximately 7 m to the west of the structure. The grid system was extended to include this area and a subdatum (C) was established to take elevations. Two units were excavated and it was determined that this area was either non-cultural in nature or so badly eroded that it contained no useful data.

The excavation of the site was supervised by Michael Dilley. The field crew included Sandi Copeland, Hannah Lockard, and Alan Madsen. Timothy Martinez and Michael Chavarria served as site monitors, representing San Ildefonso and Santa Clara pueblos, respectively.

STRATIGRAPHY

The strata excavated at LA 70025 are described in Tables 29.1 and 29.2. Stratum 1 is composed of loose, surface sediment that was 1 to 5 cm in thickness across the site. It is roughly equivalent to the top half of the A horizon (topsoil). Stratum 2 consists of post-occupational fill and ranges from 1 to 18 cm in thickness throughout the excavated area. Stratum 2 includes the lower half of the A horizon and the Bw1 and the top of the Bw2 horizon. Artifact counts by strata are presented in Table 29.3.

Table 29.1. Stratigraphic descriptions from sediments at LA 70025.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10yr 5/3	Loamy sand	1–4	Surface sediment
2	10yr 5/3	Sandy loam	4–10	Post-occupational fill
3	10yr 6/3	Sandy clay loam	-	Room 1 Living surface

Table 29.2. Soil horizon descriptions from geomorphic test pit profile at LA 70025.

Horizon	Color	Texture	Depth (cm)	Description
A	10yr 5/3	Loamy sand	0–5	Late Holocene
Bw1	10yr 4/3	Sandy loam	5–14	Late Holocene
Bw2	10yr 4/3	Sandy clay loam	14–29	Late Holocene
Btjb1	10yr 5/4	Sandy clay loam	29–40	Middle-late Holocene
BC	10yr 4/4	Silty loam	40–50	Middle-late Holocene

Table 29.3. Artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	15	0	6	0	**21**
1	33	1	0	0	**35**
2	133*	15	2	0	**148**
3	0	0	0	0	**0**
Total	**181**	**16**	**7**	**0**	**204**

*This total includes 72 sherds recovered in the southwest corner of Room 1, representing the remains of a utilityware bowl.

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a one-room structure that probably functioned as a fieldhouse. Due to its location on an eroding finger ridge, the structure was poorly preserved. Construction of the room consisted of one to two courses of either unshaped tuff block or unshaped dacite block. Only portions of two walls remained, and a few blocks that suggested a third wall (Figures 29.2 and 29.3). As best as could be determined, the room would have been roughly rectangular in shape. The room measures 2.72 m east-west by 1.65 m north-south, with approximately 4.50 m^2 of interior space. Excavation of the room began with an east-west trench that extended across the site (100N/102-106E). The excavation of this trench served to define the stratigraphy within the room and to locate the east and west walls and the living surface. After the trench was excavated, the rest of the room was excavated by grid down to the presumed living surface (the top of the Btjb1 soil horizon). Subsequent to the excavation of the room, photographs were taken of extant walls and the living surface.

Figure 29.2. Post-excavation photo of LA 70025.

Fill. The interior of the room was filled with 1 to 4 cm of loose surface sediment overlying 4 to 10 cm of semi-consolidated post-occupational fill. Flotation (Field Specimen [FS] 21) and pollen samples (FS 22) were taken from the room fill. Only ponderosa pine (*Pinus ponderosa*) culms were identified in the flotation sample. Taxa identified in the pollen sample included maize (*Zea mays*), cheno-ams (*Chenopodium/Amaranthus*), grass family (Poaceae), sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), spruce (*Picea*), fir (*Abies*), unidentified pine (*Pinus* sp.), piñon pine (*Pinus edulis*), juniper (*Juniperus*), oak (*Quercus*), Mormon tea (*Ephedra*), and sagebrush (*Artemisia*).

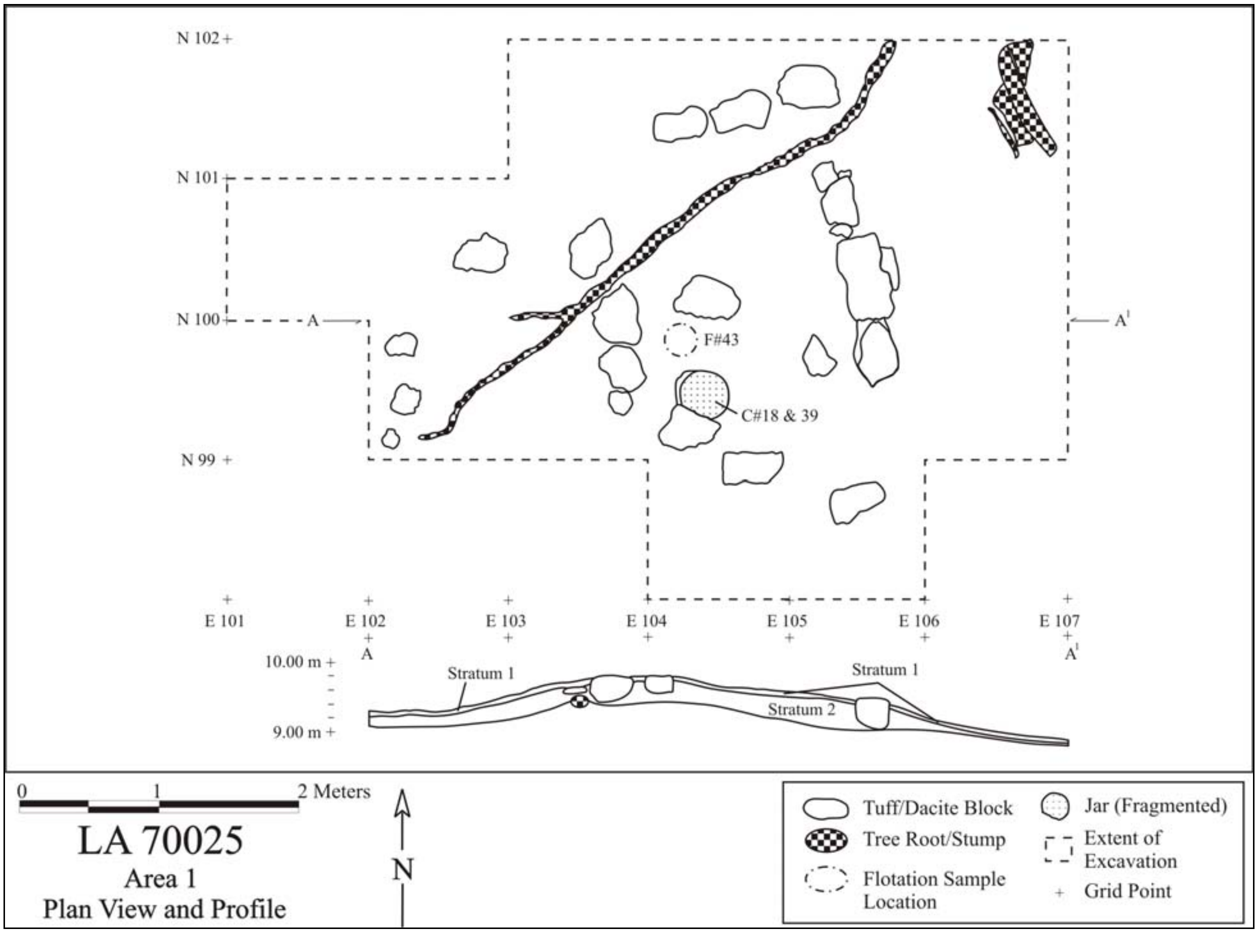

Figure 29.3. Plan view and profile of LA 70025.

Floor. There was no prepared or formal floor encountered during excavation of the room. Due to the poorly preserved nature of the structure from erosion and root disturbance, determination of a prepared floor would have been difficult if any had remained. However, an informal living surface was determined at the break between the loamy sand post-occupational fill, the Bw1 and Bw2 horizons (Stratum 2), and the top of the more consolidated, sterile sandy-clay-loam surface, the Btjb 1 horizon (Stratum 3). This surface was more compact than the general fill, and an increase in rootlets was noted between the fill and the contact zone of the more compact surface. There was also a slight color change in the soil to a lighter shade of brown with orange-hued patches of clayey soil.

A few dacite or tuff blocks were either resting on top of this surface or slightly imbedded into it and were determined to be wallfall. Several ceramic sherds were recovered from this surface, including the remains of a Sapawe Micaceous jar (FS 18 and FS 39) that was resting on a flat piece of tuff in 99N/104E. The tuff fragment and bowl were directly on top of the more compact surface, further indicating that this was likely the prehistoric living surface. This surface was also fairly level compared to the surrounding area outside of the room. A flotation sample was taken from the living surface (FS 43). Charred taxa identified in the flotation sample included ponderosa pine and unknown conifer (Gymnospermae). One pollen sample (FS 28) was taken from underneath the jar fragment; identified taxa included beeweed (*Cleome*), buckwheat (*Eriogonum*), cheno-ams, grass family, sunflower family, spurge family (Euphorbiaceae), fir, unidentified pine, piñon pine, juniper, oak, and sagebrush. Pollen and flotation samples were also collected from inside the jar (FS 23 and FS 24, respectively). Taxa identified in the pollen sample included maize, sunflower, cheno-ams, grass family, sunflower family, spurge family, fir, unidentified pine, piñon pine, juniper, rose family (Rosaceae), and sagebrush. Taxa identified in the flotation sample included grass family, unknown conifer, mountain mahogany (*Cercocarpus*), and ponderosa pine. No interior features were encountered during the excavation/exposure of the living surface.

Wall Construction. Due to the poor preservation of the site there were just two wall alignments (east and west) determined for Room 1 and their positioning suggested a rectangular shape (Figure 29.4). These were not complete wall alignments. Three additional tuff blocks were noted at the north end of the room and may represent the remains of another wall alignment. However, these blocks did not form a corner with the other alignments. The south end of the room was open, with scattered blocks forming no alignments.

The alignments, for the most part, appear to be a single row and single course of unshaped tuff and dacite blocks (Table 29.4). The majority of the blocks were tuff. Wallfall blocks within the room and in the area immediately outside of the room suggest that originally the walls were two or three courses higher, with a superstructure. The superstructure would likely have been constructed of stick and adobe. Two pieces of burned adobe (FS 12) were recovered just outside of the room, in unit 100N/103E (Stratum 2, Level 3), and several small adobe fragments were recovered inside the room in unit 99N/104E (Stratum 2, Level 3), suggesting the presence of a superstructure. Several tuff and dacite fragments/cobbles associated with the alignments were recovered during excavation of the room and may have served as chinking stones. No plaster or mortar was encountered.

An additional small rubble mound (Area 2), which was located 7 m to the west of Room 1, was also investigated. Two grid units were excavated producing no wall alignments or discernible structural elements. The material in the mound consisted of tuff blocks and fragments. This area was subject to severe erosion, root disturbance, and rodent activity.

Table 29.4. Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.20	0.16	0.26	1
South	Und	Und	Und	Und
East	1.60	0.22	0.32	1
West	0.85	0.21	0.31	1

Figure 29.4. Interior of the east wall of Room 1.

Geomorphic Analysis

A single grid unit (100N/102E) was excavated below the Bw2 horizon to serve as a geomorphic test pit. The profile of this unit was analyzed by geomorghologists Paul Drakos and Steve Reneau. A soil sequence was determined consisting of an A horizon topsoil (late Holocene), a Bw 1 and Bw 2 horizon (late Holocene), a Btjb 1 horizon (middle-late Holocene), and a BC horizon (middle-late Holocene). The A, Bwb1, and Bw2 horizons were all listed as post-occupation soils and the Btjb 1 and BC horizons were listed as pre-occupation soils.

Artifact Distribution

A total of 204 artifacts were recovered from the excavation of LA 70025. The majority of artifacts were recovered from excavation in and around Room 1 (Area 1). There were no artifact concentrations of note (other than the Sapawe Micaceous jar sherds recovered from Room 1) and no activity areas described. The highest density of artifacts outside of Room 1 was in unit 101N/106E and consisted of 26 ceramic sherds and eight chipped stone artifacts (most of which were recovered from Stratum 2, Level 2). The next highest density was recovered from unit 101N/105E and consisted of five ceramic sherds and four chipped stone artifacts (all of which were recovered from Stratum 2, Level 2). Both of these units were located on the northeast side of the site, just outside of the room. Across the remainder of the site artifacts were fairly evenly distributed. However, no chipped stone artifacts were recovered from inside Room 1. The higher density of artifacts recovered from the east side of the site is consistent with other fieldhouses excavated in Rendija Canyon, where activity areas may be located just outside the entryway of the structure.

This may be the result of a specific activity or the result of sweeping out the room. However, no entryway was determined for this structure and the density of artifacts, specifically chipped stone, does not seem to warrant calling this area an activity area. In the southwest corner of Room 1 (99N/104E; Stratum 2, Level 2), 72 ceramic sherds were recovered in a concentration that represented the remains of a Sapawe Micaceous jar. These sherds were resting on top of a tuff slab fragment that was situated directly above the living surface and may represent an *in situ* deposit.

Few artifacts were recovered from Area 2. Two ground stone fragments were surface collected from units 96N/96E and 99N/98E, which were not excavated. One ground stone fragment was recovered from unit 96N/95E (Stratum2, Level 2). Three ceramic sherds were recovered from unit 96N/95E; one from Stratum 1, Level 1 and two from Stratum 2, Level 2. One chipped stone artifact was recovered from this area in grid 96N/94E, Stratum 2, Level 2. Table 29.5 lists the artifacts recovered from each of the excavated grid units.

Table 29.5. Artifact counts by grid unit.

	94E	95E	96E	98E	101E	102E	103E	104E	105E	106E
96N	2	5	3	0	0	0	0	0	0	0
99N	0	0	1	1	0	4	6	104 (cer)	0	0
100N	0	0	0	0	3	0	6	9	7	6
101N	0	0	0	0	0	0	0	4	9	34

As was stated previously, this site is located on a narrow, eroding finger ridge. Artifacts recovered from Room 1 and the immediate surrounding area likely represent the bulk of the site assemblage, but it is also possible that some artifacts eroded downslope and into the drainages that bound the site on the north and south side. The relatively low artifact density and the poorly preserved nature of the site do not provide any reliable evidence of activity areas associated with the structure (Room 1).

SITE CHRONOLOGY AND SAMPLE ANALYSIS

A total of 204 artifacts were analyzed from the excavations conducted at LA 70025. In addition, flotation and pollen samples were selected for analysis from the post-occupational fill (Stratum 2) and the living surface (Stratum 3) (Table 29.6).

Table 29.6. Soil samples selected for analysis from LA 70025.

Stratum	Flotation	Pollen	Radiocarbon	TL*
1	--	--	--	--
2	21, 24 (from pot base)	22, 23 & 28 (pot base)	--	--
3	43	--	--	--

*thermoluminescence

Ceramic Artifacts (Dean Wilson)

A total of 185 ceramics were analyzed from LA 70025. The majority of the pottery consists of Biscuit A, Biscuit B/C, and Sapawe Micaceous types, which reflect an Early to Middle Classic period occupation (Table 29.7). Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 29.8 to 29.10. The graywares and whitewares appear to have been locally made from smeared-indented sand or tuff, in contrast to Sapawe Micaceous, which contained a non-local micaceous temper. All of the grayware and micaceous ceramics consist of jars, although the whitewares include a mix of bowl and jar vessel forms.

Table 29.7. Ceramic types from LA 70025.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	2	1.1
Santa Fe Black-on-white	2	1.1
Unpainted Biscuit one side slipped	5	2.7
Unpainted Biscuit both sides slipped	9	4.9
Biscuit paint and slip absent	7	3.8
Biscuit A	8	4.3
Biscuit B/C body	5	2.7
Northern Rio Grande Utilityware		
Plain gray body	3	1.6
Indented corrugated	4	2.2
Smeared-indented corrugated	15	8.1
Sapawe Micaceous	125	67.6
Total	**185**	**100.0**

Table 29.8. Tradition by ware for LA 70025 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	22	100.0	38	100.0	0	0.0	0	100.0	60	32.4
Rio Grande (Tewa Micaceous)	0	0.0	0	0.0	0	0.0	125	100.0	125	67.6
Middle Rio Grande	0	0.0	0	0.0	0	0.0	0	100.0	0	0.0
Total	**22**	**100.0**	**38**	**100.0**	**0**	**0.0**	**125**	**0.0**	**185**	**100.0**

Table 29.9. Temper by ware for LA 70025 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Fine tuff or ash	0	0.0	34	89.4	0	0.0	0	0.0	34	18.3
Large tuff fragments	0	0.0	2	5.2	0	0.0	0	0.0	2	1.0
Fine tuff and sand	0	0.0	1	2.6	0	0.0	0	0.0	1	0.5
Anthill sand	22	100.0	0	0.0	0	0.0	0	0.0	22	11.8
Oblate shale and tuff	0	0.0	1	2.6	0	0.0	0	0.0	1	0.5
Sapawe Micaceous temper	0	0.0	0	0.0	0	0.0	125	100.0	125	67.5
Total	**22**	**100.0**	**38**	**100.0**	**0**	**0.0**	**125**	**100.0**	**185**	**100.0**

Table 29.10. Vessel form by ware for LA 70025 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	0	0.0	9	10.5	0	0.0	0	0.0	9	4.8
Bowl rim	0	0.0	3	3.5	0	0.0	0	0.0	3	1.6
Bowl body	0	0.0	11	12.9	0	0.0	0	0.0	11	5.9
Jar neck	0	0.0	3	3.5	0	0.0	10	8.0	13	6.4
Jar rim	1	4.5	1	1.1	0	0.0	3	2.4	5	2.7
Jar body	21	96.5	11	12.9	0	0.0	111	88.8	143	77.2
Jar rim with strap handle	0	0.0	0	0.0	0	0.0	1	0.9	1	0.5
Total	**22**	**100.0**	**85**	**100.0**	**0**	**0.0**	**125**	**100.0**	**185**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 19 artifacts were analyzed from LA 70025. The assemblage consisted of a core, 14 pieces of debitage, and four ground stone artifacts and represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 29.11 presents the data on lithic artifact type by material type. The majority of the debitage is made of chalcedony, with lesser amounts of Pedernal chert and obsidian. The presence of cortex on 14.2 percent of the debitage indicates that these materials were collected from waterworn (n = 2) sources. The chalcedony and Pedernal chert are available from local Rio Grande Valley gravels and the obsidian from the nearby sources in the Jemez Mountains. Otherwise, the dacite is available both as bedrock outcrops and in stream gravels that cross-cut the Pajarito Plateau.

Table 29.11. Lithic artifact type by material type at LA 70025.

Artifact Type		Material Type													
		Basalt	**Vesic. Basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal chert**	**Sil. wood**	**Quartzite**	**Sandstone**	**Total**
Cores	Core	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Debitage	Angular debris	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Core flake	0	0	0	0	0	0	1	10	0	3	0	0	0	14
	Micro-debitage	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Subtotal	0	0	0	0	0	0	1	10	0	3	0	0	0	14
	Two-hand mano	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Und. mano	0	0	0	0	2	0	0	0	0	0	0	0	0	2
	Und. metate	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	0	4	0	0	0	0	0	0	0	0	4
Total		**0**	**0**	**0**	**0**	**4**	**0**	**1**	**11**	**0**	**3**	**0**	**0**	**0**	**19**

Lithic Reduction

The single core was reduced using a single-directional, multi-face technique. It was classified as still useable when discarded. Table 29.12 presents the metric information on this core.

Table 29.12. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Single-directional	62	105	91	697.3

The debitage assemblage consists of core flakes. The overall cortical:non-cortical ratio of 0.17 reflects an emphasis on the later stages of core reduction. The flakes exhibit both single-faceted (n = 6) and collapsed (n = 2) platforms. None of the flake platforms exhibit evidence of preparation. Most of the core flakes consist of whole flakes (n = 8), with fewer proximal (n = 2), midsection (n = 1), and distal (n = 3) fragments. The whole core flakes have a mean length of 24.2 mm (*std* = 18.4).

Tool Use

None of the flakes exhibit any obvious evidence of edge damage that could be attributed to use.

Four ground stone artifacts were identified during the analysis. The two-hand mano is a fragment that is plano-convex in cross-section. The flat surface is heavily ground, whereas the convex surface is only slightly ground on high spots. The undetermined mano fragments consist of cobble fragments that are heavily ground on both opposing surfaces. One of the manos was burned and broken into three parts, which fit back together. The other was battered on the end indicating that it was also used as a hammerstone.

Archaeobotanical Remains (Pamela McBride)

LA 70025, which is a Early/Middle Classic period fieldhouse, is located on a ridge near the mouth of Cabra Canyon. The site yielded very little in the way of non-wood cultural plant remains (Table 29.13). Charred grass stems from inside a pot base were the only possible materials associated with the occupation of the site. Unburned grass stems, sunflower seeds, and ponderosa pine needles were recovered as well, but have no cultural affiliation.

Table 29.13. Flotation sample plant remains showing count and abundance per liter.

FS No.	**24**	**43**
Feature	Inside pot base	Floor surface
Cultural		
Grasses		
Grass family	+ stem	
Non-Cultural		
Annuals		
Sunflower		+
Grasses		
Grass family		+ stem
Perennials		
Ponderosa pine		+ needle

+ 1-10/liter.

Ponderosa pine was the primary wood charcoal taxon identified; mountain mahogany and unknown conifer were also present (Table 29.14). The grass stems could have been used as a cushion for the pot or as tinder and local wood resources were used for fuel or construction.

Table 29.14. Flotation sample wood charcoal by count and weight in grams.

FS No.	**21**	**24**	**43**
Feature	Post-occupational fill	Inside pot base	Floor surface
Conifers			
Ponderosa pine	8/0.1 g	8/0.5 g	1/<0.1 g

FS No.	**21**	**24**	**43**
Unknown conifer		2/<0.1 g	3/0.1 g
Non-Conifers			
Mountain mahogany		4/0.1 g	
Totals	**8/0.1 g**	**14/0.6 g**	**4/0.1 g**

Pollen Remains (Susan J. Smith)

Two pollen samples were analyzed from LA 70025. Table 29.15 lists the frequency of identified pollen types. Maize was the only cultigen identified in the assemblage. Sunflower type was the only economic resource identified in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 29.15), and these are described in detail in Smith's chapter in Volume 3 (Chapter 63).

Table 29.15. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 70025 (*n* = 2)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	1
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	1
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 70025 (*n* = 2)**
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	2
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs and Possible Subsistence Resources	Cheno-Am	Cheno-Am	2
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	2
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	1
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	o
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 70025 (*n* = 2)
	Euphorbiaceae	Spurge Family	1
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Potential Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	2
	Pinus	Pine	2
		Pine Aggregates	2
	Pinus edulis type	Piñon	2
	Juniperus	Juniper	2
		Juniper Aggregates	0
	Quercus	Oak	1
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	1
	Artemisia	Sagebrush	2
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 70025 is a one-room Early/Middle Classic period fieldhouse that was constructed from both shaped and unshaped tuff blocks. The site is located on a ridge at the mouth of Cabra Canyon. Maize pollen was recovered during the site excavation, therefore, the one-room structure was presumably occupied during the growing season.

CHAPTER 30
RENDIJA TRACT (A-14): LA 85403

Gregory D. Lockard

INTRODUCTION

LA 85403 is a one-room Classic period structure located on a south terrace in Rendija Canyon. The site is located approximately 75 m west of the Los Alamos Sportsmen's Club archery range and approximately 30 m south of Rendija Canyon Road. Vegetation in the site area consists of ponderosa pine and piñon-juniper woodland with an understory composed primarily of grasses. The site is situated at an elevation of 2131 m (6990 ft).

LA 85403 was first recorded on August 14, 1991, by David Hill (1991) during a survey for the Bason Land Exchange Project. Hill believed the site was a one- or two-room fieldhouse. Two obsidian flakes and a chalcedony flake were the only artifacts observed on the surface. As Hill noted, the paucity of surface artifacts may be a result of surface collection by users of the archery range. The site was re-recorded and given the temporary site number of Q193 by Bradley Vierra on April 6, 1999. Vierra identified the site as a one-room fieldhouse and noted that several rocks had recently been removed from the surface of the mound. He observed no artifacts. He also documented the presence of two nearby outhouses, and noted that the paucity of artifacts could have been the result of surface collection by the people who built and utilized the outhouses.

FIELD METHODS

Before excavation, the site and surrounding area were cleared of trees and large undergrowth. The site was then visible as a small rubble mound approximately 5 by 4.8 m in area (Figure 30.1). An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the southwest corner of the site. The site was then covered with a 1- by 1-m grid that extended 5 m north and 5 m east of the site datum. Three subdata (A-C) were set up for taking elevations. The site was then photographed. A surface collection was attempted, however no artifacts were observed on the surface. A 5- by 1-m east-west trench (units 102N/100-104E) was initially excavated across the remains of the structure. The purpose of this trench was to expose a profile of the site stratigraphy, as well as to determine the location of the room's east and west walls. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. The room's west wall was encountered in grid unit 102N/101E, and the interior face of the south wall was encountered along the southern border of grid units 102N/101-103E. An east wall was not encountered during the excavation of the trench. It was later determined that the reason for this is that an entryway in the east wall was located within the trench (grid unit 102N/102E). No obvious living surface was encountered within the room during the excavation of the trench.

Figure 30.1. LA 85403 before excavation.

Excavation proceeded down to the level of the base of the room's walls. After the excavation of the trench units, the north profile of the trench was drawn and photographed. The rest of the area was subsequently excavated, again by strata and arbitrary levels for thicker strata. In all, 20 units were excavated. No obvious living surface was encountered anywhere within the room. As a result, excavation within the room proceeded down to the base of the room's walls. Outside the structure, excavation proceeded down to the top of a sterile Btb1 horizon. Excavation focused on defining the room's walls, removing wallfall, and locating features. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended at least 1 m beyond the structure in all directions to locate external features and/or outdoor activity areas. The structure was then mapped (Figure 30.2) and photographed (Figure 30.3). Finally, the southern half of that portion of grid unit 102N/101E that is within Room 1 was excavated an additional 12 cm. This excavation served as a test pit for geological analysis.

The excavation of the site was supervised by Greg Lockard. The field crew included Michael Dilley, Joseph (Woody) Aguilar, Alan Madsen, Brian Harmon, Jennifer Nisengard, Sandi Copeland, Bettina Kuru'es, and Hannah Lockard. Timothy Martinez and Aaron Gonzalez served as site monitors from San Ildefonso Pueblo and as screeners. Michael Chavarria was the site monitor representing Santa Clara Pueblo, as well as an additional screener.

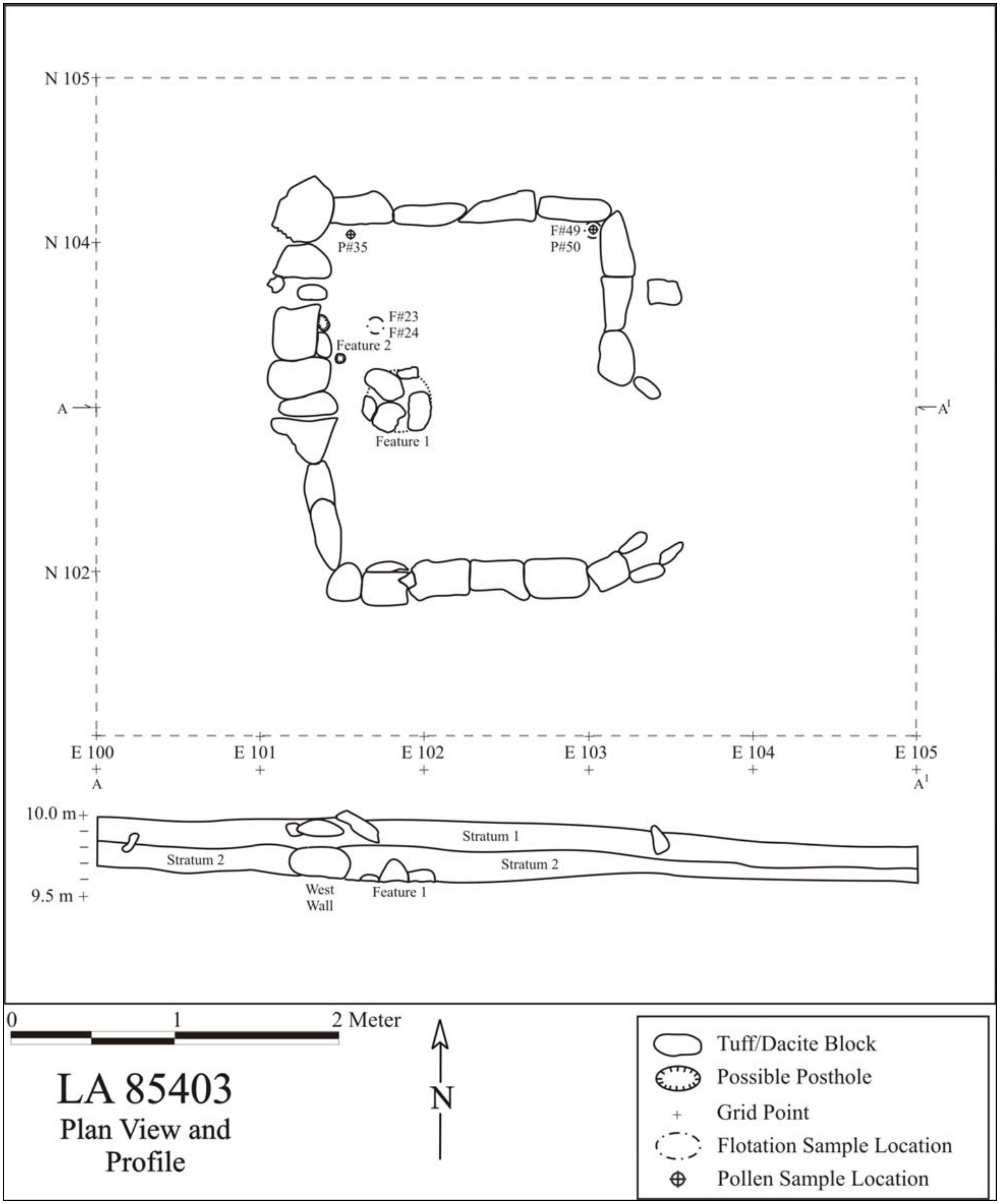

Figure 30.2. Plan view and profile of fieldhouse at LA 85403.

Figure 30.3. Post-excavation photograph of the fieldhouse at LA 85403.

STRATIGRAPHY

Stratum 1 is composed of loose, surface sediment. It is uniformly 1 to 7 cm thick across the site and is more or less equivalent to the A horizon (topsoil). Stratum 2 is post-occupational fill and ranges from 15 to 35 cm in thickness. The post-occupational fill was thickest within Room 1 and thinned away from the room. Stratum 2 is more or less equivalent to the Bw and Bwb1 horizons. Stratum 3 is the fill removed from Feature 2, which was identified as a posthole. Stratum 4 is the sterile soil removed from the geological test pit and is part of the Btb1 horizon. LA 85403 strata are summarized in Tables 30.1, 30.2., and 30.3, and artifact tallies are reported in Table 30.4.

Table 30.1. LA 85403 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 3/4	Sandy loam	1–7	Surface sediment
2	8.75YR 3/4	Silt	15–35	Post-occupational fill
3	8.75YR 3/4	Silt	6	Feature 2 (posthole) fill
4	7.5YR 4/5	Silty clay	12	Early/middle-Holocene soil

Table 30.2. LA 85403 soil horizon descriptions from the west profile of 102N/100E.

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 3/4	Sandy loam	0–9	Topsoil
Bw	8.75YR 3/4	Silt	9–22	Late-Holocene soil
Bwb1	7.5YR 4/5	Silt	22–30+	Early/middle-Holocene soil

Table 30.3. LA 85403 soil horizon descriptions from the west profile of the geological test pit (the southern half of that portion of 102N/101E that is within Room 1).

Horizon	Color	Texture	Depth (cm)	Description
Bwb1	7.5YR 4/5	Silt	30–35	Early/middle-Holocene soil
Btb1	7.5YR 4/5	Silty clay	35–50+	Early/middle-Holocene soil

Table 30.4. LA 85403 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	0	0	0	0	**0**
1	0	0	0	0	**0**
2	7	23	4	0	**34**
3	0	0	0	0	**0**
4	0	0	0	0	**0**
Total	**7**	**23**	**4**	**0**	**34**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a small, rectangular structure that probably functioned as a fieldhouse. The room measures 2.06 m in length (north-south) by 1.82 m in width (east-west), with approximately 3.75 m^2 of interior space. Excavation of the room began with an east-west trench that extended across the room (102N/100-104E). The excavation of this trench served to define the room's stratigraphy, as well as to locate the room's west and south walls. The room's entryway was also encountered in 102N/103E, although it was not recognized as such until the grid units to the north were excavated. No living surface was encountered in the trench. As a result, the excavation proceeded down to the base of the room's walls. After the excavation of the trench, the rest of the room was excavated to the base of the room's walls. After all of the grid units within Room 1 were excavated to this level, Feature 1 (a prehistoric pit) and Feature 2 (a posthole) were excavated, sampled, and mapped. After the features were excavated, the southern half of that portion of 102N/101E that is within Room 1 (i.e., the far southwest corner of Room 1) was excavated an additional 12 cm. The purpose of this excavation was to determine whether or not there were any living surfaces below and to document the depth of the wall's foundations. This excavation also served as a test pit for geological analysis (see Table 30.3).

Fill. The interior of Room 1 was filled with 1 to 6 cm of surface sediment on top of 30 to 35 cm of post-occupational fill. Two flotation samples (Field Specimen [FS] 18 and FS 27) and one pollen sample (FS 28) were analyzed from the Room 1 fill. Carbonized taxa identified in the flotation samples included unidentified pine (*Pinus*), ponderosa pine (*Pinus ponderosa*), and oak (*Quercus*). Taxa identified in the pollen sample included lily family (Liliaceae), sunflower family (Asteraceae), cheno-ams (*Chenopodium/Amaranthus*), grass family (Poaceae), penstemon family (Scrophulariaceae), unidentified pine, piñon pine (*Pinus edulis*), juniper (*Juniperus*), and sagebrush (*Artemisia*).

Floor. No floor or obvious living surface was encountered during the excavation of Room 1. The living surface was estimated to be a few cm above the base of the room's walls. At this level, the soil was fairly indurated and contained small tuff inclusions. This surface was a few cm above the Btb1 horizon. Two features were associated with the Room 1 living surface. The first, Feature 1, was identified as a prehistoric pit that was filled with rocks. This pit was mostly likely an animal burrow. The rocks and fill within the pit appear to have been placed there by the people who constructed and/or utilized the fieldhouse. In all likelihood, the animal burrow postdates the initial construction of the fieldhouse, as it is unlikely that a structure would have been built around a large hole. Instead, the burrow was probably dug while the fieldhouse was temporarily abandoned. When the fieldhouse was reoccupied, the burrow was filled in with rocks and sediment in order to repair the room's living surface.

Feature 2 consists of two small holes located in the northwest quadrant of the room. One of these, located just inside the room's west wall, is most likely a posthole. The other, located 14 cm to the southeast, may or may not have been a second posthole. Flotation samples were taken from two elevations in the northwest quadrant of Room 1 (FS 23 and FS 24). Carbonized taxa identified in these samples included unknown conifer (Gymnospermae), goosefoot (*Chenopodium*), purslane (*Portulaca*), oak (*Quercus*), and maize (*Zea mays*). At least one of these samples is probably at or very near the level of the living surface. Another flotation sample was taken from the approximate elevation of the living surface in the far northeast corner of the room (FS 49). Charred taxa identified in this sample included ponderosa pine wood charcoal. Pollen samples were taken from the approximate elevation of the living surface in the far northwest (FS 35) and far northeast (FS 50) corners of the room. Taxa identified in FS 35 included beeweed (*Cleome*), buckwheat (*Eriogonum*), grass family, cheno-ams, sunflower family, ragweed/bursage (*Ambrosia*), spurge family (Euphorbiaceae), penstemon family, unidentified pine, piñon pine, juniper, Mormon tea (*Ephedra*), and sagebrush. Only sunflower family remains were identified in FS 50.

Wall Construction. The rocks that formed the Room 1 walls are mostly dacite, with a few tuff blocks. The foundation rocks are all dacite, most of which are thin upright slabs (Table 30.5). The foundation slabs are all that remain of the north and east walls. A number of rocks that formed a second course of the south and west walls, and a single rock that formed a third course in the south wall, were encountered *in situ* (Figure 30.4). These rocks are unshaped dacite cobbles. The walls are formed by a single row of rocks in all but the southeast corner of the room. The north, south, and west walls extend for the entire length of the room. In the east wall, there is a gap in the wall that is 95 cm wide. This was most likely the room's entryway. To the north of the entryway, the east wall is composed of three upright slabs. There is also a small, thin, upright rock that extends outward at about a 45 degree angle from the south end of this portion of the east wall. This rock may have functioned as a door jamb, or to mitigate the amount of dust blowing into the room from outside. The southeast corner of the room, unlike the other corners, is not a right angle. Instead, two upright slabs extend outward at about a 45 degree angle from the east end of the south wall. These rocks, which were considered to be part of the east wall, probably had the same function as the similarly angled rock on the north side of the entryway.

Table 30.5. Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.63	0.25–0.31	0.10–0.21	1
South	1.65	0.23–0.39	0.16–0.22	2 to 3
East	1.12 (2.07)	0.18–0.23	0.09–0.17	1
West	2.04	0.22–0.44	0.08–0.34	2

Note: the length of the east wall including the entryway is given in parentheses.

Figure 30.4. South wall of LA 85403.

Judging from the amount of wallfall removed during the excavation of the area in and around Room 1, the masonry portions of the room's walls were originally considerably higher than they were at the time of excavation. In order to estimate the original height of the walls, all of the rocks removed as wallfall during the site's excavation were placed in three stacks, which were then measured. The stacks measured 0.56 by 0.90 by 0.42 m, 0.50 by 0.50 by 0.45 m, and 3.43 by 0.53 by 0.46 m, for a total of approximately 1.16 m^3 of wallfall. Based on this volume of wallfall and the overall length, average thickness, and average height of the extant portions of the walls, the masonry portions of the room's walls were originally approximately 1.33 m high. This is slightly higher than the average wall height calculated for fieldhouses excavated in the Rendija Tract during the Conveyance and Transfer (C&T) Project, excluding those in areas that are naturally rocky. LA 85403, however, is not located in an area with a lot of naturally occurring rocks. This number is therefore probably a fairly accurate reflection of the original height of the masonry portions of the room's walls. The uppermost portions of the walls, as well as the ceiling, were most likely composed of wattle and daub. These materials are rarely preserved at archaeological sites on the Pajarito Plateau. In fact, no adobe was recovered during the excavation of the site.

Room 1 Features

Feature 1 (Prehistoric Pit)

Feature 1 was a prehistoric pit filled with rocks and sediment. The feature first appeared as a cluster of five dacite rocks at or just below the estimated level of the Room 1 living surface (Figures 30.5 and 30.6).

Figure 30.5. Features 1 and 2 in Room 1.

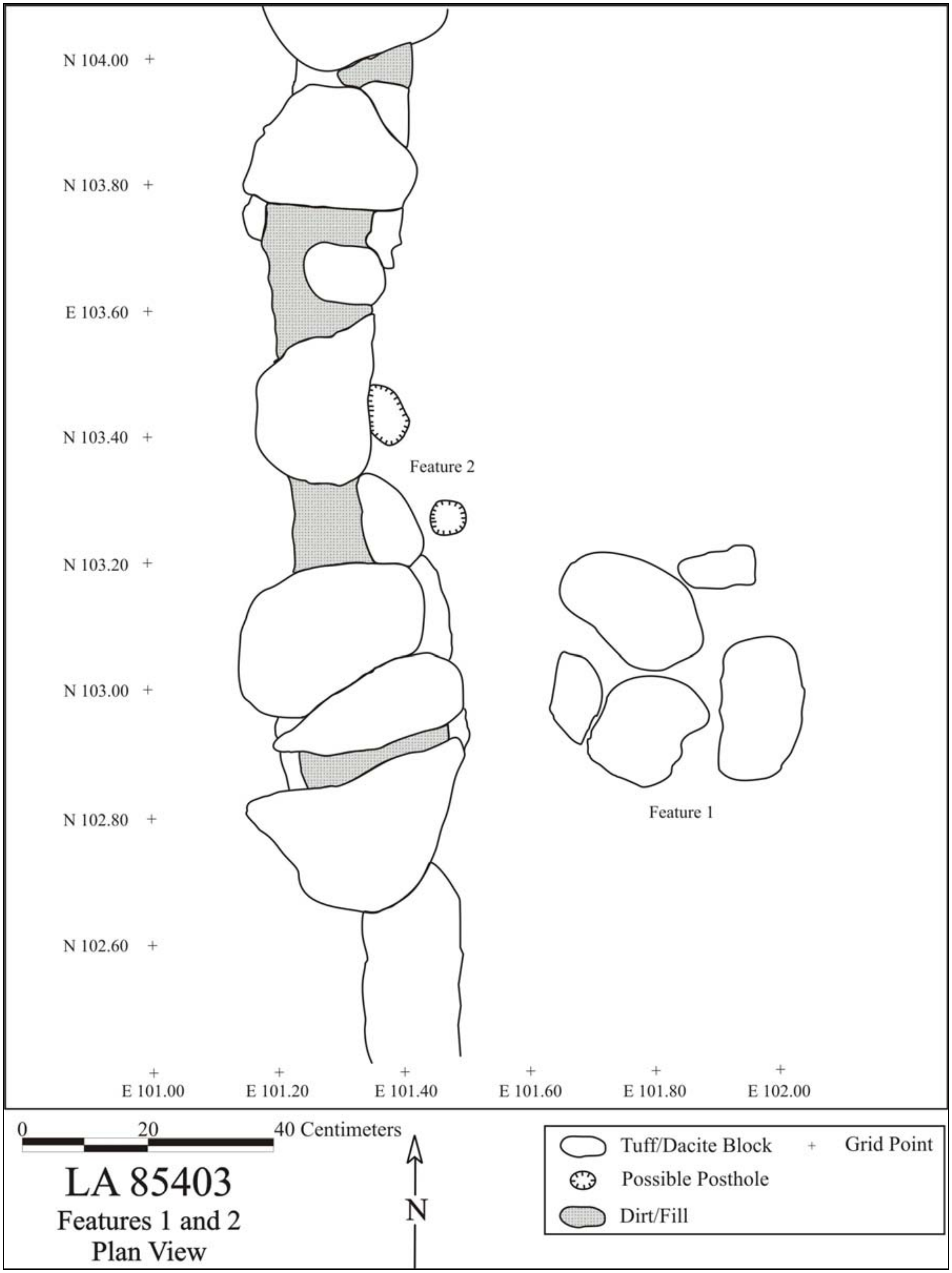

Figure 30.6. Plan view drawings of Features 1 and 2.

The dacite rocks were located in the west-central portion of the room, directly inside the room's west wall. No ash or charcoal was visible in the vicinity of the feature, and the rocks did not appear to have been burned. As a result, the feature did not appear to have been a hearth. The rocks were removed to determine their function. During the excavation of the feature, a sixth rock was encountered below the rocks visible at the presumed living surface. Compact sediment similar to the Room 1 post-occupational fill was encountered between the rocks. Beneath the rocks, a large animal burrow was encountered (Figure 30.7). The burrow was filled with soil that was considerably softer and looser than the sediment between the rocks. The rocks and fill within the pit appear to have been placed there by the people who constructed and/or utilized the fieldhouse. In all likelihood, the animal burrow postdates the initial construction of the fieldhouse, as it is unlikely that the structure would have been built around a large hole. Instead, the burrow was probably dug while the fieldhouse was temporarily abandoned. When the fieldhouse was reoccupied, the burrow was filled in with rocks and sediment in order to repair the room's living surface

Figure 30.7. Feature 1 after excavation.

Much of the sediment removed during the excavation of Feature 1 was retained as a flotation sample (FS 53). Charred taxa identified in this sample included unknown conifer, ponderosa pine, and maize. In addition, a pollen sample (FS 54) was taken from directly beneath one of the rocks in the feature. Taxa identified in this sample included beeweed, grass family, cheno-ams, sunflower family, penstemon family, unidentified pine, piñon pine, oak, Mormon tea, and sagebrush.

Feature 2 (Posthole)

Feature 2 consists of two small holes located in the northwest quadrant of Room 1 (see Figures 30.2 and 30.5). The first hole is located just inside the room's west wall, 26 cm northwest of Feature 1. The interior walls of the hole were vertical and highly compact, indicating that it was most likely a posthole. It measured 9 cm north-south by 7 cm east-west and was approximately 15 cm deep. A pollen sample (FS 51) was taken of the fill removed from the posthole. Taxa identified in this sample included knotweed (*Polygonum*), grass family, cheno-ams, spurge family, fir (*Abies*), unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush. Pine aggregates were also identified. The second small hole was located 14 cm to the southeast of the first. The interior walls of this hole were irregular and unconsolidated. It was therefore most likely a rodent burrow or root disturbance rather than a second posthole.

Geological Analysis

Geologists Paul Drakos and Steven Reneau utilized two profiles to reconstruct the natural soil horizons at the site (see Tables 30.2 and 30.3). The upper strata were described from the west profile of 102N/100E. This profile contained a soil sequence consisting of an A horizon (topsoil), a Bw horizon (a late-Holocene soil), and a Bwb1 horizon (an early/middle-Holocene soil). The lower strata were described from the west profile of the geological test pit. The geological test pit was located in the southern half of that portion of 102N/101E that is within Room 1. It consists of the interior face of the west wall of Room 1 and below. The profile contained a soil sequence consisting of the Bwb1 horizon encountered in the first profile on top of a Btb1 horizon (another early/middle-Holocene soil).

Artifact Distribution

Few artifacts were recovered from LA 85403. Nevertheless, there is a noticeable pattern in the artifact distribution at the site (Table 30.6).

Table 30.6. Artifact counts by grid unit.

	E100	E101	E102	E103	E104
N104	1	**4**	**1**	**1**	1
N103	0	**2**	**1**	**2**	5
N102	0	**3**	**4**	**1**	2
N101	0	0	1	3	2

Note: bold numbers indicate grid units that are located completely or partially within Room 1.

Most of the artifacts were recovered from within Room 1 or to the east of the room. A significant number of artifacts were also recovered from the grid units to the north of the room. Most of these, however, came from a single grid unit (104N/101E). Only a single artifact was recovered from the grid units to the west of the room. The three westernmost grid units to the south of the room also contained only a single artifact. The concentration of artifacts to the east of the fieldhouse most likely reflects an outdoor activity area, the sweeping of artifacts through the entryway in the east wall by the site's occupants, or both. Within the sample of fieldhouses in the Rendija Tract excavated during the C&T Project, there is a strong tendency for activity areas, reflected in a higher concentration of artifacts, to be located to the east.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 33 artifacts were analyzed from excavations at LA 85403. Analyses of the ceramics, lithics (chipped and ground stone), archaeobotanical, and pollen materials were conducted (Table 30.7). The results of these analyses, as well as associated tables, are presented in the following pages.

Table 30.7. Samples selected for analysis from LA 85403.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2	23, 24, 27, 49, 53	28, 35, 50, 54	53	
3		51		
4				

*thermoluminescence

Chronology

Radiocarbon Dating

A single maize sample was submitted for accelerator mass spectroscopy dating. The sample provided a date of 310±40 BP (Beta-215549), with a calibrated intercept of AD 1530 and a two-sigma range of AD 1470 to 1660. The sample was recovered from a flotation sample taken from Stratum 2.

Ceramic Artifacts (Dean Wilson)

Seven sherds were recovered from the fieldhouse. These consist primarily of utilitywares, with a single undifferentiated whiteware. Tables 30.8 through 30.11 show the summary ceramic data for the site, including general type, types by tradition, temper material by ware type, and ware by vessel form. All of the graywares and the whiteware sherd are made from local anthill sand or tuff temper, whereas, the micaceous ware sherd is made from non-local granite with mica. All of the graywares and the micaceous sherd represent jar vessel form, in contrast to the whiteware sherd, which is from a bowl.

Table 30.8. Distribution of ceramics types from LA 85403.

Ceramic Types	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	1	14.3
Northern Rio Grande Utilityware		
Plain gray body	1	14.3
Indented Corrugated	1	14.3
Smeared-indented corrugated	4	57.1
Total	**7**	**100.0**

Table 30.9. Tradition by ware for LA 85403 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	5	100.0	1	100.0	0	0.0	0	100.0	6	85.8
Rio Grande (Tewa Micaceous)	0	0.0	0	0.0	0	0.0	1	0.0	1	14.2
Middle Rio Grande	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	**5**	**100.0**	**1**	**100.0**	**0**	**0.0**	**0**	**0.0**	**7**	**100.0**

Table 30.10. Temper by ware for LA 85403 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	0	0.0	1	100.0	0	0.0	0	0.0	1	14.2
Granite with mica	0	0.0	0	0.0	0	0.0	1	100.0	1	14.2
Smeared-indented sand	5	100.0	0	0.0	0	0.0	0	0.0	5	71.4
Total	**5**	**100.0**	**1**	**100.0**	**0**	**0.0**	**0**	**100.0**	**7**	**100.0**

Table 30.11. Vessel form by ware for LA 85403 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Bowl body	0	0.0	1	100.0	0	0.0	0	0.0	1	14.2
Jar body	5	100.0	0	0.0	0	0.0	1	100.0	6	85.8
Total	**5**	**100.0**	**1**	**100.0**	**0**	**0.0**	**1**	**100.0**	**7**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

Twenty-six lithic artifacts were analyzed from LA 85403. This assemblage consisted of four cores, 17 pieces of debitage, two retouched tools, and three ground stone artifacts. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 30.12 presents the data on lithic artifact type by material type. The debitage is made of chalcedony, Pedernal chert, obsidian, and andesite. The presence of cortex on 11.7 percent of the debitage indicates that these materials were collected from waterworn (*n* = 2) sources. The chalcedony, Pedernal chert, and possibly the greenstone are all available from local Rio Grande Valley gravels and the obsidian from the nearby sources in the Jemez Mountains. Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the Pajarito Plateau. Three pieces of basalt debitage were submitted for X-ray fluorescence analysis. Two of these were identified as basalt and the other as dacite.

Table 30.12. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	**Vesic. basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Sil. wood**	**Quartzite**	**Greenstone**	**Total**
Cores	Core	1	0	0	0	0	0	0	1	0	2	0	0	0	4
	Subtotal	1	0	0	0	0	0	0	1	0	2	0	0	0	4
Debitage	Angular debris	0	0	1	0	0	0	0	1	0	3	0	0	0	5
	Core flake	3	0	0	2	0	0	0	4	0	0	0	0	0	10
	Biface flake	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Microdebitage	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Subtotal	3	0	1	2	0	0	1	5	0	5	0	0	0	17
Retouched Tools	Retouched piece	0	0	0	1	0	0	0	1	0	0	0	0	0	2
	Subtotal	0	0	0	1	0	0	1	1	0	0	0	0	0	2
Ground Stone	Undetermined mano	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Miscellaneous ground stone	0	0	0	0	2	0	0	0	0	0	0	0	0	2
	Subtotal	0	0	0	0	2	0	0	0	0	0	0	0	1	3
Total		**4**	**0**	**1**	**3**	**2**	**0**	**1**	**7**	**0**	**7**	**0**	**0**	**1**	**26**

Lithic Reduction

The four cores were reduced using a bi-directional/bifacial, bi-directional/opposed-same-face, and multi-directional/opposed-same-and-different-face technique. Two of the cores were fragments that were discarded due to material flaws, whereas the other two cores were classified as still useable. Table 30.13 presents the metric information on these cores.

Table 30.13. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Bi-directional	61	59	29	93.0
Bi-directional	68	55	29	135.2

Core Type	Length	Width	Thickness	Weight
Bi-directional	46	85	62	237.9
Multi-directional	83	54	50	257.2

The debitage primarily consists of core flakes and angular debris, with a biface flake and a piece of microdebitage. The overall cortical:non-cortical ratio of 0.10 reflects an emphasis on the later stages of core reduction. The flakes exhibit single-faceted (n = 3), collapsed (n = 1), and crushed (n = 2) platforms. Two of the flake platforms exhibit evidence of preparation as they are both ground. Most of the core flakes consist of distal fragments (n = 5), with fewer whole (n = 1), proximal (n = 3), and midsection (n = 1) fragments. The single whole core flake has a mean length of 27.0 mm and the angular debris a mean weight of 8.78 g (*std* = 5.6).

The retouched tools consist of two retouched flakes. One of these is a large flake with unidirectional dorsal retouch along the distal end with an angle of 85 degrees. The other also exhibits unidirectional retouch, but along two lateral edges with angles of 70 degrees. These edges are slightly serrated in outline.

Tool Use

None of the flakes and only one of the retouched tools exhibit any obvious evidence of edge damage that could be attributed to use. The retouched tool exhibits a slightly serrated edge with rounding and scarring.

Three ground stone artifacts were identified during the analysis. The undetermined mano fragment consists of a piece of greenstone with two opposing surfaces that are slightly ground. The undetermined ground stone items consist of two tabular pieces of dacite that refit together. The edges have been shaped and the artifacts could represent a ceramic jar lid.

Archaeobotanical Remains (Pamela McBride)

Maize cupules, a possible goosefoot seed fragment, a purslane seed, pine bark, and an unidentifiable plant part comprised the cultural plant material recovered from this one-room masonry fieldhouse (Table 30.14). Maize could have been grown near the fieldhouse that was located on a relatively flat, open area along the south side of Rendija Canyon. Pine bark is most likely part of the firewood residue. The goosefoot seed fragment and purslane seed may indicate use of these weedy annual plants that proliferate in agricultural fields. Local woods were used as fuel and included oak, ponderosa pine, and unknown conifer (Table 30.15).

Table 30.14. Flotation plant remains, count, and abundance per liter from LA 85403.

FS No.	18	23	24	27	53
Feature	Ash/charcoal area in fill	Room 1 westernmost portion, floor		Ash/charcoal area	Fea. 1, Pit fill
Cultural					
Annuals					

FS No.	18	23	24	27	53
cf. Goosefoot		1(0)			
Purslane		1(1)			
Cultivars					
Maize			1(0) cf. c		5(0) c
Other					
Unidentifiable					1(0) pp
Perennials					
Pine				+ barkscale	
Non-Cultural					
Annuals					
Goosefoot	+			+	+
Purslane	+				
Grasses					
Dropseed grass				+	
Grass family				+	
Other					
Composite family				+	
Groundcherry					+
Spurge				+	
Perennials					
cf. Dock	+			+	
Hedgehog cactus					+
Pine				+	
Ponderosa pine	+ needle			+ fascicle, + needle	

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + = 1-10/liter, c = cupule, cf. = compares favorably, pp = plant part.

Table 30.15. Flotation sample wood charcoal by count and weight in grams.

FS No.	23	24	27	49	53
Feature	Room 1 westernmost portion, floor		Ash/ charcoal area	Far NE corner, Room 1, floor	Fea. 1, Pit fill
Conifers					
Ponderosa pine			1/<0.1 g	3/0.1 g	6/0.1 g
Unknown conifer	1/<0.1 g	1/<0.1 g			4/0.1 g
Non-Conifers					
Oak		1/<0.1 g	3/0.1 g		
Totals	**1/<0.1 g**	**2/<0.1 g**	**4/0.1 g**	**3/0.1 g**	**10/0.2 g**

Pollen Remains (Susan Smith)

Five pollen samples were analyzed from LA 85403. Table 30.16 lists the frequency of identified pollen types. No cultigens were identified in the assemblage. Economic resources identified in the assemblage included only beeweed and lily family, which includes yucca, wild onion, sego lily, and others. A number of potential economic resources were also identified in the assemblage (Table 30.16), and these are described in detail in Smith's chapter in Volume 3 (Chapter 63).

Table 30.16. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85403 (*n* = 5)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	0
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	2
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	1
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	0
	Eriogonum	Buckwheat	1
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	1
	Plantago	Plantain	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85403 (*n* = 5)
	Polygala type	Milkwort	0
	Poaceae	Grass Family	4
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs and Possible Subsistence Resources	Cheno-Am	Cheno-Am	4
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	5
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	1
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	2
	Scrophulariaceae	Penstemon Family	3
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85403 (*n* = 5)
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Potential Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	0
	Abies	Fir	1
	Pinus	Pine	4
		Pine Aggregates	1
	Pinus edulis type	Piñon	4
	Juniperus	Juniper	4
		Juniper Aggregates	0
	Quercus	Oak	1
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	3
	Artemisia	Sagebrush	4
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 85403 is a one-room Classic period fieldhouse that was constructed from both shaped and unshaped tuff blocks. The site is located on a south terrace in Rendija Canyon, about 75 m west of the Los Alamos Sportsmen's Club archery range. Burned maize cupules were recovered during the site excavation, therefore, the one-room structure was presumably occupied during the growing season. Dated maize remains indicate the site was occupied circa AD 1530, during the Late Classic.

CHAPTER 31
RENDIJA TRACT (A-14): LA 85404

Gregory D. Lockard

INTRODUCTION

LA 85404 consists of one-room Classic period fieldhouse located to the northwest of an intermittent drainage. The site is located on the Los Alamos Sportsmen's Club archery range, approximately 20 m south of Rendija Road. Vegetation around the site consists of ponderosa pine and juniper woodland with a grass understory. The site is situated at an elevation of 2120 m (6954 ft).

LA 85404 was first recorded on August 15, 1991, by David Hill (1991) during a survey for the Bason Land Exchange Project. According to Hill, the site consisted of three rock features. Feature 1 is a rectangular outline of unshaped tuff blocks that is 4.3 by 5 m in area. Hill believed it was a fieldhouse. Feature 2 was identified as a linear arrangement of unshaped tuff cobbles that measured 2.5 by 13 m in area. Due to the fact that the feature was oriented parallel rather than perpendicular to the surrounding slope, Hill believed it was a structure rather than an agricultural terrace. Feature 3 measured 4 by 3.5 m in area and was believed to be a fieldhouse. Surface artifacts recorded by Hill included obsidian and a heat-treated chalcedony flake. Three sherds (an unpainted Biscuitware sherd, a Wiyo Black-on-white sherd, and a Santa Fe Black-on-white sherd) were also recorded.

In April of 1999, the site was re-recorded and given the temporary site number of Q194. Only Hill's Feature 3 was recorded at this time. Due to the fact that the site was covered with a thick layer of pine duff, no artifacts were observed on the surface. The other features at the site may not have been visible for the same reason. Los Alamos National Laboratory personnel believed that the feature that they did record was a one-room fieldhouse. During the Conveyance and Transfer Project, this was the only feature excavated at LA 85404.

FIELD METHODS

Before excavation, the site and surrounding area were cleared of trees and large undergrowth. The site was then visible as a small rubble mound approximately 4 by 3.5 m in area. An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the southwest corner of the site. The site was then covered with a 1- by 1-m grid that extended 6 m north and 5 m east of the site datum. Three subdata (A-C) were set up for taking elevations. The site was then photographed before excavation (Figure 31.1). A surface collection was attempted, however no artifacts were observed on the surface. A 5- by 1-m east-west trench (103N/100-104E) was initially excavated across the remains of the structure. The purpose of this trench was to expose a profile of the site stratigraphy, as well as to determine the location of the room's east and west walls. Units were excavated by strata, and thicker strata were excavated in arbitrary

10-cm levels. The room's west wall was encountered in 103N/101E, and the east wall in 103N/103E. No living surface was encountered in the trench.

Figure 31.1. LA 85404 before excavation.

Excavation of the trench units continued until a sterile Pleistocene soil (i.e., the Btb1 horizon) was reached. After the excavation of the trench units, the north profile of the trench was drawn and photographed. The north profile of 103N/102E was also examined by geologists Paul Drakos and Steven Reneau at this time. The rest of the site was subsequently excavated, again by strata and arbitrary levels for thicker strata. In all, 23 units were excavated. A patch of burned floor was encountered in the northeast corner of the room (within units 104N/102-103E). The patch of floor measured approximately 45 by 50 cm and was located directly on top of the Btb1 horizon. No floor was encountered in any other portion of the room. As a result, excavation of these areas terminated at the top of the Btb1 horizon. The excavation of areas outside the structure also terminated at the top of this soil horizon. Excavation focused on defining the room's walls, removing wallfall, and locating features. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended at least 1 m beyond the structure in all directions to locate external features and/or outdoor activity areas. The structure was then mapped (Figure 31.2) and photographed (Figure 31.3).

The excavation of the site was supervised by Greg Lockard. The field crew included Brad Vierra, Joseph (Woody) Aguilar, Jennifer Nisengard, and Bettina Kuru'es. Timothy Martinez and Aaron Gonzalez served as site monitors from San Ildefonso Pueblo and as screeners.

Michael Chavarria was the site monitor representing Santa Clara Pueblo, as well as an additional screener.

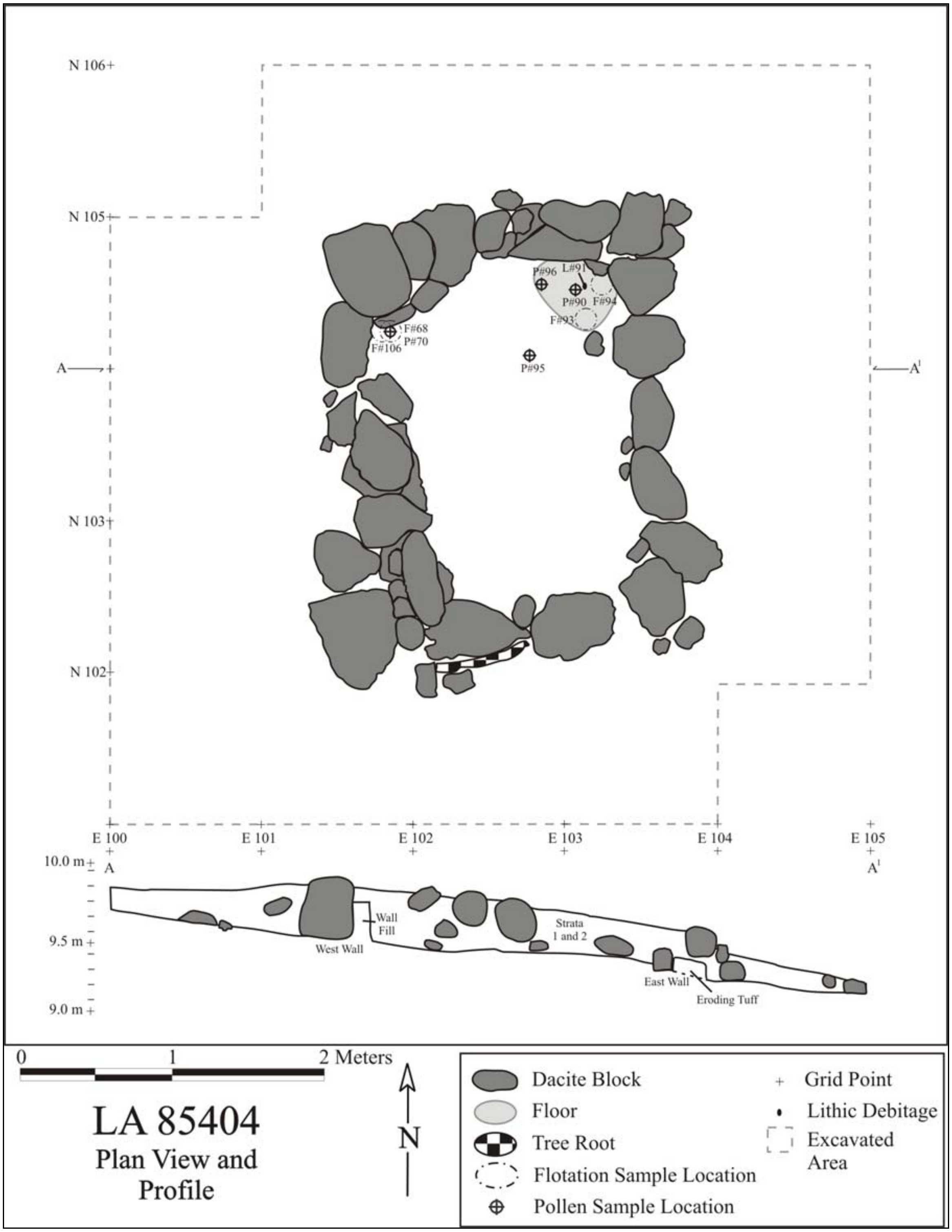

Figure 31.2. Plan view and profile views of LA 85404.

Figure 31.3. Post-excavation photograph of LA 85404.

STRATIGRAPHY

Stratum 1 is composed of loose, surface sediment. It is uniformly 1 to 7 cm thick across the site, and is more or less equivalent to the A horizon (topsoil). Stratum 2 is post-occupational fill, and ranges from 10 to 35 cm in thickness. The post-occupational fill was thickest on either side of the west wall of Room 1, and thinned to the southeast (i.e., downhill). Stratum 2 is more or less equivalent to the Bw horizon. Stratum 3 is the patch of burned floor encountered in the northeast corner of Room 1. Tables 31.1, 31.2, 31.3, and 31.4 describe the stratigraphy and summarize artifact counts from LA 85404.

Table 31.1. LA 85404 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 4/3	Sandy loam	1–7	Surface sediment
2	10YR 5/3	Sandy loam	10–35	Post-occupational fill
3	10YR 6/4	Clay	-	Room 1 floor

Table 31.2. LA 85404 soil horizon descriptions from the north profile of 103N/102E.

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 4/3	Sandy loam	0–9	Topsoil
Bw1	10YR 5/3	Sandy loam	9–21	Late-Holocene soil
Bw2	10YR 5/3	Sandy clay loam	21–30+	Late-Holocene/reworked Pleistocene soil

Table 31.3. LA 85404 soil horizon descriptions from the west profile of 102N/100E.

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 5/3	Sandy loam	0–6	Topsoil
Bw	10YR 4/3	Sandy loam	6–12	Late-Holocene soil
Btb1	7.5YR 3/4	Sandy clay loam	12–40+	Pleistocene soil

Table 31.4. LA 85404 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	0	0	0	0	**0**
1	13	3	1	0	**17**
2	189	64	0	1	**254**
3	0	1	0	0	**1**
Total	**202**	**68**	**1**	**1**	**272**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a small, rectangular structure that probably functioned as a fieldhouse. The room measures 2.25 m in length (north-south) by 1.70 m in width (east-west), with approximately 3.83 m^2 of interior space. Excavation of the room began with an east-west trench that extended across the room (103N/100-104E). The excavation of this trench served to define the room's stratigraphy, as well as to locate the room's west and south walls. The west wall was encountered in 103N/101E, and the east wall in 103N/103E. No living surface was encountered in the trench. As a result, the excavation of the trench units continued until a sterile Pleistocene soil (the Btb1 horizon) was reached. After the excavation of the trench, the rest of the room was excavated. A patch of burned floor was encountered in the northeast corner of the room (104N/102-103E). The floor is located directly on top of the Btb1 horizon. No floor was encountered anywhere else within the room. Excavation in these areas therefore terminated at the top of the Btb1 horizon.

Fill. The interior of Room 1 was filled with 3 to 6 cm of surface sediment on top of 30 to 35 cm of post-occupational fill. One flotation sample (Field Specimen [FS] 72) and one pollen sample (FS 73) were analyzed from the Room 1 fill. Carbonized taxa identified in the flotation sample included unidentified pine (*Pinus*), piñon pine (*Pinus edulis*), ponderosa pine (*Pinus ponderosa*), sagebrush (*Artemisia*), and unknown conifer (Gymnospermae). Taxa identified in the pollen sample included squash (*Cucurbita*), cheno-ams (*Chenopodium/Amaranthus*), grass family (Poaceae), sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), penstemon family (Scrophulariaceae), unidentified pine, piñon pine, juniper (*Juniperus*), Mormon tea (*Ephedra*), and sagebrush. Grass aggregates were also identified.

Floor. A patch of burned floor was encountered in the northeast corner of the room (in units 104N/102-103E) (Figure 31.4). The patch of floor measures approximately 45 cm north-south by 50 cm east-west. The floor is located directly on top of the Btb1 horizon, indicating that the people who constructed the room first cleared the area of loose surface soil to expose the considerably more compact Btb1 horizon. This compact surface was then used as a foundation for the room's floor. The floor itself was composed of a thin (1 to 2 cm) layer of highly compacted clay-rich mud. The floor appears to have been smoothed but not plastered. No floor was encountered in the rest of the room. In these areas, excavation terminated at the top of the Btb1 horizon. The surface was slightly burned in much of the northern half of the room.

Figure 31.4. A patch of burned floor in Room 1.

A single flake (FS 91) was the only artifact encountered on the patch of floor. A pollen sample was scraped from the surface of this floor (FS 90), and identified taxa included maize (*Zea mays*), buckwheat (Eriogonum), grass family, cheno-ams, sunflower family, ragweed/bursage, spurge family, penstemon family, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush. Grass aggregates were also identified. Another pollen sample (FS 96) was taken from directly beneath a rock lying on the floor, and identified taxa included grass family, cheno-ams, sunflower family, piñon pine, juniper, and sagebrush. The majority of the floor was removed and kept as two flotation samples (FS 93 and FS 94). Carbonized taxa identified in these samples included piñon pine, ponderosa pine, oak, unknown conifer, Douglas fir (*Pseudotsuga mensiezii*), sagebrush, groundcherry (*Physalis*), and goosefoot (*Chenopodium*). Uncharred tobacco (*Nicotiana*) was also identified in both samples. Two flotation samples (FS 68 and FS 106) and a pollen sample (FS 70) were taken from around floor level in the northwest corner of the room. Charred taxa identified in the flotation samples included unidentified pine, piñon pine, ponderosa pine, maize, and unknown conifer. Taxa identified in the pollen sample from the northwest corner of the room included squash, grass family, cheno-ams, sunflower family, ragweed/bursage, penstemon family, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush. A pollen sample (FS 95) was also taken from on top of the burned surface of the Btb1 horizon in the north-central portion of the room. Taxa identified in this sample included maize, cheno-ams, grass family, sunflower family, penstemon family, unidentified pine, piñon pine, and sagebrush.

Wall Construction. The Room 1 walls were constructed of dacite rocks. Most of the rocks were irregular in shape. Some of the rocks, however, had flat surfaces that were used to form the interior faces of the room's walls. The cobbles varied considerably in size, ranging from fist-sized cobbles to very large rocks. Some of the rocks were in fact so large that they would have been difficult to transport long distances by hand. There are abundant naturally-occurring dacite cobbles, however, in the drainage located a few m to the south and east of the site. In all likelihood, the drainage was mined for the rocks used to construct the room. Most of the foundation rocks were placed in shallow trenches dug into the Btb1 horizon. The larger rocks, however, appear to have been placed directly on top of or even a few cm above the Btb1 horizon. Presumably, these rocks were deemed heavy enough to be stable without being placed in a trench.

In some locations, small dacite cobbles were encountered just inside the interior wall faces. These rocks probably functioned as a foundation for floor coping. No entryway into the room was discovered. All four walls extended the entire length of the room and had a minimum height of 10 cm or greater (Table 31.5). Assuming the entryway was in one of the room's walls rather than its ceiling, it likely had a door sill of considerable height. Three tuff blocks were recovered during the excavation of the site. All three were found just above floor level within the room. These rocks were probably part of one of the higher courses of masonry in the room's walls. A flat dacite cobble was also encountered just above floor level within the room. There was no use wear visible on any of its surfaces, so it does not appear to have been a metate. This rock probably also represents wallfall. If not, it is of unknown function.

Table 31.5. LA 85404 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.76	0.19–0.53	0.33–0.57	1 to 2
South	1.40	0.10–0.24	0.16–0.43	1
East	1.99	0.13–0.28	0.12–0.40	1
West	2.00	0.30–0.50	0.23–0.50	1 to 2

Judging from the amount of wallfall removed during the excavation of the area in and around Room 1, the masonry portions of the room's walls were originally considerably higher than they were at the time of excavation. In order to estimate the original height of the walls, all of the rocks removed as wallfall during the site's excavation were placed in two stacks, which were then measured. The stacks measured 1.50 by 1.60 by 0.65 m and 0.90 by 1.00 by 0.65 m, for a total of approximately 2.15 m^3 of wallfall. Based on this volume and the overall length, average thickness, and average height of the extant portions of the walls, the masonry portions of the room's walls were originally approximately 1.16 m high. The uppermost portions of the walls, as well as the ceiling, were most likely composed of wattle and daub. These materials are rarely preserved at archaeological sites on the Pajarito Plateau. In fact, no adobe was recovered during the excavation of the site.

Geological Analysis

Geologists Paul Drakos and Steven Reneau utilized two profiles to reconstruct the natural soil horizons at the site (see Tables 30.2 and 30.3). The first, the north profile of 103N/102E, was examined after the excavation of the east-west trench and before the excavation of the rest of the site. This profile contained a soil sequence consisting of an A horizon (topsoil) on top of two Bw horizons. The upper Bw1 horizon is a late-Holocene soil. The lower Bw2 horizon is a mixture of the late-Holocene soil in the Bw1 horizon and a reworked Pleistocene soil. This horizon probably represents the disturbed remains of the Room 1 floor mixed with post-occupational fill. The second profile examined was the west profile of 102N/100E. This profile contained a soil sequence consisting of an A horizon (topsoil), a Bw horizon (a late-Holocene soil), and a Btb1 horizon (a Pleistocene soil).

Artifact Distribution

Most of the artifacts at LA 85404 were recovered from within, to the north, and to the west of Room 1 (Table 31.6). The grid unit with the highest number of artifacts is 103N/102E, located in the center of the room. The grid unit with the second highest number of artifacts is 105N/102E, located directly north of the room. Few artifacts were recovered from the grid units to the east and south of the room, with the exception of grid unit 101N/102E, which contained 14 artifacts. This pattern of artifact distribution is probably largely the result of natural site formation processes. The site's natural surface slopes downward to the southeast. Normally, artifact density is higher in the downhill portion of a site. The fieldhouse, however, is located near the edge of a small, eroding ridge. The ridge is bounded to the south and east by an incised drainage. Many of the artifacts to the south and east of Room 1 may therefore have eroded downhill into the drainage. For this reason, it is impossible to determine whether the higher concentration of artifacts to the north and west of the room is culturally significant. The artifact distribution at the site therefore does not provide any reliable evidence concerning the location of outdoor activity areas and/or the room's entryway.

Table 31.6. LA 85404 artifact counts by grid unit.

	E100	E101	E102	E103	E104
N105		9	38	7	5
N104	8	**12**	**27**	**11**	7
N103	25	**7**	**44**	**14**	5
N102	20	6	**6**	**5**	1
N101	0	1	14	0	

Note: bold numbers indicate grid units that are located completely or partially within Room 1.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 265 artifacts were analyzed from the excavations conducted at LA 85404. In addition, flotation and pollen samples (Table 31.7) were selected for analysis from the post-occupation fill (Stratum 2) and the floor (Stratum 3). The results of the artifact and sample analyses are presented in the following sections. A maize sample was submitted for radiocarbon dating.

Table 31.7. Samples selected for analysis from LA 85404.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2	68, 72, 93, 94, 106	73, 95, 96	68	
3		90		

*thermoluminescence

Chronology

Radiocarbon Dating

A single maize sample was submitted for accelerator mass spectroscopy dating. The sample provided a date of 400±40 BP (Beta-215550), with a calibrated intercept of AD 1460 and a two-sigma range of AD 1440 to 1500. The sample was recovered from a flotation sample taken from Stratum 2.

Thermoluminescence Dating

A sample of burned floor (UW 1586, FS 92) was dated from this site. It yielded an age of AD 1388±49.

Ceramic Artifacts (Dean Wilson)

A total of 199 ceramics were analyzed from LA 85404. The majority of the pottery consists of smeared-indented corrugated, glazewares, and Biscuit A (Abiquiu Black-on-gray), which presumably reflects an Early Classic period occupation (Table 31.8). These dates indicate a 14th century occupation for the site, which contradicts the 15th century radiocarbon date. Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 31.8 through 31.11. The graywares and whitewares appear to have been locally made from smeared-indented sand or tuff, in contrast to Sapawe Micaceous wares, which contained a non-local micaceous temper and the glazewares with basalt. All of the grayware and micaceous ceramics consist of jar vessel forms; however, the whitewares include mostly bowls, with some jars, while the glazewares contain mostly jars and some bowls.

Table 31.8. Ceramic types from LA 85404.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	13	6.5
Santa Fe Black-on-white	17	8.5
Biscuit paint and slip absent	4	2.0
Biscuit A	8	4.0
Biscuit B/C body	1	0.5
Northern Rio Grande Utilityware		
Plain gray body	6	3.0
Indented corrugated	1	0.5
Smeared-indented corrugated	106	53.3
Sapawe Micaceous	9	4.5
Middle Rio Grande Glazeware		
Glaze red body unpainted	30	15.1
Glaze yellow body unpainted	2	1.0
Glaze unslipped body	1	0.5
Glaze yellow body undifferentiated	1	0.5
Total	**199**	**100.0**

Table 31.9. Tradition by ware for LA 85404 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	113	100.0	42	100.0	0	0.0	0	100.0	155	77.8

Rio Grande (Tewa Micaceous)	0	0.0	1	0.0	0	0.0	9	100.0	10	5.0
Middle Rio Grande	0	0.0	0	0.0	34	0.0	0	100.0	34	17.0
Total	**113**	**100.0**	**43**	**100.0**	**34**	**0.0**	**9**	**0.0**	**199**	**100.0**

Table 31.10. Temper by ware for LA 85404 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Fine tuff or ash	0	0.0	39	90.6	0	0.0	0	0.0	39	19.5
Fine tuff and sand	0	0.0	2	4.6	0	0.0	0	0.0	2	1.0
Smeared-indented sand	113	100.0	0	0.0	0	0.0	0	0.0	113	66.8
Mica and tuff	0	0.0	1	2.3	0	0.0	0	0.0	1	0.5
Basalt	0	0.0	0	0.0	34	100.0	0	0.0	34	17.0
Sapawe Micaceous temper	0	0.0	0	0.0	0	0.0	9	100.0	9	4.5
Total	**113**	**100.0**	**43**	**100.0**	**34**	**0.0**	**9**	**100.0**	**199**	**100.0**

Table 31.11. Vessel form by ware for LA 85404 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	1	0.8	3	6.9	2	5.8	0	0.0	6	3.0
Bowl rim	0	0.0	7	16.2	0	0.0	0	0.0	7	3.5
Bowl body	0	0.0	27	23.8	1	2.9	0	0.0	28	14.0
Jar neck	6	5.3	0	0.0	2	5.8	1	11.1	9	4.5
Jar rim	3	2.6	1	2.3	1	2.9	0	0.0	5	2.5
Jar body	103	91.1	3	6.9	21	61.7	8	88.8	135	67.8
Seed jar	0	0.0	0	0.0	7	20.5	0	0.0	7	3.5
Gourd dipper	0	0.0	1	2.3	0	0.0	0	0.0	1	0.5
Miniature jar	0	0.0	1	2.3	0	0.0	0	0.0	1	0.5
Total	**113**	**100.0**	**43**	**100.0**	**34**	**0.0**	**9**	**100.0**	**199**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 66 artifacts were analyzed from LA 85404. The lithic assemblage consisted of one core, 59 pieces of debitage, five retouched tools, and one hammerstone, which represents a 100 percent sample of the recovered lithic artifacts. Table 31.12 presents the data on lithic artifact type by material type. The debitage assemblage is comprised of chalcedony, Pedernal chert, obsidian, and rhyolite. The presence of cortex on 15.2 percent of the debitage indicates that these materials were collected from waterworn (n = 9) sources. The chalcedony and Pedernal chert are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the Pajarito Plateau.

Table 31.12. Lithic artifact type by material type.

Artifact Type		Basalt	Vesic. basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. wood	Quartzite	Sandstone	Total
Cores	Core	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Debitage	Angular debris	0	0	1	0	0	0	3	13	0	4	0	0	0	21
	Core flake	1	0	6	1	0	0	2	14	1	9	0	0	0	34
	Biface flake	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Microdebitage	0	0	0	0	0	0	2	0	0	0	0	0	0	2
	Und. flake	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Subtotal	1	0	7	1	0	0	8	28	1	13	0	0	0	59
Retouched Tools	Retouched piece	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Projectile point	0	0	0	0	0	0	1	0	0	1	0	0	0	2
	Scraper	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Uniface	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Subtotal	0	0	0	0	0	0	1	1	0	3	0	0	0	5
Other	Hammerstone	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Subtotal	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Total		**1**	**0**	**7**	**1**	**0**	**0**	**9**	**29**	**1**	**17**	**0**	**1**	**0**	**66**

Three pieces of obsidian and one piece of basalt debitage were submitted for X-ray fluorescence analysis. All of these artifacts were obtained from the Valle Grande source (Table 31.13). The Valle Grande (Cerro del Medio) source area is located about 17 km (11 mi) as the “crow flies” to the west of the site. In addition, the single basalt flake is actually dacite.

Table 31.13. Obsidian source samples.

FS #	Artifact	Color	Source
6	Point	Translucent	Valle Grande rhyolite
30	Debitage	Translucent	Valle Grande rhyolite
79	Debitage	Translucent	Valle Grande rhyolite

Lithic Reduction

The single core was reduced using a multi-directional/opposed-same-and-different-face technique. The core was classified as still useable when discarded. Table 31.14 presents the metric information on this core.

Table 31.14. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Multi-directional	59	53	31	115.5

The debitage consisted primarily of core flakes and angular debris, a biface flake, microdebitage, and an undetermined flake fragment also present. The overall cortical:non-cortical ratio of 0.33 reflects an emphasis on the later stages of core reduction. The flakes mostly have single-faceted (*n* = 13) platforms with fewer cortical (*n* = 3) platforms. None of the platforms exhibit any evidence of preparation. The majority of the core flakes are whole (*n* = 14) or distal (*n* = 13) with fewer proximal (*n* = 4) and midsection (*n* = 3) fragments. The whole core flakes have a mean length of 26.4 mm (*std* = 12.7) and the angular debris a mean weight of 4.8 g (*std* = 5.6).

The retouched tools consist of two projectile points, a retouched piece, a uniface, and a scraper (Figure 31.5). The retouched piece is the distal end of a flake that is slightly serrated in outline. This fragment could represent a piece off of a scraper with unidirectional dorsal retouched edge and an angle of 60 degrees. One of the projectile points appears to be a Late Archaic stemmed point with the tip, tangs, and corner of the base broken. A neck width of 13 mm indicates that it represents a dart or lance point. The other point is a tip fragment that could also be from a well-made biface. The scraper consists of a core flake with unidirectional retouch along the perimeter that forms a circular-shaped artifact with a 65 degree edge angle. On the other hand, the uniface was made on a large cortical flake with rough retouch along the lateral and distal ends. The retouched edges exhibit a steep angle of 80 degrees.

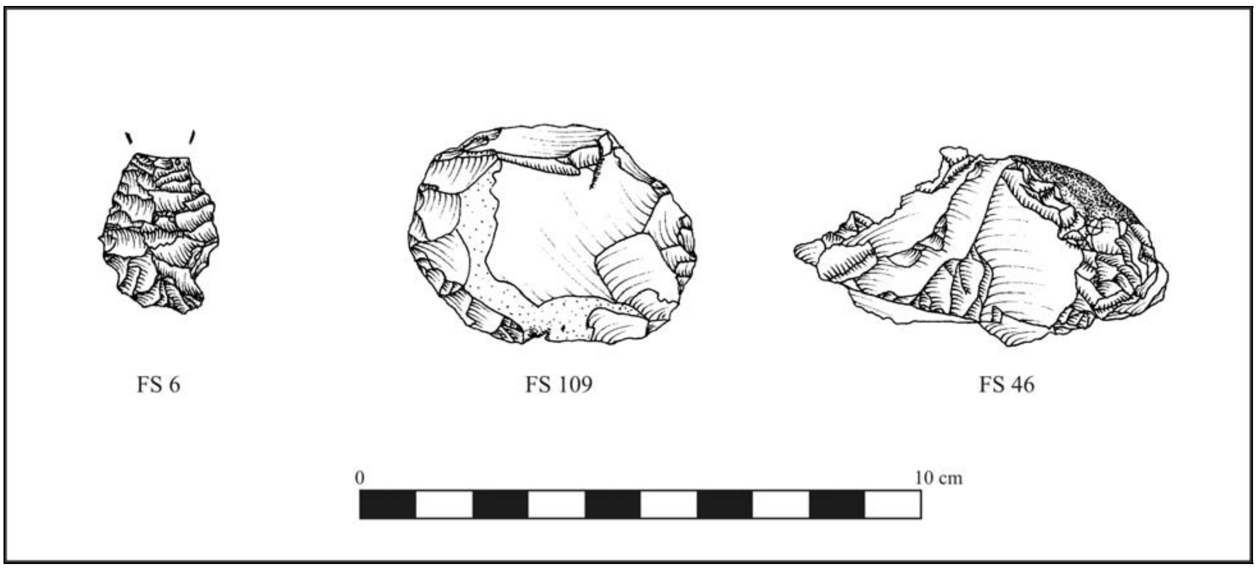

Figure 31.5. Projectile point and unifaces from LA 85404.

Tool Use

None of the flakes and two of the retouched tools exhibit any obvious evidence of edge damage that could be attributed to use. The uniface and scraper have rounding/polish or micro-scarring along their edges.

Faunal Remains (Kari Schmidt)

One piece of bone was recovered from Room 1 (Stratum 2, Level 3) of this fieldhouse. The bone was a mule deer (*Odocoileus hemionus*) distal metatarsal fragment (right), and was also manufactured into a partial fragment of a bone awl. The bone was unburned, but contained a possible cut-mark just above the epiphyseal fusion. The mark did not appear to be recent and was probably not incurred during excavation activities.

Archaeobotanical Remains (Pamela McBride)

Charred goosefoot and groundcherry seeds, found on the floor of the structure, and two corn cupule fragments from the northwest corner were the only cultural plant remains aside from conifer duff that were recovered from LA 85404 (Table 31.15). A possible pine seed and ponderosa pine needles comprised the unburned, probably non-cultural material from flotation samples. Uncharred tobacco seeds were recovered from both burned floor samples. These could be residue from plants brought into the structure for ceremonial use, although because the seeds are unburned this is uncertain. Goosefoot seeds could have been ground into meal, groundcherry fruits may have been boiled or eaten raw, and corncobs were probably used for fuel along with piñon, ponderosa pine, oak, sagebrush, and possible Douglas fir wood (Table 31.16).

Table 31.15. Flotation plant remains, count, and abundance per liter from LA 85404.

FS No.	**68**	**72**	**93**	**94**	**106**
Feature	NW corner	Post-occupational fill, Strat 2, Level 3	Burned floor 104.33N/ 102.14E	Burned floor 104.56N/ 103.25E	NW corner, charcoal concen-tration
Cultural					
Annuals					
Goosefoot				3(3)	
Cultivars					
Maize	2(0) c				
Other					
Groundcherry				1(0)	
Perennials					
Pine		+ barkscale, + umbo			
Piñon	+ needle	+ needle	+ needle	+ needle	+ needle

FS No.	68	72	93	94	106
Ponderosa pine	+ fascicle, + needle	+ fascicle, + needle	+ needle	+ needle	+ needle
Possibly Cultural					
Annuals					
Tobacco			+	+	
Non-Cultural					
Perennials					
Pine		cf. +			
Ponderosa pine		+ needle		+ needle	+ needle

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter, c cupule, cf. compares favorably.

Table 31.16. Flotation sample wood charcoal by count and weight in grams from LA 85404.

FS No.	68	72	93	94	106
Feature	NW corner	Post-occupational fill, Strat 2, Level 3	Burned floor 104.33N/ 102.14E	Burned floor 104.56N/ 103.25E	NW corner, charcoal concen-tration
Conifers					
poss. Douglas fir			8/0.6 g		
Pine	2/0.3 g	2/0.1 g		3/0.2 g	
Piñon	6/0.3 g	1/<0.1 g		8/0.2 g	
Ponderosa pine	9/0.3 g	11/0.6 g	5/0.7 g	4/0.1 g	3/0.3 g
Unknown conifer	3/0.1 g	5/<0.1 g	5/0.1 g	4/<0.1 g	17/1.2 g
Non-Conifers					
Oak			2/0.2 g		
cf. Sagebrush		1/<0.1 g		1/<0.1 g	
Totals	**20/1.0 g**	**20/0.7 g**	**20/1.6 g**	**20/0.5 g**	**20/1.5 g**

Pollen Remains (Susan Smith)

Five pollen samples were analyzed from LA 85404. Table 31.17 lists the frequency of identified pollen types. Squash and maize were the only cultigens identified in the assemblage. No other economic resources were identified. A number of potential economic resources were also identified in the assemblage (Table 31.17), and these are described in detail in Smith's chapter in Volume 3 (Chapter 63).

Table 31.17. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85404 (*n* = 5)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	1
	Zea mays	Maize	2
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	0
	Eriogonum	Buckwheat	1
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	5
		Grass Aggregates	3
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85404 (*n* = 5)
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs and Possible Subsistence Resources	Cheno-Am	Cheno-Am	5
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	5
		Sunflower Family Aggregates	1
	Ambrosia	Ragweed, Bursage	3
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	1
	Scrophulariaceae	Penstemon Family	3
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	0
	Abies	Fir	1
	Pinus	Pine	4
		Pine Aggregates	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85404 (*n* = 5)
	Pinus edulis type	Piñon	5
	Juniperus	Juniper	4
		Juniper Aggregates	0
	Quercus	Oak	0
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	3
	Artemisia	Sagebrush	5
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	2
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 85404 consists of three rock features. The site is located on the south side of Rendija Canyon adjacent to an intermittent drainage. Only one rock feature, a one-room Early-Middle Classic period fieldhouse, was excavated as part of the Conveyance and Transfer Project. Burned maize cupules with maize and squash pollen were recovered during the sire excavation; therefore, the one-room structure was presumably occupied during the growing season. Maize remains provided a radiocarbon date of circa AD 1460. The diagnostic ceramics corroborate an Early-Middle Classic period occupation.

CHAPTER 32
RENDIJA TRACT (A-14): LA 85407 (SERNA HOMESTEAD)

Gregory D. Lockard

INTRODUCTION

LA 85407 is the historic Serna Homestead located on a gently sloping bench immediately north of Rendija Canyon. The site is located in a cleared, grassy area surrounded by a mixed piñon-juniper and ponderosa pine woodland. The site is situated at an elevation of 2097 m (6880 ft).

LA 85407 was first recorded on August 16, 1991, by David Hill (1991) during a survey for the Bason Land Exchange Project. According to Hill, architecture on the site at the time of his visit consisted of a habitation structure with an iron and asphalt roof, a circular rock feature (possibly a hearth or horno), an amorphous pile of cut logs, and an animal pen. A trash scatter located along the canyon edge on the southeastern side of the site contained lard, coffee, sardine, kerosene, and condensed milk cans. Other artifacts at the site that were noted by Hill included an enamelware wash basin, galvanized metal, a stove pipe, the base of a kerosene lamp of purple glass, and a Kapo Black sherd. Four obsidian flakes found near the trash scatter indicated a prehistoric presence in the site area.

On July 20, 1992, Archaeological Research, Inc., was awarded the contract to conduct archaeological testing of the Bason Land Exchange sites. John Peterson and Christian Nightengale (1993) supervised the excavations, which took place between July 27 and August 23 of 1992. Peterson and Nightengale recorded seven architectural features at LA 85407 (1993:99–103). These features included a rectangular alignment/concentration of logs and dimension lumber (Feature 1), the remains of an horno (Feature 2), an L-shaped alignment of cobbles and boulders (Feature 3), a log structure (Feature 4), a large corral (Feature 5), another L-shaped rock alignment (Feature 6), and a small pile of cobbles (Feature 7).

Peterson and Nightengale also recorded two trash concentrations (designated Trash Areas 1 and 2) near the southeastern edge of the site. Two 1- by 1-m test pits (Units A and B) were excavated at the site (Peterson and Nightengale 1993:103–104). Unit A was located within the horno. The unit was excavated to a sterile Pleistocene soil at a maximum depth of 43 cm below ground surface. Historic artifacts were recovered from all four excavation levels. Two courses of rock that formed the feature's northwest edge were encountered below the surface. A layer of burned clay was uncovered beneath these rocks. The burned clay formed a low cone at the bottom of the feature. The clay consisted of a layer of reddish (i.e., oxidized) clay on top of a layer of bluish (i.e., reduced) clay. Unit B was placed adjacent to one of the L-shaped rock alignments (Feature 6). The unit was excavated to sterile Pleistocene soil at a maximum depth of 20 cm below ground surface. The excavations revealed no clearly defined walls and no cultural materials were recovered. As a result, Peterson and Nightengale argued that the feature probably represented a concentration of large rocks removed from a field.

In order to learn more about the homestead, Archaeological Research, Inc., also conducted historical research on the site. This research included a review of historical documents and two interviews conducted by Ada González-Peterson (Peterson and Nightengale 1993:46–82). The most important document was the Homestead Entry Survey No. 394, Santa Fe National Forest, State of New Mexico (1916). The first interview was of Annie Lujan and her husband Bernardo Lujan. Annie Lujan was the daughter of José María Serna, who was the owner of the homestead when it was seized by the U.S. government in 1943. She had visited her father's homestead on numerous occasions as a child. The second interview was of Severo and Aurora González, who provided first-hand accounts of life in Los Alamos before the Manhattan Project.

According to the historical documents, Andres Martinez applied for homestead certification in 1913, and the Homestead Entry Survey No. 394 was performed in October of 1916. The homestead was patented in 1922 and subsequently sold to José and Fidel Serna (of unknown relations), who had probably occupied the homestead since 1913. According to the survey, 40 acres of beans, corn, and vegetables were under cultivation on the homestead in 1916. Improvements included a 12- by 30-ft log house, a 12- by 20-ft pole shed, and one mile of brush fence. According to Annie Lujan, the cabin included three rooms and a sun porch. The Serna family made seasonal use of the homestead. They traveled by wagon to the site three times a year and stayed for about two weeks during each visit. In the spring, they traveled to the homestead to plant their crops. They returned to tend the fields once during the summer and to harvest the crops in the fall. Crops grown on the homestead by the Serna family included pinto beans, corn, wheat, pumpkins, and other "soft vegetables."

FIELD METHODS

Before excavation, the site was cleared of trees and large undergrowth, and an arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the northern portion of the site (Figure 32.1). The area was then covered with a 5- by 5-m grid that extended 15 m north, 65 m south, 45 m east, and 80 m west of the site datum. The site was then divided into excavation areas. These areas included the cabin (Area 1), the horno (Area 3), a small concentration of rocks (Area 4), the shed (Area 5), the corral (Area 6), and the reservoir (Area 7) (Figure 32.2). All other areas of the site were designated Area 2. Surface collection of the site began during the 2003 field season, and was completed during the 2005 field season. Surface artifacts were collected by 1- by 1-m grid unit. The grid unit of the collected artifacts was determined by tape measures extended from the 5- by 5-m grid stakes.

The 5- by 5-m grids were divided into 1- by 1-m grid units and subdata were set up for taking elevations in the areas to be excavated. The entire cabin (Area 1) was covered with a 1- by 1-m grid that measured 6 m north-south (60N-65N) by 11 m east-west (90E-100E). Three subdata (A-C) were set up for taking elevations. The horno (Area 3) was covered with a grid that measured 3 m north-south (69N-71N) by 3 m east-west (94E-96E), and a single subdatum (D) was set up for taking elevations. The small concentration of rocks (Area 4) was covered with a grid that measured 2 m north-south (45N-46N) by 2 m east-west (91E-92E), and a subdatum (E) was set up for taking elevations.

Figure 32.1. View of the cabin area before excavation.

The shed (Area 5) was covered with a grid that measured 5 m north-south (61N-65N) by 5 m east-west (90E-94E), and a subdatum (F) was set up for taking elevations. Two non-contiguous 1- by 1-m grid units (105N/130E and 108N/126E) were set up and excavated in the corral (Area 6), and a subdatum (G) was set up for taking elevations. The entire corral was mapped, however, and surface artifacts recovered from anywhere within the corral were designated Area 6. Two auger holes were the only excavations in the reservoir (Area 7). These auger holes were excavated for the sole purpose of recovering pollen samples from the reservoir. Before excavation, Areas 1 and 3 were mapped and Areas 1, 3, and 4 were photographed. Excavations proceeded by strata and did not terminate until a cultural feature (e.g., a floor or wall) or sterile soil was encountered. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. After excavation, Areas 1, 3, 4, 5, 6, and 7 were mapped and photographed.

The 2003 surface collection at LA 85407 was performed by Hannah Lockard and Mia Jonsson. During the 2005 field season, work at the site was supervised by Greg Lockard. Excavators on the 2005 field crew included Michael Dilley, Alan Madsen, Kari Schmidt, Jennifer Nisengard, Brian Harmon, Joseph (Woody) Aguilar, Sandi Copeland, and Bettina Kuru'es. Surface collectors and screeners included Ellen McGehee, Kari Garcia, Timothy Martinez, Aaron Gonzalez, Jeremy Yepa, Rhonda Robinson, Sherrie Sherwood, and Marwin Shendo.

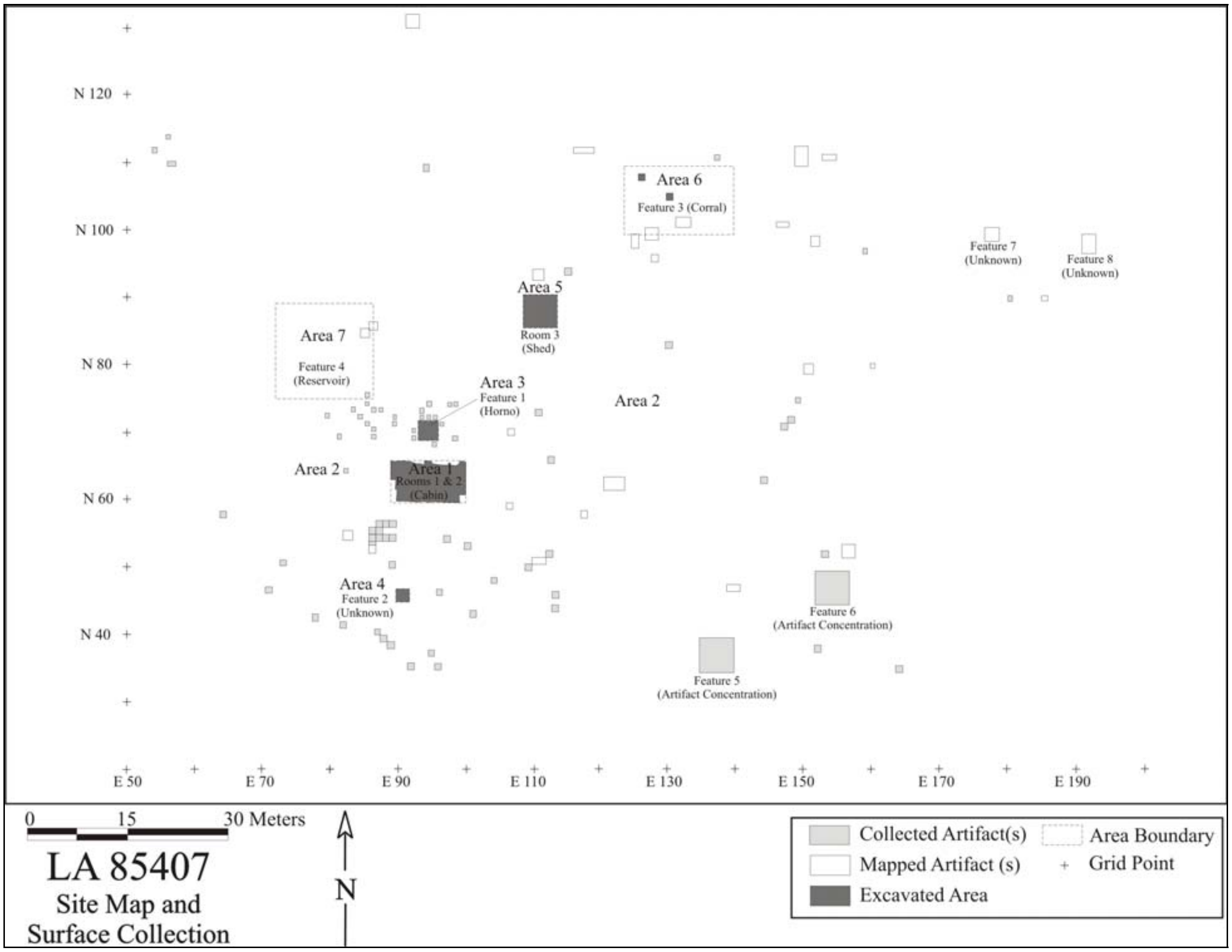

Figure 32.2. Site map and surface collection at LA 85407.

STRATIGRAPHY

Three strata were identified at LA 85407 (Figure 32.3). Stratum 1 is composed of loose, surface sediment. It is uniformly 2 to 7 cm thick across the site. Stratum 2 is post-occupational fill and ranges from 5 to 40 cm in thickness in the areas excavated. The fill was thickest (i.e., >25 cm) in Areas 3 and 5. The backfill from Peterson and Nightengale's Unit A, located in Area 3, was excavated separately. No artifacts, however, were recovered from this backfill. As a result, the backfill was not designated as a separate stratum. Due to the fact that the site's occupation has been well established by historical documents and interviews, the site's stratigraphy was not analyzed by geologists. Strata from LA 85407 are summarized in Table 32.1. Artifact counts from strata and areas at the site are listed in Tables 32.2 and 32.3. Table 32.4 lists the average artifact count per grid unit by area from LA 85407.

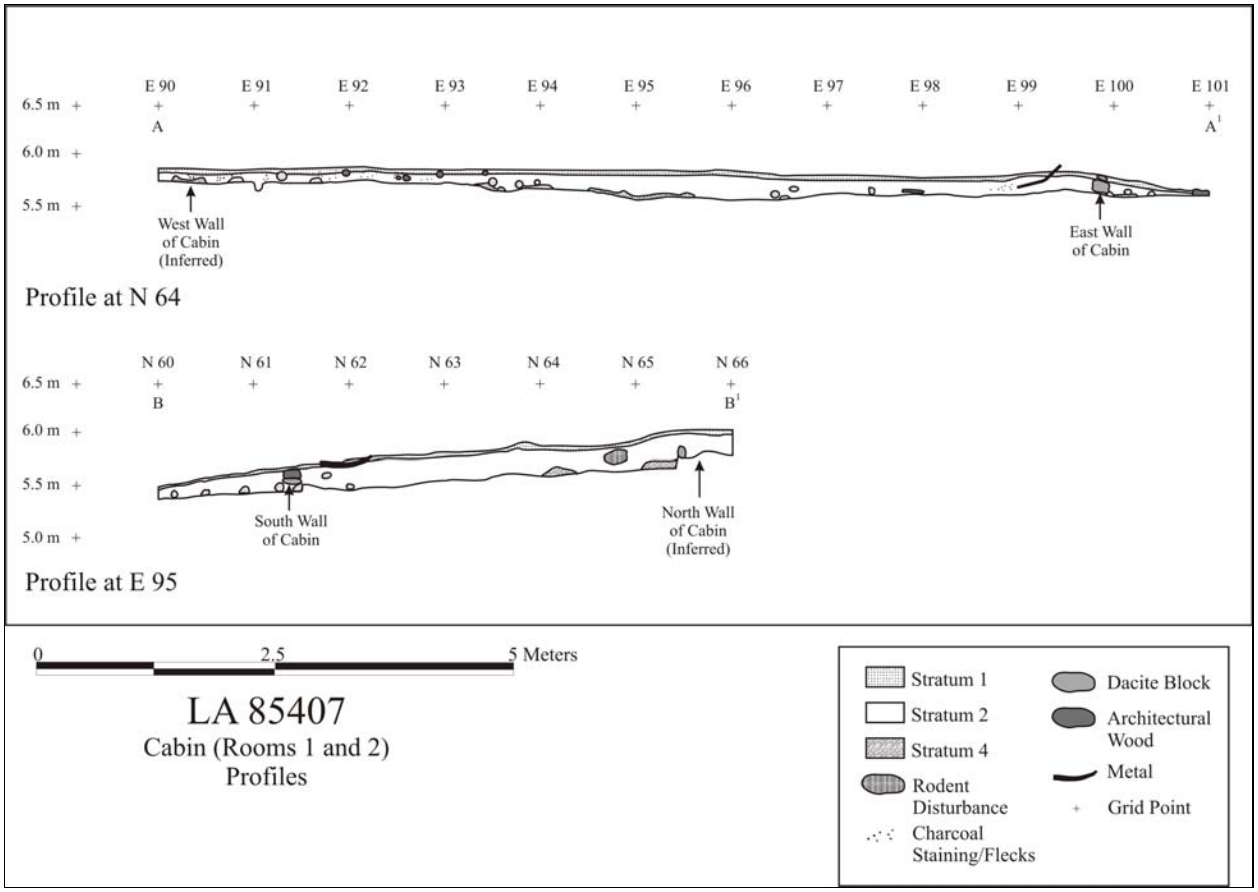

Figure 32.3. Profiles of the cabin (Rooms 1 and 2) where excavations were concentrated.

Table 32.1. Strata descriptions from LA 85407.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 5/3	Sandy loam	2–7	Surface sediment
2	10YR 4/3	Sandy loam	5–40	Post-occupational fill

Table 32.2. Artifact counts by strata at LA 85407.

Stratum	Metal	Glass	Leather	Porcelain	Ceramics	Chipped Stone	Ground Stone	Faunal Bone	Human Bone	Shell	Total
0	412	146	5	11	3	4	0	0	0	0	**581**
1	646	495	21	21	49	18	0	1	0	0	**1251**
2	2429	850	32	61	144	49	6	22	1	1	**3595**
Total	**3487**	**1491**	**58**	**93**	**196**	**71**	**6**	**23**	**1**	**1**	**5427**

Table 32.3. Artifact counts by area at LA 85407.

Area	Metal	Glass	Leather	Porcelain	Ceramics	Chipped Stone	Ground Stone	Faunal Bone	Human Bone	Shell	Total
1	2790	1184	34	76	186	44	4	14	1	1	**4334**
2	385	135	5	8	2	4	0	0	0	0	**539**
3	95	42	2	4	1	2	2	0	0	0	**148**
4	51	43	2	2	6	0	0	1	0	0	**105**
5	146	87	15	3	0	16	0	6	0	0	**273**
6	20	0	0	0	1	5	0	2	0	0	**28**
Total	**3487**	**1491**	**58**	**93**	**196**	**71**	**6**	**23**	**1**	**1**	**5427**

Table 32.4. Average artifact count per grid unit by area at LA 85407.

Area	Metal	Glass	Leather	Porcelain	Ceramics	Chipped Stone	Ground Stone	Faunal Bone	Human Bone	Shell	Total
1	46.50	19.73	0.57	1.27	3.10	0.73	0.07	0.23	0.02	0.02	**72.23**
3	10.56	4.67	0.22	0.44	0.11	0.22	0.22	0.00	0.00	0.00	**16.44**
4	12.75	10.75	0.50	0.50	1.50	0.00	0.00	0.25	0.00	0.00	**26.25**
5	5.84	3.48	0.60	0.12	0.00	0.64	0.00	0.24	0.00	0.00	**10.92**
6	10.00	0.00	0.00	0.00	0.50	2.50	0.00	1.00	0.00	0.00	**14.00**

SITE EXCAVATION

Area 1 (Rooms 1 and 2 – Cabin)

Sequence of Excavation. Area 1 consists of the remains of a historic log cabin and the area immediately adjacent to the cabin (Figures 32.4 and 32.5). According to Homestead Entry Survey No. 394, the cabin measured 12 by 30 ft in 1916 (Peterson and Nightengale 1993:51). According to Annie Lujan, who frequented the homestead as a child, the cabin contained three interior rooms and included an exterior sun porch (Peterson and Nightengale 1993:62, 71). Excavation of the room began with an east-west trench (63N/90-100E) followed by a north-south trench (60-65N/95E), both of which extended across the entire cabin (see Figure 32.3). The trenches were excavated in 1- by 1-m grid units, and intersected in the approximate center of the cabin. The excavation of the trenches served to define the room's stratigraphy, as well as to locate the room's perimeter walls. The rock foundation of the cabin's east wall was encountered in 63N/99E of the east-west trench. Unit 63N/100E is therefore completely outside of the cabin. No evidence of the cabin's west wall was encountered in the east-west trench.

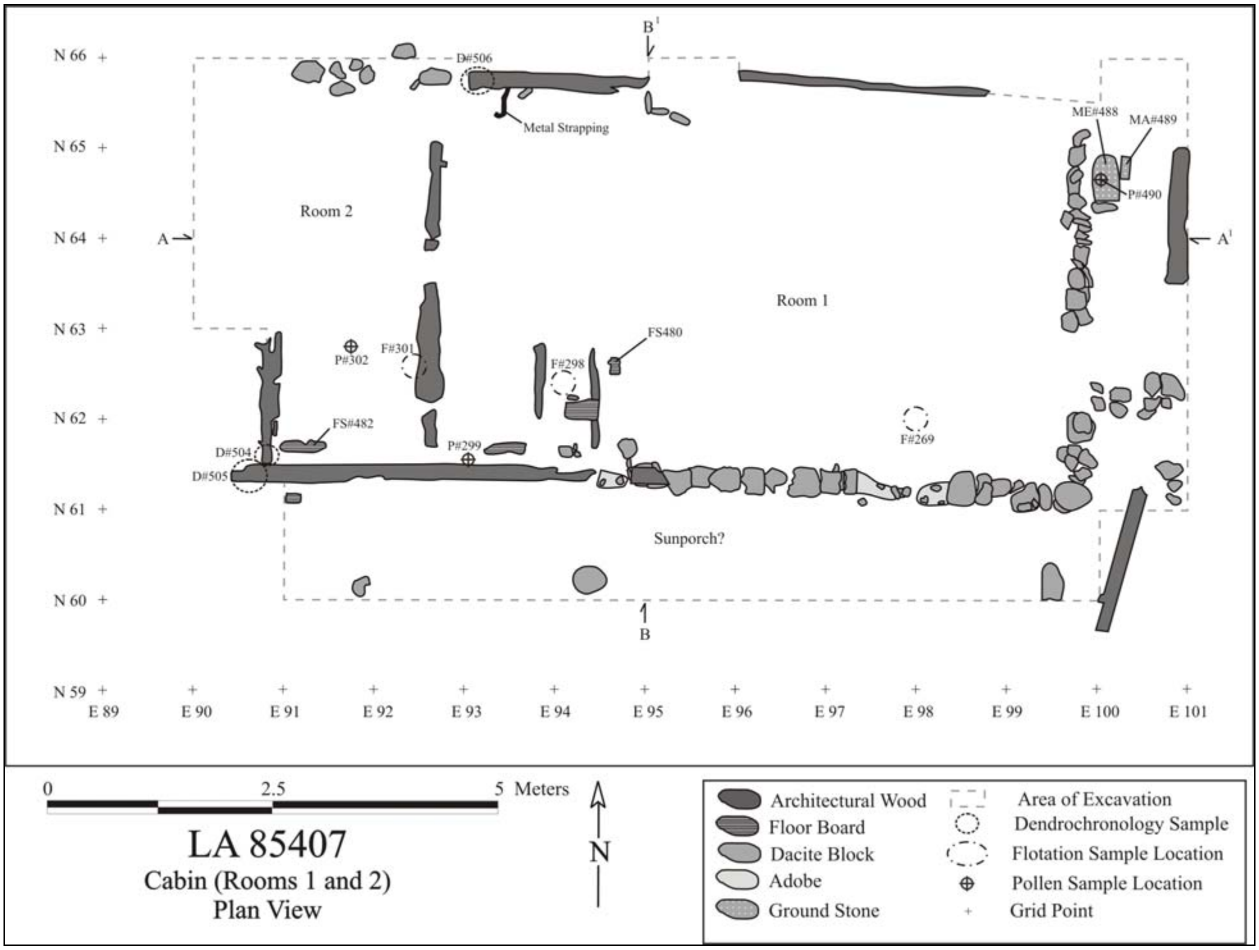

Figure 32.4. Plan view of cabin (Rooms 1 and 2).

Surface wood beams to the south of the trench, however, indicated that the wall passed through the easternmost portion of unit 63N/90E. Most of this unit is therefore also outside of the cabin. The rock foundation of the cabin's south wall was encountered in unit 61N/95E of the north-south trench. Unit 60N/95E is therefore located outside of the cabin. The only evidence encountered in the north-south trench of the cabin's north wall was a few displaced rocks in unit 65N/95E. Coping of the sterile soil beneath the cabin's post-occupational fill and surface wood beams to the east and west of the trench, however, indicated that the north wall passed through the northern half of this grid unit.

The excavation of the trenches also served to divide the cabin into four quadrants of roughly the same size. The initial excavation strategy for the cabin was for each of these quadrants to serve as a large excavation unit. During the excavation of the east-west trench, however, a wood beam was encountered in unit 63N/92E. This beam extended from north to south across the unit and was roughly parallel to the structure's east and west walls. It was originally thought that this beam was the remains of a wall that divided the cabin's interior into separate rooms. As a result, the cabin's western quadrants were each divided by the wood beam into two excavation units.

Figure 32.5. Post-excavation photo of Area 1, the cabin.

The area to the east of the wood beam (including the cabin's two eastern quadrants) was designated Room 1, and the area to the west of the wood beam was designated Room 2. The cabin's interior, excluding the trench units, was therefore excavated in six large units. During the excavation of these units, other wood beams were encountered that were parallel to the beam that divided the areas designated Rooms 1 and 2. A small piece of floorboard was still nailed to the top of one of these beams. As a result, the wood beam that divided the areas that were designated Room 1 and Room 2 most likely was not part of an interior wall. Instead, it appears to have been the best preserved of many support beams for the cabin's floorboards. The room designation of the various areas within the cabin, and consequently the room designation of the artifacts recovered from the cabin, is therefore almost certainly inaccurate. The cabin probably was divided into two or three rooms, as suggested by the informant Annie Lujan. The location and extent of these rooms, however, could not be determined through excavation.

After the excavation of the cabin's interior, units were excavated to the east and south of the cabin. The purpose of these excavations was to locate the sun porch noted by the informant Annie Lujan, as well as to determine the prevalence and distribution pattern of artifacts in the area immediately surrounding the cabin. The area to the east of the cabin was excavated in two 1- by 2-m units (61-63N/100-101E and 64-66N/100-101E). These units were located on either side of the easternmost 1- by 1-m unit in the east-west trench (63N/100E). A mano and a single-footed metate were discovered side by side just outside the cabin's east wall (Figure 32.6). The mano is located completely within unit 64N/100E, while the metate extends slightly into unit

64N/99E. A pollen sample (Field Specimen [FS] 490) was taken from directly beneath the metate, which was upside down. Taxa identified in the sample included prickly pear (*Opuntia*), beeweed (*Cleome*), grass family (Poaceae), cheno-ams (*Chenopodium/Amaranthus*), sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), fir (*Abies*), unidentified pine (*Pinus*), piñon pine (*Pinus edulis*), juniper (*Juniperus*), Mormon tea (*Ephedra*), and sagebrush (*Artemisia*).

The area to the south of the cabin was also excavated in two units, which were located on either side of the southernmost 1- by 1-m unit in the north-south trench (60N/95E). The unit to the east measured 1 by 4 m (60-61N/96-100E), and the unit to the west measured 1.3 by 4 m (60-61.3N/91-95E). A small portion of the area to the west of the cabin was also excavated. This includes most of the westernmost 1- by 1-m unit in the east-west trench (63N/90E) and the westernmost portion of the Room 2 section (i.e., western half) of the cabin's northwest quadrant (64-66N/90-92.6E). No evidence of the cabin's west wall was found in either of these excavation units. For this reason, the fill from inside the cabin could not be distinguished from the fill just outside of the cabin. Because most of the smaller excavation unit (63N/90E) was located outside of the cabin, the artifacts recovered from it were not given a room designation. Since most of the larger excavation unit (64-66N/90-92.6E) was located inside the cabin, however, the artifacts from this unit were designated from Room 2.

Figure 32.6. *In situ* mano and metate recovered just outside the cabin.

The cabin's floor was composed of wooden boards (see below). As a result, no sedimentary living surface of any kind was encountered in Area 1. The vertical distribution of cultural materials was fairly uniform throughout the area. This cultural debris terminated rather suddenly at the top of a layer of sterile, clay-rich soil that predates the site's occupation. The excavation of all of the units in Area 1 terminated at the top of this soil horizon.

Fill. The interior of the cabin was filled with 2 to 7 cm of surface sediment on top of 5 to 25 cm of fill. The fill probably began to accumulate during the site's occupation in the form of sediment, and artifacts fell through the cracks between the boards that formed the cabin's floor. Most of the fill, however, is probably post-occupational. The fact that the fill is uniform down to the sterile, clay-rich soil probably indicates significant mixing of pre-occupational and post-occupational Holocene sediments as a result of rodent bioturbation. A number of rodents were in fact still living and constructing tunnels within the cabin during its excavation.

The cabin fill was extremely rich in charcoal. Most if not all of this charcoal is probably the burned remains of the beams and boards that formed the cabin's walls and floor. According to Peterson and Nightengale (1993), little remained of the cabin's walls when they performed their testing at the site in 1992. An inspection of the site shortly after the Cerro Grande fire on October 4, 2000, however, indicates that at least some of the cabin's remains burned during this fire. At least some of the charcoal may therefore date to this time. Flotation (FS 269 and FS 298) and pollen (FS 299) samples were analyzed from the post-occupational fill from the southeast (FS 269) and southwest (FS 298 and FS 299) corners of Room 1.

Carbonized taxa identified in the flotation samples include pigweed (*Amaranthus*), goosefoot (*Chenopodium*), beeweed, maize (*Zea mays*), grass family (Graminae), sage (*Salvia*), vervain (*Verbena*), grape (*Vitis*), sedge family (Cyperaceae), unidentified pine, ponderosa pine, and unknown conifer (Gymnospermae). Taxa identified in the single analyzed pollen sample include sunflower type (*Helianthus*), rose family (Rosaceae), grass family, cheno-ams, sunflower family (Asteraceae), fir, unidentified pine, piñon pine, juniper, oak (*Quercus*), and sagebrush. A flotation sample (FS 301) and a pollen sample (FS 302) were also taken from the post-occupational fill from the southern half of Room 2. Charred taxa identified in the flotation sample include goosefoot, stickseed (*Lappula*), groundcherry (*Physalis*), grass family, juniper, unidentified pine, and ponderosa pine. Taxa identified in the pollen sample include grass family, cheno-ams, sunflower family, evening primrose (Onagraceae), unidentified pine, piñon pine, juniper, oak, and sagebrush.

Floor. Excavation revealed that the cabin's floor was formed by wooden boards oriented east to west placed on top of and nailed to wooden beams oriented north to south. The floorboards also presumably rested on top of the foundations of the cabin's south, east, and west walls. To the north, the floorboards probably extended to the sterile, clay-rich soil that functioned as the foundation for the cabin's north wall (see below). Floor board fragments were preserved in four locations. All of these fragments were oriented from east to west. The largest fragment was located in the southwest quadrant of unit 62N/94E (Figure 32.7). This unit is located in the southwest corner of Room 1. The floorboard fragment, which was 1 in. thick and 6 in. wide, was still nailed to a wood beam below that was oriented north to south. The board was very poorly preserved and fragmented. As a result, it was not kept as a sample.

Figure 32.7. ***In situ*** **remnants of the cabin floor**.

A smaller floorboard fragment was encountered in the northeast quadrant of the same grid unit (see Figure 32.7). The board was also one inch thick, but was four inches wide. Due to its poor state of preservation, however, it fractured into two pieces during removal. The last floorboard fragment encountered within the cabin was located in the far southwest corner of Room 2, in the northwest quadrant of unit 61N/91E. Due to its poor state of preservation, however, it fractured into three pieces during removal. No artifacts were encountered in direct association with any of the floorboard fragments within the cabin.

The fourth floorboard fragment encountered in Area 1 was located just outside the cabin. It was located just south of the cabin's southwest corner, in the southwest corner of grid unit 61N/91E (Figure 32.8). This floorboard fragment may be the remains of the sun porch described by the informant Annie Lujan (Peterson and Nightengale 1993:71). This interpretation is supported by the presence of three large dacite cobbles to the south of the cabin. These rocks may have functioned as the porch's foundation. All three rocks were located approximately 1 m from the cabin's south wall. The central rock was located approximately twice as far from the east rock as the west rock. This suggests that there was a fourth rock located between the central and east rocks. If this is the case, the four rocks would have been roughly equidistant from one another in addition to being approximately the same distance from the south wall. The location of the rocks, in addition to the fact that large dacite cobbles do not occur naturally in the area, therefore indicates that even if the rocks did not function as the porch's foundation, they were at least intentionally placed in the area to the south of the cabin.

Figure 32.8. ***In situ*** **floorboard located just outside the cabin**.

Wall and Roof Construction. The cabin utilized three types of wall foundations. The foundation of the entire east wall, the eastern two-thirds of the south wall, and the western quarter of the north wall were composed of irregularly shaped dacite cobbles. In most locations, the wall is only a single course high. In a few locations, the wall foundation is composed of two courses of shorter rocks. An almost complete lack of rock wallfall in the excavated area indicates that the masonry was probably never higher than the extant remains. Wall dimensions are provided in Table 32.5.

Table 32.5. Room 1/2 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	8.80	0.09–0.18 (rock) 0.05–0.25 (wood)	0.14–0.35 (rock) 0.06–0.12 (wood)	1 (rock) 1 to 2 (wood)
South	8.80	0.05–0.17 (rock) 0.01–0.15 (wood)	0.05–0.33 (rock) 0.08–0.18 (wood)	1 (rock) 1 (wood)
East	4.20	0.07–0.25 (rock)	0.08–0.38 (rock)	1 to 2 (rock)
West	4.20	0.05–0.17 (wood)	0.07–0.20 (wood)	2 (wood)

The sediment between the rocks was slightly more compact than the surrounding sedimentary matrix, especially in the south wall. This suggests that simple mud was utilized as mortar for the rocks. The rock foundation of the south wall appears to be almost completely intact. Most of the rock foundation in the east wall is also intact. The most notable exception is within unit 62N/99E. None of the rocks that formed this section of the wall's foundation were found *in situ*. A number of loose rocks, however, were found in the area to the east. These rocks most likely formed the wall foundation's missing section. The northernmost portion of the east wall also appears to be disturbed. It is impossible to determine to what extent, however, as the north wall is poorly defined in this area of the cabin. The rock foundation of the north wall is very poorly preserved. All of the rocks appear to be present, but slightly displaced.

The foundation of the western third of the south wall and the southern third of the west wall was composed of wooden beams. Presumably, the foundation of the northern two-thirds of the west wall was also composed of wooden beams, as no rocks were found in this location. If this is the case, however, the wooden beams were no longer preserved in this location. The foundation of the eastern three-quarters of the north wall was composed of compact sediment. The sediment is a sterile, clay-rich soil. This soil slopes upward to the north, forming a near vertical surface below the lowest wood beams in the north wall. Presumably, some of the compact, clay-rich soil was excavated in the northern, uphill portion of the cabin's interior during its construction to create a level surface. The sloped surface to the north thereby represents the northern extent of these excavations. The cabin's floorboards probably rested on top of this highly compact surface, as the base of the north wall is considerably higher than the floorboard fragments found within the cabin. The sloped surface of the compact soil probably formed coping between the floorboards and the base of the north wall. Most of the base of the north wall is composed of two wood beams. These wood beams are located approximately 1 m apart. No wood beams were encountered in the area of the north wall within grid unit 65N/95E. Three small dacite cobbles, however, were encountered to the south of this area. These rocks may be the displaced remains of the base of the central section of the north wall.

The upper portions of all four walls were most likely composed of large wood beams. Unfortunately, very little of the cabin's superstructure was preserved at the time of excavation. The cabin's roof was probably composed of sheet metal and asphalt, as argued by Hill (1991). Several small pieces of asphalt were in fact recovered during the excavation of the cabin, and several large pieces of sheet metal were found within and around the cabin. The sheet metal was concentrated in the area to the south of the cabin. These materials are most likely the remains of the cabin's roof.

Three dendrochronology samples were taken from *in situ* wood beams in Area 1. The first sample (FS 504) was taken from the south end of the southernmost log in the cabin's west wall. The second sample (FS 505) was taken from the west end of the westernmost log in the cabin's south wall. The last sample (FS 506) was taken from the end of a log in the western half of the north wall. In addition, three dendrochronology samples (FS 291, FS 303, and FS 406) were taken from logs that were not *in situ* but were almost certainly part of the cabin's walls. All three wood beams were located just south of the cabin. All of the samples were identified as ponderosa pine and are discussed in the chronology section near the end of the chapter.

Artifact Distribution. Due to the fact that several excavation units contained multiple grid units, as well as portions of grid units in some cases, the exact distribution of artifacts in Area 1 could not be calculated. Artifact counts for each grid unit were mathematically calculated, however, using the following technique. First, the average number of artifacts per 1 m^2 was calculated for each excavation unit. If an entire grid unit was within a single excavation unit, the artifact count of the former is the average number of artifacts per 1 m^2 of the latter. If only part of the grid unit was excavated, but all of the excavated portion was within a single excavation unit, the artifact count of the grid unit is the area of that grid unit multiplied by the average number of artifacts per 1 m^2 of the excavation unit. If the grid unit contained portions of more than one excavation unit, the artifact count for the grid unit is the sum of the area of that portion of the grid unit that is within each excavation unit multiplied by the average artifacts per 1 m^2 of the respective excavation units. As Table 32.6 demonstrates, the distribution of artifacts was fairly uniform throughout the excavated portion of Area 1. The grid unit with the highest density of artifacts was 63N/95E, which was located in the center of the cabin. There was also a slightly higher density of artifacts in the southwest corner of Room 1. Interestingly, this is also the area in which the cabin's floor was best preserved. The reason for this artifact distribution pattern is unclear.

Table 32.6. Artifact counts from Area 1 by grid unit.

	E90	E91	E92	E93	E94	E95	E96	E97	E98	E99	E100
N65	**53.46**	**53.46**	**49.33**	**43.12**	**43.12**	**74**	**39.63**	**39.63**	**39.63**	**39.63**	38.00
N64	**53.46**	**53.46**	**49.33**	**43.12**	**43.12**	**69**	**56.62**	**56.62**	**56.62**	**56.62**	38.00
N63	**100**	**83**	**174**	**58**	**106**	**209**	**57**	**154**	**162**	**44**	5
N62	**8.64**	**43.20**	**69.37**	**147.88**	**147.88**	**129**	**52.00**	**52.00**	**52.00**	**52.00**	16.50
N61	**5.62**	**51.67**	**68.68**	**119.71**	**119.71**	**125**	**52.00**	**52.00**	**52.00**	**52.00**	16.50
N60		67.41	67.41	67.41	67.41	50	72.00	72.00	72.00	72.00	

Note: All but the trench units (63N/90-100E and 60-65N/95E) are mathematical calculations based on the averages from the excavation unit(s) in which each grid unit is located; lightly shaded grid units were partially excavated; bold numbers indicate grid units that are located completely or partially within the cabin (Rooms 1 and 2).

Area 2

Area 2 consists of the entire site except for Area 1 (the cabin), Area 3 (the horno), Area 4 (a circular rock alignment), Area 5 (the shed), Area 6 (the corral), and Area 7 (the reservoir). No excavations were conducted in Area 2. Artifacts from the surface of the area, however, were collected during two surface collections. The first surface collection was performed by Hannah Lockard and Mia Jonsson during the 2003 field season. During this collection, all artifacts visible on the surface of grid units 69-74N/80-100E were collected. This area includes Area 3 (69-71N/94-96E).

The second surface collection was performed during the 2005 field season. There were two stages in this collection. The first stage was performed by Ellen McGehee and Kari Garcia and involved a survey of the entire site and the flagging of diagnostic artifacts. The survey extended from 35-113N and from 54-180E, although the survey area was not completely rectangular. During the survey, diagnostic artifacts were marked for collection or mapping by labeled pin flags. Artifacts marked for mapping were mostly large pieces of sheet metal.

The second stage of the surface collection was performed by Gregory Lockard, Kari Schmidt, and Jennifer Nisengard. Artifacts marked for collection were collected by 1- by 1-m unit. The grid unit of the artifacts was determined by tape measures extended from the 5- by 5-m grid stakes. A single piece of metal (FS 222) was collected from a grid unit (74N/99E) within the area of the first surface collection. Artifacts marked for mapping were photographed with a board labeled with the artifact's grid unit(s). The labels were later utilized to mark the location of the artifacts on a map of the site (see Figure 32.1). The locations of the collected artifacts (from both surface collections) were marked on the same map. Area 2 includes two dense artifact scatters located along the southeast margin of the site. These scatters were comprised almost entirely of metal cans. Due to their association and artifact density, the scatters were collected in 5- by 5-m units rather then 1- by 1-m units. The first scatter, designated Feature 5 (Peterson and Nightengale's Trash Area 1), extended from 35-40N and 135-140E. The second scatter, designated Feature 6 (Peterson and Nightengale's Trash Area 2), extended from 45-50N and 152-157E.

Area 3 (Feature 1 – Horno)

Feature 1 is the remains of a rock feature (Figures 32.9 and 32.10) located approximately 3 m north of the cabin.

Figure 32.9. Rock feature (Feature 1) located north of the cabin.

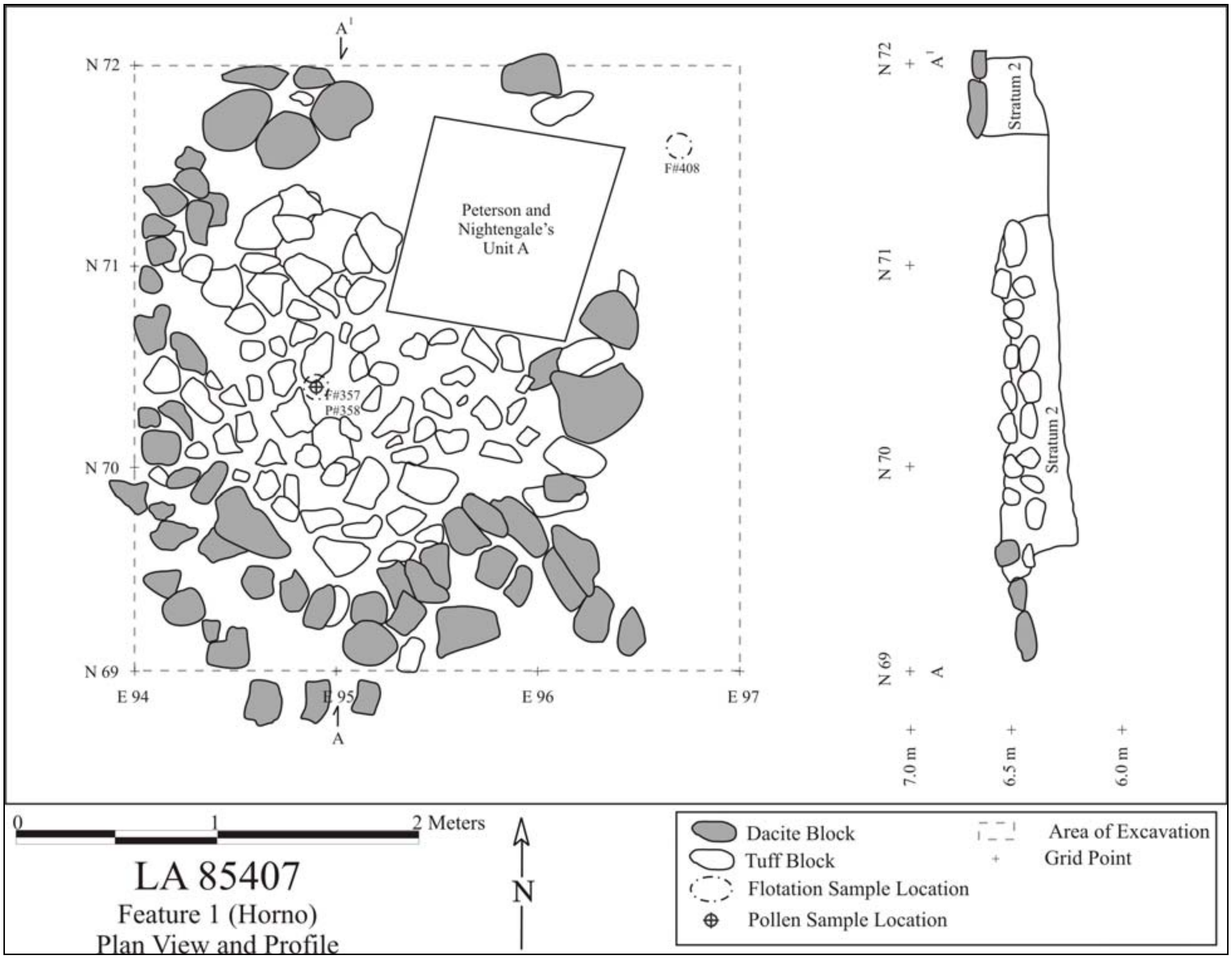

Figure 32.10. Plan view and profile of Feature 1 (horno).

According to Peterson and Nightengale (1993:103), the excavation of their Unit A and informant interviews confirmed that the feature was a horno. The entire feature (excluding the portion removed by Peterson and Nightengale during the excavation of their Unit A) was excavated during the Conveyance and Transfer (C&T) Project. The excavations confirmed that the feature was C-shaped, with the open end facing northeast. The feature was approximately 3 m in diameter. The feature's outer perimeter was composed of a single course of large dacite cobbles. A dense concentration of tuff rocks was found within the feature's perimeter. These rocks appeared to be the collapsed remains of the feature's superstructure. The rocks appeared to be oxidized, most likely as a result of thermal activity. During the excavation of their Unit A, Peterson and Nightengale encountered a layer of burned adobe at the base of the feature. During the C&T Project excavations, only a small patch of this burned surface was encountered. It is a patch of oxidized soil located in the northeast corner of grid unit 69N/95E (Figure 32.11). Beneath the oxidized soil was a dark layer that appeared to be a charcoal lens. Alternatively, it could have been the layer of bluish (i.e., reduced) clay described by Peterson and Nightengale (1993:103). A fairly high concentration of charcoal was encountered throughout the area near the base of the feature. The charcoal was especially dense near the open end of the feature to the northeast. This charcoal concentration probably represents a dump zone.

Figure 32.11. Patch of oxidized soil associated with a burned adobe surface in Feature 1.

A flotation sample (FS 357) and a pollen sample (FS 358) were taken from near the base of the west-central portion of Feature 1. Charred taxa identified in the flotation sample included unknown conifer and ponderosa pine. Taxa identified in the pollen sample included buckwheat, grass family, cheno-ams, sunflower family, fir, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush. A flotation sample (FS 408) was taken from the charcoal concentration in the northeast portion of the feature. Carbonized taxa identified in the flotation sample included goosefoot, juniper, unidentified pine, piñon pine, and ponderosa pine.

The grid unit in Area 3 with the highest number of artifacts was 70N/95E, located in the center of the feature (Table 32.7). The next highest concentration of artifacts was in the grid unit to the southwest (69N/96E), followed by the grid units to the northeast (71N/96E) and north (71N/95E). The higher concentration of artifacts to the north and especially northeast is probably a result of the fact that the open end of the horno was located in this area. The higher concentration of artifacts in this area therefore most likely represents a dump zone. The reason for the higher concentration of artifacts to the southeast is unknown.

Table 32.7. Area 3 (horno) artifact counts by grid unit.

	E94	**E95**	**E96**
N71	7	14	27
N70	8	45	5
N69	4	1	37

Area 4 (Feature 2 – Circular Rock Alignment)

Feature 2 was a small rock feature (Figures 32.12 and 32.13) located approximately 14 m south of the western end of the cabin.

Figure 32.12. Post-excavation photo of Feature 2 (possible privy).

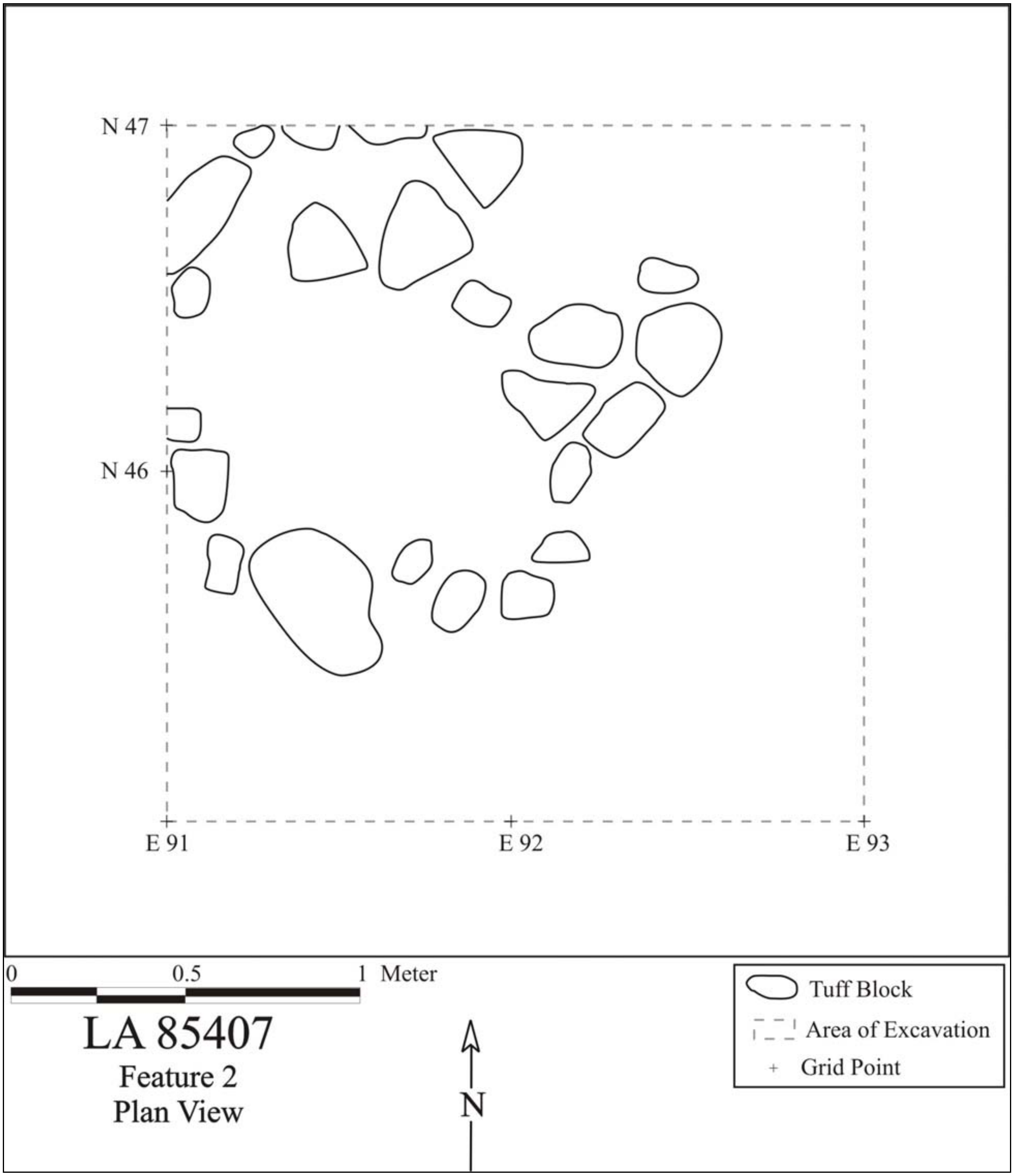

Figure 32.13. Plan view of Feature 2, a circular rock feature identified as a possible privy.

Before excavation, the feature appeared to be a small, circular concentration of rocks. The feature was excavated because it was believed to be the remains of a privy. The entire extant portion of the feature was excavated in four 1- by 1-m units (45-46N/91-E92E). The excavations revealed that the feature was a circular rock alignment. The eastern and westernmost portions of the feature were not encountered *in situ*. There were a number of disturbed rocks, however, that were encountered in the eastern half of the feature. These are probably the disturbed remains of the eastern portion of the circular alignment. The westernmost portion of the feature may have been open. A layer of sterile, clay-rich soil was encountered 15 to 20 cm below the surface. The feature was therefore superficial and could not have been a privy. The feature's function is unknown.

The grid unit in Area 4 with the highest number of artifacts was 45N/92E, followed by 46N/92E (Table 32.8). Much fewer artifacts were recovered from the two grid units to the west (45N/91E and 46N/91E). This indicates that there was a higher concentration of artifacts outside of the feature than within it.

Table 32.8. Area 4 artifact counts by grid unit.

	E91	E92
N46	7	27
N45	9	62

Area 5 (Room 3 – Shed)

Sequence of Excavation. Room 3 is the remains of a wood structure (Figures 32.14 and 32.15) located approximately 21.5 m north-northeast of the cabin.

Figure 32.14. Post-excavation photo of Room 3, the shed.

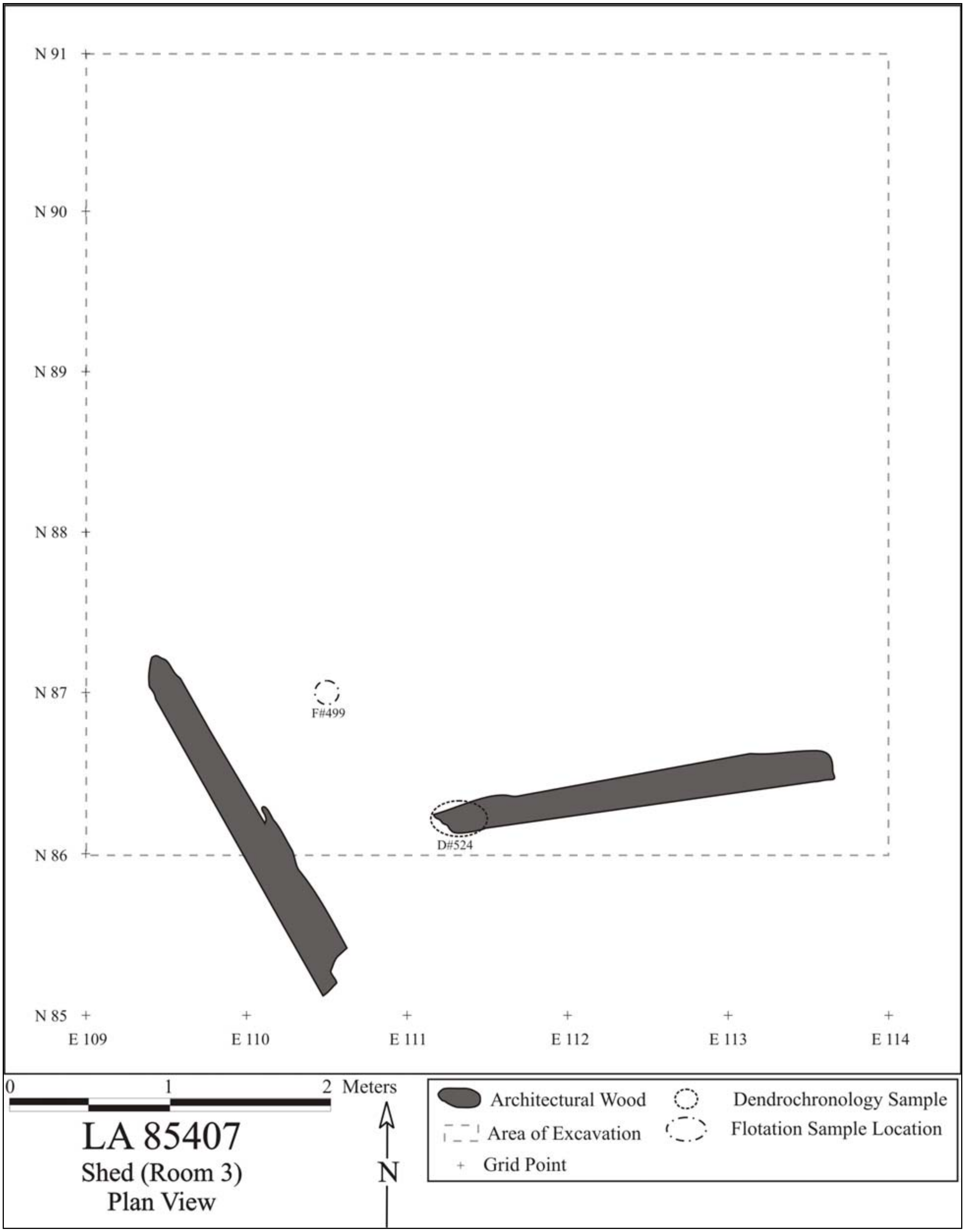

Figure 32.15. Plan view of Room 3, the shed.

Two large wood beams were the only remains of this structure visible on the surface before excavation. These wood beams appeared to have been part of the structure's south wall. Room 3 is most likely the pole shed described in Homestead Entry Survey No. 394. According to this document, the shed measured 12 by 20 ft (Peterson and Nightengale 1993:51). A 5- by 1-m east-west trench was initially excavated to the north of the wood beams. The trench was excavated in 1- by 1-m units. The trench was excavated to expose a profile of the area's stratigraphy, as well as to determine the location of the room's east and west walls. Unfortunately, no wall remains were encountered in the trench units, suggesting that the shed lacked a firm foundation. In addition, no living surfaces were encountered, nor were there any obvious changes in the structure's fill. As a result, the trench's profile was not drawn or photographed. The excavation of the trench units terminated at a sterile, clay-rich soil.

After the excavation of the trench, the structure's extent was estimated based on the dimensions provided in Homestead Entry Survey No. 394. According to this document, the shed was 12 by 20 ft, with the long side oriented east to west (Peterson and Nightengale 1993:51). Based on these dimensions, it was decided that the excavations should extend 2 m north and 2 m south of the east-west trench. The southern extension included the entire eastern wood beam and the northern half of the western wood beam of the shed's south wall. The excavations therefore extended to the approximate location of the shed's southern boundary. By extending the excavations 2 m north and south of the east-west trench, the excavations in Area 5 measured 5 by 5 m. Provided that the center of the excavations was located more or less in the center of the shed, the excavations therefore included the shed's entire width (12 ft, or approximately 3.66 m) and most of its length (20 ft, or approximately 6.10 m). The excavations to the north and south of the east-west trench were each divided into two large excavation units. The eastern excavation units (86-88N/112-114E and 89-91N/112-114E) measured 2 by 2 m, and the western excavation units (86-88N/109-112E and 89-91N/109-112E) measured 2 by 3 m. No additional wall remains or living surfaces were encountered in any of the excavations. The excavations terminated at the top of the layer of sterile, clay-rich soil encountered in the east-west trench.

Fill. Room 2 contained 2 to 7 cm of surface sediment (Stratum 1) on top of 25 to 40 cm of relatively undifferentiated post-occupational fill (Stratum 2). Only one flotation sample (FS 499) was taken of the shed's post-occupational fill. This sample was taken from a concentration of burned soil and charcoal in the southwest quadrant of the room. Charred taxa identified in the sample included goosefoot, cheno-ams, beeweed, doveweed (*Croton*), groundcherry (*Physalis*), sedge family (Cyperaceae), juniper, piñon pine, and ponderosa pine.

Floor. No living surface of any kind was encountered during the excavation of Room 3. The shed probably had an unprepared dirt floor.

Wall and Roof Construction. All that remained of the shed's walls at the time of excavation was two wood beams lying on the surface. These wood beams are believed to have been part of the shed's south wall. The quantity and nature of the artifacts recovered from the excavations to the north of the wood beams suggest that this area was in fact the shed's interior. The shed's walls were probably composed of wood beams and/or boards and the roof of sheet metal, although no evidence was found to support these suppositions. A dendrochronology sample (FS 524) was taken from the west end of the east wood beam in the south wall of the shed. It was identified as ponderosa pine and results are presented in the chronology section later in this chapter.

Artifact Distribution. Due to the fact that several excavation units contained multiple grid units, the exact distribution of artifacts in Area 5 could not be calculated. Artifact counts for each grid unit in the four large excavation units, however, were mathematically calculated. The artifact counts for the grid units are the average number of artifacts per 1 m^2 of the excavation unit in which they were located. As Table 32.9 demonstrates, the distribution of artifacts was surprisingly uniform throughout the excavated portion of Area 5. The number of artifacts recovered from the trench units ranges from 5 to 14. The artifact density was slightly higher in the room's northwest quadrant (16.67), but nearly identical in the room's other three quadrants (8.17 to 9.50).

Table 32.9. Artifact counts by grid unit in Area 5.

	E109	**E110**	**E111**	**E112**	**E113**
N90	16.67	16.67	16.67	9.50	9.50
N89	16.67	16.67	16.67	9.50	9.50
N88	11	14	5	6	14
N87	8.17	8.17	8.17	9.00	9.00
N86	8.17	8.17	8.17	9.00	9.00

Note: All but the trench units (N88 E109-113) are averages from the excavation units in which the grid units are located.

Area 6 (Feature 3 - Corral)

Feature 3 is the remains of a corral (Figure 32.16) located approximately 14 m northeast of the shed. Judging from Peterson and Nightengale's map and description of the corral, it was in a much better state of preservation when they worked at the site in 1992 than it was during the C&T Project. Some of the structural remains appear to have burned in the Cerro Grande fire, which is probably the most important contributing factor to the corral's recent degradation (Nisengard et al. 2002). According to Peterson and Nightengale, the remains of the corral in 1992 measured approximately 11 by 12 m in area (1993:103). The feature's walls formed an irregular polygon and consisted of stacked logs that were wired together for support. No upright posts were evident. A partially intact, covered area that measured 3 by 4 m was located in the southwest corner of the corral.

During the C&T Project, the corral measured approximately 15 m east-west by 9.5 m north-south. The discrepancy between these measurements and those of Peterson and Nightengale are most likely the result of the feature's recent degradation. The C&T Project measurements are approximations, as the feature's structural remains are sparse and quite possibly partially scattered. Therefore, the Peterson and Nightengale measurements probably more accurately reflect the original size of the feature. The partially intact, covered area in the southwest corner of the corral no longer existed during the C&T Project, and was presumably destroyed by the Cerro Grande fire. In fact, the best-preserved portion of the corral during the C&T Project was the northwest corner. In this location, the remaining logs were mostly unburned.

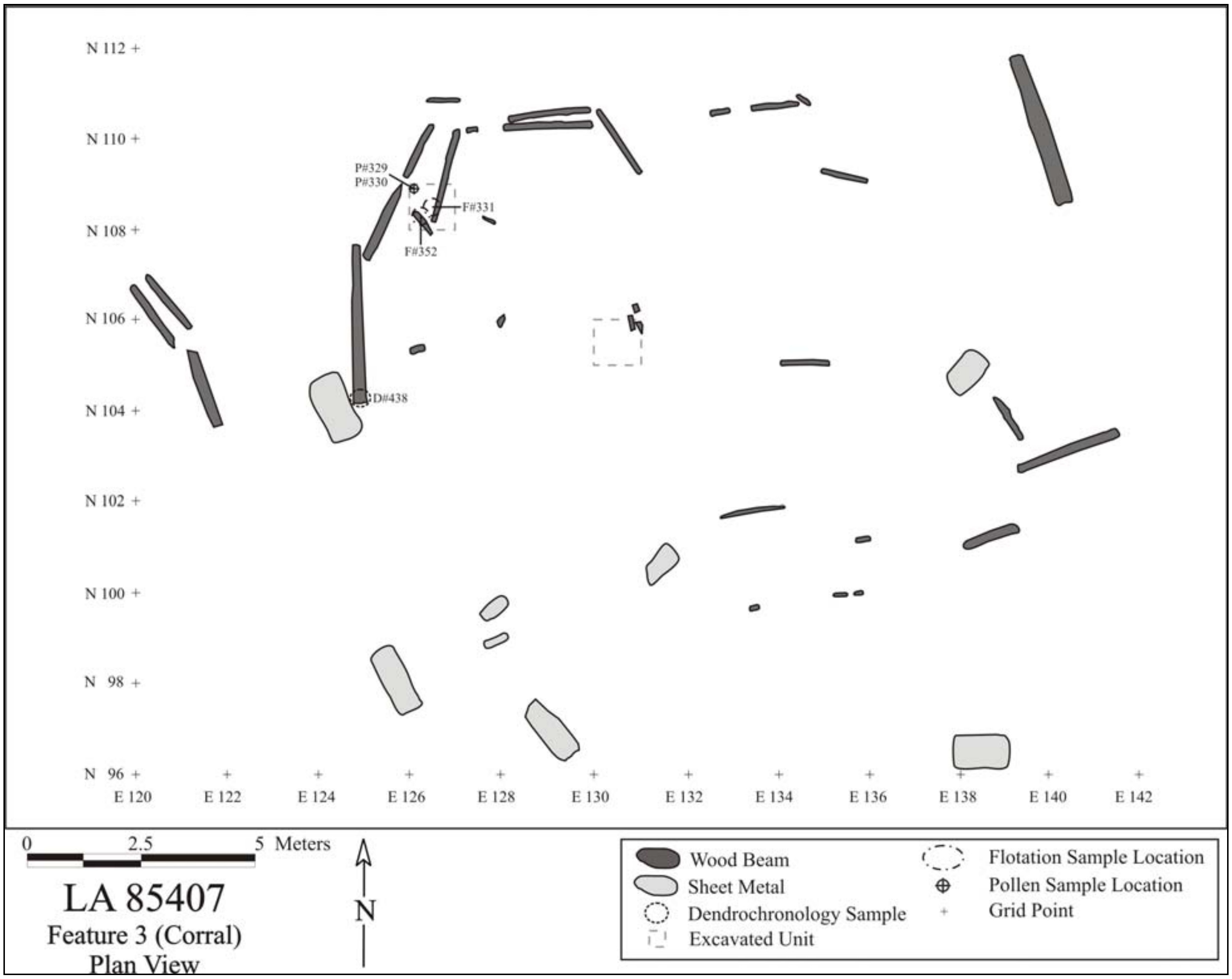

Figure 32.16. Plan view of Feature 3, the corral.

Most of the feature's logs that were extant during the C&T Project varied from 10 to 20 cm in thickness and 1 to 3.5 m in length. The logs are in such poor condition, however, that it is impossible to tell if any of them are still of their original length. The best preserved log was located in the northeast corner of the corral. This log was 40 cm wide and 3.6 m long. Both ends of the log appeared to have been cut, indicating that it probably retained its original length. All of the logs appear to be juniper, and no notches were observed. A dendrochronology sample (FS 438) was taken from the end of one of the logs, which was located in the corral's west wall. It was identified as ponderosa pine and dendro results are presented later in this chapter. Although no logs remained wired together, lengths and loops of wire were present in and around the corral. Large fragments of corrugated sheet metal were also found in and around the feature. The highest concentration of sheet metal was in the southwest corner of the feature. This metal probably functioned as the roof for the covered area in the southwest corner of the corral described by Peterson and Nightengale (1993:103). The extent of the corral was also marked by the presence of tumbleweed, which was not present in any other location of the site. Presumably, the tumbleweed reflects the fact that the soil within the corral was different from that of the rest of the site as a result of being fertilized by the manure of the animals that it housed.

Two 1- by 1-m test pits were excavated in Feature 3 to recover the remains of manure for analysis to determine what types of animals were housed in the corral. For this reason, numerous soil samples were taken from the test pits. The first test pit was grid unit 108N/126E, which was located in the northwest corner of the corral. Four flotation samples (FS 331, FS 332, FS 333, and FS 352) and five pollen samples (FS 329, FS 330, FS 354, FS 355, and FS 356) were collected from the fill in several different locations and at different elevations within the unit. FS 331 was the only flotation sample analyzed from this unit. Carbonized taxa identified included goosefoot, summer cypress (*Kochia scoparia*), dropseed grass (*Sporobolus*), piñon pine, and ponderosa pine. FS 329 and FS 330 were the only pollen samples analyzed, and the taxa identified in these samples included maize grass family, cheno-ams, sunflower type (Asteraceae), globemallow (Sphaeralcea), spurge family (Euphorbiaceae), spruce (*Picea*), fir (*Abies*), penstemon family (Scrophulariaceae), unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

The second test pit was unit 105N/130E, which was located just west of the center of the corral. Three flotation samples (FS 398, FS 399, and FS 400) and three pollen samples (FS 395, FS 396, and FS 397) were taken of fill from different locations and at different elevations within the unit, but none of these samples were analyzed. The excavation of the test pits terminated at a layer of sterile, clay-rich soil approximately 20 to 25 cm below the surface. The fill above was fairly uniform, and no living surface of any kind was encountered. The soil in the test pits, however, was highly disturbed by rodent bioturbation. Extensive rodent activity was also evident on the surface throughout much of the rest of the corral.

Area 7 (Feature 4 – Reservoir)

Feature 4 is a small reservoir located approximately 9.5 m north-northwest and uphill from the cabin and 22 m west of the shed (Figure 32.17). The reservoir is also located directly east of a small arroyo. The reservoir is roughly circular, with a diameter of approximately 14 m. The reservoir presumably functioned as a catchment basin for rainwater. A human-made berm formed the south and west borders of the reservoir. This berm reaches a height of between 1.5 and 2 m as measured from the basin. The northern edge of the reservoir is formed by the natural ground surface, which slopes up to the north. The eastern edge of the reservoir is formed by only a slight mound, as the natural ground surface also slopes upward (although not as steeply) to the east. The depth of the basin is approximately 1 m as measured from the slight mound to the east.

Two auger holes were excavated in Feature 4. The purpose of these excavations was to recover pollen samples from different elevations in two separate locations of the feature. Auger Hole 1 was located on the slope between the basin and the berm to the south, at 82.70N/82.50E. Auger Hole 2 was located within the basin, at 81.00N/82.00E. The sediment removed from Auger Hole 2 (within the basin) was rich in silt, while the sediment removed from Auger Hole 1 was rockier and had a higher clay content. The former presumably reflects the accumulation of alluvial sediments within the reservoir, while the latter represents the cultural fill used to construct the berms. No artifacts were observed in either auger hole.

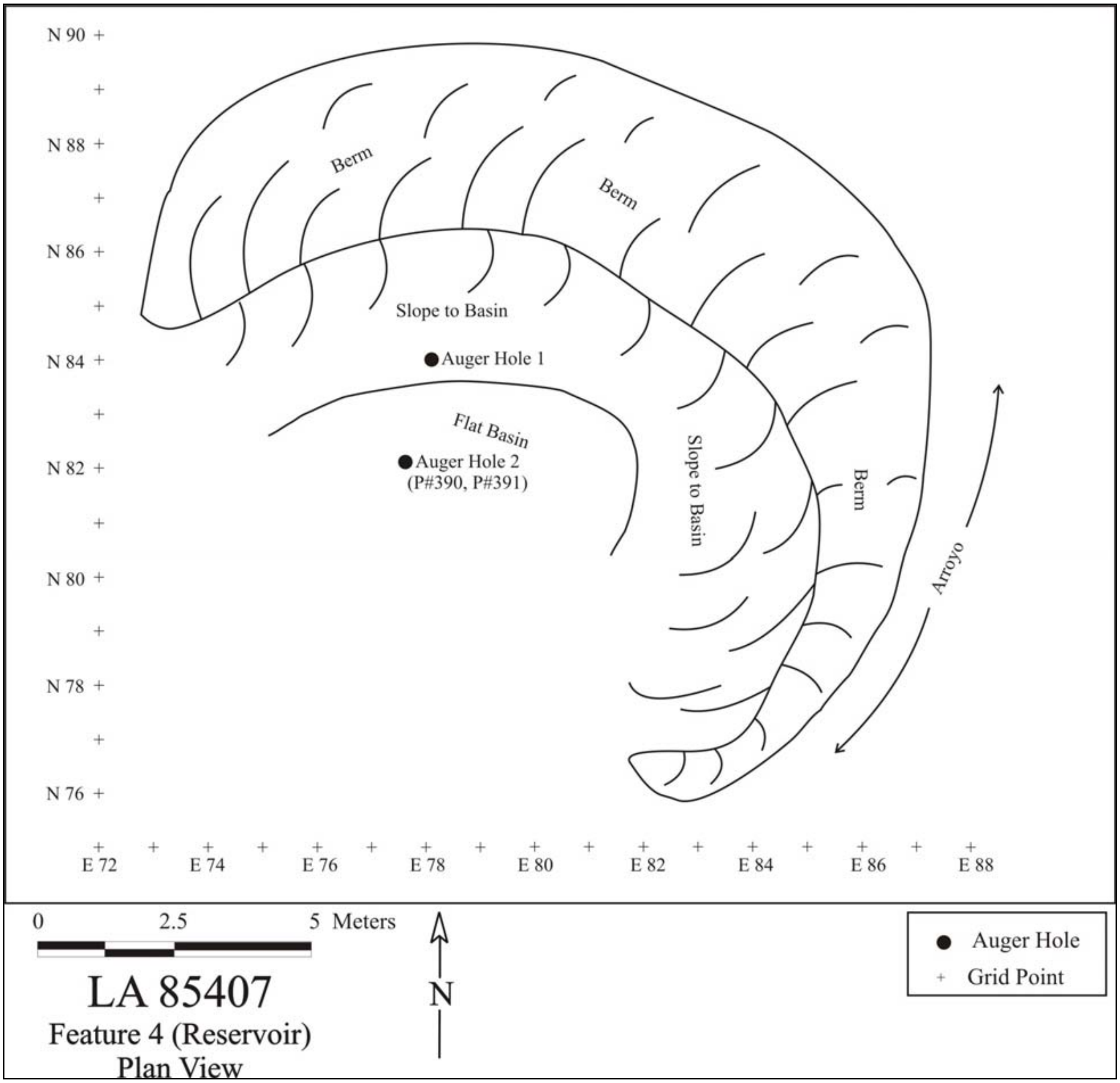

Figure 32.17. Plan view of Feature 4, the reservoir.

Pollen samples were taken from 5 (FS 385), 10 (FS 386), 15 (FS 387), and 20 (FS 388) cm below ground surface in Auger Hole 1, and from 5 (FS 389), 10 (FS 390), 20 (FS 391), and 30 (FS 392) cm below ground surface in Auger Hole 2. Only FS 390 and FS 391 were analyzed and identified taxa included prickly pear, cheno-ams, sunflower family, ragweed/bursage, spurge family, spruce, fir, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 5591 artifacts were analyzed from the excavations conducted at LA 85407. Flotation and pollen samples were selected for analysis from the post-occupation fill (Stratum 2). Architectural wood was also submitted for tree-ring dating. The results of the artifact and sample analyses are presented in the following sections. Table 32.10 lists the samples that were selected for analysis.

Table 32.10. Samples selected for analysis from LA 85407.

Stratum	Sample Type			
	Flotation	Pollen	Macrobot.	Tree-ring
0				291, 303, 406, 438, 504, 505, 506, 524
1				
2	269, 298, 301, 331, 352, 357, 408, 499	299, 302, 329, 330, 358, 390, 391, 490	41, 64, 95	

Chronology

Tree-Ring Dating

Eight wood construction elements from LA 85407 were submitted to the Dendrochronology Laboratory at the University of Arizona (Table 32.11). Ron Towner reported that all the samples were ponderosa pine, with five of the eight yielding dates. However, none provided cutting dates due to the poor preservation of the outside rings, leading to a couple of interpretations. The simplest is that the entire structure was built sometime after 1900, based on the 1900+vv date from NM-27 (Room 2). Alternatively, the mini-cluster of noncutting dates in the late 1860s to 1870 (NMI-29, 31, 33) might indicate construction of Rooms 1 and 3 and the corral in the late 1800s. Given that the cabin was built as a single unit, it appears that the former interpretation is probably more accurate.

Table 32.11. Tree-ring dated samples from the Serna Homestead.

FS No.	Sample No.	Species*	Provenience	Inside Date	Outside Date	Outside Symbol
504	NMI-27	PP	Rm 2	no date		
505	NMI-28	PP	Rm 2	1778	1900	+vv
524	NMI-29	PP	Rm 3	1793	1868	vv
291	NMI-30	PP	South of Rm 1	no date		
438	NMI-31	PP	Corral	1779	1866	vv
506	NMI-32	PP	Rm 1	no date		
303	NMI-33	PP	South of Rm 1	1681	1870	vv

FS No.	Sample No.	Species*	Provenience	Inside Date	Outside Date	Outside Symbol
406	NMI-34	PP	South of Rm 1	1753	1818	+vv

***ponderosa pine**

Ceramic Artifacts (Dean Wilson)

A total of 193 ceramics were analyzed from LA 85407. The majority of the pottery consists of Athabaskan plainware, with fewer biscuitwares, micaceous utilitywares, and historic utilitywares (Table 32.12). A more detailed analysis of the Athabaskan plainware sherds was conducted by Sunday Eiselt (see Chapter 75, Volume 4; Appendix O). Eiselt's analysis also identified the presence of two Tewa blackware sherds, four Tewa micaceous slipped sherds, and four Hispanic/Tewa Buff sherds. Two of the Tewa micaceous sherds could have been derived from a vessel produced at nearby San Ildefonso or Santa Clara pueblos, while the other two sherds could have been derived from a vessel produced at Nambe, Tesuque, or Pojoaque. Eiselt suggests a post-1913 date for the historic ceramic assemblage at the Serna Homestead. Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 32.13 to 32.15 and in Chapter 75.

Table 32.12. Ceramic types from LA 85407.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	1	0.5
Biscuit unpainted one side slipped	2	1.0
Biscuit B/C body	5	2.6
Northern Rio Grande Utilityware		
Tewa Buff	2	1.0
Tewa polished gray	2	1.0
Unpolished mica slip	2	1.0
Sapawe micaceous	3	1.6
Athabaskan plain unpolished	176	91.2
Total	**193**	**100.0**

Table 32.13. Tradition by ware for LA 85407 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	0	0.0	8	97.1	0	0.0	0	0.0	8	47.0
Rio Grande (Tewa Micaceous)	0	0.0	0	0.0	0	0.0	3	100.0	3	17.6
Rio Grande (Historic)	6	100.0	0	0.0	0	0.0	0	0.0	6	35.2
Total	**6**	**100.0**	**8**	**100.0**	**0**	**0.0**	**3**	**100.0**	**17**	**100.0**

Table 32.14. Temper by ware for LA 85407 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Fine tuff and sand	4	66.6	8	100.0	0	0.0	2	66.6	14	82.3
Mostly tuff with phenocrysts	2	33.4	0	0.0	0	0.0	0	0.0	2	11.7
Granite with mica	0	0.0	0	0.0	0	0.0	1	33.3	1	5.8
Total	**6**	**100.0**	**8**	**100.0**	**0**	**0.0**	**3**	**100.0**	**17**	**100.0**

Table 32.15. Vessel form by ware for LA 85407 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Bowl body	1	16.6	8	100.0	0	0.0	0	0.0	9	52.9
Jar body	2	33.4	0	0.0	0	0.0	3	100.0	5	29.4
Body polished int-ext	3	50.0	0	0.0	0	0.0	0	0.0	3	17.6
Total	**6**	**100.0**	**8**	**100.0**	**0**	**0.0**	**3**	**100.0**	**17**	**100.0**

The Analysis of the Historic Artifacts from the Serna Homestead (Charles M. Haecker and Louanna L. Haecker)

A total of 5325 historic artifacts were collected from the LA 85407. All of these artifacts were coded using a material type classification and functional typology. In this system, each artifact is analyzed both in terms of its material type and method of manufacture. Determination of the probable function of each artifact was the goal of the analysis. An artifact was assigned to 1 of 10 functional categories based on expected domestic household activities. These categories derive from classificatory schemes used in other studies of 20th century rural habitation sites in New Mexico (Haecker 1999, 2006; Maxwell 1983; McKeown 1983; Seaman n.d.; Ward et al. 1977; Wilson 1979). The basic assumption is that the activities that took place in the historic household are basically similar to those in a present-day household.

The 10 categories represent generalized domestic activities and permit quantification of those artifacts assigned within each category. It is important to note that simple quantification of artifacts within a category does not necessarily reflect a direct correlation with its relative importance within a household. For example, a high percentage of beverage bottle fragments are often represented within collections of artifacts derived from 19th and 20th century homesteads. These glass fragments, however, may be the result of the breakage of only a relatively few bottles over the lifetime of the homestead. Conversely, complete tools within the same collection typically are a rare occurrence; it would be a mistake to interpret their sparse numeric count in an archaeological collection as reflecting unimportance in the day-to-day activities that once took place at the homestead. Several other factors prevent an artifact assemblage from unambiguously reflecting the period(s) of occupation of a site, or from replicating the inventory of items used or consumed on the site. Non-cultural processes include decay and weathering.

Cultural processes include dumping of trash off-site, scavenging, relic collecting, and archaeological excavation.

The function of an artifact and its date of manufacture and use can infer changes in production and subsistence. To obtain this information, artifacts recovered from the Serna Homestead assemblage are classified in terms of *functional categories* and *material types.* Other than a few fragments of adobe, the Serna assemblage consists of mass-produced items; therefore, the functions of most items, as intended by the manufacturers, can be identified. We assume that the site occupants used most of the manufactured items for the purpose intended by the manufacturers. Items used otherwise will show evidence of modification or re-use.

As with prehistoric artifacts, functional artifact identification can be divided into three categories: descriptive, chronological, and functional. Descriptive variables provide information about the physical properties of the artifact (e.g., maker's mark and brand contents). Chronological variables place the artifact in a temporal framework. Maker's techniques (e.g., wire nails and sanitary seal cans) are useful in this regard. Functional categories provide information about the use(s) of the artifact. The relevant variables are artifact type, primary function, reuse function, and contents. The artifacts from the Serna Homestead were initially classified into the general material categories of glass, metal, ceramic, and miscellaneous. The majority of artifacts fall into the first three categories. The miscellaneous group contains an assortment of artifacts of different materials, no one of which is sufficiently common to warrant placing the artifact into a separate group. Examples of materials in the miscellaneous category are leather, rubber, wood, and adobe. The artifacts were then described in terms of more specific physical properties. Each artifact was also classified in the general and specific functional categories. Dates were recorded for each artifact when possible, and any evidence for reuse modification/function was also noted.

Definitions

<u>Primary Function</u>: This variable describes the use or function of an artifact in broad terms. For example, a can that is known to have once contained food has a primary function of household in that it provided subsistence; a nail has a primary function of construction.

<u>Secondary Function</u>: This variable indicates the presence or absence of modification of the artifact. If modified, there is a determination as to the function other than that intended by the manufacturer.

<u>Manufactured Technique</u>: This variable indicates how the artifact was made by the manufacturer, and what specific material type(s) was used. For example, a can is made of rolled steel; a wood stove part is made of cast iron.

<u>Artifact Identification</u>: This variable indicates the artifact type (e.g., wire nail, window glass, whiteware, or shoe leather).

Condition: This variable identifies the overall physical state of the artifact at the time of its analysis. For example, from a list of coded identifiers, the artifact could be described as bent, crushed, melted, or a combination of any coded identifier.

Color: A determination of artifact color is provided only for glass, since glass color is an essential attribute that can provide information regarding chronology and function.

Measurements: Measurements were taken, where appropriate, and expressed in the standard United States system, that is, inches for linear measurements and ounces for volume (if known).

Comments: Specific information not identified by the above-stated coded identifiers are provided in written format. A sketch of the artifact is also done if such illustration would assist in better describing the artifact.

Results of the Analysis

The functional assemblages monitored for analysis are described below:

Construction

This assemblage is composed of hardware and building materials used in the fabrication and upkeep of site structures. Artifact types include nails, barbed wire, window glass, caulking, mortar, milled lumber, adobe, and bricks. As discussed by Maxwell (1983) and Seaman (n.d.), the diversity of articles in construction is indicative of varied building techniques as well as loss probabilities. Small easily carried items such as nails can be expected to have a higher loss probability, but that probability decreases as relative size and weight increases. Loss probability is also affected by the relative monetary value and availability of the item in the market. Through destruction, deterioration, scavenging, or even a subsequent occupation, all the materials that comprise a structure could enter the archaeological record. For most situations, these objects are expected to be abundant and concentrated within the location of the structure.

From their number alone, the most significant type of artifacts found in the construction assemblage is nails. Nail form is dictated by technological transitions that occurred during the late 19th century. American wire nail machinery was perfected during the 1860s and 1870s and wire nails replaced cut nails very gradually. The relative cheapness and ease of handling made wire nails more acceptable.

Wire nails were manufactured in standardized pennyweights and performed the same functions as their cut counterparts. All of the nails recovered from the Serna Homestead are the wire variety, which is appropriate given the period of site occupation: 1913–1943. Nail size categories were arranged and ranked according to the most frequent nail sizes recovered. Only whole nails, including both bent and unbent nails, were measured. The most common nail size measures 3.0 in. long (n = 153), followed by 2.5 in. (n = 86), 4.0 in. (n = 42), 3.5 in. (n = 41), 2.0 in. (n = 10), 5.0 in. (n = 10), 4.5 in. (n = 8), 1.5 in. (n = 3), 6.0 in. (n = 2), 5.5 in. (n = 1), 1.2 in. (n = 1), 1.0 in. (n = 1), and 3.25 in. (n = 1). Approximately 88 percent of the nails were recovered in the immediate vicinity of the cabin, and it is assumed that these nails are representative of what nail sizes were used to construct and maintain the cabin.

The two most commonly found nails sizes, that is, 3.0 in. and 2.5 in. long, are termed “box” nails. These nails are typically used for light framing, such as joining planks to floor and ceiling joists. The 3.5-in. and 4.0-in. nails may have joined together wider-dimensioned lumber such as floor joists to joist board spacers (Jurney 1991). Only one 1.2-in. nail was recovered. The evident paucity of this nail size, intended for roof shingles, reflects the fact that roofing of the Serna cabin consisted of sheet steel.

Approximately 750 fragments of window glass were recovered. Four concentrations of window glass occurred in the immediate vicinity of the cabin. Several window glass fragments are melted or else show crazing and these conditions may be the result of the cabin having been destroyed by burning; however, evidence of burning is minimal as opposed to what was found within the McDougall cabin, a homestead located in Technical Area 55 at Los Alamos National Laboratory (McGehee et al. 2006).

Several large pieces of sheet steel were recovered from testing the site. According to informants regarding the Serna Homestead, the cabin roof was sheathed with sheet steel. In fact, nail holes are positioned either at the corners of sheet steel or along the edges. Some of the sheet steel sheets have been cut or modified to accommodate the placement of, for example, a stove or vent pipe. One segment of stove pipe was recovered in the vicinity of the cabin.

Tools

This assemblage typically is included with construction activities in the analysis of historic artifacts; however, in this present study it is identified as its own assemblage to facilitate comparison between the Serna and McDougall homesteads (Haecker 2006). Tools include hammers, wrenches, and files. Being relatively expensive, large tools are typically curated and usually discarded only when damage is irreparable. Since the loss probability is low, a discard pattern is expected for broken tools, assuming no reuse or recycling. Usable tools found in the interior of a structure or activity area represent what Schiffer (1977:24) terms *de facto* archaeological refuse. This results from rapid destruction of the area or structure, or abandonment under conditions that allow belongings to be taken only as time or subsequent space availability permits.

Testing of the Serna Homestead recovered several undamaged and presumably still serviceable tools, including three sizes of bastard files, two pairs of scissors, a hacksaw blade, a box wrench, and a shovel blade. Fragments of a pocket compass and a gear wheel to what is believed to be a pocket watch were also recovered. All of these items were discovered either within or in the immediate vicinity of the cabin. The presence of these items in the archaeological record suggests that the cabin was destroyed or abandoned before the occupants could remove them along with all their other possessions.

Household

This category consists of common household artifacts used to store, prepare, and serve foods including furniture, lighting, washing, writing, and so on. Major components of the household category are the containers and other closures for commercially prepared foods. Items such as egg shells and peach pits are assigned to this group. Archaeological finds recovered from homesteads rarely indicate the inhabitants' dependence on bulk staples such as flour and dried beans. These types of important food items are typically packaged in perishable materials, which leave little or no trace of their former presence. In contrast, empty food cans deposited in an arid environment may remain largely intact for decades. It is usually the case that cans lack labels and are deteriorated in varying degrees, thereby preventing identification of the original can contents. Fortunately, some can shapes and dimensions are representative of the contents, such as sardine cans, lard buckets, tapered cans intended for meat, and condensed milk cans. Slide-off lid containers held products such as baking powder, coffee, and lard. All of the key strip-opened cans recovered from the Serna Homestead once contained coffee.

Of the 1561 can remains that were recovered, only 9 percent (n = 165) could provide accurate dimension measurements. The measurable cans indicate that the homestead inhabitants depended on canned fruits, juices, vegetables, and baked beans. Sardine cans also were present but represented less than 3 percent of the total number of food cans. It is presumed, then, that sardines were consumed on an occasional basis and likely eaten as a serving for one individual, as indicated by the small sizes of the entire sardine cans. Canned sardines, a possible luxury purchase, may have been consumed only on a non-meat fast day such as Friday. The excavations recovered only one meat can, which would have contained approximately one pound of commercially prepared meat such as corned beef.

Seventeen lard pails were identified in the assemblage. These pails typically contained lard, but the same type of container may have also held peanut butter, fruit jam, honey, or axle grease. A number of the pails have non-manufactured baling wire handles and presumably were attached to these pails by an occupant of the homestead. Pail opening diameters are 10 in., 9 in., 7.5 in., 6 in., and 5 in. Once empty of its packaged food content, lard-type pails sometimes were recycled for a variety of other purposes including use as lunch pails, water buckets, and collection receptacles for rendered fat. The collection includes a 4-in. diameter pail, which may have once contained hard candy. This unusually small-sized pail also has a non-commercial bailing wire handle. Its opening has been pinched shut and the base of the pail has eight small nail holes. Perhaps this object had been recycled by a child to hold a "pet" animal or insect.

Coffee was definitely the beverage of choice at the homestead, as indicated by the numbers of coffee cans and coffee can strip keys in the collection. Only two condensed milk cans and one cocoa can were identified in the artifact collection. The seeming paucity of condensed milk cans may reflect the fact that the Sernas brought a milk cow with them when on their seasonal visits to the homestead (Peterson and Nightengale 1993:61).

Glass containers that once contained food and condiments were also identified in the collection; however, the small-fragment conditions of the glass shards recovered from the homestead prevents diagnostic identification for virtually all of these types of artifacts. It was possible to identify one glass container that once contained a pickle-type relish. This jar is similar in shape and size to commercially packed glass jars of pickle relish recovered at a World War II Japanese-American internment camp (J. Burton 1996:746, Figure B.12b). A fragment of a catsup bottle, three glass stoppers of a type used on various types of bottled pickles and other preserves, a fragment of a bottle that once contained chili pepper sauce comparable to Tabasco Sauce, and a fragment of a bottle that once contained Karo-brand syrup were also identified.

A few fragments of canning jars were also identified in the collection. Canning jars are intended to be used over and over again, thus representing multiple years of usage. Also, since the Sernas only seasonally occupied the homestead, it is possible that home canning at that location was not a worthwhile task. One informant recalled that his mother canned a great amount of home-grown vegetables and fruits, but it was not noted if this task was performed at both the Serna primary residence in Nambe and at the homestead (Peterson and Nightengale 1993:66). According to Jansen (1982:362 in Akins 1995:36), Hispanic women in New Mexico relied mostly on drying rather than canning as their principal method of food preservation into the 1930s. Drying is inexpensive and efficient while jars and caps are expensive, and cold-pack canning required considerable time and effort. Corn, chile, onions, beans, squash, and meat were traditionally dried. Agricultural extension agents made little effort to teach Spanish-speaking women the art of canning before 1929 (Jansen 1982:365).

A total of 84 ceramic fragments were recovered, representing a minimum of 24 vessels, including plates, saucers, bowls, cups/mugs, and a decorative vase. Vessel forms were recognized by rims, bases, or distinctive curvature. Other fragments were labeled as indeterminate in form. Paste type is the primary criterion by which historic, commercially manufactured ceramics are categorized; however, it can be difficult in distinguishing white earthenware paste types from harder, fired ironstone or graniteware paste types. Since the separation of these types on the basis of hardness may be invalid, Majewski and O'Brien's approach of combining these types into one 'refined whiteware' was used (1987).

Refined whitewares were favored by the occupants of the Serna Homestead. Vessels of this durable, inexpensive type were used to serve meals and represent over 90 percent of the recovered ceramic fragments. A number of the whiteware sherds are decorated using the decal method. One pattern design consists of sprigs of small flowers, which was a ceramic motif popular during the early 20th century and prior ceramic designs inspired by the Art Deco period of design (circa 1920–1940). There is not an overall ceramic design pattern in the collection of decorated whiteware sherds. It may be the case, therefore, that vessels were bought one at a time at local stores, rather than buying complete matching sets. Only one fragment of a porcelain bowl was recovered. This vessel, which would have been significantly more expensive than domestic whitewares, was made in either Japan or China during the late 19th or early 20th century. The presence of a few fragments of stoneware crockery is indicative of food storage and/or food preparation. One fragment of a whiteware vase was also recovered, as well as a Kapo Black sherd.

Indulgences

This category is represented by objects that are not essential for human survival but instead provide pleasure or satisfy a superfluous desire. These items include glass fragments of alcoholic and non-alcoholic beverages and toys. Several clay and glass marbles were found, as were one fragment of a bisque-fired doll's head and several plastic beads. All of these objects are indicants that children lived at the homestead. A fragment of a harmonica reed plate was also identified in the assemblage. A harmonica can be in the possession of a child or an adult.

Only a few diagnostic glass fragments of wine and beer bottles are in the collection, and none of these fragments appear to date to 1913–1943. Likewise, there is only one identifiable fragment of a soda pop bottle (probably Coca-Cola) and three crown bottle caps in the collection. FS 431 consists of a concentration of fragments of wine and beer bottles, located approximately 50 m (152 ft) to the northwest of the Serna cabin. The few identifiable closures for the wine bottles are screw-tops, which would date these bottles to post-1970. Also, the few diagnostic beer bottle fragments are dated to post-1960, suggesting that the site area has recently been used by hunters, hikers, or others using the area for various forms of recreation. The collection also does not contain tobacco cans; however, there is one cigarette holder made of plastic.

Personal Possessions

This category includes individually owned items such as shoes, clothing, coins, jewelry, or those related to personal hygiene. These items would have variable use-lives such as shoes and clothing that were eventually discarded when worn out, and jewelry that was carefully safeguarded and entered the archaeological record only when lost. Smaller items, such as buttons and clothing rivets may be either discarded or lost. The artifact collection contains several buttons that are made of milk glass, bone, and shell. Most of these buttons are typically found on work shirts and work jackets. There are two mother-of-pearl buttons that may have been attached to a woman's dress blouse, and one button for a woman's dress coat. Several pieces of jewelry are present in the collection, including a possible broach made of carved mother-of-pearl with a cupreous decorative inset and several glass beads from a probable necklace. Fragments of shoe leather and fragments of a rubberized cloth Wellington-type boot are present. The remains of a man's shoe heel made of rubber and a woman's or child's rubber shoe heel were also found.

Firearms and ammunition were also included in the personal possessions category. A concentration of nine .22-caliber cartridge cases was found in the area between the cabin and horno. This suggests that occasional target practice and/or shooting of varmints took place at this location. Also discovered in the vicinity of the cabin are one .38-caliber rifle cartridge case and one .50-caliber rifle cartridge case.

Other personal items include the remains of a clasp knife, the needle of a pocket compass, a brass gear wheel that probably came from a pocket watch, a plastic comb, the above-mentioned cigarette holder, a five-cent coin that dates to 1902, and a fragment of a cold cream jar. Two pennies that date to post-1958 are also in the collection and reflect casual visitation to the Serna Homestead long after it was abandoned in 1943.

Animal Husbandry

Four horseshoes and one horseshoe nail were also identified in the collection, as were fragments of what is believed to be a leather harness. The presence of several fence staples in the collection suggests that the homestead included a wire fence compound, presumably for penning livestock.

Transportation

An informant described how he, as a child, rode a horse on the Serna Homestead during their seasonal visits. He also recalled how the Serna family made the trips in a covered wagon (Peterson and Nightengale 1993:63). In fact, four horseshoes, a horseshoe nail, and possible metal brace fittings for a wagon were also identified in the collection. A leaf spring that could have been part of a wagon or automobile, a cam shaft that presumably derived from an automobile, truck, or tractor, and fragments of a worn-out automobile tire were also identified. It should be kept in mind that, during the early to mid-20th century, it was common for rural inhabitants to collect metal scrap both for their recycling possibilities and/or for selling to dealers in scrap metal (Buckles et al. 1986:354). It should not be assumed, therefore, that the discovery of automobile or truck parts is an indication that the site inhabitants actually owned such vehicles. The hubcap of a circa-1948 Plymouth automobile is in the collection; therefore its deposition post-dates abandonment of the Serna Homestead. We suspect that the Sernas did not own an internal combustion conveyance because motor oil cans are notably absent from the collection. Such cans are usually present on a 20th century rural habitation site where various types of internal combustion engines were maintained.

Health and Hygiene

Fragments of a paneled bottle(s) were identified in the collection. These bottles are of a type that were typically used for non-prescription patent medicines during the late 19th and early 20th centuries. There is little else to suggest that the Serna Homestead depended on commercially manufactured medicines.

Summary of Findings

Oral interviews and documents research indicate that, beginning in 1913 and up to 1942, the Serna family occupied the homestead on a seasonal basis. They traveled by wagon to the homestead, lived in a log cabin that had sheet metal roofing, and cultivated 40 acres of beans, corn, wheat, pumpkins, and various vegetables. Artifacts collected from this site are supportive of these findings. They occupied the homestead approximately six weeks a year, which would have generated significantly less refuse when compared to the refuse generated by those families who lived year-round on the Pajarito Plateau. Non-staple foods consumed at the homestead include commercially canned vegetables and baked beans and, perhaps, canned fruits and/or juices. Canned meats likely were not regular items on the menu, and neither were home-canned foods. An informant recalled that his family regularly ate fresh beef (Peterson and Nightengale 1993:66), which would explain the virtual absence of meat cans. It is likely that, at least during the harvest season, the Sernas were consuming at least some of what they were harvesting (e.g., onions, beans, squash, chili, and corn). There is little to suggest that the inhabitants treated themselves to even the occasional culinary luxury.

Ceramic plates, saucers, cups, and mugs are of types that are utilitarian and inexpensive. Cooking and lighting is appropriate for the time and place, that is, dependence on kerosene lamps and wood used for heating. Indulgences are minimally represented in the collection, and what few indulgences that are represented are mostly children's toys. The Sernas apparently were not imbibers of alcoholic beverages or tobacco, at least not during their seasonal visits to the homestead.

Comparison of the Serna and McDougall homesteads (see McGehee et al. 2006) indicate not-surprising idiosyncratic differences between the daily routines of the two households (Table 32.16). As examples, the McDougall household indulged in alcoholic beverages and tobacco, whereas these indulgences were virtually absent at the Serna Homestead. Extensive food can refuse is present at the McDougall homestead, but significantly fewer cans are present at the Serna Homestead. This difference, however, may be misleading since the Sernas occupied their homestead on a seasonal basis. In contrast, the McDougalls lived on their homestead year-round, thus generating significantly more domestic refuse.

Table 32.16. Comparison of artifacts from the McDougall and Serna homesteads by primary functions.

Primary Functions	McDougall Homestead	Serna Homestead
	Construction	
Nails	3621 nails, mostly within the cabin; light framing nail is the most common type	354 nails, mostly within or near the cabin; light framing nail is the most common type
Sheet steel	Present but sparse	Present; used for roofing
Window glass	Present in cabin area; many fragments are melted, crazed	Present in cabin area; few fragments are melted, crazed
Tools	One hammer head	Files, scissors, wrench, hacksaw blade, shovel blade
	Domestic Routine	
Food cans	Two extensive can dumps; most of cans once contained fruits, vegetables, juices; single-serving potted meats and sardine cans present; condensed milk cans are common	Can dump absent; most cans once contained fruits, vegetables, juices; only one meat can; only two condensed milk cans; single-serving sardine cans present
Commercial food jars	Condiments, sauces, pickles	Condiments, sauces, pickles
Canning jars	Present	Present, but scarce

Primary Functions	**McDougall Homestead**	**Serna Homestead**
Ceramics	Inexpensive whitewares are common; one Limoges porcelain sherd; stoneware storage vessels; local Native American ceramics present	Inexpensive whitewares are common; one Asian porcelain sherd, one vase sherd; stoneware storage vessels; local Native American ceramics present
Kerosene lamp chimney glass	Present	Present but scarce
Lard pails	Present; two sizes. Recycling not evident	Present, five sizes; possible recycling for other use(s)
	Indulgences	
Alcohol bottles	Present	Absent from the period of homestead occupation
Soda bottles	Present but scarce	Possibly absent from the period of homestead occupation
Tobacco cans	Present	Absent
Toys	One marble	Marbles, doll fragment, plastic beads
Personal possessions	Shirt and blouse buttons, glass beads	Glass beads, brooch fragment, harmonica fragment, clasp knife fragment, pocket compass fragment, shirt, blouse, jacket buttons, shoe and boot fragments, comb, cold cream jar
	Transportation	
Auto/truck	Oil-can, post-1947 spark plug	Cam shaft, leaf spring; circa 1948 car hub cap
Horse/wagon	One horseshoe	Four horseshoes, possible hardware for a wagon
	Health	
Medicine	Patent medicine bottle fragments	Patent medicine bottle fragments

There is some physical evidence of different ethnic backgrounds at the two homesteads. The Sernas utilized an horno, used adobe as a building material, and employed a Mexican-style metate. There are no indications of comparable Hispanic architecture or ethnic-identity artifacts recovered at the McDougall homestead. What are more notable are the strong similarities. Both homesteads utilized building materials such as logs and stones to a large extent. Recycling of commercially manufactured building materials occurred. Food items were limited in variety and simple to prepare, and the plates and bowls that contained the food were as basic as the food itself. It is clear that both families operated on minimal cash income, which restricted discretionary spending on indulgences. It is possible that the McDougall's possessed a bit more discretionary income, judging by their evident consumption of alcoholic beverages, tobacco, and (perhaps) owning an automobile. These differences, however, are marginal.

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 75 artifacts were analyzed from LA 85407, consisting of 54 pieces of debitage, 12 retouched tools, six ground stone items, two hammerstones, and a manuport. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 32.17 presents the data on lithic artifact type by material type. The debitage is primarily made of obsidian, with less chalcedony, Pedernal chert, and general chert. The presence of cortex on 14.8 percent of the debitage indicates that these materials were collected from waterworn (*n* = 6) and nodule (*n* = 2) sources. The chalcedony, Pedernal chert, and chert are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. The manuport is an unmodified piece of schist that could also have been obtained from local gravel sources. The ground stone igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the Pajarito Plateau.

Table 32.17. Lithic artifact type by material type.

Artifact Type		Material												
		Basalt	Vesic. Basalt	Rhyolite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Quartzite	Sandstone	Other	Total
Debitage	Angular debris	0	0	0	0	0	2	8	0	3	0	0	0	13
	Core flake	0	0	0	0	0	8	8	1	9	0	0	0	26
	Biface flake	0	0	0	0	0	12	0	0	0	0	0	0	12
	Microdebitage	0	0	0	0	0	1	0	0	0	0	0	0	1
	Und. flake	0	0	0	0	0	2	0	0	0	0	0	0	2
	Subtotal	0	0	0	0	0	25	16	1	12	0	0	0	54
Retouched Tools	Retouched piece	0	0	1	0	0	0	5	0	2	0	0	1	9
	Biface	0	0	0	0	0	1	0	0	1	0	0	0	2
	Projectile point	0	0	0	0	0	1	0	0	0	0	0	0	1
	Subtotal	0	0	1	0	0	2	5	0	3	0	0	1	12
Ground Stone	One-hand mano	0	0	0	1	0	0	0	0	0	0	0	0	1
	Two-hand mano	0	1	0	0	0	0	0	0	0	0	0	0	1
	Und. mano frag.	0	0	0	0	1	0	0	0	0	0	0	0	1
	Slab metate	0	1	0	0	0	0	0	0	0	0	0	0	1
	Grinding slab	0	0	0	0	1	0	0	0	0	0	0	0	1
	Whet stone	0	0	0	0	0	0	0	0	0	0	1	0	1
	Subtotal	0	2	0	1	1	0	0	0	0	0	1	0	6
Other	Hammerstone	0	0	0	0	0	0	0	0	1	1	0	0	2
	Manuport	0	0	0	0	0	0	0	0	0	0	0	1	1

Artifact Type		Material												
		Basalt	Vesic. Basalt	Rhyolite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Quartzite	Sandstone	Other	Total
	Subtotal	0	0	0	0	0	0	0	0	1	0	0	1	3
Total		**0**	**2**	**1**	**1**	**1**	**27**	**21**	**1**	**16**	**1**	**1**	**2**	**75**

Nine pieces of obsidian and one biface were submitted for X-ray fluorescence analysis. Most of the artifacts are made from the Cerro Toledo source, but fewer from the Valle Grande and El Rechuelos sources (Table 32.18). The Cerro Toledo (Obsidian Ridge/Rabbit Mountain) and the Valle Grande (Cerro del Medio) source areas are located about 19 km (12 mi) and 17 km (11 mi) as the "crow flies" to the southwest and west of the site. Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present in the area of the site as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval and are scattered along the mesa top. Lastly, the El Rechuelos (Polvadera Peak) source area is located approximately 27 km (17 miles) to the northwest.

Table 32.18. Obsidian source samples.

FS #	Artifact	Color	Source
96	Debitage	Black dusty	El Rechuelos
215	Debitage	Translucent	Valle Grande rhyolite
380	Debitage	Black dusty	El Rechuelos
401	Debitage	Translucent	Cerro Toledo rhyolite
445	Debitage	Translucent	Cerro Toledo rhyolite
451	Biface	Black opaque	Cerro Toledo rhyolite
477	Debitage	Translucent	Cerro Toledo rhyolite
493	Debitage	Translucent	Cerro Toledo rhyolite
501	Debitage	Translucent	Valle Grande rhyolite
516	Debitage	Black opaque	Cerro Toledo rhyolite

Lithic Reduction

The debitage consists primarily of core flakes, with fewer angular debris, biface flakes, microdebitage, and an undetermined flake fragment. The overall cortical:non-cortical ratio of 0.28 reflects an emphasis on the later stages of core reduction and tool production/maintenance. The flakes mostly have single-faceted (n = 10), with fewer cortical (n = 2), and crushed (n = 4) platforms. Four of the platforms exhibit evidence of preparation and were abraded/crushed. The majority of the core flakes are whole (n = 9) or distal (n = 8) fragments, with fewer proximal (n = 4), midsection (n = 3), and undetermined (n = 2) fragments. The whole core flakes have a mean length of 26.3 mm (*std* = 10.8), the single whole biface flake a length of 13.0 mm, and the angular debris a mean weight of 3.9 g (*std* = 6.2).

The retouched tools primarily consist of retouched pieces with two bifaces and a projectile point (Figure 32.18). Four of the retouched pieces exhibit bidirectionally retouched lateral edges that include a projection. In contrast, the other five flakes have unidirectionally retouched lateral edges with angles of 65 degrees. The bifaces are fragments with edge angles of 60 to 65 degrees that presumably reflects that they were broken during the middle reduction stage. The projectile point is the midsection of a possible stemmed Late Archaic dart point.

Tool Use

None of the flakes and all of the retouched pieces exhibit evidence of edge damage that could be attributed to use. The retouched pieces that include projections have rounding/polish on their points, whereas the other retouched pieces exhibit some rounding and/or micro-scarring along their lateral edges. The projectile point has a broken tip and base that presumably occurred during use.

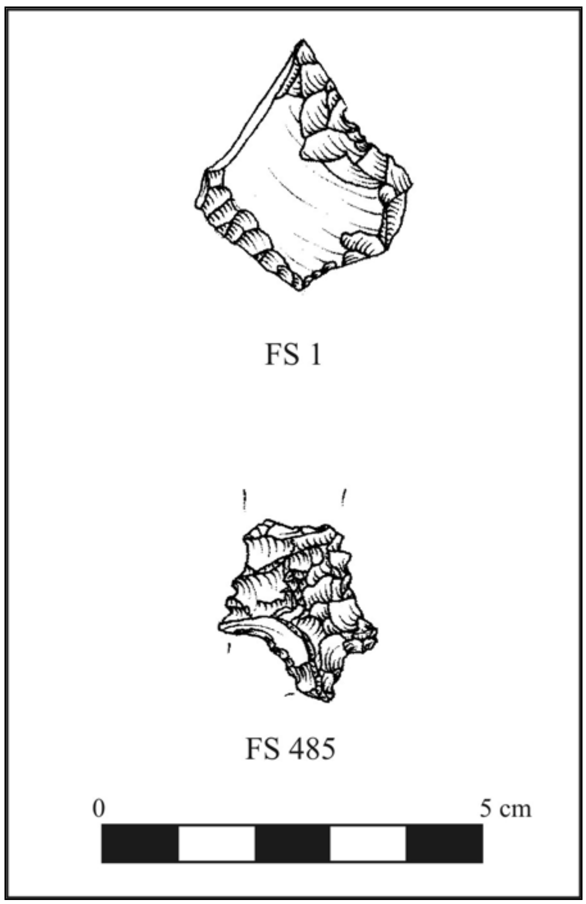

Figure 32.18. Retouched flake and projectile point.

The ground stone artifacts include manos, a metate, a grinding slab, and a whet stone. The one-hand mano is a flat dacite cobble that exhibits some grinding on both opposing surfaces. In contrast, the two-hand mano is a formal basalt, wedge-shaped mano that is heavily ground on all three sides. This mano was found in association with a formal basalt slab metate. It is a Mexican-style metate with one rear leg (see Figure 32.6). The grinding slab consists of a rectangular-shaped tuff slab with rounded corners and an oval grinding surface. Lastly, the whet stone is a small tabular piece of sandstone with a very smooth and striated surface. This artifact was presumably used to sharpen metal knives.

Faunal Remains (Kari Schmidt)

Twenty-seven pieces of bone were recovered during excavations at LA 85407. The site consists of the remains of a historic log cabin and various features in the surrounding area.

Cabin (Area 1)

The cabin was divided into Rooms 1 and 2. Ten bones were recovered in Room 1 and included one unfused kangaroo rat (*Dipodomys* sp.) femur, a fragment of a mule deer (*Odocoileus hemionus*) rib, a horn fragment from a domestic cow (*Bos taurus*), a fragment of an elk (*Cervus elaphus*) thoracic vertebra, two medium/large-sized mammal bones (one burned), two large-sized mammal rib fragments that both contained butcher saw marks, one large-sized mammal unidentified burned bone, and one unidentified piece of unburned bone. One bone, an unidentified medium/small-sized mammal long bone fragment, was identified in the Room 2 deposits.

Four bones were identified in the fill around the cabin and included a complete human premolar, a burned unidentified medium/large-sized mammal bone, an unidentified large-sized mammal bone, and a large-sized mammal rib fragment that contained evidence of butchery from a large saw.

Horno (Area 3)

Three bones were identified in the area around the horno, but no bones were recovered directly from the feature fill. Analyzed bones included one medium/large-sized mammal bone fragment and two domestic cow vertebral body fragments. None of the bones were burned, and all contained evidence of old breaks.

Area 4 (Feature 2, Circular Rock Alignment)

Feature 2 was a small rock feature located approximately 14 m south of the western end of the cabin (see Figure 32.13). The excavations revealed that the feature was a circular rock alignment. One bone was recovered from the circular alignment and it was identified as a fragment of a domestic cow axis vertebra. It was not burned, but did contain evidence of some butchering activities.

Shed (Area 5, Room 3)

Room 3 is the remains of a wood structure located approximately 21.5 m north-northeast of the cabin. Two large wood beams were the only remains of this structure visible on the surface prior to excavation. These wood beams appeared to have been part of the structure's south wall. Room 3 is most likely the pole shed described in Homestead Entry Survey No. 394. Six bones were recovered from this feature and included one unidentified bone, one blue grouse axis vertebra (*Dendragapus obscurus*), a domestic goat (*Capra hircus*) cervical vertebra and rib fragment, and a domestic cow distal metatarsal fragment. None of these bones were burned or otherwise altered.

Corral (Area 6, Feature 3)

Feature 3 is the remains of a corral located approximately 14 m northeast of the shed. Two bones were identified in the feature: one was an unidentified small/medium-sized mammal bone and one was a medium/large-sized mammal bone fragment.

Archaeobotanical Remains (Pamela McBride)

The contents of samples from post-occupational fill in the log cabin, a test pit in the corral, and an area of burned soil and charcoal in the shed produced a similar assemblage of burned conifer duff, native annual seeds, grass seeds, grass stems, and other disturbance-loving plants like groundcherry and vervain (Table 32.19). Burned sedge family seeds from the cabin and the shed together with unburned bulrush seeds from the corral attest to the proximity of the homestead to the creek just below in Rendija Canyon. Burned seeds that resembled summer cypress were recovered from the corral. Summer cypress is a weed introduced from Eurasia that is widespread in New Mexico and flourishes in waste places and open fields. The corral and some of the cabin burned during the Cerro Grande fire. Because of this and the similarity of the wild plant assemblages, the majority of wild floral remains probably represent weeds burned in the conflagration rather than debris from food preparation or animal feed.

Evidence for domesticates was restricted to the inside of the cabin and included maize cupules and one burned and one unburned grape seed. Interviews with Annie Lujan, the daughter of José María Serna, owner of the homestead, reported that crops grown included pinto beans, corn, wheat, pumpkins, and other "soft vegetables" (see site excavation section in this chapter). There is no mention of grapes or vineyards, but two peach pit fragments were identified in the vegetal sample from Room 1 post-occupational fill, and Mrs. Lujan did not mention that they grew at the homestead either. Wild grapes grow on canyon walls, in canyon bottoms, and piñon-juniper woodland (Foxx et al. 1998:40). While there are no gnaw marks on the specimens, the possibility that rodents deposited them cannot be ruled out. The grape seeds and peach pits could also be remnants of fruit "brought up from the valley (valley here refers to the Pojoaque-Española valley) orchards and vineyards" (Foxx and Tierney 1999:22) or orchards were present on the homestead, but were either not mentioned by Ms. Lujan.

A broken bean cotyledon from the same context and a piece of ponderosa pine wood were also identified in vegetal samples (Table 32.20). Interviews with residents or descendants of residents of the area document beans as the primary cash crop that was grown on the Pajarito Plateau (Tierney 1999c:15–23). With only one fragment recovered, it seems difficult to fathom the huge volume of beans grown on the Pajarito Plateau by homesteaders. One informant said that in 1915, he harvested about 2100 pounds of beans (Tierney and Foxx 1999:10) and this was not unusual before the drought of the late 1930s. The paucity of physical evidence is related to the fragility of beans and threshing and preparation methods. Beans may be removed from the pods elsewhere than the house interior and preparation does not usually involve parching or frying. Beans have no protective seed coat, as the pod acts as a container before harvest, leaving them vulnerable to consumption by animals or insects.

Table 32.19. Flotation sample plant remains, count, and abundance per liter.

FS No.	**269**	**298**	**301**	**331**	**352**
Context	Post-occup. fill in SE corner, Room 1	Post-occup. fill in SW corner, Room 1	Post-occup. fill, S ½, Room 2	Test pit NW corner, corral	
Cultural					
Annuals					
Beeweed	1(1)	4(4)			
Goosefoot		68(67)	31(31)	143(143)	1(1)
Pigweed		2(2)			
Stickseed			1(1)		
cf. Summer cypress				19(19)	
Cultivars					
Grape		1(1), 1(0) u			
Maize	2(1) c	3(0) c			
Grasses					
Dropseed grass				1(1)	
Grass family	1(1) pc	1(1), culm +	2(2)		
Other					
Groundcherry			1(1)		
Sage		4(4), 3(2) pc			
Unidentifiable		1(0)			
Vervain		3(3)			
Perennials					
Juniper			twig + pc		
Pine	bark +	bark +, needle +	bark +		cf. umbo+
Piñon				needle +	needle +
Ponderosa pine				needle +	needle +

FS No.	269	298	301	331	352
Sedge family		1(1)			
Non-Cultural					
Annuals					
Beeweed	+	+	+	+	+
Goosefoot	+++	+++	+++	++++	+++
Pigweed	++	+	+	+++	++
Purslane	+++	+++	+	++++	+++
Stickseed	+		+	+	
Sunflower	+	+	+		+
Grasses					
Dropseed grass	+	+	+	+	+
Grass family	+	+	+	+	+
Other					
Doveweed	+	+			+
Groundcherry	+	+	+	+	+
Knotweed family					+
Purslane family				+	
Sage	+	+	+		
Stickleaf		+	+		+
Sunflower family	+	+	+	++++	+
Unknown				+	
Other					
Vervain	+	+			
Perennials					
Bulrush				+	+
Globemallow		+	+		
Hedgehog cactus			+		
Juniper				+	+
Pine			♂ cone +		
Piñon	nutshell+			needle+, nutshell+	needle+, nutshell +
Ponderosa pine	needle+			needle+	needle+

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter, ++ 11-25/liter, +++ 25-10/liter, ++++ >100/liter, c cupule, pc partially charred, u uncharred.

Table 32.19 (continued). Flotation sample plant remains, count, and abundance per liter.

FS No.	**357**	**408**	**499**
Context	Near base of horno	Charcoal concentration, NE corner, horno	Burned soil/charcoal in shed
Cultural			
Annuals			
Beeweed			2(2), 1(0) pc
Cheno-am			3(3)
Croton			1(1)
Goosefoot		1(1)	56(56)
Other			
Groundcherry			2(2)
Unidentifiable		1(0)	11(11) e, 1(0) pp
Perennials			
Pine		bark +	
Sedge family			3(3)
Non-Cultural			
Annuals			
Beeweed			+
Goosefoot	+	+++	+++
Pigweed		+	+
Purslane	+	+++	+++
cf. Russian thistle			+
Stickseed			+
Sunflower		+	
Grasses			
Dropseed grass	+	+	+
Grass family			+
Other			
Doveweed			+
Groundcherry	+	+	+
Purslane family			+
Sage		+	+
Sunflower family		+	
Perennials			
Bulrush			+
Hedgehog cactus			+
Juniper			♀ cone +
Piñon			needle +, nutshell +

Table 32.20. Room 1, post-occupational fill vegetal sample plant remains.

FS No.	FS 41	64	95
Cultivars			
Bean	1(0)/<0.1 g		
Peach			2(0) u/2.1 g
Wood			
Ponderosa pine		1/<0.1 g	

Wood charcoal from the majority of contexts is overwhelmingly ponderosa pine (Table 32.21). Exceptions are the samples from inside the horno and the burned soil/charcoal concentration in the shed. Fuel used for cooking seems to have been primarily juniper, although piñon and ponderosa were also present. Wood from the shed context is a mixture of juniper, piñon, and ponderosa, but here ponderosa was the most common wood identified. This could reflect the use of ponderosa for construction and juniper for fuel in the horno.

Table 32.21. Flotation sample wood charcoal by count and weight in grams.

FS No.	269	298	301	331	352	357
Context	Post-occup. fill in SE corner, Room 1	Post-occup. fill in SW corner, Room 1	Post-occup. fill, S ½, Room 2	Test pit NW corner, corral		Near base of horno
Conifers						
Ponderosa pine	19/1.7 g	20/1.3 g	20/2.9 g	8/0.5 g	1/0.1 g	1/<0.1 g
Unknown conifer						1/<0.1 g
Non-Conifers						
Unknown non-conifer	1/0.1 g					
Totals	**20/1.8 g**	**20/1.3 g**	**20/2.9 g**	**8/0.5 g**	**1/0.1 g**	**2/<0.1 g**

Table 32.21 (continued). Flotation wood charcoal by count and weight in grams.

FS No.	408	499	Totals	
Context	Charcoal concentration, NE corner, horno	Burned soil/charcoal in shed	Weight	%
Conifers				
Juniper	12/1.8 g	4/0.1 g	1.9 g	19%
Piñon	3/0.8 g	1/<0.1 g	0.8 g	8%
Ponderosa pine	2/0.3 g	15/0.2 g	7.0 g	72%
Unknown conifer			<0.1 g	<1%
Non-Conifers				

FS No.	408	499	Totals	
Unknown non-conifer			0.1 g	1%
Totals	**17/2.9 g**	**20/0.3 g**	**9.8 g**	**100%**

The Serna family grew corn and beans among other crops documented in interviews and the Homestead Entry Survey. The family traveled to the homestead three times a year by wagon and stayed for about two weeks during each visit. The burned beeweed, goosefoot, pigweed, and groundcherry seeds could be evidence that the family ate the fruits of groundcherry and encouraged and collected annual greens from the fields, a practice documented in several interviews of Spanish residents of the region (Tierney 1999c:15-23). Local wood resources were used for fuel and construction.

Pollen Remains (Susan Smith)

Eight pollen samples were analyzed from LA 85407. Table 32.22 lists the frequency of identified pollen types. Maize was the only cultigen identified in the botanical assemblage. Prickly pear was the only other economic resource that was identified. A number of potential economic resources were also identified in the assemblage (Table 32.22).

Table 32.22. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85407 (*n* = 8)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	2
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	1
	cf. *Helianthus*	Sunflower type	1
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85407 (*n* = 8)
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	2
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	7
		Grass Aggregates	1
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	1
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs	Cheno-Am	Cheno-Am	7
		Cheno-Am Aggregates	2
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	7
		Sunflower Family Aggregates	1
	Ambrosia	Ragweed, Bursage	2
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 85407 (*n* = 8)**
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	2
		Globemallow Aggregates	1
	Euphorbiaceae	Spurge Family	2
	Scrophulariaceae	Penstemon Family	1
	Onagraceae	Evening Primrose	1
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Potential Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	3
	Abies	Fir	6
	Pinus	Pine	8
		Pine Aggregates	1
	Pinus edulis type	Piñon	8
	Juniperus	Juniper	8
		Juniper Aggregates	0
	Quercus	Oak	2
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	5
	Artemisia	Sagebrush	7
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 85407 is the historic Serna Homestead that is located on a gently sloping mesa immediately north of Rendija Canyon. The site is composed of several different areas including the main cabin (Area 1), the horno (Area 3), a small concentration of rocks (Area 4), the shed (Area 5), the corral (Area 6), and the reservoir (Area 7) (see Figure 32.2). Samples of wood submitted for tree-ring analysis returned a construction date for the cabin of around 1900. According to the historical documents, Andres Martinez applied for homestead certification in 1913, and the Homestead Entry Survey No. 394 was performed in October of 1916. The homestead was patented in 1922, and subsequently sold to José and Fidel Serna (of unknown relations), who had probably occupied the homestead since 1913. According to the survey, 40 acres of beans, corn, and vegetables were under cultivation on the homestead in 1916. Improvements included a 12- by 30-ft log house, a 12- by 20-ft pole shed, and one mile of brush fence. According to Annie Lujan, the cabin included three rooms and a sun porch, but the archaeological evidence neither supported nor refuted this information. Portions of the wood cabin floor were, however, identified. The Serna family made seasonal use of the homestead, as supported by the historic artifacts. In addition, the remains of maize, beans, peach and grapes were recovered during the site excavation.

CHAPTER 33
RENDIJA TRACT (A-14): LA 85408

Gregory D. Lockard

INTRODUCTION

LA 85408 is the remains of a small Middle Classic period fieldhouse located on the east-facing slope of a narrow ridge on the mesa between Rendija and Guaje canyons. The site is located near the northern boundary of the eastern portion of the Rendija Tract, a few m north of a two-track dirt road. Vegetation on the site consists of piñon-juniper woodland with some oak and ponderosa pine trees and a grass understory. The site is situated at an elevation of 2124 m (6970 ft).

LA 85408 was first recorded on August 16, 1991, by David Hill (1991) during a survey for the Bason Land Exchange Project. Hill believed the site to be a fieldhouse with at least two rooms. Surface Biscuit A (Abiquiu Black-on-gray) sherds indicated that the site was most likely occupied during the Classic period (AD 1325–1600). On July 20, 1992, Archaeological Research, Inc., was awarded the contract to conduct archaeological testing of the Bason Land Exchange sites. John Peterson and Christian Nightengale (1993) supervised the excavations, which took place between July 27 and August 23 of 1992. A single 1- by 1-m test pit (Unit A) was excavated at LA 85408. The unit was excavated to bedrock at a maximum depth of 42 cm below the ground surface. No convincing floor surface was encountered during the excavation of the unit. Artifacts recovered during the excavation of Unit A and a surface collection of the site include 16 pieces of chipped stone, two fragments of a single slab metate, and 19 ceramic sherds (11 Biscuit A, two Biscuit B, two undifferentiated Biscuitware, one White Mountain Redware, and two utilityware sherds). Most of the surface artifacts were collected from the areas to the northeast and southeast of the structural remains.

FIELD METHODS

Before excavation, the site and surrounding area were cleared of trees and large undergrowth. The site was then visible as a rubble mound approximately 5 by 6 m in area (Figure 33.1). An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the southwest corner of the site. The site was then covered with a 1- by 1-m grid that extended 8 m north and 8 m east of the site datum. Two subdata (A and B) were set up for taking elevations. The site was then photographed. No artifacts were visible on the surface, most likely due to the fact that it had been previously surface collected by Peterson and Nightengale (1993). A 7- by 1-m east-west trench (104N/101-107E) was initially excavated across the middle of the rubble mound. The purpose of this trench was to expose a profile of the site stratigraphy, as well as to determine the location of the structure's east and west walls. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels.

Figure 33.1. Photo of the mound at LA 85408 before excavation.

Within the structure, the trench units were excavated to a compact surface that may have been the room's living surface. Outside of the structure, the trench units were excavated to the top of a sterile layer of weathered Cerro Toledo bedrock. The westernmost unit in the trench (unit 104N/101E) was chosen to serve as a test pit for geological analysis. Excavation in this grid unit therefore continued until intact bedrock was encountered. The northern profile of the trench was then drawn and photographed. The rest of the site was subsequently excavated, again by strata and arbitrary levels for thicker strata. In all, 40 units were excavated. Within the structure, excavation proceeded to the compact surface encountered while excavating the trench. Outside of the structure, excavation terminated at the sterile layer of weathered bedrock. Excavation focused on defining the structure's walls, removing wallfall, and locating features. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended at least 1 m beyond the structure in all directions to locate external features and/or outdoor activity areas. The site was mapped (Figure 33.2) and photographed (Figure 33.3).

The excavation of the site was supervised by Greg Lockard. The field crew included Michael Dilley, Alan Madsen, Joseph (Woody) Aguilar, Kevin Hanselka, Brandon Gabler, Margaret Dew, and Samuel Duwe. Timothy Martinez and Aaron Gonzalez served as site monitors from San Ildefonso Pueblo and as screeners. Jeremy Yepa served as site monitor from Santa Clara Pueblo and as an additional excavator.

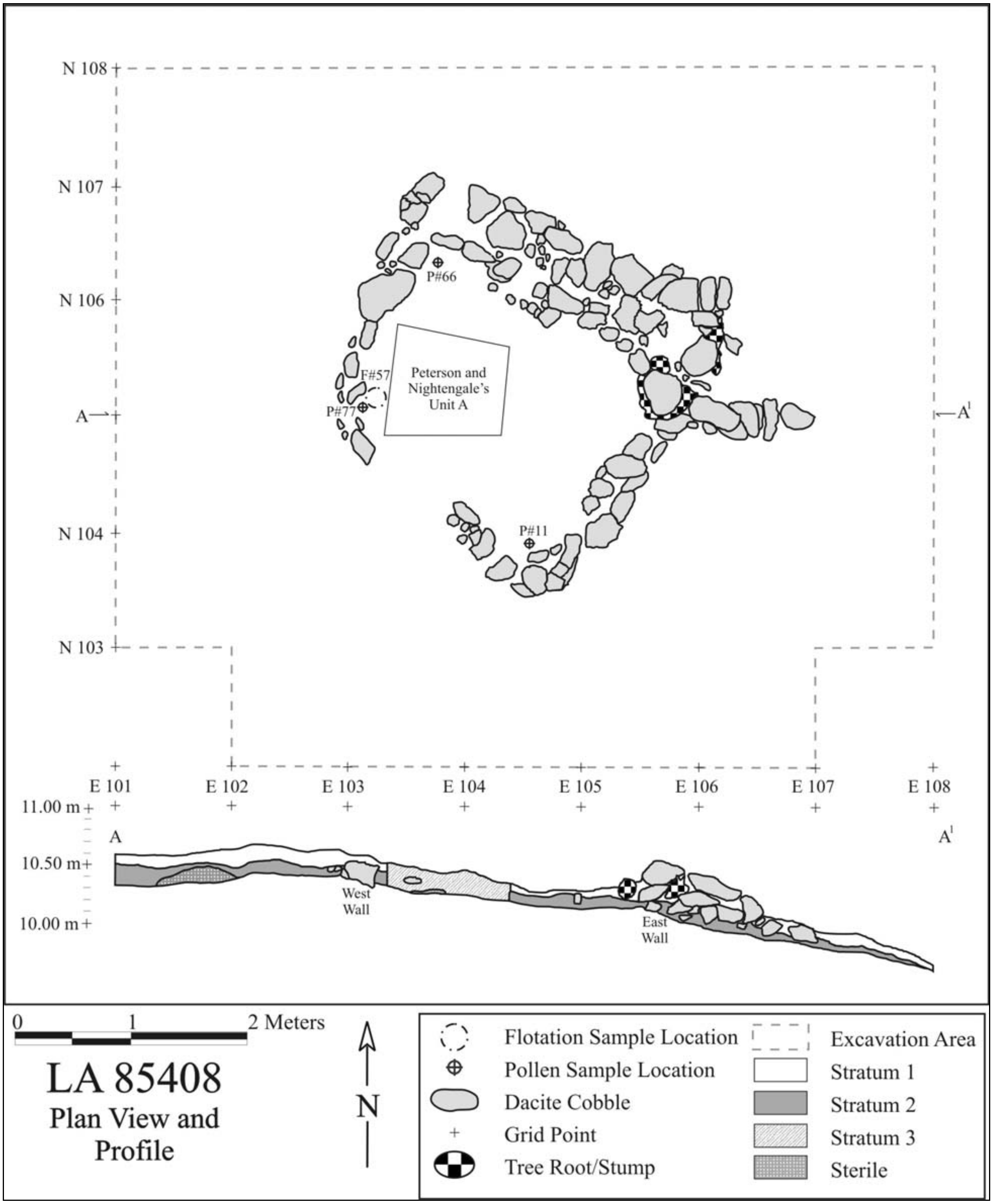

Figure 33.2. Plan view and profile of the fieldhouse at LA 85408.

Figure 33.3. Post-excavation of the fieldhouse at LA 85408.

STRATIGRAPHY

Stratum 1 is composed of loose, surface sediment. It is uniformly 1 to 8 cm thick across the site and is part of the A horizon (topsoil). Stratum 2 is post-occupational fill and ranges from 5 to 30 cm in thickness in the area excavated. This fill was thickest in and around the collapsed walls of the structure and thinned away from the walls and towards the center of the room. In the west profile of the geological test pit (unit 104N/101E), Stratum 2 is part of the A horizon. In other locations, however, the lower portion of Stratum 2 may have been part of a thin Bw horizon. Stratum 3 is the backfill removed from Peterson and Nightengale's Unit A. Stratum 3 is therefore a disturbed context. Tables 33.1 through 33.3 describe the strata at the site.

Table 33.1. LA 85408 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 4.5/3	Sandy loam	1–8	Surface sediment
2	10YR 4.5/3	Sandy loam	5–30	Post-occupational fill
3	10YR 4.5/3	Sandy loam	20	Back fill from P & N test pit

Table 33.2. LA 85408 soil horizon descriptions from the west profile of the geological test pit (104N/101E).

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 4.5/3	Sandy loam	0–9	Topsoil
Rk	-	-	9–20	Weathered Cerro Toledo bedrock
R	-	-	20+	Cerro Toledo bedrock

Table 33.3. LA 85408 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	0	0	0	0	**0**
1	10	14	0	0	**24**
2	74	56	3	1	**134**
3	1	0	0	0	**1**
Total	**85**	**70**	**3**	**1**	**159**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a small structure that probably functioned as a fieldhouse. The fieldhouse is slightly trapezoidal in shape, with the northeast wall being approximately 20 cm longer than the southwest wall. The northeast wall is also significantly thicker than the other walls. The room measures 2.25 m in length (northwest to southeast) by 1.80 m in width (northeast to southwest), with approximately 4.05 m^2 of interior space. Excavation of the room began with an east-west trench that extended across the site (104N/101-107E). The excavation of this trench served to define the room's stratigraphy, as well as to locate the structure's southeast wall and an entryway in the southwest wall. A compact surface was encountered just above the base of the rocks that formed the foundation of the room's southeast and southwest walls. This surface was most likely the room's living surface. After the excavation of the trench, the rest of the room was excavated to the compact surface encountered in the trench. The backfill within Peterson and Nightengale's Unit A was removed as a separate stratum (Stratum 3). This test pit, which is located entirely within the western half of the room, was excavated to intact bedrock. An examination of the pit's profile indicated that there were no discernible living surfaces below the compact surface noted above. After the excavation of the site was complete, the room was mapped, photographed, and documented (see Figures 33.2 and 33.3).

Fill. The interior of Room 1 was filled with 2 to 8 cm of surface sediment on top of 10 to 30 cm of post-occupational fill. The fill was thickest in and around the room's collapsed walls, and thinned away from the walls and towards the center of the room. Flotation (Field Specimen [FS] 57) and pollen (FS 58) samples were taken of the Room 1 fill. The pollen sample was not analyzed, but charred taxa identified in the flotation sample included unknown conifer (Gymnospermae), piñon pine (*Pinus edulis*), and ponderosa pine (*Pinus ponderosa*).

Floor. No prepared floor was encountered during the excavation of Room 1. A compact surface was encountered, however, that was most likely the room's living surface. This surface was distinguishable from the post-occupational fill above in that it was slightly more compact, relatively devoid of rocks, and had a slightly higher clay content. The Room 1 living surface was most likely formed by excavating the loose sediment within the room to expose the compact layer of weathered bedrock below. A thin layer of clay was then most likely placed on top of this naturally compact surface. The relative flatness of the surface compared to the same surface outside of Room 1 (which slopes down from east to west as well as to the north and to the south) indicates that the layer of weathered bedrock was probably leveled to create a flat living surface.

Pollen samples were taken from directly on top of the presumed living surface in the southeast (FS 11), northwest (FS 66), and southwest (FS 77) corners of the room. Identified taxa included maize (*Zea mays*), sedge (Cyperaceae), rose family (Rosaceae), grass family (Poaceae), cottonwood/aspen (*Populus*), cheno-ams (*Chenopodium/Amaranthus*), sunflower family (Asteraceae), ragweed/bursage (*Ambrosia*), spurge family (Euphorbiaceae), spruce (*Picea*), fir (*Abies*), unidentified pine (*Pinus*), piñon pine, juniper (*Juniperus*), oak (*Quercus*), Mormon tea (*Ephedra*), and sagebrush (*Artemisia*). A flotation sample (FS 56) was taken from directly on top of the presumed living surface in the northeast corner of the room, but was not analyzed (see below). The flotation sample was taken from a concentration of fine, light gray sediment. At first, this sediment was believed to be organic ash, possibly from a hearth. Further examination of the site's stratigraphy, however, indicated that it was more likely naturally occurring, pulverized pumice. No artifacts were encountered in direct association with the presumed living surface.

Wall Construction. The extant portions of the Room 1 walls indicate that the wall foundations were composed of dacite cobbles and upright dacite slabs. These rocks were placed into a shallow trench dug into the compact layer of weathered bedrock that most likely served as the room's living surface. What little remains of a second course of rocks indicates that it was composed of oblong dacite cobbles. The rocks that formed the Room 1 walls varied in size from fist-sized cobbles to small boulders. The northeast wall is composed of two rows of rocks separated by a thin space filled in with loose sediment and a few rocks, and is considerably thicker than the other walls. The southwest, southeast, and northwest walls are composed of a single row of large rocks in some places, and two rows of small rocks or thin upright slabs in other places. The southwest wall is divided into southeast and northwest sections by a wide (80 cm) entryway. The southeast section is considerably longer than the northwest section, which is just long enough to form the room's west corner.

Judging from the amount of wallfall removed during the excavation of LA 85408, the room's masonry was originally considerably higher than it was at the time of excavation. In order to estimate the original height of the masonry, all of the rocks removed as wallfall during the site's excavation were placed in five stacks, which were then measured. The stacks measured 0.85 by 1.10 by 0.62 m, 0.86 by 1.85 by 0.78 m, 0.82 by 1.29 by 0.74 m, 1.10 by 1.56 by 0.43 m, and 1.04 by 1.63 by 0.52 m, for a total of approximately 4.22 m^3 of wallfall. Based on this volume of wallfall and the overall length, average thickness, and average height of the extant masonry, the room's masonry was originally approximately 2.01 m in height. This figure is probably too high, however, due to the fact that dacite cobbles occur naturally, albeit sporadically, in the area where the fieldhouse was built. In other words, some of the rocks removed during the site's excavation were probably never part of the room's walls. Nevertheless, the volume of rocks removed during the excavation of the site indicates that the room's masonry was originally quite high (Table 33.4). The uppermost portions of the walls, as well as the ceiling, were most likely composed of wattle and daub. These materials are rarely preserved at archaeological sites on the Pajarito Plateau. In fact, no adobe was recovered from the site.

Table 33.4. Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
Northeast	2.00	0.04–0.46	0.61–0.70	1 to 2
Southwest	1.00 (1.80)	0.15–0.36	0.15–0.38	1
Southeast	1.70	0.19–0.50	0.24–0.48	1 to 2
Northwest	1.64	0.15–0.47	0.20–0.34	1 to 2

Note: The length of the southwest wall including the possible entryway is given in parentheses.

Geological Test Pit

Geologists Paul Drakos and Steven Reneau utilized the west profile of the geological test pit (unit 104N/101E) to reconstruct the natural soil horizons at the site (see Table 33.2). This profile contained a soil sequence consisting of an A horizon (topsoil), a Rk horizon (weathered Cerro Toledo bedrock), and a R horizon (intact Cerro Toledo bedrock) (Figure 33.4).

Artifact Distribution

As Table 33.5 demonstrates, the distribution of artifacts recovered during the excavation of LA 85408 is fairly uniform. There is a slight increase in the artifact distribution within and to the northeast of the room. The former most likely represents artifacts found in their primary context. The increased artifact distribution to the northeast of the room, on the other hand, is most likely the result of post-depositional processes. The natural surface slopes down to the northeast. Many of the artifacts to the northeast of the room have therefore probably washed down into this area. The most dramatic deviation from this pattern of artifact distribution is unit 102N/104E. Twenty-one artifacts were recovered from this unit. Of these, however, 20 are biscuitware sherds recovered from a single excavation level (Stratum 2, Level 2). These sherds most likely represent a pot drop or a large sherd or sherds that were further fragmented after the site was abandoned.

Table 33.5. LA 85408 artifact counts by grid unit.

	E101	E102	E103	E104	E105	E106	E107
N107	1	0	5	13	2	13	4
N106	1	3	**0**	**4**	3	16	3
N105	2	3	**6**	**3**	**3**	4	2
N104	0	1	**6**	**8**	**4**	0	1

	E101	E102	E103	E104	E105	E106	E107
N103	0	4	4	**1**	1	3	2
N102		0	3	21	5	4	

Note: Bold numbers indicate grid units that are located completely or partially within Room 1.

Figure 33.4. West profile of the geological test pit (unit 104N/101E).

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 151 artifacts were analyzed from the excavations conducted at LA 85408. In addition, flotation and pollen samples were selected for analysis from the post-occupation fill (Stratum 2). The results of the artifact and sample analyzes are presented in the following sections. Samples taken from the site are listed in Table 33.6.

Table 33.6. Samples selected for analysis from LA 85408.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2	41, 42, 57	11, 66, 77		
3				

*thermoluminescence

Ceramic Artifacts (Dean Wilson)

A total of 80 ceramics were analyzed from LA 85408. The majority of the pottery consists of Biscuit B/C (Biscuit B?), Biscuit A, and Biscuit B (Table 33.7). These types, in addition to the two glazeware sherds, would seem to indicate a Middle Classic period (15th century) occupation. Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 33.8 to 33.10. The graywares and whitewares appear to have been locally made from tuff temper; however, a single grayware sherd does exhibit granite with mica temper. This latter sherd is presumably associated with the Classic period occupation. The redware sherd also differs by exhibiting non-local sherd and sand temper. All of the grayware ceramics consist of jar vessel forms whereas the whiteware and redware sherds derived from bowls.

Table 33.7. Ceramic types from LA 85408.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	11	13.8
Mineral paint undifferentiated	1	1.3
Organic paint undifferentiated	9	11.3
Jemez/Santa Fe/Vallecitos Black-on-white	1	1.3
Biscuit unpainted slipped both sides	2	2.5
Biscuit A	6	7.5
Biscuit B	4	5.0
Biscuit B/C body	25	31.3
Sankawi Black-on-cream	4	5.0
Northern Rio Grande Utilityware		
Plain gray body	7	8.8
Sapawe Micaceous	6	7.5
Middle Rio Grande Glazeware		

Ceramic Type	Frequency	Percent
Glaze red body	2	2.5
Agua Fria Glaze-on-red	1	1.3
Largo Glaze yellow	1	1.3
Total	**80**	**100.0**

Table 33.8. Tradition by ware for LA 85408 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	8	100.0	63	100.0	0	0.0	0	0.0	71	87.7
Rio Grande (Tewa Micaceous)	0	0.0	0.0	0.0	0	0.0	5	100.0	5	6.3
Middle Rio Grande	0	0.0	0.0	0.0	4	100.0	0	0.0	4	6.0
Total	**8**	**100.0**	**63**	**100.0**	**4**	**100.0**	**5**	**100.0**	**80**	**100.0**

Table 33.9. Temper by ware for LA 85408 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Sand	7	87.5	0	0.0	0	0.0	0	0.0	7	8.7
Fine tuff or ash	0	0.0	2	3.1	0	0.0	0	0.0	1	1.2
Large tuff fragments	1	12.5	0	0.0	0	0.0	0	0.0	1	1.2
Fine tuff and sand	0	0.0	57	90.4	0	0.0	0	0.0	57	71.2
Anthill sand	0	0.0	1	1.5	0	0.0	0	0.0	1	1.2
Vitrified	0	0.0	3	4.7	0	0.0	0	0.0	3	3.7
Scoria	0	0.0	0	0.0	3	75.0	0	0.0	3	3.7
Latite Keres area	0	0.0	0	0.0	1	25.0	0	0.0	1	1.2
Sapawe Micaceous	0	0.0	0	0.0	0	0.0	5	100.0	5	6.2
Total	**8**	**100.0**	**63**	**100.0**	**4**	**0.0**	**5**	**100.0**	**80**	**100.0**

Table 33.10. Vessel form by ware for LA 85408 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	0	0.0	6	9.5	0	0.0	0	0.0	6	7.5
Bowl rim	0	0.0	7	11.1	3	75.0	0	0.0	10	12.5
Bowl body	0	0.0	49	77.7	1	25.0	0	100.0	50	62.5
Jar body	8	100.0	0	0.0	0	0.0	5	0.0	13	16.2
Flared bowl rim	0	0.0	1	1.5	0	0.0	0	0.0	1	1.2
Total	**8**	**100.0**	**63**	**100.0**	**4**	**0.0**	**5**	**100.0**	**80**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 71 artifacts were analyzed and consisted of three cores, 62 pieces of debitage, four retouched tools, and two ground stone artifacts, which represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 33.11 presents the data on lithic artifact type by material type. The debitage is primarily made of chalcedony, with less Pedernal chert, obsidian, silicified wood, and other materials. The presence of cortex on 19.3 percent of the debitage indicates that these materials were collected from waterworn (n = 11) and nodule (n = 1) sources. The chalcedony, Pedernal chert, and silicified wood are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. A piece of obsidian was the only artifact with nodule cortex. The igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the Pajarito Plateau.

Table 33.11. Lithic artifact type by material type from LA 85408.

Artifact Type		Material Type													
		Basalt	**Vesic. basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Sil. Wood**	**Quartzite**	**Schist**	**Total**
Cores	Core	0	0	0	0	0	0	0	1	0	1	0	0	0	2
	Cobble uniface	0	0	0	1	0	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	1	0	0	0	1	0	1	0	0	0	3
Debitage	Angular debris	0	0	0	0	0	0	3	5	0	3	0	0	0	11
	Core flake	3	0	0	1	0	0	2	26	0	9	8	0	0	49
	Biface flake	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Microdeb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Und. flake	0	0	0	0	0	0	0	2	0	0	0	0	0	2
	Subtotal	3	0	0	1	0	0	5	33	0	12	8	0	0	62
Retouched Tools	Retouched piece	1	0	1	0	0	0	0	1	0	0	0	0	0	3
	Biface	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Projectile point	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Subtotal	1	0	1	0	0	0	1	1	0	0	0	0	0	4
Ground Stone	Grinding slab	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Polishing stone	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	0	1	1	0	0	0	0	0	0	0	2
Total		**4**	**0**	**1**	**2**	**1**	**1**	**6**	**35**	**0**	**13**	**8**	**0**	**0**	**71**

Three pieces of obsidian and two pieces of basalt debitage were submitted for X-ray fluorescence analysis. The obsidian artifacts were made from Cerro Toledo and Valle Grande materials (Table 33.12). The Cerro Toledo (Obsidian Ridge/Rabbit Mountain) and the Valle Grande (Cerro del Medio) source areas are located about 19 km (12 mi) and 17 km (11 mi) to the southwest and west of the site. Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present in the site area as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval and are scattered across the mesa top. The X-ray fluorescence analysis also indicates that the two basalt pieces of debitage are probably basalt and not dacite.

Table 33.12. Obsidian source samples.

FS #	Artifact	Color	Source
45	Debitage	Translucent	Cerro Toledo rhyolite
63	Debitage	Translucent	Cerro Toledo rhyolite
78	Debitage	Translucent	Valle Grande rhyolite

Lithic Reduction

The two cores were reduced using a single-directional, single, and multi-face technique. Flakes were removed from an unprepared cortical platform on a cobble uniface (Figure 33.5). The two cores were discarded due to material flaws and extensive hinging/stepping, whereas the cobble uniface was considered still useable. Table 33.13 presents the metric information on the cores.

Table 33.13. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Single-directional	54	46	59	154.5
Single-directional	53	79	64	274.6
Cobble Uniface	48	86	102	553.9

The debitage consists primarily of core flakes, with fewer angular debris and undetermined flake fragments. The overall cortical:non-cortical ratio of 0.41 reflects an emphasis on the later stages of core reduction. The flakes mostly have single-faceted platforms (n = 19), with fewer cortical (n = 5) and collapsed (n = 8) platforms. None of the platforms exhibit any obvious evidence of preparation. The majority of the core flakes are whole (n = 24), with fewer proximal (n = 8), midsection (n = 4), distal (n = 12), and lateral (n = 1) fragments. The whole core flakes have a mean length of 27.4 mm (*std* = 9.7) and the angular debris a mean weight of 2.2 g (*std* = 4.5).

The retouched tools consist of retouched pieces and a biface. The retouched pieces consist of two small flakes with retouch along a distal end and a lateral side. This is unidirectional retouch with edge angles of 65 degrees. The other retouched piece was made on a large flake with unidirectional dorsal retouch along two lateral sides and edge angles of 60 degrees. The biface is a small base fragment that could have been broken during the late-stage reduction process (i.e., a projectile point preform).

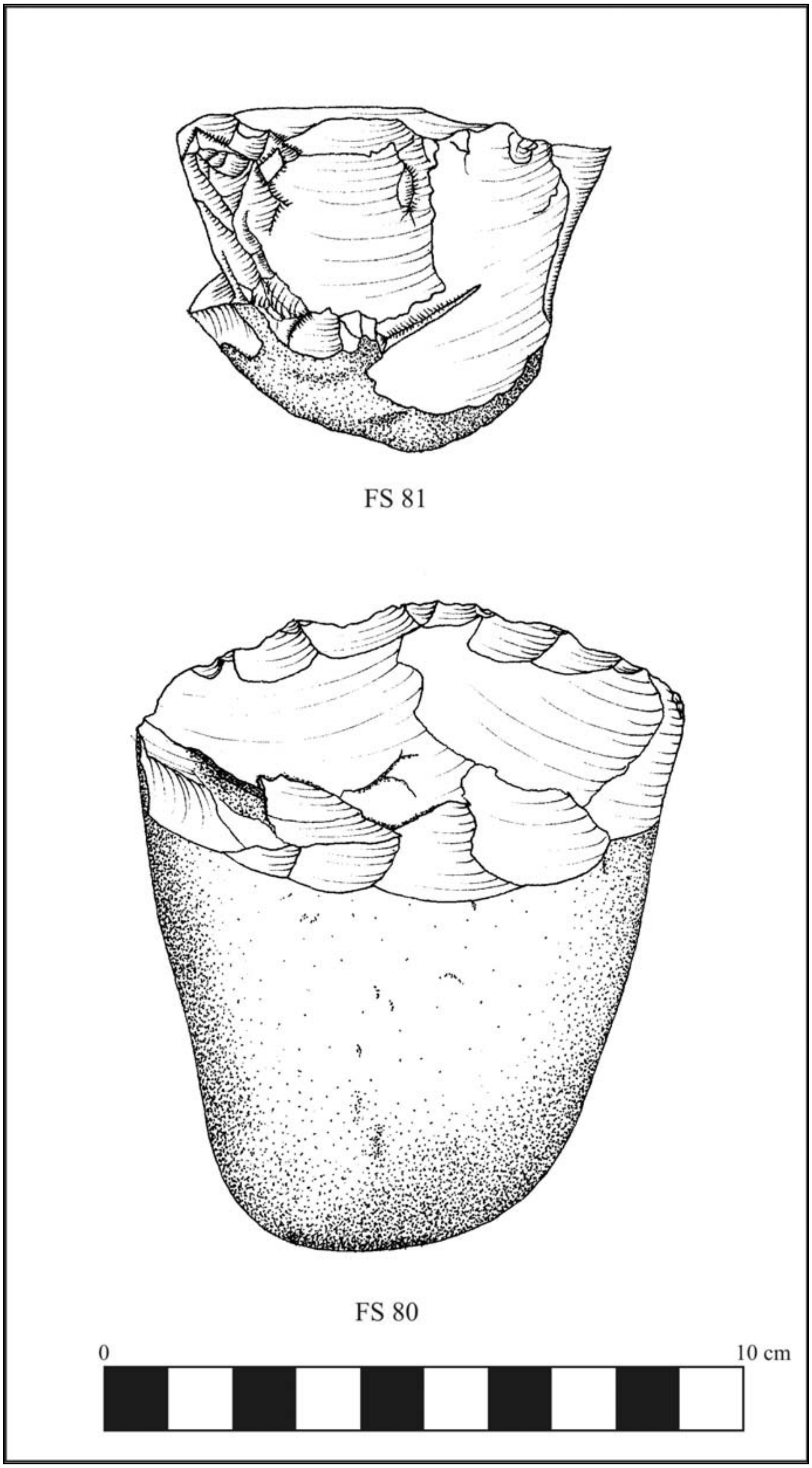

Figure 33.5. Cobble uniface and single-directional core.

Tool Use

Two of the retouched pieces exhibit evidence of edge damage that could be attributed to use. One of the small retouched flakes has a slight projection with rounding/polish, whereas, the large retouched flake exhibits rounding/polish wear along both retouched edges. None of the flakes exhibited similar use damage.

The ground stone consists of a grinding slab and polishing stone. The grinding slab is a large tuff rock with a concave surface that appears to be natural with little or no obvious grinding or striations. Therefore, it might actually represent site furniture rather than a grinding slab. The polishing stone is a small dacite pebble with a flat polished surface.

Faunal Remains (Kari Schmidt)

One piece of bone was recovered from 107N/105E (Stratum 2, Level 2). The bone was an unidentified piece of medium/large-sized mammal bone. The bone was unburned and contained an old break.

Archaeobotanical Remains (Pamela McBride)

Possible piñon nutshell was the only cultural plant material not directly related with firewood use that was found in the fieldhouse (Table 33.14). A total of five pieces of unknown conifer wood, four from the middle fill of the pit and one from post-occupational fill were also recovered. Modern debris included unburned goosefoot, prickly pear, and sedge seeds, grass florets, piñon nutshell, and conifer twigs and needles.

Table 33.14. Flotation plant remains, count, and abundance per liter from LA 85408.

FS No.	**41**	**42**	**57**
Context	Middle fill, round pit	Lower fill, round pit	Post-occup. fill, Room 1
Cultural			
Perennials			
Piñon			needle +, cf. nutshell +
Ponderosa pine	needle +	needle +	needle +
Non-Cultural			
Annuals			
Goosefoot			+
Grasses			
Grass family			floret +
Perennials			
Juniper	twig +		twig +
Piñon			needle +, nutshell +
Ponderosa pine			needle +

FS No.	**41**	**42**	**57**
Context	Middle fill, round pit	Lower fill, round pit	Post-occup. fill, Room 1
Prickly pear cactus			+
cf. Sedge			+

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter, cf. compares favorably.

Pollen Remains (Susan Smith)

Three pollen samples were analyzed from LA 85408. Table 33.15 lists the frequency of identified pollen types. Maize was the only cultigen identified in the botanical assemblage. Sedge was the only other economic resource that was identified. A number of potential economic resources were also identified in the assemblage (Table 33.15).

Table 33.15. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 85408 (*n* = 3)**
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	1
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 85408 (*n* = 3)**
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	3
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	1
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	3
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	2
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	1
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85408 (*n* = 3)
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	2
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Potential Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	1
	Pinus	Pine	3
		Pine Aggregates	0
	Pinus edulis type	Piñon	3
	Juniperus	Juniper	2
		Juniper Aggregates	0
	Quercus	Oak	3
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	1
	Artemisia	Sagebrush	3
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	1
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 85408 is a one-room Middle Classic period fieldhouse that was constructed from both shaped and unshaped tuff blocks. The site is situated on a ridge to the north of Rendija Canyon. Maize pollen was recovered during the site excavation, therefore, the one-room structure was presumably occupied during the growing season.

CHAPTER 34
RENDIJA TRACT (A-14): LA 85411

Gregory D. Lockard

INTRODUCTION

LA 85411 consists of the remains of a small Early/Middle Classic period structure and a possible feature. The site is located on a south-facing ridge on the mesa between Rendija and Guaje canyons. The structure is located a few m south of a two-track dirt road. The possible feature is located approximately 30 m to the south of the structure, at the southern edge of the ridge. Vegetation on the site consists of piñon-juniper woodland with a grass understory. The site is situated at an elevation of 2134 m (7000 ft).

The LA 85411 structure was first recorded on August 16, 1991, by David Hill (1991) during a survey for the Bason Land Exchange Project. Hill believed the structure was a one-room fieldhouse. Surface Biscuit A sherds indicated that the structure was most likely occupied during the Classic Period (AD 1325–1600). On July 20, 1992, Archaeological Research, Inc., was awarded the contract to conduct archaeological testing of the Bason Land Exchange sites. John Peterson and Christian Nightengale (1993) supervised the excavations, which took place between July 27 and August 23 of 1992. A single 1- by 1-m test pit (Unit A) was excavated within the LA 85411 structure. In addition, Peterson and Nightengale recorded and excavated a single 1- by 1-m test pit (Unit B) within the possible feature. Unit A was excavated to a sterile Pleistocene soil at a maximum depth of 36 cm below the ground surface. Artifacts recovered during the excavation of Unit A included one obsidian flake and eight sherds (one Biscuit A, one brown utilityware, and seven smeared-indented corrugated sherds).

Unit B was excavated to a maximum depth of 35 cm below the ground surface. No distinct rock alignments or living surfaces were encountered during the excavation. However, two pieces of chipped stone and two ceramic sherds (an unidentified Biscuitware sherd and a micaceous utilityware sherd) were recovered from the excavation. In addition, seven pieces of chipped stone, a small piece of ground stone (a mano fragment), and 21 ceramic sherds (one smeared-indented, four Biscuit B, and 16 Biscuit A sherds) were recovered during a surface collection of the site. Peterson and Nightengale (1993) concluded that the area in and around Unit B was either not a cultural feature or was an ephemeral construction that was no longer intact. As a result, they argued that the research potential of this area of the site was exhausted by the excavation of Unit B. This area of the site was therefore not excavated during the Conveyance and Transfer (C&T) Project.

FIELD METHODS

The excavation of LA 85411 began during the 2004 field season and was completed during the 2005 field season of the C&T Project. In 2004, the LA 85411 structure and surrounding area

(Area 1) were cleared of trees and large undergrowth. The structure was then visible as a rubble mound approximately 5 m across (Figure 34.1).

Figure 34.1. Pre-excavation photo of the mound at LA 85411.

An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the southwest corner of the site. The site was then covered with a 1- by 1-m grid that extended 7 m north and 9 m east of the site datum. Two subdata (A and B) were set up for taking elevations. The site was then photographed. A single piece of ground stone (Field Specimen [FS] 1) was the only artifact visible on the surface, most likely due to the fact that the site had been previously surface collected by Peterson and Nightengale (1993). An 8- by 1-m east-west trench (units 103N/100-107E) was initially excavated across the center of the rubble mound. The excavation of the trench was begun in 2004 and completed in 2005. The purpose of this trench was to expose a profile of the site stratigraphy, as well as to determine the location of the structure's east and west walls.

Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. The trench passed through a single room, designated Room 1. The east and west walls of Room 1 were encountered just below the surface. Within the structure, the trench units were excavated to the room's living surface, which was well-preserved in several patches in the eastern half of the room. Outside of the structure, the trench units were excavated to the top of a sterile Bwb1 horizon. The easternmost unit in the trench (103N/107E) was chosen to serve as a test pit (Test Pit 1) for geological analysis. This unit was excavated to intact Cerro Toledo bedrock. The northern profile of the trench was then drawn and photographed. The rest of the site was subsequently excavated, again by strata and arbitrary levels for thicker strata. In all, 48 units were excavated. Within Room 1, excavation proceeded down to the living surface encountered while excavating the trench. During the excavation of units to the east of Room 1, a second, adjacent room was encountered. This smaller room was designated Room 2. Within Room 2, excavation proceeded down to a similar, although lower and less-well-preserved, living surface.

Outside of the structure, excavation terminated at the top of the sterile Bwb1 horizon. Excavation focused on defining the structure's walls, removing wallfall, and locating features. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended at least 1 m beyond the structure in all directions to locate external features and/or outdoor activity areas. The site was then photographed (Figure 34.2) and mapped (Figure 34.3).

Figure 34.2. Post-excavation photo of the fieldhouse at LA 85411.

A second, smaller test pit (Test Pit 2) was excavated beneath the living surface in Room 1. Test Pit 2 comprises the northernmost 35 cm of that portion of unit 103N/101E that is within Room 1. The purpose of excavating this test pit was to determine the nature of the subfloor stratigraphy in Room 1, as well as to determine the depth of the room's wall foundations.

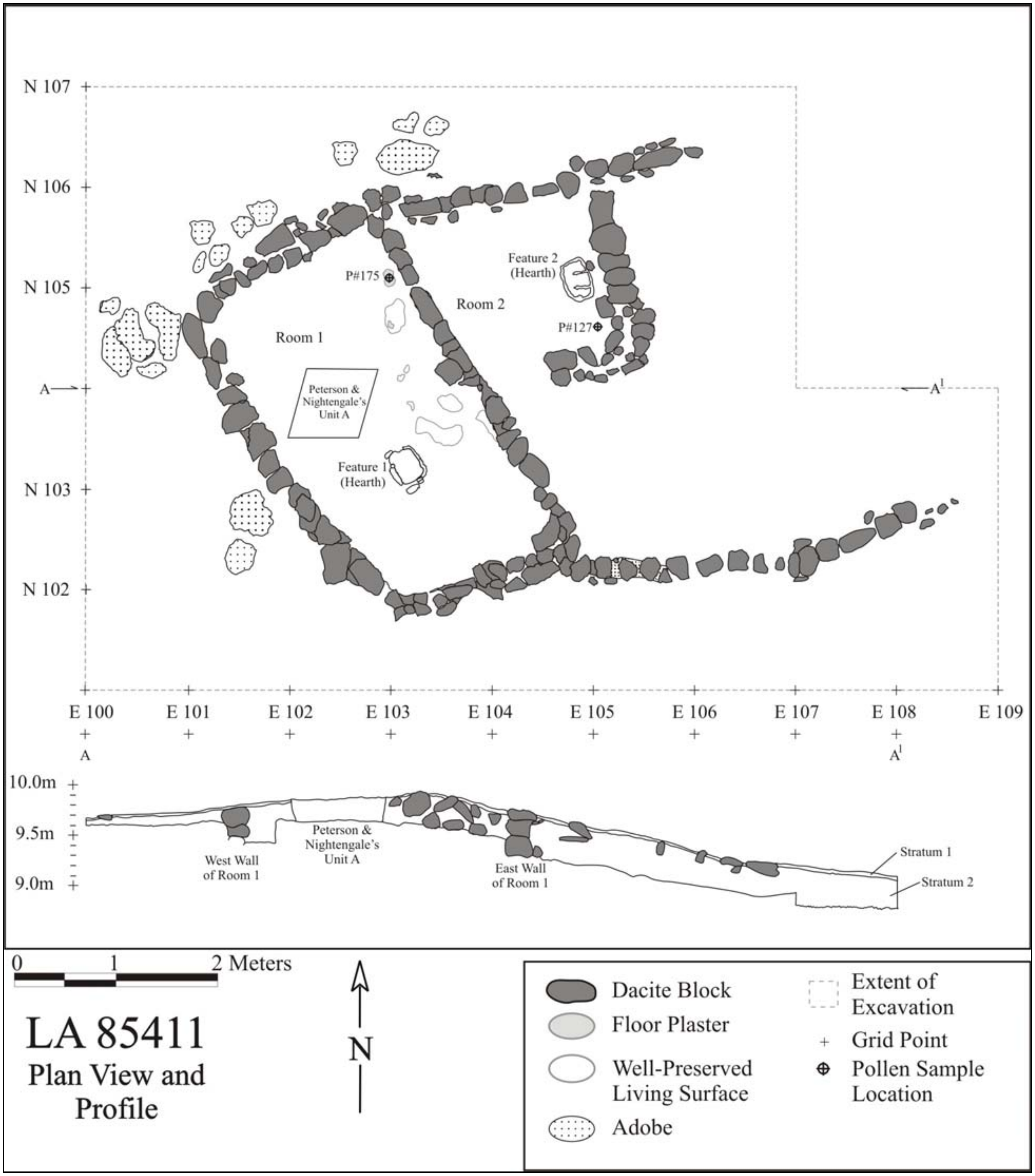

Figure 34.3. Plan view and profile of LA 85411.

During the 2004 field season, the excavation of the site was supervised by Michael Dilley. The field crew included Alan Madsen, Sandi Copeland, and Hannah Lockard. During the 2005 field season, the excavation of the site was supervised by Gregory Lockard. The field crew included Michael Dilley, Joseph (Woody) Aguilar, Kevin Hanselka, Brandon Gabler, Margaret Dew, and Samuel Duwe. Timothy Martinez and Aaron Gonzalez served as site monitors from San

Ildefonso Pueblo and as screeners. Jeremy Yepa served as site monitor from Santa Clara Pueblo and as an additional excavator.

STRATIGRAPHY

Stratum 1 is composed of loose, surface sediment. It is uniformly 1 to 5 cm thick across Area 1 and is roughly equivalent to the A horizon (i.e., topsoil) documented in Test Pit 1. Stratum 2 is post-occupational fill and ranges from 5 to 45 cm in thickness in Area 1. This fill was thickest in and around the collapsed walls of the structure, and thinned away from the walls and towards the center of the rooms. Stratum 2 is roughly equivalent to the Bw horizon documented in Test Pit 1. Stratum 3 is the fill from the hearth in Room 1 (Feature 1), Stratum 4 is the Room 2 living surface, Stratum 5 is the fill from the hearth in Room 2 (Feature 2), and Stratum 6 is the Room 1 living surface. Stratum 7 is the subfloor sediment excavated in Test Pit 2 (i.e., the Btjb1 horizon). This horizon is slightly more developed but otherwise similar to the Bwb1 horizon in documented in Test Pit 1. Tables 34.1 through 34.4 describe and summarize the strata at the site.

Table 34.1. LA 85411 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 4/3	Loamy sand	1–5	Surface sediment
2	10YR 4/3	Sandy loam	5–45	Post-occupational fill
3	10YR 4/2	Sandy loam	10	Feature 1 (hearth) fill
4	10YR 4/3	Clay loam	-	Room 2 living surface
5	10YR 4/2	Sandy loam	10	Feature 2 (hearth) fill
6	10YR 4/3	Clay loam	10	Room 1 living surface
7	-	-	20	Middle/late-Holocene soil

Table 34.2. LA 85411 soil horizon descriptions from the north profile of Geological Test Pit 1 (103N/107E).

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 4/3	Loamy sand	0–4	Topsoil
Bw	10YR 4/3	Sandy loam	4–14	Late-Holocene soil
Bwb1	7.5YR 5/3	Sandy loam	14–30	Middle/late-Holocene soil
R	-	-	30+	Cerro Toledo bedrock

Table 34.3. LA 85411 soil horizon descriptions from the west profile of Test Pit 2.

Horizon	Color	Texture	Elevation (cm)	Description
Bw2	-	-	~20–30	Room 1 floor matrix
Btjb1	-	-	~30–44+	Slightly more developed than but otherwise similar to the Bwb1 horizon in Test Pit 1

Table 34.4. LA 85411 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	2	1	1	0	**4**
1	23	10	0	0	**33**
2	294	92	4	4	**394**
3	3	1	0	0	**4**
4	0	0	0	0	**0**
5	0	0	0	0	**0**
6	0	0	0	0	**0**
7	0	0	0	0	**0**
Total	**322**	**104**	**5**	**4**	**435**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a fairly large, rectangular room in a two-room structure that probably functioned as a fieldhouse or small hamlet. The room measures 3.60 m in length (northwest to southeast) by 1.95 m in width (northeast to southwest), with approximately 7.02 m^2 of interior space (Figure 34.4).

Figure 34.4. Room 1 after excavation.

Excavation of the room began with an east-west trench that extended across the site (103N/100-107E). The excavation of this trench served to define the room's stratigraphy as well as to locate the room's east and west walls. A compact living surface was encountered between the east and west walls. The living surface was well-preserved in several patches within units 103N/103-104E (i.e., the eastern half of the room). In addition, a slab-lined hearth (Feature 1) was discovered in unit 103N/103E. After the excavation of the trench, the rest of the room was excavated to the living surface. Additional patches of well-preserved living surface, as well as two patches of floor plaster, were encountered in the northeast corner of the room.

Excavation of the Room 1 fill included the backfill from Peterson and Nightengale's Unit A. No artifacts were recovered from the backfill, which was excavated separately from the surrounding post-occupational fill. After the entire Room 1 living surface was exposed, Feature 1 was excavated. Room 1 was thereafter mapped, photographed, and documented. Test Pit 2 (the northernmost 35 cm of that portion of unit 103N/101E that is within Room 1 was then excavated below the room's living surface. The purpose of excavating this test pit was to determine if there were additional floors or living surfaces below, as well as to ascertain the depth of the room's wall foundations. The test pit reached a maximum depth of 23 cm below the living surface. No additional living surfaces were encountered.

Fill. The interior of Room 1 was filled with 1 to 5 cm of surface sediment (Stratum 1) on top of 15 to 35 cm of post-occupational fill (Stratum 2). The fill was thinnest in the easternmost portion of the room and thickened to the west (i.e., downhill). Flotation (FS 66) and pollen (FS 67) samples were taken of the Room 1 fill, but these samples were not analyzed.

Floor. A fairly well-preserved living surface was encountered throughout most of Room 1. The only location where the living surface was not well-preserved was in the southeast corner of the room. In this area, the living surface was badly disturbed by roots. The living surface was best preserved in several patches in the northeast corner and east-central portion of the room. Two patches of floor plaster were in fact encountered in the northeast corner of the room (Figure 34.5). Excavation of Test Pit 2 revealed a 10-cm-thick layer of clay-rich mud that functioned as the floor's foundation. The reason for the considerable thickness of the floor foundation is unclear. It may have at least partially functioned to level the Room 1 living surface. The floor foundation was then capped by a thin layer of plaster, which was only preserved in two small patches at the time the room was excavated.

Pollen samples were taken from directly on top of the living surface in the southwest corner (FS 81, not analyzed), northeast corner (FS 63 [not analyzed] and 175), and along the eastern edge (FS 31) of the room. One of these samples (FS 175) was scraped from directly on top of a patch of floor plaster. Taxa identified in this sample included rose family, grass family, cheno-ams, sunflower family, ragweed/bursage, fir, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush. Taxa identified in FS 31 included maize, cheno-ams, pea family, sunflower family, fir, unidentified pine, piñon pine, juniper, oak, and sagebrush. In addition, flotation (FS 33) and pollen (FS 34) samples were taken from a clump of adobe located directly on top of the living surface in the northwest corner of the room, but were not analyzed. This adobe was most likely the partially dissolved remains of a piece of wall or rooffall. Similar clumps of adobe were found just outside of the room to the north and west.

Figure 34.5. Living surface identified in Room 1.

Wall Construction. The extant portions of the Room 1 walls indicate that the wall foundations were composed of dacite cobbles. These rocks were placed into a shallow trench dug into the compact Btjb1 or Bwb1 horizons that predate the site's occupation. What remains of the second and third courses of the walls indicate that they were composed mostly of oblong dacite cobbles. In most places, the walls were composed of a single row of rocks. Most of the south wall and part of the north wall, however, were composed of two rows of smaller rocks. There was no break in any of the walls to indicate the location of the room's entryway. The room's entryway therefore had a substantial doorsill. The living surface in Room 2 sloped up to the level of the Room 1 living surface in the northwest corner of Room 2. This suggests that there may have been an entryway that led from the northwest corner of Room 2 into the northeast corner of Room 1. If this is the case, the doorsill was up to 20 cm tall on the Room 1 side of the entryway.

A substantial auxiliary wall extended approximately 2 m due east from the southeast corner of Room 1. The wall then gently curved northwards. The wall measured 3.30 m in total length and had similar width and height dimensions to the extant portions of the Room 1 perimeter walls. The wall most likely functioned to define the southern border of an outdoor activity area (see below). If this is the case, the wall was most likely only a single course high. This interpretation is supported by the fact that increasingly smaller amounts of wallfall were encountered away from Room 1 (i.e., to the east) on either side of the auxiliary wall.

Judging from the amount of wallfall removed during the excavation of the area in and around Room 1, the room's masonry was originally considerably higher than it was at the time of excavation. In order to estimate the original height of the masonry, all of the rocks removed as wallfall during the site's excavation were placed in seven stacks, which were then measured. The stacks measured 2.05 by 0.33 by 0.43 m, 2.35 by 0.37 by 0.43 m, 1.40 by 0.40 by 0.47 m, 3.25 by 0.42 by 0.45 m, 2.30 by 0.67 by 0.40 m, 1.60 by 0.60 by 0.58 m, and 2.30 by 0.40 by 0.67 m, for a total of approximately 3.33 m^3 of wallfall. Based on this volume of wallfall and the overall length, average thickness, and average height of the extant portions of the walls, the Room 1 wall masonry was originally approximately 1.03 m in height (Table 34.5). This figure assumes that the Room 1 auxiliary wall and the eastward extension of the north wall of Room 2 were only one course high. It also assumes that the Room 1 and Room 2 masonry were the same height. The uppermost portions of the walls, as well as the ceiling, were most likely composed of wattle and daub. Several large clumps of adobe, which were most likely the partially dissolved remains of wallfall from this section of the walls and/or rooffall, were discovered both within and just outside to the north and west of Room 1. These clumps of adobe were sampled. They were not collected, however, due to the fact that they were partially dissolved, which made it difficult to clearly distinguish them from the surrounding sedimentary matrix.

Table 34.5. LA 85411 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.87	0.08–0.22	0.12–0.44	1 to 2
South	1.75	0.10–0.27	0.20–0.40	1 to 2
East	3.65	0.10–0.25	0.14–0.33	2 to 3
West	3.32	0.04–0.32	0.15–0.34	2 to 3
Auxiliary	3.30	0.20–0.38	0.15–0.32	1

Feature 1

Feature 1 is a small, elliptical pit hearth located in the south-central portion of Room 1 (Figures 34.6 and 34.7). Most of the north, south, and west walls of the hearth were formed by upright dacite slabs or small dacite cobbles. There was only a single small dacite cobble along the hearth's eastern margin. The remainder of the hearth's perimeter may have been formed by an adobe collar. If this is the case, however, nothing remained of the collar. The interior of the hearth was lined with a fairly thick layer of adobe plaster that was hardened by the heat associated with the hearth's use. The entire hearth measured 60 cm north to south by 44 cm east to west. The interior of the hearth was 41 cm north to south by 34 cm east to west. The hearth was 22 cm deep as measured from the top of the highest perimeter rock to the base of the hearth, and contained approximately 10 cm of ashy fill. Three flotation samples were taken of the ashy fill from the northern (FS 76, FS 77, and FS 78) and southern (FS 111, FS 112, and FS 118) halves of the hearth. Charred taxa identified in the northern half included mountain mahogany, piñon pine, ponderosa pine, oak, goosefoot, maize, unknown conifer, and unidentified pine. Charred taxa identified in the southern half included mountain mahogany, unknown conifer, piñon pine, ponderosa pine, unidentified pine, and maize. In addition, a pollen sample was taken from the base of the hearth's northern (FS 180) and southern (FS 174) halves. Taxa identified in the sample from the northern half included grass family, cheno-ams, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, oak, and sagebrush, while those identified in the southern half included rose family, cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, fir, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush.

Figure 34.6. Pit hearth (Feature 1) in Room 1 at LA 85411.

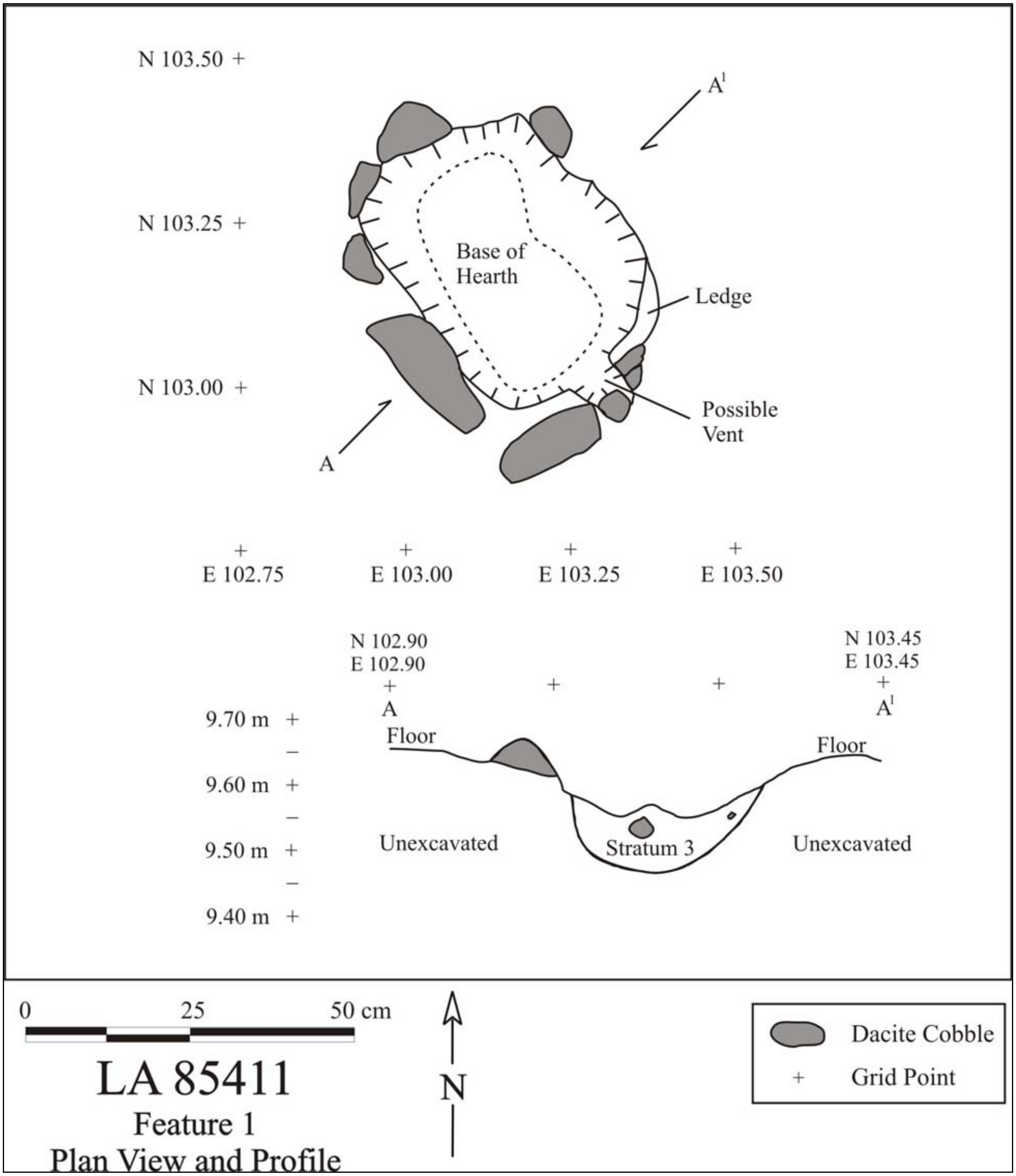

Figure 34.7. Plan view and profile of Feature 1.

Room 2

Sequence of Excavation. Room 2 is a small room that shares a wall with Room 1 (Figure 34.8). The room's north, east, and south walls have a slightly different orientation than the Room 1 walls, including the wall that the two rooms share (i.e., the west wall of Room 2). This strongly suggests that Room 2 was constructed at a later time than Room 1, and was therefore an addition. The room measured 1.58 m north to south by 1.55 m east to west, with approximately 2.45 m^2 of interior space. Room 2 was not visible as a separate room before the excavation of the site. In addition, the east-west trench excavated across the site did not pass through any portion of the room. As a result, Room 2 was only discovered while excavating the exterior of Room 1. During the excavation of the units surrounding Room 1, several walls were encountered to the east of the room. These walls were eventually identified as the walls of a separate room. Once the extent of the room was defined, excavation within proceeded to a compact surface similar, although less well preserved, to the Room 1 living surface. During the excavation of the interior of Room 2, a small hearth was encountered. This hearth was designated Feature 2, and excavated only after the excavation of the rest of the room was complete.

Figure 34.8. Post-excavation photograph of Room 2 at LA 85411.

Fill. The interior of Room 2 was filled with 1 to 3 cm of surface sediment (Stratum 1) on top of 20 to 40 cm of post-occupational fill (Stratum 2). The fill was thickest in and around the room's collapsed walls, and thinned away from the walls and towards the center of the room. No samples were taken of Room 2 fill. This is because much of the room's interior had already been excavated by the time it was identified as a separate room.

Floor. The Room 2 living surface was a compact surface composed of rocks, sand, and clay from a Pleistocene soil. There was a thin layer of blackened, ash-stained sediment in much of the eastern half, and especially the southeast corner, of the room. This thin layer of ashy sediment was the best evidence of a floor, and was designated Stratum 4. Much of the living surface in Room 2 appears to have been leveled. The eastern half and west-central portion of the room are relatively flat compared to the surrounding surface, which slopes down to the east and south. In the northwest corner of the room, the surface slopes up to the wall that divides Rooms 1 and 2. The living surface in this area forms a slight ramp that leads to a possible entryway between Rooms 1 and 2. If this is an entryway between the rooms, it had a doorsill that was up to 27 cm tall on the Room 2 side. The living surface is also sloped in the southwest corner of the room. In this location, the living surface slopes downward to the south through an entryway into the room from outside. This entryway is located in the western half of the room's south wall.

A pollen sample (FS 127) and a charcoal sample (FS 128) were taken from the ashy surface in the room's southeast corner. Taxa identified in the pollen sample included rose family, grass family, cheno-ams, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, oak, and sagebrush, while the charcoal sample was not analyzed. Pollen samples were also taken from the northwest (FS 176) and northeast (FS 177) corners of the room. These samples were designated Stratum 2, however, because there was no clearly definable living surface in this area. Only FS 177 was analyzed and identified taxa included squash, grass family, cheno-ams, sunflower family, ragweed/bursage, unidentified pine, piñon pine, oak, and sagebrush. No artifacts were recovered from directly on top of the Room 2 living surface.

Wall Construction. The north, south, and east walls of Room 2 do not share the same orientation as the wall that divides Rooms 1 and 2 and the other walls in Room 1. The former are more closely oriented with the cardinal directions. The fact that the common wall shares the orientation of the other walls of Room 1 and not those of Room 2 indicates that the latter is a later addition to the former. The north wall of Room 2 extends approximately 1 m beyond the room's east wall. The function of this eastward extension is unknown. The south wall of Room 2 is essentially a short, right-angle continuation of the east wall. The room's north, east, and west walls were constructed of a single row of upright dacite slabs and dacite cobbles. The south wall, on the other hand, was composed of two rows of smaller dacite cobbles (Table 34.6).

The entryway into Room 2 from outside is located in the western half of the south wall. There does not appear to have been any doorsill. The living surface slopes down to the south as it passes through the entryway. There may have been an entryway between Rooms 1 and 2 in the northernmost portion of the rooms' common wall. This possible entryway is indicated by the fact that the living surface in the northwest corner of Room 2 slopes up towards the common wall. If there was an entryway in this location, it had a doorsill that was up to 27 cm tall on its Room 2 side. Small rocks line both the interior and exterior faces of the Room 2 walls, especially the north wall (including the eastward extension). The small rocks along the room's interior wall faces probably served as foundations for floor coping.

Based on the volume of wallfall removed during the excavation of LA 85411 and the overall length, average thickness, and average height of the extant portions of the walls, the Room 2 masonry was originally approximately 1.03 m in height (see above). The uppermost portion of the walls and ceiling were most likely composed of wattle and daub. Several large but amorphous clumps of adobe were in fact encountered in the area directly north of Room 2. These clumps of clay are most likely the partially dissolved remains of wall or roof fall from Room 1 and/or Room 2.

Table 34.6. LA 85411 Room 2 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.80 (3.00)	0.08–0.22	0.16–0.28	1
South	0.83 (1.35)	0.08–0.16	0.20–0.34	1
East	1.50	0.09–0.18	0.16–0.35	2
West	~1.75	0.15–0.45	0.12–0.34	1 to 2

Note: The length of the north wall including its eastward extension and the length of the south wall including the entryway are given in parentheses.

Feature 2

Feature 2 is a small pit hearth located just inside the east wall of Room 2 (Figures 34.9 and 34.10). The remains of an adobe collar were encountered in the northwest corner of the hearth. Presumably, this collar originally encircled the entire hearth. Two small dacite cobbles were encountered between the eastern border of the hearth and the east wall of Room 2. These rocks most likely functioned to further define the hearth's eastern border. No rocks, however, were found along the hearth's northern, southern, or western boundaries. The hearth's interior was originally lined with a thin layer of adobe plaster that was burned during the hearth's use. This plaster has been significantly disturbed, however, most recently by a number of roots. What remains of this plaster lining is extremely thin and friable. As a result, it was not possible to take archaeomagnetic samples from the hearth.

Geological Test Pits

Geologists Paul Drakos and Steven Reneau utilized two profiles to reconstruct the natural soil horizons at the site. The first was the north profile of Test Pit 1 (unit 103N/107E). This profile contained a soil sequence consisting of an A horizon (topsoil), a Bw horizon (a late-Holocene soil), a Bwb1 horizon (a middle/late-Holocene soil), and an R horizon (Cerro Toledo bedrock) (see Table 34.2 and Figure 34.11). The second profile examined was the west profile of Test Pit 2. Test Pit 2 is the subfloor excavation of the northernmost 35 cm of that portion of grid unit 103N/101E that is within Room 1. The purpose of excavating this test pit was to determine whether or not there were additional living surfaces below, as well as to determine the depth of the Room 1 wall foundations. The west profile of Test Pit 2 contained a soil sequence consisting of a Bw2 horizon on top of a Btjb1 horizon (see Table 34.3 and Figure 34.12). The Bw2 horizon is a culturally constructed layer of clay-rich sediment that is approximately 10 cm thick. This layer functioned as the foundation of the Room 1 floor. It is unknown why the floor foundation was made so thick. The Btjb1 horizon is slightly more developed than, but otherwise similar to, the Bwb1 horizon encountered in Test Pit 1.

Figure 34.9. Post-excavation photo of Feature 2 at LA 85411.

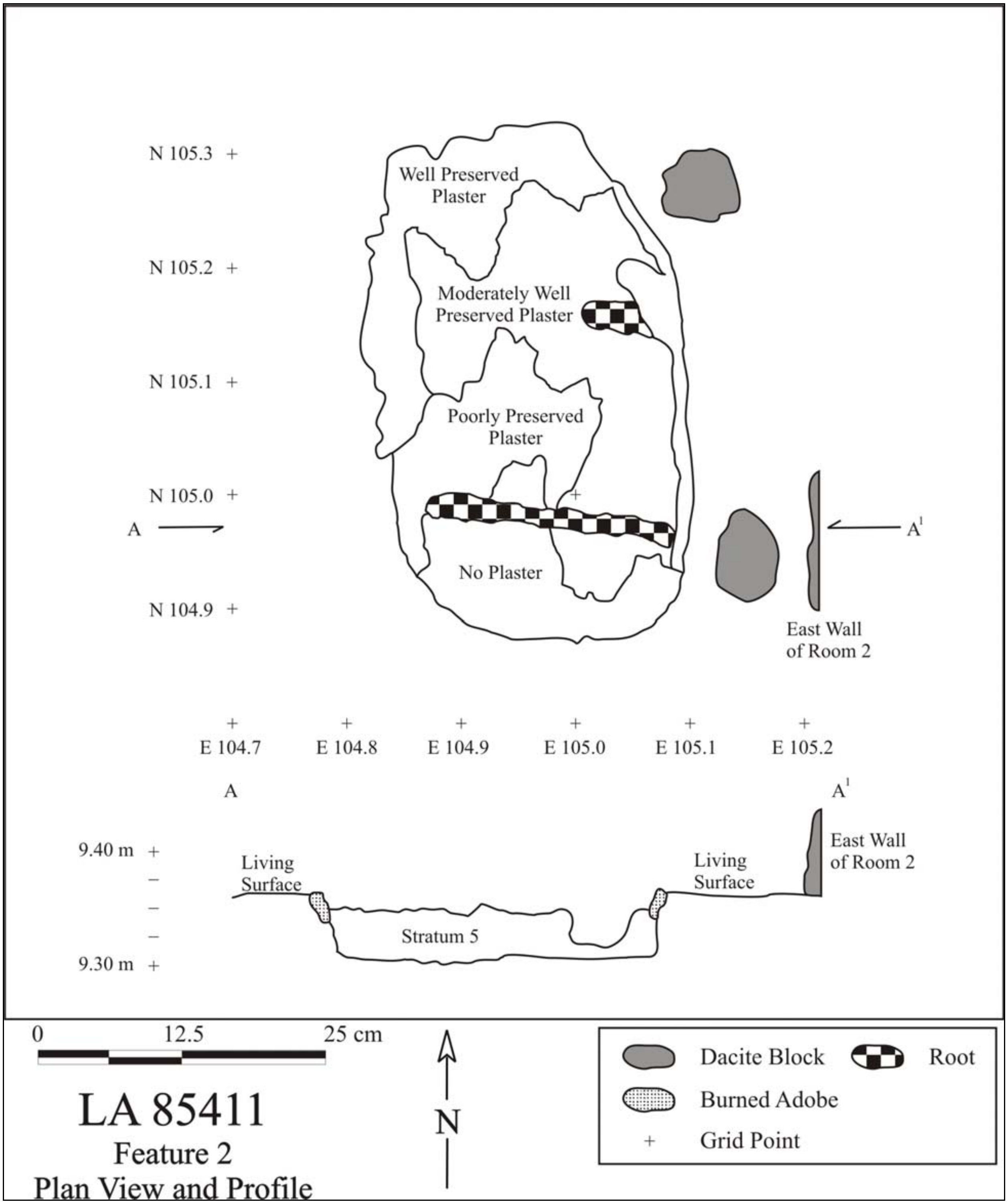

Figure 34.10. Plan view and profile drawings of Feature 2 (hearth) in Room 2 at LA 85411.

Figure 34.11. Photograph of the north profile of Test Pit 1 (103N/107E).

Figure 34.12. Photograph of the west profile of Test Pit 2 (subfloor excavation of the northernmost 35 cm of that portion of 103N/101E that is within Room 1).

Artifact Distribution

As Table 34.7 demonstrates, the highest concentration of artifacts at LA 85411 was in the area to the east of Rooms 1 and 2, to the south of the eastward extension of the north wall of Room 2, and to the north of the Room 1 auxiliary wall. This area, which is circumscribed on all but its eastern border, most likely functioned as an outdoor activity area for the site's residents. A higher concentration of artifacts was also encountered in the units to the south of the easternmost section of the Room 1 auxiliary wall (101N/107-108E). This is most likely the result of site formation processes (i.e., the artifacts are washed down from the area to the west). There is also a slightly higher concentration of artifacts in the northern half of Room 2 (105N/103-104E), and a significantly higher concentration in the unit directly north of the eastern half of Room 2 (106N/104E). The reason for the increased concentration of artifacts in these areas is unknown.

Table 34.7. LA 85411 artifact counts by grid unit.

	E100	E101	E102	E103	E104	E105	E106	E107	E108
N106	0	3	0	0	40	13	2	--	--
N105	0	**0**	**1**	***12***	*14*	*9*	29	--	--
N104	1	**3**	**4**	***3***	*4*	*50*	47	--	--
N103	1	**11**	**5**	**9**	**4**	16	13	3	9
N102	4	4	**6**	**7**	**6**	30	8	2	4
N101	0	2	1	**2**	1	7	0	25	19

Note: One artifact was collected from the surface of a grid unit that was not excavated (107N/95E); bold numbers indicate grid units that are located completely or partially within Room 1, and italic numbers indicate grid units that are located completely or partially within Room 2.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 429 artifacts were analyzed from the excavations conducted at LA 85411. In addition, flotation and pollen samples were selected for analysis from the post-occupation fill (Stratum 2), Feature 1 hearth fill (Stratum 3), Room 2 living surface (Stratum 4), and Feature 2 hearth fill (Stratum 5) (Table 34.8). Maize was submitted for radiocarbon dating, two Biscuit A sherds were selected for thermoluminescence (TL) dating, pieces of the floor plaster of the hearth in Room 1 were submitted for archaeomagnetic dating, and five pieces of obsidian were submitted for hydration dating. The results of the artifact and sample analyzes are presented in the following sections.

Table 34.8. Samples selected for analysis from LA 85411.

Stratum	Sample Type				
	Flotation	Pollen	Archaeomag	Radiocarbon	TL
1					
2		31, 177			30, 68
3	76, 77, 78, 111, 112, 118	174, 180	Set 1282	78	

Stratum	Sample Type				
	Flotation	**Pollen**	**Archaeomag**	**Radiocarbon**	**TL**
4		127			
5	136, 137, 138, 178	173			
6		175			
7					

Chronology

Radiocarbon Dating

One maize sample was submitted for accelerator mass spectroscopy dating. This specimen was derived from a flotation sample taken of the Feature 1 hearth fill (FS 78). The sample provided a date of 630±40 BP (Beta-221840), with calibrated intercepts of AD 1310, AD 1370, and AD 1380 and a two-sigma range of AD 1290 to 1410.

Archaeomagnetic Dating

Nine specimens were collected as a set (ADL 1282) from a hearth (Feature 1) in Room 1. No specimens could be collected from the hearth walls or rim, and all were collected from the plaster lining of the hearth floor. Table 34.9 shows the single archaeomagnetic result. Blinman and Cox's chapter (Volume 3, Chapter 66) should be consulted for additional information.

Table 34.9. Archaeomagnetic (AM) results from LA 85411.

Sample	Site	Feature	Inc.	Dec.	VGP* Lat.	VGP Long.	$\forall_{95}$	$*_p$	$*_m$	N	De-mag level	AM Date ranges (AD)	
												Wolfman or *DuBois*	SWCV2000
1282	LA85411	Room 1, Feature 1	-9.724	317.3	32.882	127.31	13.623	6.696	13.772	9/8	NRM	N/A	N/A

*VGP is virtual geomagnetic pole

Thermoluminescence Dating

Two Biscuit A sherds were submitted for TL dating from LA 85411 (Table 34.10). All derived ages are given in years BP, which refers to years before 2003. The 14th century date appears to correspond with the radiocarbon dates and the 13th century date does have a large sigma that includes the early 14th century. The ages did not differ at two sigma, and the weighted average is AD 1371±40.

Table 34.10. TL dates from Biscuit A ceramics at LA 85411.

FS#	Lab #	Context	Burial depth (cm)	Years BP	% error	Years AD
30	UW1502	Sherd, Room 1, Stratum 3	20	611	7.1	1395±43
68	UW1503	Sherd, Room 1, Stratum 2	25	801	14.2	1205±114

Obsidian Hydration Dating

Five obsidian artifacts from LA 85411 were submitted for age determination using the obsidian hydration dating method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rim, was measured. Second, the high-temperature hydration-rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site was estimated in order that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 34.11).

Table 34.11. Obsidian hydration dates for LA 85411.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
24	2006-59	Valle Grande	3.55	488	84
44	2006-60	Valle Grande	5.80	221	60
91	2006-61	Valle Grande	2.07	325	161
145	2006-62	Cerro Toledo	5.26	1018	36
148	2006-63	Cerro Toledo	5.82	1154	28

Relative to other dating methods conducted at the site, the obsidian hydration dates seem to be the least accurate. Radiocarbon and TL dates indicate a 14th century date, while the obsidian samples indicate Late Archaic and Developmental period dates.

Ceramic Artifacts (Dean Wilson)

A total of 320 ceramics were analyzed from LA 85411. The majority of the pottery consists of Sapawe Micaceous, with Biscuit A, Biscuit B, and Biscuit B/C (Biscuit B?) sherds (Table 34.12). This assemblage indicates a late 14th century or early 15th century occupation for the site, which is commensurate with the radiocarbon date. Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 34.13 to 34.15. The graywares and whitewares appear to have been locally made from local tuff temper. This contrasts with the Sapawe Micaceous pottery, which appears to have been derived from a non-local and local source. The former is represented by a micaceous temper and the latter by a tuff temper with a micaceous slip. All of the grayware and micaceous ceramics consist of jar vessel forms while the whiteware sherds were solely derived from bowls.

Table 34.12. Ceramic types from LA 85411.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	8	2.5
Indeterminate organic	9	2.8
Santa Fe Black-on-white	2	0.6
Biscuit unpainted one side slipped	3	0.9
Biscuit unpainted both sides slipped	2	0.6
Biscuit painted unspecified	2	0.6
Biscuit paint and slip absent	1	0.3
Biscuit A	43	13.4
Biscuit B	7	2.2
Biscuit B/C body	11	3.4
Northern Rio Grande Utilityware		
Plain gray body	14	4.4
Smeared-indented corrugated	14	4.4
Smeared plain corrugated	2	0.6
Sapawe Micaceous	202	63.1
Total	**320**	**100.0**

Table 34.13. Tradition by ware for LA 85411 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	30	100.0	88	100.0	0	0.0	0	0.0	118	76.2
Rio Grande (Tewa Micaceous)	0	0.0	0	0.0	0	0.0	202	100.0	202	23.8
Middle Rio Grande	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	**30**	**100.0**	**88**	**100.0**	**0**	**0.0**	**202**	**0.0**	**320**	**100.0**

Table 34.14. Temper by ware for LA 85411 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Sand	16	53.3	0	0.0	0	0.0	0	0.0	16	5.0
Fine tuff or ash	0	0.00	2	22.7	0	0.0	0	0.0	2	0.6
Fine tuff and sand	0	0.0	84	95.4	0	0.0	0	0.0	84	26.2
Large tuff fragments	12	40.0	0	0.0	0	0.0	97	48.0	109	34.0
Mostly tuff with phenocrysts	0	0.0	0	0.0	0	0.0	5	2.4	5	1.5
Smeared-indented sand	2	6.6	0	0.0	0	0.0	0	0.0	2	0.6
Large tuff with smeared-indented sand	0	0.0	0	0.0	0	0.0	28	13.8	28	8.7

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Oblate shale and tuff	0	0.0	2	22.7	0	0.0	0	0.0	2	0.6
Sapawe Micaceous temper	0	0.0	0	0.0	0	0.0	72	35.6	72	22.5
Total	**30**	**100.0**	**88**	**100.0**	**0**	**0.0**	**202**	**100.0**	**320**	**100.0**

Table 34.15. Vessel form by ware for LA 85411 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	0	0.0	1	1.1	0	0.0	0	0.0	1	0.3
Bowl rim	0	0.0	13	14.7	0	0.0	0	0.0	13	4.0
Bowl body	0	0.0	72	81.8	0	0.0	0	0.0	72	22.5
Jar rim	0	0.0	0	0.0	0	0.0	4	1.9	4	1.2
Jar body	29	96.6	0	0.0	0	0.0	198	98.1	227	70.9
Body sherd unpolished	0	0.0	2	2.2	0	0.0	0	0.0	2	0.6
Indeterminate rim	1	3.4	0	0.0	0	0.0	0	0.0	1	0.3
Total	**30**	**100.0**	**88**	**100.0**	**0**	**0.0**	**202**	**100.0**	**320**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 109 artifacts were analyzed from LA 85411, consisting of four cores, 95 pieces of debitage, four retouched tools, and six ground stone artifacts. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 34.16 presents the data on lithic artifact type by material type. The debitage is primarily made of obsidian, with less Pedernal chert, chalcedony, and other materials. The presence of cortex on 38.9 percent of the debitage indicates that these materials were collected from waterworn (n = 18) and nodule (n = 19) sources. The chalcedony, Pedernal chert, quartzite, and greenstone are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. Nodule cortex is solely present on obsidian artifacts. Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 34.16. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Greenstone	Total
Cores	Core	1	0	0	0	0	0	0	0	0	1	0	0	0	2

Artifact Type		**Material Type**													
		Basalt	**Vesic. Basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Sil. Wood**	**Quartzite**	**Greenstone**	**Total**
	Tested material	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Cobble uniface	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	Subtotal	1	0	1	0	0	0	1	0	0	1	0	0	0	4
Debitage	Angular debris	0	0	0	0	0	0	6	1	0	4	0	0	0	11
	Core flake	0	0	1	3	6	0	25	15	0	18	0	0	0	68
	Biface flake	0	0	0	0	0	0	5	2	0	1	0	0	0	8
	Core trimming flake	0	0	0	0	0	0	1	0	0	1	0	0	0	2
	Hammer stone flake	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Microdeb.	0	0	0	0	0	0	2	1	0	0	0	0	0	3
	Und. flake	0	0	0	0	0	0	0	2	0	0	0	0	0	2
	Subtotal	0	0	1	3	6	0	41	19	0	25	0	0	0	95
Retouched Tools	Endscraper	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Biface	0	0	0	0	0	0	1	1	0	0	0	0	0	2
	Projectile point	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	Subtotal	1	0	0	0	0	0	1	1	0	1	0	0	0	4
Ground Stone	Und. mano fragment	0	0	0	0	0	0	0	0	0	0	0	2	0	2
	Millingstone	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Axe	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Misc. ground stone	0	0	0	0	2	0	0	0	0	0	0	0	0	2
	Subtotal	0	0	0	0	3	0	0	0	0	0	0	2	1	6
Total		**2**	**0**	**2**	**3**	**9**	**0**	**43**	**20**	**0**	**27**	**0**	**2**	**1**	**109**

Eight pieces of obsidian and one piece of basalt debitage, an obsidian tested pebble, an obsidian biface, and a basalt projectile point were submitted for X-ray fluorescence analysis. The obsidian artifacts are made from the Cerro Toledo and Valle Grande materials (Table 34.17). The Cerro Toledo (Obsidian Ridge/Rabbit Mountain) and the Valle Grande (Cerro del Medio) source areas are located about 19 km (12 mi) and 17 km (11 mi) as the "crow flies" to the southwest and west of the site. Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present in the area of the site as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval and are scattered across the mesa top. Indeed, the test pebble is probably derived from this local source. The X-ray fluorescence analysis also indicates that the basalt flake is actually made of dacite from a local source and the projectile point from a non-local dacite source at San Antonio Mountain. San Antonio Mountain is located about 115 km (70 mi) north of Rendija Canyon.

Table 34.17. Obsidian source samples.

FS #	Artifact	Color	Source
6	Debitage	Translucent	Cerro Toledo rhyolite
24	Debitage	Translucent	Valle Grande rhyolite
84	Debitage	Translucent	Cerro Toledo rhyolite
91	Debitage	Translucent	Valle Grande rhyolite
93	Debitage	Translucent	Valle Grande rhyolite
106	Tested pebble	Translucent	Cerro Toledo rhyolite
145	Debitage	Translucent	Cerro Toledo rhyolite
148	Biface	Translucent	Cerro Toledo rhyolite
163	Debitage	Translucent	Valles Grande rhyolite

Lithic Reduction

Two cores were reduced using a bi-directional, bifacial technique. Flakes were also removed from an unprepared cortical platform on a cobble uniface (Figure 34.13) and a local obsidian pebble had a single flake removed. One of the cores was broken and thought to be discarded due to a culturally induced fracture, whereas, the other core and cobble uniface were considered still useable. Table 34.18 presents the metric information on the cores.

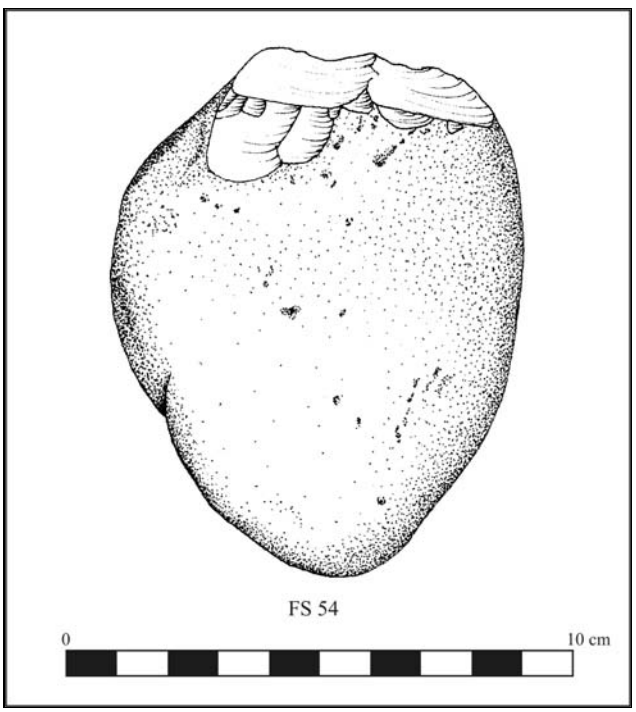

Figure 34.13. Cobble uniface.

Table 34.18. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Bi-directional	77	70	44	291.9
Cobble Uniface	37	83	104	458.8

The debitage primarily consists of core flakes, with fewer angular debris, biface flakes, and other items. The overall cortical:non-cortical ratio of 1.0 reflects an even distribution between early stage core reduction and late stage core reduction and tool production/maintenance. The flakes mostly have single-faceted platforms (*n* = 27), with fewer cortical (*n* = 8), multi-faceted (*n* = 1), collapsed (*n* = 13), and crushed (*n* = 4) platforms. Only two of the platforms exhibit any obvious evidence of preparation and are abraded/crushed. The majority of the core flakes are whole (*n* = 31), with fewer proximal (*n* = 15), midsection (*n* = 3), and distal (*n* = 19) fragments. The biface flakes consist of whole (*n* = 2), proximal (*n* = 3), midsection (*n* = 1), and distal (*n* = 2) fragments. The whole core flakes have a mean length of 25.3 mm (*std* = 7.9), the whole biface flakes a mean length of 44.0 (*std* = 5.6), and the angular debris a mean weight of 3.4 g (*std* = 2.5).

The retouched tools consist of an endscraper, two biface fragments, and a projectile point. The endscraper and the projectile point are depicted in Figure 34.14.

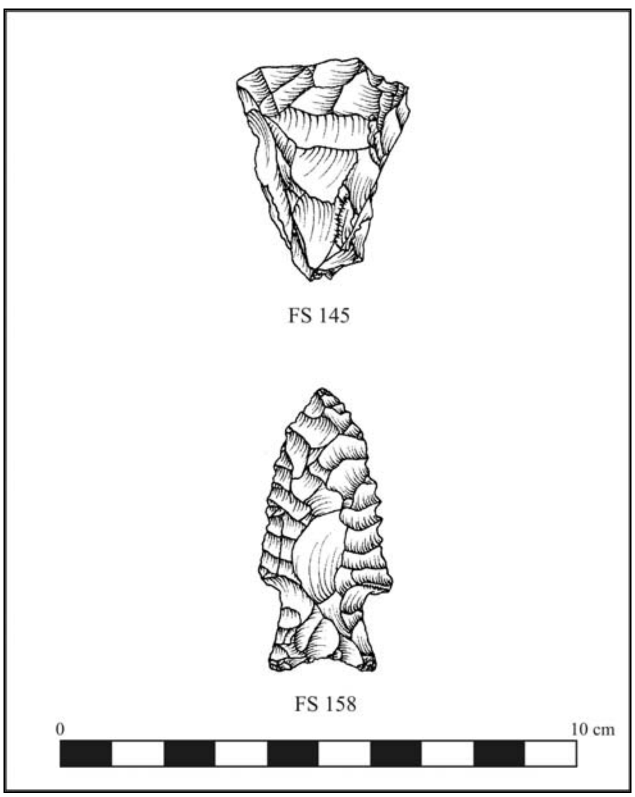

Figure 34.14. Endscraper (top) and San Jose dart point (bottom).

The endscraper is a flake that has been retouched along three edges, creating a steep-angled (80 degrees), triangular-shaped tool with a convex working edge. The two biface fragments consist of a midsection and an undetermined fragment that broke during the early-middle stage of the reduction process. The projectile point is a whole San Jose style dart point. Metrical and descriptive information on the projectile point is presented in Table 34.19.

Table 34.19. Projectile point metrical (mm) and descriptive data.

FS #	Material	Condition	Overall Length	Blade Length	Neck Width	Stem Length	Stem Width	Thickness	Weight (g)	Haft Type	Blade Shape	Base Shape
158	Basalt (Dacite)	Whole	54	38	15	16	20	6	8.9	Stemmed	Serrated	Con-cave

Tool Use

None of the flakes or retouched pieces exhibit evidence of edge damage that could be attributed to use. The ground stone includes manos, a millingstone, and an axe. The manos are both fire-cracked quartzite cobbles with a single flat surface that is heavily ground. The millingstone is a tabular piece of dacite with some grinding on one surface. The axe appears to have a refurbished bit that had originally broken off and was subsequently resharpened along one face (Figure 34.15).

The area around the bit also exhibits evidence of rounding, scarring, and use-striations. The surface of the axe has been well ground and polished with numerous striations along the long axis of the tool. It is notched with a shallow-pecked central groove. The butt also exhibits heavy use with battering wear.

Faunal Remains (Kari Schmidt)

Four pieces of bone were recovered during excavations of this Early/Middle Classic period fieldhouse. One bone was recovered in 104N/106E and was identified as a fragment of a mule deer (*Odocoileus hemionus*) atlas vertebra. Three bones were identified in 105N/106E and were all identified as part of a mule deer sacrum. None of the bones were burned and the pieces of the sacrum all contained recent breaks suggesting these bones may have come from a single animal.

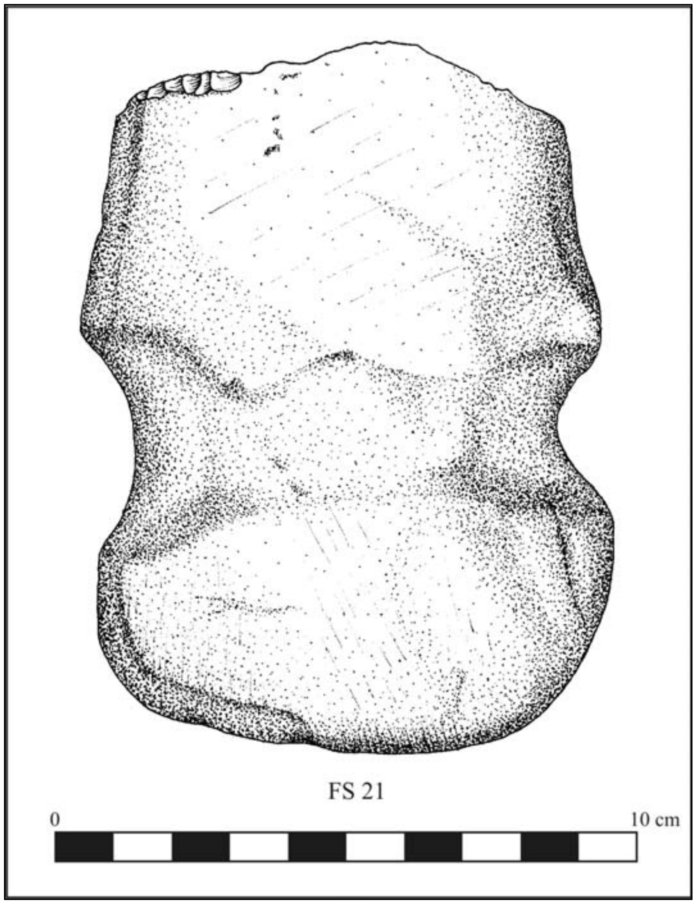

Figure 34.15. Axe from LA 85411.

Archaeobotanical Remains (Pamela McBride)

Tobacco was found in the small pit hearth (Feature 2) in Room 2 along with pigweed and purslane seeds (in upper and middle fill) and the ever present conifer needles and cone fragments (Table 34.20). Unlike the hearth in Room 2, it was only the lower fill of the Feature 1 hearth in Room 1 that yielded floral remains unrelated to wood use (maize and one goosefoot seed). Ponderosa pine and mountain mahogany were the two most frequently encountered wood taxa (Table 34.21). Unknown conifer, pine, and oak were also present. A single vegetal sample from post-occupational fill just outside Room 1 contained a pine umbo and six pieces of ponderosa pine weighing a tenth of a gram.

Table 34.20. Flotation plant remains, count, and abundance per liter from LA 85411.

FS No.	**76**	**77**	**78**	**111**	**112**	**118**
Context	F. 1 Hearth, N ½			F. 1 Hearth, S ½		
	Upper fill	Middle fill	Lower fill	Upper fill	Middle fill	Lower fill
Cultural						

FS No.	76	77	78	111	112	118
Context	F. 1 Hearth, N ½			F. 1 Hearth, S ½		
	Upper fill	Middle fill	Lower fill	Upper fill	Middle fill	Lower fill
Annuals						
Goosefoot			1(1)			
Cultivars						
Maize			poss. 2(0) c			cf. 1(0) k
Other						
Unidentifiable	1(0) pp			1(0) pp		
Perennials						
Pine			needle +			
Piñon	needle +			needle +		needle +
Ponderosa pine	needle +	needle +		needle +	needle +	
Non-Cultural						
Annuals						
Goosefoot	+			+		+
Spurge				+		
Grasses						
Grass family						floret +
Sunflower family				+		
Perennials						
Piñon				needle +		needle +

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter, c cupule, cf. compares favorably, k kernel, pp plant part.

Table 34.20 (continued). Flotation plant remains, count and abundance per liter from LA 85411.

FS No.	136	137	138	178
Context	F. 2 Hearth, N ½			F. 2 Hearth
	Upper fill	Middle fill	Lower fill	S ½
Cultural				
Annuals				
Pigweed	1(1)			
Purslane	1(1)	1(1)		
Tobacco		1(1)		
Other				
Unidentifiable	1(0) pp	1(0) pp		1(0) pp
Perennials				
Pine		umbo +		umbo +
Piñon				needle +
Ponderosa pine	needle +	needle +	needle +	needle +
Non-Cultural				

FS No.	136	137	138	178
Annuals				
Purslane		+		
Grasses				
Grass family				floret +
Perennials				
Piñon			needle +	
Ponderosa pine				needle +

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter, pp plant part.

Table 34.21. Flotation wood charcoal by count and weight in grams from LA 85411.

FS No.	76	77	78	111	112	118	136
Context	F. 1 Hearth, N ½			F. 1 Hearth, S ½			F. 2 Hearth, N ½
	Upper fill	Middle fill	Lower fill	Upper fill	Middle fill	Lower fill	Upper fill
Conifers							
Pine						10/0.3 g	
Ponderosa pine	3/0.1 g		1/<0.1 g	2/<0.1 g	1/<0.1 g		1/<0.1 g
Unknown conifer				2/0.3 g	2/<0.1 g	4/0.2 g	
Non-Conifers							
Mountain mahogany	1/<0.1 g			1/<0.1 g	12/0.3 g	2/0.1 g	1/<0.1 g
Oak	1/<0.1 g	1/<0.1 g	1/<0.1 g				
Totals	**5/0.1 g**	**1/<0.1 g**	**2/<0.1 g**	**5/0.3 g**	**15/0.3 g**	**16/0.6 g**	**2/<0.1g**

Table 34.21 (continued). Flotation wood charcoal by count and weight in grams from LA 85411.

FS No.	137	138	178	Totals	
Context	F. 2 Hearth, N ½, middle fill	F. 2 Hearth, N ½. lower fill	F. 2 Hearth, S ½	Weigh t	%
Conifers					
Pine				0.3 g	15%
Ponderosa pine	2/0.1 g	8/0.1 g	7/0.3 g	0.6 g	30%
Unknown conifer	3/0.1 g			0.6 g	30%
Non-Conifers					
Mountain mahogany		1/<0.1 g	4/<0.1 g	0.4 g	20%
Oak		4/0.1 g	1/<0.1 g	0.1 g	5%

Totals	**5/0.2 g**	**13/0.2 g**	**12/0.3 g**	**2.0 g**	**100 %**

Pollen Remains (Susan Smith)

Seven pollen samples were analyzed from LA 85411. Table 34.22 lists the frequency of identified pollen types. Squash and maize were the only cultigens identified in the botanical assemblage, and each were found in only one sample. Sedge and lily family were the only other economic resources that were identified. A number of potential economic resources were also identified in the assemblage (Table 34.22), and these are discussed in detail in Smith's chapter in Volume 3.

Table 34.22. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85411 (*n* = 7)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	1
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	1
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	1
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	3
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85411 (*n* = 7)
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	6
		Grass Aggregates	1
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	7
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	1
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	7
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	5
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	4
	Scrophulariaceae	Penstemon Family	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85411 (*n* = 7)
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	1
	Picea	Spruce	1
	Abies	Fir	4
	Pinus	Pine	7
		Pine Aggregates	1
	Pinus edulis type	Piñon	7
	Juniperus	Juniper	5
		Juniper Aggregates	0
	Quercus	Oak	7
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	2
	Artemisia	Sagebrush	6
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 85411 is a two-room Early/Middle Classic period fieldhouse that was constructed from both shaped and unshaped tuff blocks. Two internal hearths were identified at the site, and the ceramic assemblage and chronometric dates indicate a probable 14th century occupation. The site is located on a ridge north of Rendija Canyon. The presence of two rooms with internal hearths indicates that the site was occupied for extended period(s) of time, possibly during the winter. The presence of maize kernels, with maize and squash pollen indicates that the site was also occupied during the growing season.

CHAPTER 35
RENDIJA TRACT (A-14): LA 85413

Gregory D. Lockard

INTRODUCTION

LA 85413 is the remains of a small Early Classic period structure located on a south-facing slope on the mesa between Rendija and Guaje canyons. The site is located in the northeast corner of the Rendija Tract, a few tens of m north of a two-track dirt road. Vegetation on the site consists of piñon-juniper woodland with a grass understory. The site is situated at an elevation of 2109 m (6920 ft).

LA 85413 was first recorded on August 16, 1991, by David Hill (1991) during a survey for the Bason Land Exchange Project. Hill believed the site was a two-room fieldhouse. Surface Biscuit A, Glaze-on-Red, and Glaze Polychrome sherds indicated that the site was most likely occupied during the Early Classic period (AD 1325–1600). On July 20, 1992, Archaeological Research, Inc., was awarded the contract to conduct archaeological testing of the Bason Land Exchange sites. John Peterson and Christian Nightengale (1993) supervised the excavations, which took place between July 27 and August 23 of 1992. Two 1- by 1-m test pits (Units A and B) were excavated at LA 85413. Units A and B were both excavated to a maximum depth of 60 cm below the ground surface. No floor or other features were encountered during the excavation of the units.

Artifacts recovered during the excavation of the units and a surface collection of the site include 37 pieces of chipped stone and 57 ceramic sherds (29 Biscuit A sherds, 11 smeared-indented sherds, five small Black-on-red sherds that could be Glaze A, three sherds tentatively identified as Wiyo Black-on-white, four decorated sherds too badly eroded to identify, and five utilityware sherds). In addition to the excavations and surface collection, Peterson and Nightengale documented two small rock alignments (designated Features 2 and 3) at the site that they interpreted as check dams. The check dams are located approximately 16 m northeast of the structure. Feature 2 measures 1.5 m and Feature 3 measures 2 m in length.

FIELD METHODS

Before excavation, the site and surrounding area were cleared of trees and large undergrowth. The site was then visible as a mound of rubble measuring approximately 5 by 7 m in area. The northern half of the rubble mound contained clearly definable rock alignments that appeared to be the remains of a small, rectangular room (Figure 35.1). Immediately to the south, there was a wider, less clearly defined rock alignment that extended southward and terminated at an amorphous concentration of rocks that extended a few m to the east. Hill (1991) and Peterson and Nightengale (1993) believed that the rocks in this southern area were the remains of a second room. An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the southwest corner of the site. The site was then covered with a 1- by 1-m grid that extended 9 m north and 8 m east of the site datum. Three subdata (A-C) were set up for taking elevations. The site was then photographed. Artifacts visible on the surface were collected by grid unit.

Figure 35.1. Pre-excavation photograph of the mound at LA 85413.

An 8- by 1-m east-west trench was initially excavated across the room (designated Room 1) in the northern half of the rubble mound (grids 106N/100-107E). The purpose of this trench was to expose a profile of the site stratigraphy, as well as to determine the location of the room's east and west walls. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. A fairly large patch of burned floor was encountered in the east corner of the room in unit 106N/105E. In the grid units to the west, the room's living surface took the form of a compact surface relatively devoid of rocks. Within the structure, the trench units were excavated to the floor or compact living surface.

Outside of the structure, the trench units were excavated to the top of a sterile layer of weathered Cerro Toledo bedrock. The easternmost unit in the trench (unit 106N/107E) was chosen to serve as a test pit for geological analysis and was therefore excavated to intact bedrock. Ultimately, however, the profiles of other areas were chosen for geological analysis (see below). The northern profile of the trench was then drawn and photographed. The rest of the site was subsequently excavated, again by strata and arbitrary levels for thicker strata. In all, 44 units were excavated. Within the structure, excavation proceeded to the floor or compact living surface encountered while excavating the trench. Outside of the structure, excavation terminated at the top of the sterile layer of weathered bedrock in the northern portion and the top of a Btk1b1 horizon in the southern portion of the excavated area.

Excavation focused on defining the structure's walls, removing wallfall, and locating features. During the excavation of the area to the south of Room 1, no convincing walls or other features were defined. The rock alignment and concentration visible on the surface appear to have been natural, or at the very least non-structural and of unknown function. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended at least 1 m beyond the structure in all directions to locate external features and/or outdoor activity areas. The site was then photographed (Figure 35.2) and mapped (Figure 35.3).

The excavation of the site was supervised by Greg Lockard. The field crew included Michael Dilley, Alan Madsen, Brian Harmon, Joseph (Woody) Aguilar, Bettina Kuru'es, Kevin Hanselka, Brandon Gabler, Margaret Dew, and Samuel Duwe. Timothy Martinez and Aaron Gonzalez served as site monitors from San Ildefonso Pueblo and as screeners. Jeremy Yepa was the site monitor representing Santa Clara Pueblo, as well as an additional excavator.

Figure 35.2. Post-excavation photograph of LA 85413.

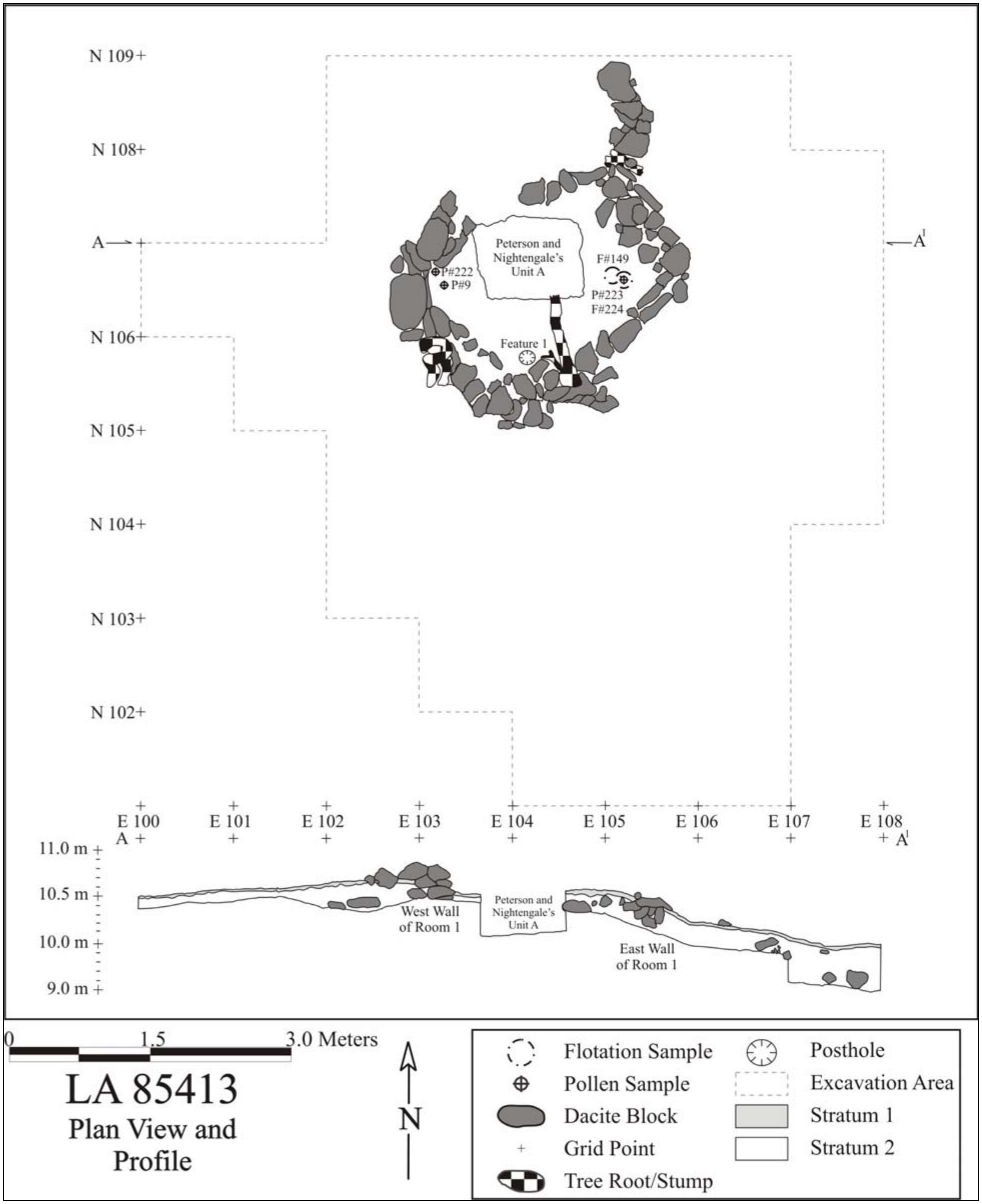

Figure 35.3. Plan view and profile of LA 85413.

STRATIGRAPHY

Stratum 1 is composed of loose, surface sediment. It is uniformly two to six cm thick across the site and is part of the A horizon (topsoil). Stratum 2 is post-occupational fill and ranges from 10 to 40 cm in thickness in the area excavated. This fill was thickest in and around the collapsed walls of the structure and thinned away from the walls and towards the center of the room. It was also considerably thicker in the downhill (i.e., southern) half of the site. Stratum 2 is more or less equivalent to the Bw horizon. Stratum 3 is weathered Cerro Toledo bedrock excavated in the grid unit originally chosen for geological analysis (106N/107E). Stratum 4 is the backfill removed from the test pits excavated by Peterson and Nightengale. Stratum 4 is therefore a disturbed context. Stratum 5 is the Room 1 floor/living surface, and Stratum 6 is the fill removed from Feature 1 (posthole). Tables 35.1 through 35.4 summarize and describe the strata excavated at the site.

Table 35.1. LA 85413 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 3/3	Loamy sand	2–6	Surface sediment
2	10YR 4/4	Sandy loam	10–40	Post-occupational fill
3	-	-	5	Weathered Cerro Toledo bedrock
4	10YR 4/4	Sandy loam	45	Backfill from P & N test pit
5	7/5YR 4/3	Clay loam	1–4	Room 1 living surface
6	10YR 4/4	Sandy loam	10	Feature 1 (posthole) fill

Table 35.2. LA 85413 soil horizon descriptions from the east profile of unit 101N/106E.

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 3/3	Loamy sand	0–7	Topsoil
Bw	10YR 4/4	Sandy loam	7–31	Late-Holocene soil
Btk1b1	7.5YR 4/4	Sandy clay	31–42	Late-Pleistocene soil
Btk2b1	7.5YR 5/5	Sandy clay loam	42–56+	Late-Pleistocene soil

Table 35.3. LA 85413 soil horizon descriptions from below the exterior face of the northeast wall of Room 1 (in unit 107N/105E).

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 4/3	Sandy loam	0–18	Topsoil
Bw	10YR 5/4	Sandy loam	18–46	Late-Holocene soil
Rk	-	-	46–55+	Weathered Cerro Toledo bedrock

Table 35.4. LA 85413 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	8	3	1	0	**12**

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
1	54	38	2	0	**94**
2	433	193	11	10	**647**
3	0	0	0	0	**0**
4	7	7	0	0	**14**
5	0	0	0	1	**1**
6	0	0	0	0	**0**
Total	**241**	**502**	**14**	**11**	**768**

Note: Does not include unprovenienced artifacts (two ceramic sherds and two pieces of chipped stone) recovered while cleaning the site for photographs.

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a small structure that probably functioned as a fieldhouse. The fieldhouse is roughly rectangular in shape. The room measures 2.30 m in length (northeast to southwest) by 1.83 m in width (northwest to southeast), with approximately 4.21 m^2 of interior space. Excavation of the room began with an east-west trench that extended across the site (units 106N/100-107E). The excavation of this trench served to define the room's stratigraphy, as well as to locate the walls that formed the east and west corners of the room. A large patch of burned floor was encountered in the east corner of the room. To the west, the room's living surface took the form of a compact surface relatively devoid of rocks. After the excavation of the trench, the rest of the room was excavated to the floor or compact living surface encountered in the trench. One of the test pits excavated by Peterson and Nightengale (Unit A) is located completely within the northern half of the room. The backfill within this test pit was removed as a separate stratum (Stratum 4). Unit A was excavated to intact Cerro Toledo bedrock. An examination of the pit's profile indicated that there were no floors or living surfaces below the floor discussed above. After the excavation of the site was complete, the room was mapped, photographed, and documented.

Fill. The interior of Room 1 was filled with 2 to 6 cm of surface sediment on top of 20 to 35 cm of post-occupational fill. The fill was thickest in and around the room's collapsed walls and thinned away from the walls and towards the center of the room. Flotation (Field Specimen [FS] 119) and pollen (FS 120) samples were taken of the Room 1 fill, but were not analyzed.

Floor. A large patch of burned floor was encountered in the east corner of the room. The floor was composed of a thin layer of clay. In the rest of the room, the living surface took the form of a compact surface relatively devoid of rocks. This surface was presumably the foundation upon which the clay floor was constructed. Throughout the room, the living surface (including the patch of floor) had been disturbed by tree roots. The source of these roots included two trees that were growing within the Room 1 walls before being cut done shortly before the excavation of the site. The living surface was particularly disturbed in the northernmost portion of the room. In fact, no compact surface at all was encountered in this area. The Room 1 living surface was associated with a single feature. This feature, designated Feature 1, was a probable posthole (see below).

A pollen sample (FS 9) and a flotation sample (FS 10) were taken from beneath a rock near the level of the floor. The flotation sample was not analyzed, but taxa identified in the pollen sample included maize, cheno-ams, sunflower family, ragweed/bursage, fir, unidentified pine, piñon pine, juniper, and sagebrush. A flotation sample (FS 149) was also taken of a concentration of ash and charcoal on top of the burned floor in the east corner of the room. Carbonized taxa identified in this sample included maize, mountain mahogany, unidentified pine, piñon pine, and ponderosa pine. In addition, a pollen sample (FS 223) was taken of sediment that was scraped from the burned floor surface, and a flotation sample (FS 224) was taken of the burned floor matrix. Taxa identified in the pollen sample included beeweed, prickly pear, buckwheat, grass family, walnut, cheno-ams, sunflower family, ragweed/bursage, spurge family, spruce, unidentified pine, piñon pine, juniper, oak, and sagebrush. Charred taxa identified in the flotation sample included goosefoot, mountain mahogany, unknown conifer, piñon pine, oak, and ponderosa pine. Finally, a pollen sample (FS 222) was taken from directly on top of a fairly well-conserved patch of living surface in the west corner of the room. Taxa identified in this sample include beeweed, grass family, cheno-ams, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

Wall Construction. The extant portions of the Room 1 walls indicate that the wall foundations were composed of unshaped dacite cobbles and a few upright slabs. These rocks appear to have been placed directly on top of the Bw horizon. Unlike at most of the other Rendija Canyon fieldhouses excavated during the Conveyance and Transfer Project, the wall foundations do not appear to have been placed in a trench. In some places, the wall was composed of a single row of large rocks. In other places, the wall was composed of two rows of upright slabs or two to three rows of small cobbles (Table 35.5). There is a short rock alignment that extends north from the room's north corner. This alignment may have been a short auxiliary wall. If this is the case, the function of the wall is unknown. There is a break of approximately 56 cm in the northwest wall. This may have been the room's entryway. This area of the site, however, has been significantly disturbed by several large roots. Two trees growing within the room's walls were cut down just before the site was excavated. One of these is located in the room's southwest wall, and the other is located in the southwestern half of the southeast wall (see Figure 35.2). The stumps and roots of these trees have contributed to the overall poor state of preservation of the Room 1 walls.

An alignment of rocks extending southward from the room's south corner was visible on the surface before the site was excavated. This alignment terminated to the south at an amorphous concentration of rocks that extended to the east. Originally, the alignment and concentration of rocks were believed to be the remains of a second room. Excavation of this area of the site, however, failed to reveal any clearly definable walls. If the rock alignment is cultural, it most likely took the form of a linear mound of rocks. The rock concentration to the south is most likely natural. Excavation revealed that the rock concentration is located within a prehistoric gully. The gully, which originally ran from the northwest to the southeast, has been filled in with small to medium-sized rocks and colluvial sediment.

Judging from the amount of wallfall removed during the excavation of the area in and around Room 1, the room's masonry was originally considerably higher than it was at the time of excavation. Due to the substantial number of rocks removed from the alignment and concentration to the south of the room, which could not be distinguished from wallfall, the original height of the room's masonry could not be estimated with any degree of certainty. For this reason, the volume of wallfall removed during the excavation of LA 85413 was not calculated. The uppermost portions of the walls, as well as the ceiling, were most likely composed of wattle and daub. These materials are rarely preserved at archaeological sites on the Pajarito Plateau. In fact, no adobe was recovered from the site.

Table 35.5. LA 85413 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
Northwest	1.50 (2.06)	0.04–0.07	0.08–0.32	1
Southeast	1.80	0.11–0.33	0.14–0.65	1 to 3
Northeast	1.30	0.26–0.42	0.21–0.53	1 to 2
Southwest	1.30	0.23–0.43	0.23–0.46	1 to 3

Note: The length of the northwest wall including the possible entryway is given in parentheses.

Feature 1

Feature 1 is a small posthole located just inside the southeast wall in the southernmost portion of the room. The compactness of the base and interior walls of the hole, as well as its verticality and circular shape, preclude the possibility of it being caused by a root and make it unlikely that it was created by an animal. The posthole measured 9 by 8 cm in area and was 10 cm deep. A pollen sample (FS 158) was taken of the fill removed from the posthole, but it was not analyzed.

Geological Analysis

The grid unit originally chosen for geological analysis (106N/107E) was excavated below the surface of the layer of weathered Cerro Toledo bedrock encountered in the northern portion of the site. The excavation proceeded only a few cm before intact Cerro Toledo bedrock was encountered. No artifacts were encountered in this level of the unit. Ultimately, the exposed profiles in this unit were not chosen for geological analysis. Instead, geologists Paul Drakos and Steven Reneau analyzed two different profiles. The first was the east profile of grid unit 101N/106E (see Table 35.2). This profile contained a soil sequence consisting of an A horizon (topsoil), a Bw horizon (a late-Holocene soil), and two Btkb1 horizons (late-Pleistocene soils). The second profile that was examined was below the exterior face of the northeast wall of Room 1 (within unit 107N/105E) (see Table 35.3). This profile contained a soil sequence consisting of an A horizon (topsoil), a Bw horizon (a late-Holocene soil), and a Rk horizon (weathered Cerro Toledo bedrock).

Artifact Distribution

As Table 35.6 demonstrates, an increasingly higher number of artifacts were recovered from grid units to the south and east within the excavated area. This pattern is almost certainly due to site formation processes, as the natural hillside slopes downward in this direction. The only deviation from this pattern is the 109 artifacts recovered from unit 105N/106E. This is by far the highest number of artifacts recovered from any unit. Of the 109 artifacts, however, 104 are sherds recovered from Stratum 2. Most of these sherds are of the same type and were concentrated in a single location. They therefore most likely represent a pot drop or the fragmentation of a very large sherd.

Table 35.6. LA 85413 artifact counts by grid unit.

	E100	E101	E102	E103	E104	E105	E106	E107
N108	--	--	1	11	4	14	11	--
N107	--	--	3	3	**6**	**11**	23	23
N106	1	1	4	**5**	**8**	**19**	8	30
N105	--	2	3	**7**	**4**	15	109	27
N104	--	--	4	11	21	20	38	18
N103	--	--	2	18	28	28	43	--
N102	--	--	--	9	27	29	31	--
N101	--	--	--	--	17	25	38	--

Note: Does not include eight artifacts recovered from the surface of unexcavated grid units and four unprovenienced artifacts recovered while cleaning the site for photographs; bold numbers indicate grid units that are located completely or partially within Room 1.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 740 artifacts were analyzed from the excavations conducted at LA 85413. In addition, flotation and pollen samples were selected for analysis from the post-occupation fill (Stratum 2) and the Room 1 living surface (Stratum 5) (Table 35.7). The results of the artifact and sample analyzes are presented in the following sections.

Table 35.7. Samples selected for analysis from LA 85413.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2	149	9, 61		
3				
4				
5	224	222, 223		
6				

*thermoluminescence

Ceramic Artifacts (Dean Wilson)

A total of 494 ceramics were analyzed from LA 85413. The majority of the pottery consists of Sapawe Micaceous and Biscuit A (Table 35.8) types. These types, in addition to the Cieneguilla Glaze-on-yellow sherd, would seem to indicate an Early Classic period (14th century) occupation. Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 35.9 to 35.11. The graywares and whitewares appear to have been locally made from tuff temper; however, the glazeware and micaceous pottery are made from non-local tempers. All of the grayware and micaceous ceramics consist of jar vessel forms while the whiteware and glazeware sherds were derived solely from bowls.

Table 35.8. Ceramic types from LA 85413.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Santa Fe Black-on-white	3	0.6
Biscuit painted unspecified	1	0.2
Biscuit unpainted slipped one side	1	0.2
Biscuit A	50	10.1
Northern Rio Grande Utilityware		
Smeared plain corrugated	2	0.4
Smeared-indented corrugated	1	0.2
Mica utility undifferentiated	26	5.3
Sapawe Micaceous	395	80.0
Middle Rio Grande Glazeware		
Glaze red body	13	2.6
Glaze yellow body	1	0.2
Cieneguilla Glaze-on-yellow	1	0.2
Total	**494**	**100.0**

Table 35.9. Tradition by ware for LA 85413 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	3	100.0	55	100.0	0	0.0	0	0.0	231	46.7
Rio Grande (Tewa Micaceous)	0	0.0	0.0	0.0	0	0.0	421	100.0	248	50.2
Middle Rio Grande	0	0.0	0.0	0.0	15	100.0	0	0.0	15	3.0
Total	**3**	**100.0**	**55**	**100.0**	**15**	**100.0**	**421**	**100.0**	**494**	**100.0**

Table 35.10. Temper by ware for LA 85413 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Fine tuff or ash	0	0.0	6	10.9	0	0.0	0	0.0	6	1.2
Fine tuff and sand	0	0.0	49	89.1	0	0.0	0	0.0	49	9.9

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Mostly tuff with phenocrysts	0	0.0	0	0.0	0	0.0	173	41.0	173	35.0
Anthill sand	3	100.0	0	0.0	0	0.0	0	0.0	3	0.6
Granite with mica	0	0.0	0	0.0	0	0.0	1	0.2	1	0.2
Highly micaceous paste	0	0.0	0	0.0	0	0.0	1	0.2	1	0.2
Sapawe Micaceous	0	0.0	0	0.0	0	0.0	246	58.4	246	49.7
Galisteo igneous latite	0	0.0	0	0.0	3	20.0	0	0.0	3	0.6
Latite Keres area	0	0.0	0	0.0	12	80.0	0	0.0	12	2.4
Total	**3**	**100.0**	**55**	**100.0**	**15**	**100.0**	**421**	**100.0**	**494**	**100.0**

Table 35.11. Vessel form by ware for LA 85413 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Bowl rim	0	0.0	8	14.5	1	6.6	0	0.0	9	1.8
Bowl body	0	0.0	44	80.0	4	26.6	0	0.0	48	9.7
Jar neck	0	0.0	0	0.0	3	20.0	28	6.6	31	6.2
Jar rim	0	0.0	0	0.0	0	0.0	29	6.8	29	5.8
Jar body	3	100.0	0	0.0	7	46.6	364	86.4	374	75.7
Flared bowl rim	0	0.0	3	5.4	0	0.0	0	0.0	3	0.6
Total	**3**	**100.0**	**55**	**100.0**	**15**	**100.0**	**421**	**100.0**	**494**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 246 artifacts were analyzed from LA 85413. The assemblage consists of nine cores, 224 pieces of debitage, one retouched tool, 11 ground stone artifacts, and a hammerstone. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 35.12 presents the data on lithic artifact type by material type. The debitage is primarily made of chalcedony, with less Pedernal chert, obsidian, and other materials. The presence of cortex on 36.6 percent of the debitage indicates that these materials were collected from waterworn (n = 62) and nodule (n = 20) sources. The chalcedony, Pedernal chert, quartzite, and silicified wood are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. Nodule cortex is solely present on obsidian artifacts. The igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Seven pieces of debitage, a core, and two tested pebbles were submitted for X-ray fluorescence analysis. The obsidian artifacts are made solely from Cerro Toledo obsidian (Table 35.13). The Cerro Toledo (Obsidian Ridge/Rabbit Mountain) source area is located about 19 km (12 mi). Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present in the area of the site as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval and are scattered across the mesa top. Indeed, two tested pebbles and an obsidian pebble core are probably derived from this local source.

Table 35.12. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	**Vesic. Basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Sil. Wood**	**Quartzite**	**Other**	**Total**
Cores	Core	0	0	1	0	0	0	1	0	0	2	0	0	0	4
	Tested material	0	0	0	0	0	0	3	0	0	0	0	0	0	3
	Cobble uniface	0	0	0	1	0	0	0	0	0	1	0	0	0	2
	Subtotal	0	0	1	1	0	0	4	0	0	3	0	0	0	9
Debitage	Angular debris	0	0	0	1	0	0	3	17	0	18	0	0	0	37
	Core flake	0	0	1	1	2	0	23	84	0	45	5	12	0	173
	Uniface flake	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Outrepasse	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	Microdeb.	0	0	0	0	0	0	0	6	0	0	0	0	0	6
	Und. flake	0	0	0	0	0	0	0	5	0	0	0	0	0	5
	Subtotal	0	0	2	1	2	0	26	112	0	64	5	12	0	224
Retouched Tools	Drill	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Ground Stone	One-hand mano	0	0	0	0	3	0	0	0	0	0	0	1	0	4
	Millingstone	0	0	0	1	1	0	0	0	0	0	0	0	0	2
	Und. metate fragment	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Polishing stone	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Abrading stone	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Axe	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Und. ground stone	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	1	8	0	0	0	0	0	0	2	0	11
Other	Hammerstone	0	0	0	1	0	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Total		**0**	**0**	**3**	**4**	**10**	**0**	**30**	**113**	**0**	**67**	**5**	**14**	**0**	**246**

Table 35.13. Obsidian source samples.

FS #	Artifact	Color	Source
39	Tested pebble	Translucent	Cerro Toledo rhyolite
49	Debitage	Translucent	Cerro Toledo rhyolite
55	Debitage	Translucent	Cerro Toledo rhyolite
59	Tested pebble	Translucent	Cerro Toledo rhyolite
74	Debitage	Translucent	Cerro Toledo rhyolite
91	Debitage	Translucent	Cerro Toledo rhyolite
147	Debitage	Translucent	Cerro Toledo rhyolite
151	Debitage	Translucent	Cerro Toledo rhyolite
155	Debitage	Translucent	Cerro Toledo rhyolite
157	Core	Translucent	Cerro Toledo rhyolite

Lithic Reduction

Five cores, one cobble uniface, and three tested pebbles were identified during the analysis. The cores were reduced using a single-directional, single face, a bidirectional, change-of-orientation, and a multi-directional opposed/90 degrees and opposed-same-and-different-face technique. Flakes were removed from an unprepared cortical platform on the cobble unifaces and tested pebbles (Figure 35.4). Two of the cores were discarded because they were broken along a material flaw and due to extensive stepping/hinging, while the other two were exhausted. Table 35.14 presents the metric information on the cores.

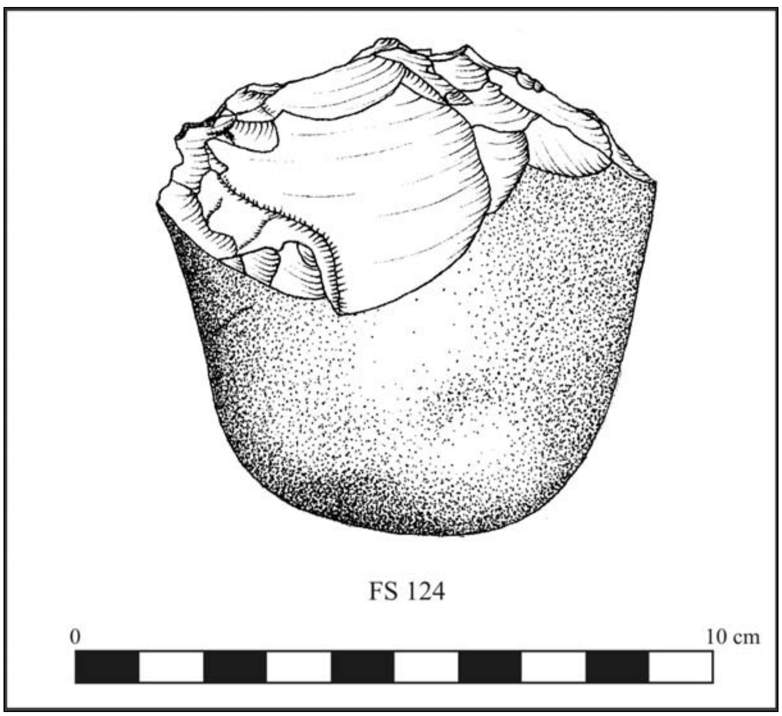

Figure 35.4. Cobble uniface from LA 85413.

Table 35.14. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Single-directional	21	26	24	15.3
Single-directional	37	71	65	198.9
Bi-directional	32	46	33	59.9
Multi-directional	68	50	43	140.3
Multi-directional	74	73	57	237.2
Cobble Uniface	60	82	80	464.2

The debitage consists primarily of core flakes with fewer angular debris, microdebitage, and other items. Table 35.15 summarizes the various stages of reduction represented by the whole core flakes. The debitage assemblage is composed primarily of secondary non-cortical, with less secondary cortical and a few primary flakes. The overall cortical:non-cortical ratio of 0.77 reflects this slight emphasis on the later stages of core reduction. However, this varies by material type. Obsidian is primarily represented in the early stages of core reduction, presumably due to the use of locally available pebbles. In contrast, Pedernal chert is a mix of early- and late-stage reduction and chalcedony emphasizes the late stage of core reduction.

Table 35.15. Debitage reduction stages.

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Basalt	0	0	1	0	---
Obsidian	3	6	2	0	4.5
Chalcedony	0	12	25	0	0.48
Pedernal chert	0	10	12	0	0.83
Total	**3**	**28**	**40**	**0**	**0.77**
Percentage	4.2	39.4	56.3	0	---

The flakes mostly have single-faceted platforms (n = 56), with fewer cortical (n = 24), multi-faceted (n = 1), collapsed (n = 17), and crushed (n = 11) platforms. None of the platforms exhibit any obvious evidence of preparation. The majority of the core flakes are whole (n = 80), with fewer proximal (n = 29), midsection (n = 9), distal (n = 54), and undetermined (n = 1) fragments. The whole core flakes have a mean length of 29.3 mm (*std* = 11.9) and the angular debris a mean weight of 7.5 g (*std* = 8.5).

The retouched tools consist solely of a drill. The tool is a midsection fragment, bifacially retouched and with a diamond-shaped cross-section.

Tool Use

A single flake exhibits evidence of edge damage that could be attributed to use. This flake has a ground and polished area along the dorsal cortical surface of the artifact. It was presumably removed from a ground stone tool.

The ground stone includes manos, metates, polishing stones, abrading stones, and an axe. The manos are all the one-hand variety and consist of dacite and quartzite cobbles with one to two ground surfaces. One of these artifacts was also used as a hammerstone. The millingstone is a large piece of andesite with a single concave grinding surface, whereas, the undetermined metate consists of a broken tabular piece of dacite with a flat, heavily ground surface. The polishing stone is a dacite pebble that is polished over most of its surface. It also appears to exhibit some staining. In contrast, the abrading stone is an irregular-shaped dacite cobble with a single heavily polished edge and ground surface with unidirectional striations. The axe is a thin quartzite cobble fragment that was unifacially flaked along one lateral side and the ends. The other lateral side consists of a clean broken face (Figure 35.5). Each of the four edges of the artifact are notched so that it could be hafted. There is some rounding/scarring on the bit, but the item was probably resharpened. Several quartzite flakes were observed in the site assemblage that could have been removed from the artifact during shaping and/or resharpening. Lastly, the undetermined ground stone item is a small fragment of dacite with a ground surface that might represent a broken mano.

Figure 35.5. Axe from LA 85413.

Faunal Remains (Kari Schmidt)

Twelve pieces of bone were recovered during excavations of this Classic period fieldhouse. The majority of the bones were recovered in Stratum 2 (post-occupational fill), but two bones were identified in Stratum 5, which was the living surface identified in the fieldhouse. The bones identified on the living surface were unidentified to the level of class and were both heavily calcined. The bones identified in Stratum 2 included two pocket gopher (*Thomomys* sp.) elements (right humerus, left mandible), five mule deer (*Odocoileus hemionus*) bones, one small/medium-sized mammal remain, one medium/large-sized mammal remain, and one unidentified remain. The mule deer elements included three rib fragments, one right calcaneus, and one right astragalus. None of the bones were burned.

Archaeobotanical Remains (Pamela McBride)

Cultural plant remains consisted of one goosefoot seed and one possible maize cupule fragment (Table 35.16). Charred and partially charred plant part fragments were not identified and conifer needles are probably a product of firewood use. Wood charcoal was primarily mountain mahogany and pine with piñon, ponderosa pine, oak, and unknown conifer occurring in smaller numbers (Table 35.17).

Table 35.16. Flotation plant remains, count, and abundance at LA 85413.

FS No.	**149**	**224**
Context	Ash/charcoal deposit on floor	Room 1, burned floor, east corner
	Cultural	
Annuals		
Goosefoot		1(1)
Cultivars		
Maize	cf. 1(0) c	
Other		
Unidentifiable	1(0) pp	1(0) pp, 1 (0) pp pc
Perennials		
Piñon	needle +	
Ponderosa pine	needle +	needle +
	Non-Cultural	
Annuals		
Goosefoot	+	+
Perennials		
Juniper	+, twig +	twig +
Piñon	needle +, nutshell +	

+ 1-10/liter, c cupule, cf. compares favorably, pc partially charred, pp plant part

Table 35.17. Wood charcoal taxa by count and weight in grams from LA 85413.

FS No.	**149**	**224**
Context	Ash/charcoal deposit on floor	Room 1, burned floor, east corner
Conifers		
Pine	11/0.4 g	
Piñon		4/0.1 g
Ponderosa pine	1/<0.1 g	
Unknown conifer		3/<0.1 g
Non-Conifers		
Mountain mahogany	8/0.2 g	1/<0.1 g
Oak		4/0.2 g

FS No.	149	224
Totals	**20/0.6 g**	**12/0.3 g**

Pollen Remains (Susan Smith)

Four pollen samples were analyzed from LA 85413. Table 35.18 lists the frequency of identified pollen types. Maize was the only cultigen identified in the botanical assemblage and was found in only one sample. Prickly pear and beeweed were the only economic resources that were identified in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 35.18), and these are discussed in detail in Smith's chapter in Volume 3.

Table 35.18. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85413 (*n* = 4)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	2
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	1
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	3
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	1
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85413 (*n* = 4)
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	6
		Grass Aggregates	2
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	1
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	4
		Cheno-Am Aggregates	1
	Fabaceae	Pea Family	1
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	4
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	4
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	1
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	3
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	1

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85413 (*n* = 4)
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	1
	Pinus	Pine	4
		Pine Aggregates	0
	Pinus edulis type	Piñon	4
	Juniperus	Juniper	4
		Juniper Aggregates	0
	Quercus	Oak	1
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	1
	Ephedra	Mormon Tea	1
	Artemisia	Sagebrush	4
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 85413 is a one-room Early Classic period fieldhouse that was constructed from both shaped and unshaped tuff blocks. A single feature (a posthole) was identified at the site. The site is situated on the mesa north of Rendija Canyon and just south of Guaje Canyon. The presence of maize cupules and pollen indicates that the one-room structure was presumably occupied during the growing season.

CHAPTER 36
RENDIJA TRACT (A-14): LA 85414

Gregory D. Lockard

INTRODUCTION

LA 85414 is the remains of a small Middle Classic period structure located on a southeast-facing ridge slope on the mesa between Rendija and Guaje canyons. The site is located in the far northeast corner of the Rendija Tract, approximately 30 m north of a two-track dirt road. Vegetation on the site consists of piñon-juniper woodland with a grass understory. The site is situated at an elevation of 2109 m (6920 ft).

LA 85414 was first recorded on August 16, 1991, by David Hill (1991) during a survey for the Bason Land Exchange Project. Hill believed that the site was a one-room fieldhouse. Two chalcedony flakes were the only artifacts noted on the surface. On July 20, 1992, Archaeological Research, Inc., was awarded the contract to conduct archaeological testing of the Bason Land Exchange sites. John Peterson and Christian Nightengale (1993) supervised the excavations, which took place between July 27 and August 23 of 1992. Two 1- by 1-m test pits (Units A and B) were excavated at LA 85414. Unit A was located in the center of the rubble mound, and Unit B was located just west of the mound. Units A and B were excavated to a maximum depth of 62 and 20 cm below the ground surface, respectively. No clear rock alignments or living surfaces were encountered in either unit. Artifacts recovered during the excavation of the units and a surface collection of the site include 16 pieces of chipped stone and 11 ceramic sherds (nine smeared-indented sherds, one plain brownware body sherd, and two other utilityware sherds).

FIELD METHODS

Before excavation, the site and surrounding area were cleared of trees and large undergrowth. The site was then visible as a mound of rubble measuring approximately 5 by 4 m in area (Figure 36.1). An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the southwest corner of the site. The site was then covered with a 1- by 1-m grid that extended five m north and eight m east of the site datum. Two subdata (A and B) were set up for taking elevations. The site was then photographed. Artifacts visible on the surface were collected by grid unit. A 6- by 1-m east-west trench (102N/102-107E) was initially excavated across the remains of the one-room structure, which was designated Room 1. The purpose of this trench was to expose a profile of the site stratigraphy, as well as to determine the location of the room's east and west walls. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels.

Much of Peterson and Nightengale's Unit A was located within unit 102N/105E. The eastern edge of three aligned rocks that were most likely part of the room's west wall (see below) formed the western border of Unit A. The unit extends eastward across much of the narrow room. Unit A was excavated to bedrock. The room's living surface was therefore only encountered in thin strips just north of Unit A (the northernmost portion of grid unit 102N/105E) and just inside the room's east wall (the westernmost portion of unit 102N/106E) during the excavation of the east-west trench. Outside of the room, the trench units were excavated to the top of a sterile Btb1 horizon. Peterson and Nightengale's Unit A was chosen to serve as a sub-floor test pit for geological analysis. The northern profile of the trench was then drawn and photographed. The rest of the site was subsequently excavated, again by strata and arbitrary levels for thicker strata. In all, 29 units were excavated. Within the structure, excavation terminated at the compact living surface encountered while excavating the trench.

Figure 36.1. Pre-excavation photograph of LA 85414.

Outside of the structure, excavation terminated at the top of the Btb1 horizon. Excavation focused on defining the structure's walls, removing wallfall, and locating features. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended at least 1 m beyond the structure in all directions to locate external features and/or outdoor activity areas. The site was then mapped (Figure 36.2) and photographed (Figure 36.3).

During the excavation of Area 1, an obsidian projectile point fragment was discovered in association with a small concentration of rocks. The rock concentration, which is located approximately 35 m southwest of Room 1, was designated Area 2. The Area 1 grid was extended to Area 2, and a 2- by 2-m grid was placed over the rock concentration. All four grid units (73-75N/82-84E) were then excavated. Excavation revealed that the rocks were superficial and did not form any clear pattern (Figure 36.4). In addition, very few artifacts were recovered from the excavations. As a result, it is highly unlikely that the rock concentration was a cultural feature.

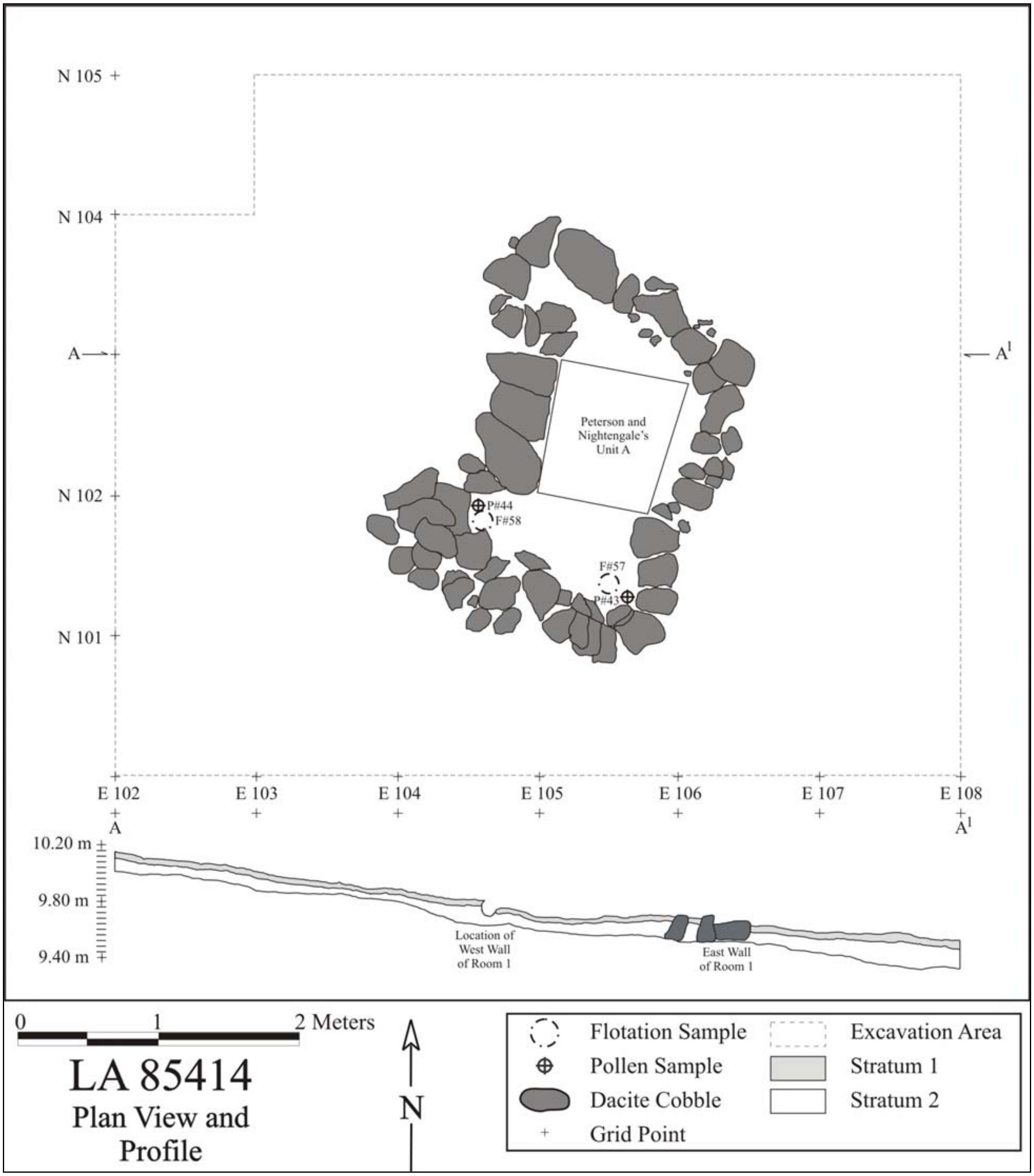

Figure 36.2. Plan view and profile of LA 85414.

Figure 36.3. Post-excavation photograph of the fieldhouse at LA 85414.

Figure 36.4. Area 2, a rock concentration located southwest of Room 1.

The excavation of the site was supervised by Greg Lockard. The field crew included Michael Dilley, Alan Madsen, Brian Harmon, Bettina Kuru'es, and Margaret Dew. Timothy Martinez and Aaron Gonzalez served as site monitors from San Ildefonso Pueblo and as screeners. Jeremy Yepa was the site monitor representing Santa Clara Pueblo, as well as an additional excavator.

STRATIGRAPHY

Stratum 1 is composed of loose, surface sediment. It is uniformly 2 to 6 cm thick across the site and is part of the A horizon (topsoil). Stratum 2 is post-occupational fill and ranges from 5 to 20 cm in thickness in Area 1 and 7 to 8 cm in Area 2. In Area 1, the post-occupational fill was thickest in and around the collapsed walls of the structure and thinned away from the walls and towards the center of the room. It was also considerably thicker in the downhill (i.e., eastern) half of the site. Stratum 2 is more or less equivalent to the Bw horizon. Stratum 3 is the backfill removed from Peterson and Nightengale's Unit A. Stratum 3 is therefore a disturbed context. Peterson and Nightengale's Unit B could not be located. Judging from their map of the site, however, it was most likely located within the excavated area. The back fill in this shallow (20 cm) excavation was therefore indistinguishable from the surrounding post-occupational fill, and therefore could not be excavated as a separate stratum. Stratum 4 is the Room 1 living surface. Tables 36.1 through 36.4 summarize and describe the strata excavated at the site.

Table 36.1. LA 85414 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 5/3	Loamy sand	2–6	Surface sediment
2	10YR 5/3	Sandy loam	5–20	Post-occupational fill
3	10YR 5/3	Sandy loam	60	Backfill from P & N test pit
4	10YR 5/2	Clay loam	-	Room 1 living surface

Table 36.2. LA 85414 soil horizon descriptions from the east profile of unit 103N/107E.

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 5/3	Loamy sand	0–8	Topsoil
Bw	10YR 5/3	Sandy loam	8–5	Late-Holocene soil
Btb1	7.5YR 4/3.5	Sandy clay loam	15–23	Late-Pleistocene soil
R	-	-	23+	Weathered Cerro Toledo bedrock

Table 36.3. LA 85414 soil horizon descriptions from the east profile of Peterson and Nightengale's Unit A (within grid unit 102N/105E).

Horizon	Color	Texture	Depth (cm)	Description
Bw	10YR 5/3	Sandy loam	~10–20	Late-Holocene soil
Btb1	7.5YR 4/3	Sandy clay loam	20–32	Late-Pleistocene soil
Rk	-	-	32+	Cerro Toledo bedrock

Table 36.4. LA 85414 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	1	2	0	0	**3**
1	8	6	0	0	**14**
2	25	19	5	0	**49**
3	3	3	0	1	**7**
4	0	0	0	0	**0**
Total	**37**	**30**	**5**	**1**	**73**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a small structure that probably functioned as a fieldhouse. The fieldhouse is roughly rectangular in shape, although the west wall does appear to curve significantly inward (see below). Room 1 measures 2.05 m in length (north to south) by 1.40 m in width (east to west), with approximately 2.87 m^2 of interior space. Excavation of the room began with an east-west trench that extended across the rubble mound in Area 1 (102N/102-107E). The excavation of this trench served to define the room's stratigraphy, as well as to locate the room's east and west walls. Peterson and Nightengale's Unit A, which was excavated to bedrock, covers much of that portion of the trench that is within Room 1. As a result, the room's living surface was only encountered in thin strips to the north and east of Unit A during the excavation of the trench. An excavation of the test pit's profiles indicated that there were no additional floors or living surfaces below. After the excavation of the trench, the rest of the room was excavated down to the compact living surface encountered in the trench.

Fill. The interior of Room 1 was filled with 2 to 6 cm of surface sediment on top of 7 to 11 cm of post-occupational fill. The fill was thickest in and around the room's collapsed walls and thinned away from the walls and towards the center of the room. Flotation (Field Specimen [FS] 39) and pollen (FS 40) samples were taken of the Room 1 fill, but were not analyzed.

Floor. No prepared floor was encountered in Room 1. There is a compact surface just above the Btb1 horizon, however, that was most likely the room's living surface. This surface is relatively flat, devoid of rocks, and slightly stained in the area south of Peterson and Nightengale's Unit A. To the north of Unit A, there were several large rocks embedded in the presumed living surface. These rocks may be wallfall. The fact that they are deeply embedded in the presumed living surface and Btb1 horizon below, however, indicates that this may not be the case. The rocks do not present a discernible pattern. If they are not wallfall, their function is therefore unknown. The tops of the rocks may have been at floor level, in which case the floor was slightly higher than the excavated surface in this area of the room. A thin strip of living surface was encountered to the east of Unit A, which was poorly preserved.

Pollen samples were taken at the level of the presumed living surface in the northeast (FS 47), northwest (FS 42), southeast (FS 43), and southwest (FS 44) corners of the room. FS 43 and FS 44 were analyzed and identified taxa included grass family, sunflower family, ragweed/bursage, cheno-ams, spurge family, spruce, fir, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush. Flotation samples were taken of the fairly well-preserved living surface matrix in the southeast (FS 57) and southwest (FS 58) corners of the room. Carbonized taxa identified in these samples included unidentified pine and piñon pine.

Wall Construction. In general, the Room 1 walls were constructed of dacite cobbles of various sizes (Table 36.5). The people who constructed the walls do not appear to have selected for any particular size or shape of rock. The foundation of the walls was formed by placing dacite cobbles in a shallow trench dug into the Btb1 horizon, which is a late-Pleistocene soil. The north wall was composed of a single row of irregularly shaped dacite cobbles. One rock remained of the wall's second course. It was located in the westernmost portion of the wall. Small dacite cobbles were placed in the crevices between the wall's larger rocks. The south wall was a double wall of irregularly shaped dacite cobbles. The cobbles were also irregularly placed, which may indicate that the wall was partially disturbed. A few rocks of the second course remained in the westernmost portion of the wall. The east wall was only one course high and was largely composed of a single row of irregularly shaped dacite cobbles. These rocks tend to be rounder, however, than those of the other walls. The west wall was quite unusual. The northernmost 55 cm of the wall extended southward from the west end of the north wall.

Table 36.5. LA 85414 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.45	0.10–0.30	0.25–0.35	1 to 2
South	1.40	0.08–0.42	0.26–0.53	1 to 2
East	1.72	0.08–0.15	0.20–0.35	1
West	1.65	0.14–0.22	0.20–0.50	1

Note: The west wall measurements include the large rocks in the central portion of the wall that are lower and offset to the east.

There was also a short section of the wall that extended northward from the west end of the south wall. In between were three very large rocks that extended down into the Btb1 horizon. The central of the three rocks was especially large and extended at least 10 cm into the Btb1 horizon. All three of the rocks extended eastward into the room. If the rocks were part of the east wall, the wall curved significantly inward, making the central portion of the room extremely narrow. For this reason, the rocks may instead have been a slightly raised platform or stair just inside the room's entryway. A small upright cobble extended from the southernmost of the three large rocks diagonally to the northern end of the west wall's south section. There were several cobbles that similarly extended from the northernmost of the three large rocks diagonally to the southern end of the west wall's north section. The location of these rocks suggests that the three large rocks were indeed *in situ*. If this is the case, the room was rectangular only if the three large rocks were part of an internal feature (i.e., a platform or stair just inside the room's entryway).

Judging from the amount of wallfall removed during the excavation of the area in and around Room 1, the room's masonry was originally considerably higher than it was at the time of excavation. In order to estimate the original height of the masonry, all of the rocks removed as wallfall during the site's excavation were placed in three stacks, which were then measured. The stacks measured 0.35 by 4.00 by 0.58 m, 0.65 by 1.20 by 0.70 m, and 0.35 by 2.7 by 0.50 m, for a total of approximately 1.83 m^3 of wallfall. Based on this volume of wallfall and the overall length, average thickness, and average height of the extant portions of the walls, the room's masonry was originally approximately 1.08 m in height. The uppermost portions of the walls, as well as the ceiling, were most likely composed of wattle and daub. These materials are rarely preserved at archaeological sites on the plateau. In fact, no adobe was recovered from the site.

Geological Analysis

Geologists Paul Drakos and Steven Reneau utilized two profiles to reconstruct the natural soil horizons at the site. The upper strata were described from the east profile of unit 103N/107E, and the lower strata were described from the east profile of Peterson and Nightengale's Unit A (within unit 102N/105E). The east profile of unit 103N/107E contained a soil sequence consisting of an A horizon (topsoil), a Bw horizon (a late-Holocene soil), a Btb1 horizon (a late-Pleistocene soil), and a R horizon (weathered Cerro Toledo bedrock). The east profile of Peterson and Nightengale's Unit A contained a soil sequence consisting of a Bw horizon, a Btb1 horizon, and a Rk horizon (Cerro Toledo bedrock).

Artifact Distribution

The number of artifacts encountered during the excavation of LA 85414 (*n* = 73) is small compared to other Rendija Canyon fieldhouses excavated during the Conveyance and Transfer Project. This may indicate that the site was occupied for only a short period of time. As Table 36.7 demonstrates, the number of artifacts in Area 1 increases slightly in grid units to the south and east. This artifact distribution is most likely the result of site formation processes, as the natural hillside surface slopes downward in this direction. No other patterns are discernible in the artifact distribution at the site. Only three artifacts were recovered from Area 2 (Table 36.8). This supports the conclusion that the concentration of rocks in the area was not a cultural feature.

Table 36.6. LA 85414, Area 1 artifact counts by grid unit.

	E102	E103	E104	E105	E106	E107
N104	--	2	2	0	0	2
N103	0	0	**0**	**1**	**0**	1
N102	0	0	**0**	**9**	**6**	8
N101	0	0	**1**	**0**	8	9
N100	2	3	1	0	8	6

Note: Does not include one artifact found outside of the excavated area within Area 1 during surface collection; bold numbers indicate grid units that are located completely or partially within Room 1.

Table 36.7. LA 85414, Area 2 artifact counts by grid unit.

	E82	E83
N74	0	0
N73	1	2

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 70 artifacts were analyzed from the excavations conducted at LA 85414. In addition, flotation and pollen samples were selected for analysis from the Room 1 living surface (Stratum 4) (Table 36.8). The results of the artifact and sample analyzes are presented in the following sections.

Table 36.8. Samples selected for analysis from LA 85414.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2				
3				
4	57, 58	43, 44		

*thermoluminescence

Ceramic Artifacts (Dean Wilson)

A total of 35 ceramics were analyzed from LA 85414. The majority of the pottery consists of Sapawe Micaceous, with Biscuit A, and glazeware sherds (Table 36.9). This would indicate a Middle Classic (14th century) occupation for the site. Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 36.10 to 36.12. The graywares and whitewares appear to have been locally made from local tuff temper. This contrasts with the Sapawe Micaceous pottery that appears to have been derived from a non-local and local source. The former is represented by a micaceous temper and the latter by a tuff temper with a micaceous slip. All of the grayware, micaceous, and glazeware ceramics consist of jar vessel forms while the whiteware sherds were derived solely from bowls.

Table 36.9. Ceramic types from LA 85414.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	3	8.6
Biscuit unpainted one side slipped	1	2.9
Biscuit A	1	2.9
Northern Rio Grande Utilityware		
Smeared plain corrugated	3	8.6

Ceramic Type	Frequency	Percent
Sapawe Micaceous	24	68.6
Middle Rio Grande Glazeware		
Glaze red body	1	2.9
Glaze yellow body	2	5.8
Total	**35**	**100.0**

Table 36.10. Tradition by ware for LA 85414 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	3	100.0	5	100.0	0	0.0	0	0.0	8	23.0
Rio Grande (Tewa Micaceous)	0	0.0	0	0.0	0	0.0	24	100.0	24	68.5
Middle Rio Grande	0	0.0	0	0.0	3	100.0	0	0.0	3	8.5
Total	**3**	**100.0**	**5**	**100.0**	**3**	**0.0**	**24**	**0.0**	**35**	**100.0**

Table 36.11. Temper by ware for LA 85414 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Fine tuff or ash	0	0.0	1	20.0	0	0.0	0	0.0	1	2.8
Fine tuff and sand	0	0.0	3	60.0	0	0.0	0	0.0	3	8.5
Self tempered	0	0.0	1	20.0	0	0.0	0	0.0	1	2.8
Mostly tuff with phenocrysts	3	100.0	0	0.0	0	0.0	8	33.3	11	31.4
Sapawe Micaceous temper	0	0.0	0	0.0	0	0.0	16	66.6	2	5.7
Latite Keres area	0	0.0	0	0.0	3	100.0	0	0.0	3	8.5
Total	**3**	**100.0**	**5**	**100.0**	**3**	**100.0**	**24**	**100.0**	**35**	**100.0**

Table 36.12. Vessel form by ware for LA 85414 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Bowl body	0	0.0	3	60.0	0	0.0	0	0.0	3	8.5
Jar neck	1	33.3	0		2	66.6	4	16.6	7	20.0
Jar body	2	66.6	1	20.0	1	33.3	20	83.3	24	68.5
Indeterminate coil, strap handle	0	0.0	1	20.0	0	0.0	0	0.0	1	2.8
Total	**3**	**100.0**	**5**	**100.0**	**3**	**0.0**	**24**	**100.0**	**35**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 35 artifacts were analyzed from LA 85414. The assemblage consists of 28 pieces of debitage, two retouched tools, four ground stone artifacts, and a hammerstone. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 36.13 presents the data on lithic artifact type by material type. The debitage is primarily made of chalcedony and Pedernal chert with less obsidian, silicified wood, and basalt materials. The presence of cortex on 14.2 percent of the debitage indicates that these materials were collected from waterworn (*n* = 4) sources. The chalcedony, Pedernal chert, and silicified wood are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. The igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 36.13. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. wood	Quartzite	Other	Total
Debitage	Angular debris	0	0	0	0	0	0	1	1	0	3	0	0	0	5
	Core flake	1	0	0	0	0	0	3	11	0	6	2	0	0	23
	Subtotal	1	0	0	0	0	0	4	12	0	9	2	0	0	28
Retouched Tools	Biface	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Projectile point	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	2	0	0	0	0	0	0	2
Ground Stone	One-hand mano	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Millingstone	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Grinding slab	0	0	0	1	0	0	0	0	0	0	0	0	0	1
	Grooved abrader	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Und. ground stone	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	1	3	0	0	0	0	0	0	0	0	4
Other	Hammerstone	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	Subtotal	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Total		**2**	**0**	**0**	**1**	**3**	**0**	**6**	**12**	**0**	**9**	**2**	**0**	**0**	**35**

Three pieces of obsidian debitage, a biface, and a projectile point, and a single basalt flake were submitted for X-ray fluorescence analysis. The obsidian artifacts are mostly made from Cerro

Toledo obsidian; however, the projectile point is made from the El Rechuelos source (Table 36.14). The Cerro Toledo (Obsidian Ridge/Rabbit Mountain) source area is located about 19 km (12 mi) as the "crow flies" to the west of the site. Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present in the area of the site as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval and are scattered across the mesa top. The El Rechuelos (Polvadera Peak) source area is situated about 27 km (17 mi) northwest of the site. The single basalt flake is actually dacite, which is derived from the San Antonio Mountain area located approximately 115 km (70 mi) north of Rendija Canyon.

Table 36.14. Obsidian source samples.

FS #	Artifact	Color	Source
23	Debitage	Translucent	Cerro Toledo rhyolite
34	Projectile point	Black dusty	El Rechuelos
35	Debitage	Translucent	Cerro Toledo rhyolite
36	Biface	Translucent	Cerro Toledo rhyolite
55	Debitage	Translucent	Cerro Toledo rhyolite

Lithic Reduction

The debitage consists solely of core flakes and angular debris. The overall cortical:non-cortical ratio of 0.28 reflects a slight emphasis on the later stages of core reduction. The flakes mostly have single-faceted platforms (n = 5), with fewer collapsed (n = 4) and crushed (n = 11) platforms. None of the platforms exhibit any obvious evidence of preparation. The majority of the core flakes are distal fragments (n = 11), with fewer whole (n = 9), proximal (n = 1), midsection (n = 1), and undetermined (n = 1) fragments. The whole core flakes have a mean length of 34.5 mm (*std* = 10.3) and the angular debris a mean weight of 1.7 g (*std* = 1.2).

The retouched tools consist of a biface and projectile point. The biface is a proximal fragment with an edge angle of 60 degrees indicating that it was broken during the middle stage of the reduction process. The projectile point is a midsection fragment with a broken tip and base. It was manufactured on a flake and was only partially bifacially retouched. It could represent the broken remains of a corner-notched arrow point.

Tool Use

A single flake exhibits evidence of edge damage that could be attributed to use. This damage consists of some rounding and polish on a distal end with an edge angle of 70 degrees. The ground stone includes a mano, a millingstone, a grinding slab, and a grooved abrader. The mano is a one-hand variety made on a small dacite slab that exhibits a single well-used grinding surface. The millingstone is a large piece of dacite with a single concave-shaped grinding surface. In contrast, the grinding slab is a flat piece of andesite with a single, flat, heavily ground surface that also exhibits slight polish. The polished area includes striations that are oriented along a single direction. Lastly, the grooved abrader is a small dacite cobble with a natural indentation that appears to exhibit some wear along the groove.

Faunal Remains (Kari Schmidt)

One piece of bone was recovered during excavations of this Middle Classic period fieldhouse. The bone was recovered in 102N/105E and was identified as a fragment of the proximal metacarpal of a mule deer (*Odocoileus hemionus*). The bone was identified as a possible awl in the field, but closer inspection suggested that it was not an awl, but was simply shaped and polished. The bone was not burned.

Archaeobotanical Remains (Pamela McBride)

Piñon needles were the only non-wood plant material recovered from the fieldhouse and most likely relate to fuelwood use (Table 36.15). Wood charcoal was limited to five pieces of pine recovered from the southeast corner of the living surface.

Table 36.15. Flotation plant remains, count, and abundance from LA 85414.

FS No.	**57**	**58**
Context	Room 1, living surface, SE corner	Room 1, living surface, SW corner
Cultural		
Perennials		
Piñon		needle +
Non-Cultural		
Grasses		
Grass family	floret +	floret +
Perennials		
Juniper	twig +	
Piñon	needle +	
Ponderosa pine	needle +	

+ 1-10/liter.

Pollen Remains (Susan Smith)

Only two pollen samples were analyzed from LA 85414. Table 36.16 lists the frequency of identified pollen types. No cultigens or other economic resources were identified in the assemblage. Other potential economic resources were identified in the assemblage (Table 36.16), and these are discussed in detail in Smith's chapter in Volume 3.

Table 36.16. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85414 (*n* = 2)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	0
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	0
	Eriogonum	Buckwheat	o
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	2
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85414 (*n* = 2)
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs	Cheno-Am	Cheno-Am	2
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	2
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	1
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	1
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85414 (*n* = 2)
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	1
	Pinus	Pine	2
		Pine Aggregates	0
	Pinus edulis type	Piñon	2
	Juniperus	Juniper	2
		Juniper Aggregates	0
	Quercus	Oak	2
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	1
	Artemisia	Sagebrush	2
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 85414 is a one-room Middle Classic period fieldhouse that was constructed from both shaped and unshaped tuff blocks. The site is situated on a southeast-facing ridge slope on the mesa between Rendija and Guaje canyons. Although no evidence of cultigens was identified, the one-room structure was presumably occupied during the growing season when maize was being cultivated.

CHAPTER 37
RENDIJA TRACT (A-14): LA 85417

Gregory D. Lockard

INTRODUCTION

LA 85417 is a small Classic period site located on a south-facing ridge slope of the mesa between Rendija and Guaje canyons. The site is located near the southern boundary of the Rendija Tract. Vegetation on the site consists of piñon-juniper woodland with a grass understory. The site is situated at an elevation of 2091 m (6860 ft).

LA 85417 was first recorded on August 17, 1991, by David Hill (1991) during a survey for the Bason Land Exchange Project. According to Hill, the site consisted of a burned jacal structure with a rock foundation, two isolated sub-rectangular rooms, a hearth or burned rock midden, and two agricultural terraces. The jacal structure was associated with a few obsidian and chalcedony flakes, a few plain smooth brown sherds, and two indented corrugated sherds. A single black micaceous sherd was found between the two features interpreted as isolated sub-rectangular rooms. On July 20, 1992, Archaeological Research, Inc., was awarded the contract to conduct archaeological testing of the Bason Land Exchange sites. John Peterson and Christian Nightengale (1993) supervised the excavations, which took place between July 27 and August 23 of 1992.

Seven 1- by 1-m test pits (Units A-G) and one test pit extension (Unit E-Ex) were excavated at LA 85417. Unit A is located in the center and Unit B is located just west of the burned jacal structure, which they designated Feature 1. Unit A was excavated to a maximum depth of 41 cm. Several pieces of burned daub, many of which had wattle impressions, were recovered from the unit, as well as a chalcedony flake and a utilityware sherd. An elevated layer of clay was encountered in the unit's northeast quadrant, which was interpreted as a possible living surface. Unit B was excavated to a maximum depth of 30 cm. A high concentration of burned adobe fragments was encountered just below the surface. No additional artifacts were recovered.

Unit C is located in the concentration of rocks that Hill (1991) interpreted as a hearth or burned rock midden. This rock concentration was designated Feature 3. Unit C was excavated to a maximum depth of 30 cm. After the removal of surface rocks, a semi-circular rock alignment was exposed. Several pieces of partially burned wood were recovered during the excavation of the unit, and a charcoal-stained surface was encountered within the semi-circular rock alignment. Peterson and Nightengale (1993) argue that the feature was a hearth that post-dates the occupation of the burned jacal structure (i.e., Feature 1).

Unit D is located in one of the features that Hill (1991) interpreted as an isolated sub-rectangular room. The unit was excavated to a maximum depth of 40 cm. No artifacts were recovered from the excavation, and no rock alignments or cultural surfaces were encountered. Peterson and Nightengale (1993) argue that the feature may have been utilized for soil control.

Unit E is located in the other feature that Hill (1991) interpreted as an isolated sub-rectangular room. The unit was excavated to a maximum depth of 40 cm. Excavation revealed the feature to be the remains of a historic hearth, which was designated Feature 2. The hearth consisted of a firepit lined with small cobbles bounded by upright slabs and surrounded by an outer ring of rocks. Most of the hearth's interior was exposed during the excavation of Unit E. A 0.5- by 0.5-m extension (Unit E-Ex) was excavated to the east of the northern half of Unit E to investigate the extent and function of the outer ring of rocks around the firepit. Unit E-Ex was excavated to a maximum depth of 30 cm. The excavation revealed that the rocks did not continue to the east. Artifacts recovered from within the hearth include three plain gray utilityware sherds (possibly prehistoric), one glazed earthenware sherd, and numerous pieces of rusted metal (possibly the remains of food cans). No artifacts were found outside of the hearth.

Units F and G are located in the rock concentrations that Hill (1991) interpreted as agricultural terraces. These rock concentrations were designated Features 5 and 6. Unit F is located in Feature 5 and was excavated to a maximum depth of 40 cm. Unit G is located in Feature 6 and was excavated to a maximum depth of 35 cm. No cultural materials of any kind were found in either unit. Peterson and Nightengale (1993) argue that both features are probably check dams. In addition to the artifacts described above, five pieces of chalcedony debitage and 57 ceramics were recovered during a surface collection of the site. One of these was identified as a Wiyo Black-on-white sherd. The rest are utilityware sherds. Peterson and Nightengale (1993) argue that the research potential of Features 2 to 6 was exhausted by their excavations. For this reason, only Feature 1, which was re-designated Area 1, was excavated during the Conveyance and Transfer (C&T) Project.

FIELD METHODS

Before excavation, Area 1 was cleared of trees and large undergrowth (Figure 37.1). An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the southwest corner of the area. The area was then covered with a 1- by 1-m grid that extended 7 m north and 8 m east of the site datum, and three subdata (A-C) were set up for taking elevations. The area was then photographed. Artifacts visible on the surface were then collect by grid unit. A 7- by 1-m east-west trench (units 103N/101-107E) was initially excavated across the remains of the structure, which was designated Room 1. The purpose of this trench was to expose a profile of the site stratigraphy, as well as to determine the location of the room's east and west walls. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels.

A high quantity of wallfall was removed from the central grid units in the trench (103N/103-106E). This wallfall included rocks of various sizes, as well as countless pieces of burned adobe, many of which contained wattle impressions. All adobe fragments that were the size of a golf ball or larger were kept for analysis. The location of the room's east and west walls could not be determined with certainty until the foundation rocks were exposed. Above the foundation rocks were poorly defined rock alignments. These alignments were the partially disturbed remains of the room's walls. Part of the room's west wall and most of its entryway were encountered in unit 103N/104E. Part of the room's east wall and the entire south wall, excluding the entryway, were encountered in unit 103N/105E.

Figure 37.1. Pre-excavation photograph of LA 85417.

Several patches of a burned plaster floor were encountered in those portions of units 103N/104E and 103N/105E that were within Room 1. In those areas where the plaster floor was not preserved, the floor's foundation (a compact layer of clay-rich sediment) was encountered. Outside of the room, the trench units were excavated down to the top of a sterile Btb1 horizon. Peterson and Nightengale's Unit B occupies much of unit 103N/102E, as well as the east-central portion of unit 103N/101E. The backfill within this test pit was excavated as a separate stratum (Stratum 4). The northern profile of the trench was then drawn and photographed. The rest of the site was subsequently excavated, again by strata and arbitrary levels for thicker strata. In all, 32 units were excavated. Within the structure, excavation proceeded down to the plaster floor or floor foundation encountered while excavating the trench.

Outside of the structure, excavation proceeded down to the top of the Btb1 horizon. Excavation focused on defining the structure's walls, removing wallfall, and locating features. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended at least 1 m beyond the structure in all directions to locate external features and/or outdoor activity areas. The structure was then mapped (Figure 37.2) and photographed (Figure 37.3).

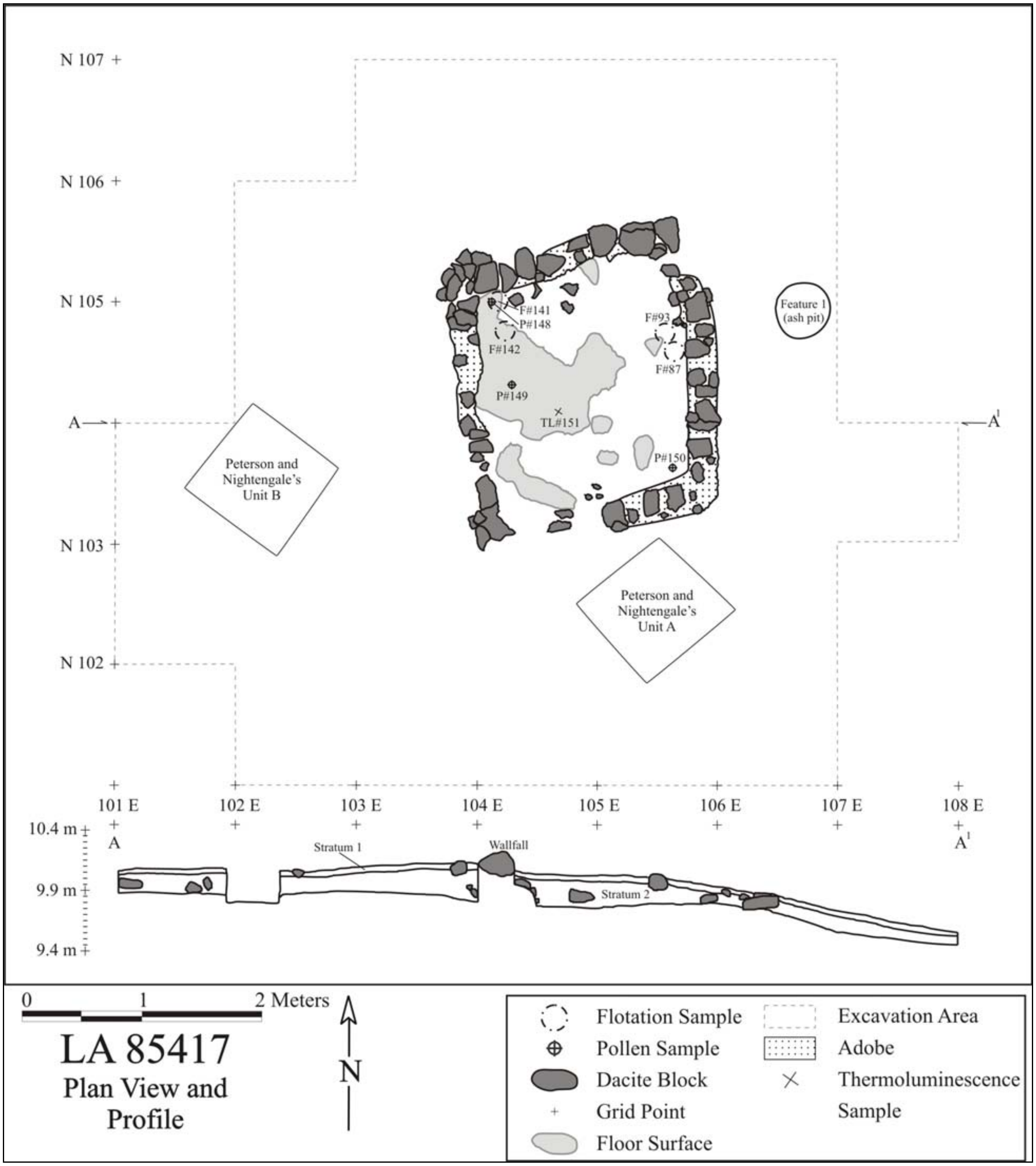

Figure 37.2. Plan view and profile of LA 85417.

Figure 37.3. Post-excavation photograph of the fieldhouse at LA 85417.

The excavation of the site was supervised by Greg Lockard. The field crew included Michael Dilley, Alan Madsen, Brian Harmon, Jennifer Nisengard, Bettina Kuru'es, and Rhonda Robinson. Timothy Martinez and Aaron Gonzalez served as site monitors from San Ildefonso Pueblo and as screeners. Jeremy Yepa was the site monitor representing Santa Clara Pueblo, as well as an additional excavator.

STRATIGRAPHY

Stratum 1 is composed of loose, surface sediment. It is uniformly 2 to 6 cm thick across the site and is part of the A horizon (topsoil). Stratum 2 is post-occupational fill and ranges from 5 to 30 cm in thickness in the area excavated. Stratum 3, which is wallfall, is located between Strata 1 and 2. A separate stratum for wallfall was only utilized in those units in which a high concentration of burned daub was encountered below the surface sediment. This amounted to nine units, all of which are located to the south and west of Room 1. Stratum 3 ranges from 5 to 20 cm in depth. The combined post-occupational fill and wallfall (i.e., Strata 2 and 3) was thickest in and around the structure and thinned away from the room. Strata 2 and 3 are more or less equivalent to the Bw horizon. Stratum 4 is the backfill removed from Peterson and Nightengale's Units A and B. Stratum 4 is therefore a disturbed context. Stratum 5 is the Room 1 floor, and Stratum 6 is the fill removed from Feature 1 (a small, circular firepit). Tables 37.1 through 37.4 summarize and describe the strata excavated at LA 85417.

Table 37.1. LA 85417 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 5/3	Sandy loam	2–6	Surface sediment
2	10YR 5/3	Sandy loam	5–30	Post-occupational fill
3	10YR 5/3	Sandy loam	5–20	Wallfall
4	10YR 5/3	Sandy loam	20–25	Backfill from P & N test pits
5	7.5YR 4/1	Clay	-	Room 1 floor
6	10YR 4/2	Sandy loam	8	Feature 1 (fire pit) fill

Table 37.2. LA 85417 soil horizon descriptions from the west profile of unit 104N/102E.

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 5/3	Loam	0–6	Topsoil
Bw	10YR 5/3	Loamy sand	6–15	Late-Holocene soil
Btb1	7.5YR 4/6	Sandy clay	15–25+	Pleistocene soil

Table 37.3. LA 85417 soil horizon descriptions from the interior face of the west wall of Room 1 (within unit 104N/104E).

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 5/3	Sandy loam	0–7	Topsoil
Bw	10YR 5/3	Sandy loam	7–15	Late-Holocene soil
Btb1	7.5YR 4/6	Sandy clay loam	15–24+	Pleistocene soil

Table 37.4. LA 85417 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	0	0	0	0	**0**
1	30	2	2	0	**34**
2	95	10	2	0	**107**
3	9	1	0	0	**10**
4	0	0	0	0	**0**
5	0	0	0	0	**0**
6	0	0	0	0	**0**
Total	**134**	**13**	**4**	**0**	**151**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a small, rectangular shaped structure that probably functioned as a fieldhouse. It measures 1.95 m in length (north to south) by 1.65 m in width (east to west), with approximately 3.22 m^2 of interior space. Excavation of the room began with an east-west trench that extended across Area 1 (103N/101-107E). The excavation of this trench served to define the room's stratigraphy, as well as to locate the room's east and west walls. The room's entryway and south wall were also encountered while excavating the trench. Within the room, the trench units were excavated down to the room's living surface. After the excavation of the trench, the rest of the room was excavated down to the living surface. In much of the room, this living surface took the form of a plaster floor (see below).

Fill. The interior of Room 1 was filled with 2 to 6 cm of surface sediment on top of 25 to 30 cm of post-occupational fill. The fill was fairly uniform in thickness throughout the room. Flotation (Field Specimen [FS] 80) and pollen (FS 81) samples were taken of post-occupational fill from the center of the room, but the samples were not analyzed.

Floor. A burned plaster floor was encountered throughout much of Room 1 (Figure 37.4). In those areas where the plaster floor was not preserved, an extremely compact layer of clay-rich sediment was encountered.

Figure 37.4. Burned floor in Room 1 at LA 85417.

This layer of sediment is most likely the floor's foundation (i.e., matrix). Only small patches of burned plaster floor were encountered at other fieldhouses in the Rendija Tract that were excavated as part of the C&T Project. Most of these patches of plaster floor were located in the area immediately surrounding a hearth. The fact that the floor in Room 1 at LA 85417 was baked and thus preserved throughout the room indicates that the structure burned down either while the site was occupied or shortly thereafter. This interpretation is supported by the unusually high number of pieces of burned daub that were recovered during the excavation of the site (see below).

As is the case for other fieldhouses in the Rendija Tract in which evidence was available, the plaster floor appears to have been formed by a thin (1 to 2 cm) layer of clay mud spread evenly throughout the room. The floor's foundation is composed of a thicker layer of compact, clay-rich sediment. The best preserved portions of the plaster floor are in the westernmost and central portions of the room. There are also patches of the plaster floor in the eastern half of the room. In those areas where the plaster floor is not preserved, the floor's foundation is well-preserved in all but the north-central portion of the room.

Two flotation samples were taken from post-occupational fill directly on top of the floor in the east-central portion of the room (FS 87 and FS 93). These samples were not analyzed. Additional flotation samples were taken from a concentration of ash and charcoal directly on top of the floor in the far northwest corner (FS 141) and west-central portion (FS 142) of the room. Carbonized taxa identified in these samples included pine, ponderosa pine, cheno-ams, unknown conifer, and juniper. Pollen samples of sediment scraped from the floor were also taken in the far northwest corner (FS 148) and west-central portion (FS 149) of the room. Taxa identified in these samples included maize, buckwheat, grass family, cheno-ams, sunflower family, spurge family, ragweed/bursage, evening primrose, unidentified pine, juniper, and sagebrush. An additional pollen sample was taken of floor matrix from the southeast corner of the room (FS 150), but it was not analyzed. Finally, a large piece of the burned plaster floor was taken from the center of the room as a sample for thermoluminescence (TL) dating (FS 151). The sample dated to 1415±39.

Wall Construction. During the excavation of Room 1, several rock alignments were encountered that were presumed to be the room's walls. Further excavation confirmed that the rock alignments were indeed the remains of the room's walls. The walls were highly disturbed, however, and were no longer in their original position. In other words, the upper courses of the walls were no longer directly on top of the wall foundations. As a result, these rocks were removed, and the wall foundations thus exposed. The wall foundations were constructed of small to medium-sized dacite cobble of irregular shape and adobe mortar. In some locations, the adobe mortar fills in significant space between the rocks. The room's entryway is located in the western half of the south wall. Two small, narrow rocks are located within the entryway. These rocks are most likely the remains of a short doorsill. A fairly large patch of plaster floor is in fact located just inside and terminates at the inner of these two rocks.

During the excavation of the area in and around Room 1, hundreds of pieces of burned daub were recovered. Many of the larger of these contain impressions of branches of varying sizes and/or reed-like vegetal material. The fragments of burned daub are the remains of the upper portion of the room's walls and the roof. No more than a few pieces of burned daub were recovered from any other site in the Rendija Tract. The unusually high number of pieces of burned daub recovered from the site indicates that the structure burned down either while it was occupied or shortly after it was abandoned. This interpretation is supported by the fact that much of the room's plaster floor was burned and thus preserved. Large pieces of burned daub were removed from FS 104 and FS 136 to serve as samples from TL dating. These samples dated to 992±59 and 1277±58, respectively.

Judging from the amount of wallfall removed during the excavation of the area in and around Room 1, the masonry portions of the room's walls were originally considerably higher than they were at the time of excavation. In order to estimate the original height of the walls, all of the rocks removed as wallfall during the site's excavation were placed in three stacks, which were then measured. The stacks measured 1.50 by 1.20 by 0.40 m, 1.40 by 0.70 by 0.30 m, and 9.70 by 0.53 by 0.45 m, for a total of approximately 3.33 m^3 of wallfall. Based on this volume of wallfall and the overall length, average thickness, and average height of the extant portions of the walls, the masonry portions of the room's walls were originally approximately 2.44 m in height (Table 37.5). This number is highly inflated, however, due to the fact that there was a consistent and dense layer of small, naturally occurring rocks just above the Bt horizon across much of the site. This layer of rocks was especially dense in the area to the south of Room 1. There were also quite a few rocks on the surface that appeared to be naturally occurring. The naturally occurring rocks could not be differentiated from the Room 1 wallfall. At least half of the rocks removed during the excavation of the site were therefore probably never part of the Room 1 walls. Based on the analysis of wallfall from other fieldhouses excavated in the Rendija Tract that are located in areas with little or no naturally occurring rocks, the masonry portions of the walls were probably around 1 m tall. As indicated by the numerous fragments of burned adobe with wattle impressions recovered from the site, the upper portions of the walls and roof were composed of wattle and daub.

Table 37.5. LA 85417 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.55	0.10–0.25	0.17–0.30	1 to 2
South	0.85 (1.60)	0.07–0.21	0.20–0.27	1
East	1.90	0.07–0.32	0.22–0.30	1 to 2
West	1.85	0.07–0.31	0.15–0.30	1 to 3

Note: The length of the south wall including the entryway is given in parentheses.

Feature 1

Feature 1 is a small circular depression that was filled with ashy and charcoal-rich sediment (Figures 37.5 and 37.6). It does not appear to have been a formal hearth. Instead, it was most likely an unprepared, limited-use firepit. The pit extends down into the compact, clay-rich Btb1 horizon. The interior of the firepit is fairly well preserved. Only the northeast corner is disturbed. The sides and base of the rest of the pit appear to have been hardened and oxidized by heat. The fill in the southern portion of the pit was removed as two flotation samples (FS 71 and

FS 72) and charred taxa included cheno-ams, juniper, unidentified pine, piñon pine, and ponderosa pine. The fill in the northern portion was removed as a single flotation sample (FS 114) and carbonized taxa included unknown conifer and ponderosa pine. A pollen sample (FS 123) was taken of sediment scraped from the bottom of the hearth and identified taxa included cheno-ams, grass family, sunflower family, unidentified pine, piñon pine, juniper, and sagebrush.

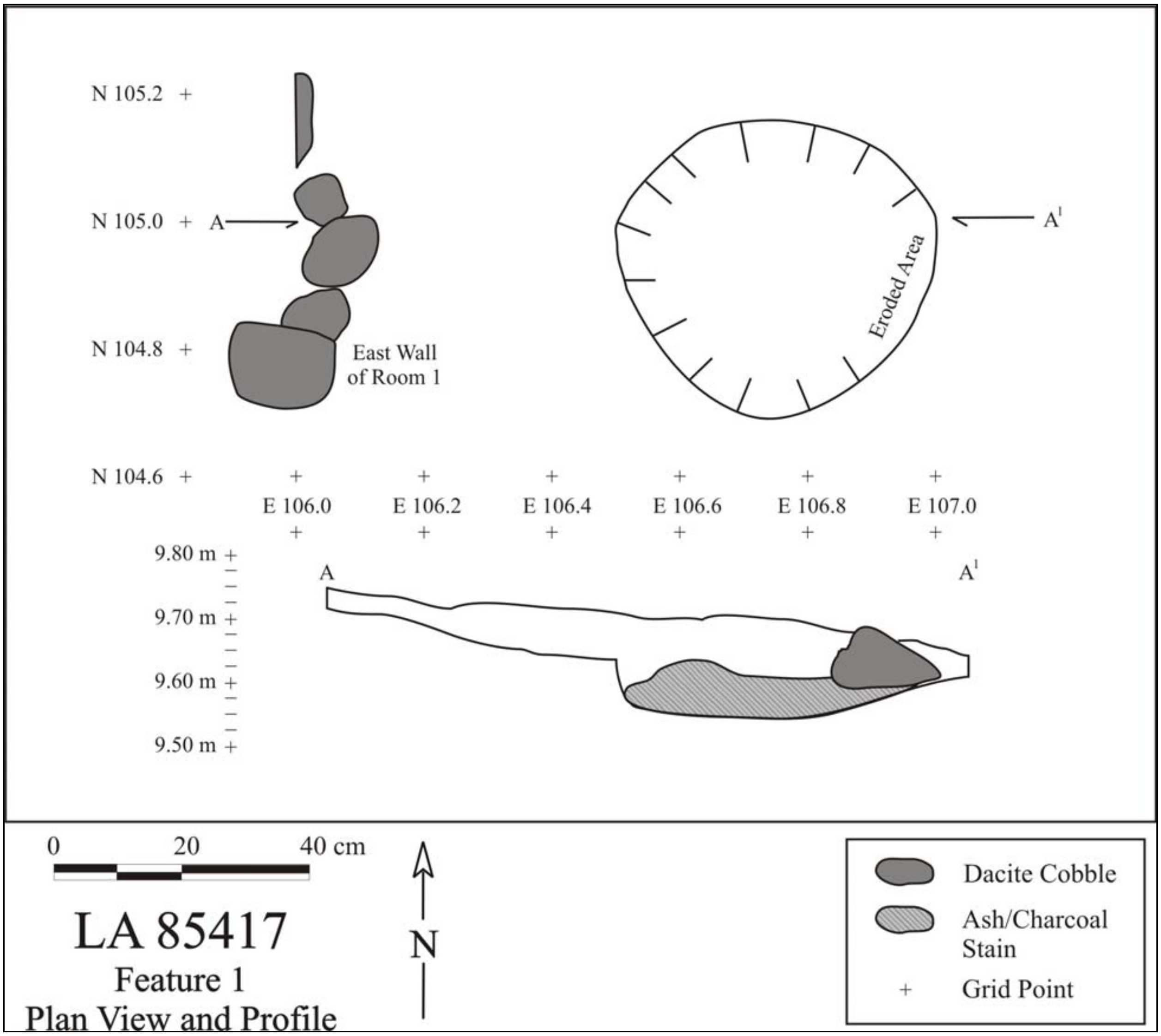

Figure 37.5. Plan view and profile of Feature 1, a small ashpit or hearth.

Geological Analysis

Geologists Paul Drakos and Steven Reneau utilized two profiles to reconstruct the natural soil horizons at the site. In order to reconstruct the soil stratigraphy in the area surrounding the site, they analyzed the west profile of unit 104N/102E. In order to reconstruct the soil stratigraphy in the area of the structure, they analyzed the interior face of the room's west wall (within unit

104N/104E). Both profiles contained a soil sequence consisting of an A horizon (topsoil), a Bw horizon (a late-Holocene soil), and a Btb1 horizon (a Pleistocene soil).

Figure 37.6. Post-excavation of Feature 1, a possible hearth.

Artifact Distribution

Interestingly, the grid units with the highest number of artifacts at LA 85417 are those that are located completely or partially within Room 1 (103-105N/104-105E; Table 37.6). This contrasts with most of the other fieldhouses excavated in the Rendija Tract. At these other sites, the highest concentration of artifacts is located just outside one side of the structure. In those fieldhouses in which the entryway is discernible, the highest concentration of artifacts is usually in the area just outside of the entryway. At LA 85417, the highest concentration of artifacts outside the structure is in the grid units immediately to the east (103-105N/106E). The unit immediately south of the entryway (102N/104E) does also have an elevated number of artifacts (n = 10). Little or no artifacts, however, were encountered in the other units to the south of the room. It should be noted that the entryways and activity areas of many of the Rendija Tract fieldhouses are located to the east. One explanation for this pattern is that this was the best location to take advantage of the heat and light from the early morning sun. At LA 85417, the entryway is located to the south. Feature 1, however, which was most likely an informal firepit, is located to the east. The presence of the firepit, along with the higher concentration of artifacts, indicates that the area immediately to the east of the fieldhouse was an activity area. LA 85417 therefore only deviates from the pattern at other Rendija Tract fieldhouses in that the entryway is located to the south.

Table 37.6. LA 85417 artifact counts by grid unit.

	E101	E102	E103	E104	E105	E106	E107
N106	--	--	2	4	0	0	--
N105	--	1	2	**7**	**10**	8	--
N104	--	0	1	**16**	**8**	10	--
N103	0	0	3	**28**	**13**	11	4
N102	2	0	1	10	0	2	--
N101	--	0	0	0	2	6	--

Note: Bold numbers indicate grid units that are located completely or partially within Room 1.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 146 artifacts were analyzed from LA 85417. Flotation and pollen samples were selected for analysis from the post-occupational fill (Stratum 2), the floor in Room 1 (Stratum 5), and Feature 1 (hearth) fill (Stratum 6) (Table 37.7). A sherd and several burned pieces of adobe from the walls and floor of the structure were also submitted for TL dating. The results of the artifact and sample analyzes are presented in the following sections.

Table 37.7. Samples selected for analysis from LA 85417.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL
1				
2	141, 142			47, 136
3				104
4				
5		148, 149		151
6	71, 72, 114	123		

Chronology

Thermoluminescence Dating

Three pieces of burned adobe and a Santa Fe Black-on-white sherd were submitted for TL dating from LA 85417 (Table 37.8). All derived ages are given in years BP, which refers to years before 2003. The 13th century date from the Santa Fe Black-on-white and a piece of burned adobe from the fill appear to be in agreement with the ceramics present on the site; however, the 10th century date seems too early and the 15th century date seems too late.

Table 37.8. TL dates from ceramics at LA 85417.

FS#	Lab #	Context	Burial depth (cm)	Years BP	% error	Years AD
47	UW1504	Sherd from fill	23	722	6.5	1284±47
104	UW1505	Adobe from wall	11	1014	5.8	992±59
136	UW1506	Adobe from fill	30	729	8.0	1277±58
151	UW1507	Adobe from floor	40	591	6.6	1415±39

Archaeomagnetic Dating

Ten specimens were collected as a set (ADL 1281) from a portion of burned floor in the northwest corner of Room 1 at the site. The estimated date range based on the Wolfman curve is AD 1100–1235, whereas the date range based on SWCV2000 is AD 1010–1310. The date range is much bigger for the SWCV2000 curve because of the tightness of the AD 1125 loop represented in that curve and because of the size of the sample error ellipse. The dating implications of the archaeomagnetic pole position are that the structure burned in the early Coalition period, probably before AD 1250 (based on the Wolfman curve) or in the Late Developmental through Early Classic period (based on SWCV2000).

Ceramic Artifacts (Dean Wilson)

A total of 129 ceramics were analyzed from LA 85417. The majority of the pottery consists of smeared plain corrugated, with a single Santa Fe Black-on-white sherd. These types presumably date to the Coalition period, with the dominance of smeared plain corrugated ceramics possibly indicating late 13th century (Table 37.9). On the other hand, the buffware sherds with mica slip appear to be historic in age. These sherds are primarily situated in the upper levels of the excavation, so they may be associated with the historic features present in the area of the site. Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 37.10 to 37.12. The grayware and whiteware pottery appear to have been locally made from smeared-indented sand and tuff temper; however, the micaceous pottery is actually an historic buffware with a mica slip that would have been produced at a nearby pueblo in the Rio Grande Valley. All of the grayware ceramics consist of jar vessel forms. The single whiteware sherd is from a bowl and the micaceous pottery is represented by both jar and bowl forms.

Table 37.9. Ceramic types from LA 85417.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Santa Fe Black-on-white	1	0.8
Northern Rio Grande Utilityware		
Indeterminate utilityware	4	3.1
Plain gray body	2	1.5
Smeared plain corrugated	90	69.7
Smeared-indented corrugated	8	6.2

Ceramic Type	Frequency	Percent
Buff ware with mica slip	24	18.6
Total	**129**	**100.0**

Table 37.10. Tradition by ware for LA 85417 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	104	100.0	1	100.0	0	0.0	0	0.0	105	81.3
Rio Grande (Historic Tewa)	0	0.0	0.0	0.0	0	0.0	24	100.0	24	18.6
Middle Rio Grande	0	0.0	0.0	0.0	0	0.0	0	0.0	0	0.0
Total	**104**	**100.0**	**1**	**100.0**	**0**	**0.0**	**24**	**100.0**	**129**	**100.0**

Table 37.11. Temper by ware for LA 85417 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Sand	6	5.7	0	0.0	0	0.0	24	100.0	30	23.2
Fine tuff or ash	0	0.0	1	100.0	0	0.0	0	0.0	1	0.7
Anthill sand	98	94.3	0	0.0	0	0.0	0	0.0	98	75.9
Total	**104**	**100.0**	**1**	**100.0**	**0**	**0.0**	**24**	**100.0**	**129**	**100.0**

Table 37.12. Vessel form by ware for LA 85417 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Bowl body	0	0.0	1	100.0	0	0.0	0	0.0	1	0.7
Jar neck	8	7.6	0	0.0	0	0.0	3	12.5	11	8.5
Jar rim	9	8.6	0	0.0	0	0.0	1	5.0	10	7.7
Jar body	87	100.0	0	0.0	0	0.0	0	0.0	87	67.4
Body sherd polished int & unpolished ext.	0	0.0	0	0.0	0	0.0	20	83.3	20	15.5
Total	**104**	**100.0**	**1**	**100.0**	**0**	**0.0**	**24**	**100.0**	**129**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 17 artifacts were analyzed from LA 85417. The assemblage consists of a core, 13 pieces of debitage, two ground stone artifacts, and a hammerstone, which represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 37.13 presents the data on lithic artifact type by material type. The debitage is primarily made of chalcedony and Pedernal chert with a single piece of andesite. Cortex was not identified on any of the debitage artifacts. Nonetheless, the chalcedony and Pedernal chert are available from local Rio Grande Valley gravels. Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 37.13. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Other	Total
Cores	Core	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Debitage	Angular debris	0	0	0	1	0	0	0	0	0	0	0	0	0	1
	Core flake	0	0	0	0	0	0	0	7	0	2	0	0	0	9
	Biface flake	0	0	0	0	0	0	0	0	0	2	0	0	0	2
	Microdebitage	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	1	0	0	0	8	0	4	0	0	0	13
Ground Stone	Two-hand mano	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Grinding slab	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	0	2	0	0	0	0	0	0	0	0	2
Other	Hammerstone	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Subtotal	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total		**0**	**0**	**0**	**1**	**2**	**0**	**0**	**8**	**0**	**5**	**0**	**0**	**1**	**17**

Lithic Reduction

The core was reduced using a single-directional, single-face technique. It was classified as still useable when discarded. Table 34.14 presents the metric information on the core.

Table 37.14. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Single-directional	34	30	35	57.2

The debitage consists of core flakes, biface flakes, a piece of angular debris, and microdebitage. The total absence of cortex indicates an emphasis on the later stages of core reduction and tool production/maintenance. The flakes mostly have single-faceted platforms (n = 5), with fewer collapsed (n = 1) and crushed (n = 3) platforms. None of the platforms exhibit any obvious evidence of preparation. The majority of the core flakes are whole (n = 6), with fewer proximal (n = 1) and distal (n = 4) fragments. The whole core flakes have a mean length of 23.6 mm (*std* = 5.7), the biface flakes have a mean length of 22.0 mm (*std* = 4.2), and the single piece of angular debris a weight of 8.8 g.

Tool Use

None of the debitage exhibit evidence of edge damage that could be attributed to use.

The ground stone includes a mano and a grinding slab. The mano is a two-hand variety made on a piece of dacite (Figure 37.7). It is heavily worn and has a wedge-shaped cross-section. The grinding slab is a tabular dacite fragment with a single heavily ground surface.

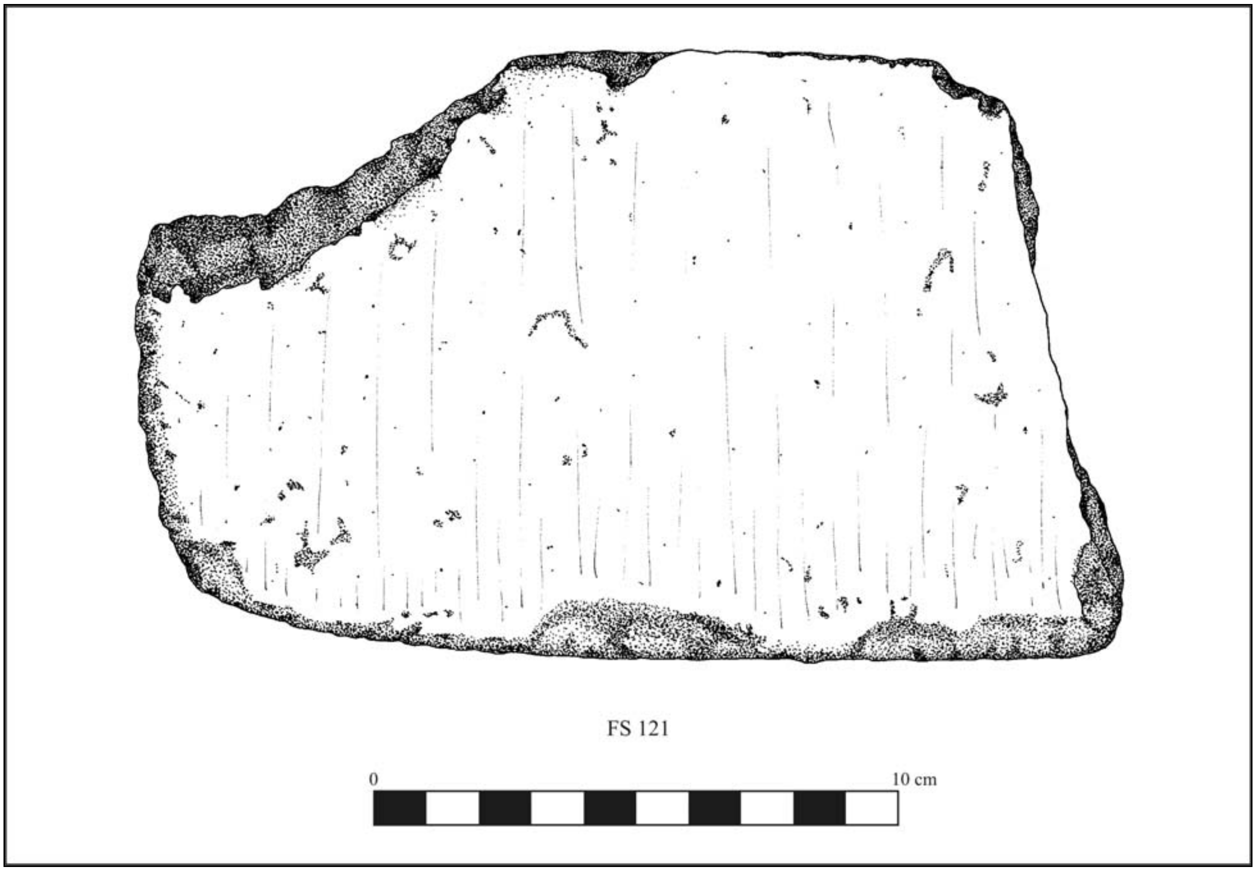

Figure 37.7. Two-hand mano from LA 85417.

Archaeobotanical Remains (Pamela McBride)

Cheno-am seeds were identified in the south half of the ashpit fill and in the ash/charcoal deposit on the floor of the structure (Table 37.15). Piñon seeds (immature, so identification is tentative), juniper cone fragment, and unidentifiable plant parts were also recovered in the south half of the ashpit. Non-cultural material included annual seeds, cactus seeds, and conifer needles. Wood charcoal was entirely coniferous, with ponderosa pine and unknown conifer the most common taxa, followed by pine and juniper (Table 37.16).

Table 37.15. Flotation plant remains, count, and abundance at LA 85417.

FS No.	71	72	114	142
Context	F. 1 Ash pit fill, S ½		F. 1 Ash pit fill, N ½	Room 1 floor, ash/charcoal south of NW corner
Cultural				
Annuals				
Cheno-Am	1(1)			1(1)
Other				
Unidentifiable	3(0) pp			
Perennials				
Juniper	cf. 1 (0) ♀ cone			
Piñon	cf. 2(2)			
Non-Cultural				
Annuals				
Goosefoot	+		+	
Purslane	+	+	+	
Perennials				
Hedgehog cactus	+			
Piñon				needle +
Ponderosa pine	needle +			

+ 1-10/liter, cf. compares favorably, pp plant part.

Table 37.16. Wood charcoal taxa by count and weight in grams from LA 85417.

FS No.	71	72	114	141	142
Context	F. 1 Ash pit fill, S ½		F. 1 Ash pit fill, N ½	Room 1 floor, Ash/charcoal, NW corner	Room 1 floor, ash/charcoal south of NW corner
Conifers					
Juniper					2/0.2 g
Pine		2/<0.1 g		3/0.3 g	
Ponderosa pine		2/<0.1 g	1/<0.1 g	15/1.8 g	12/1.3 g
Unknown conifer	1/<0.1 g		3/0.1 g	2/<0.1 g	6/0.1 g
Totals	**1/<0.1 g**	**4/<0.1 g**	**4/0.1 g**	**20/2.1 g**	**20/1.6 g**

Pollen Remains (Susan Smith)

Three pollen samples were analyzed from LA 85417. Table 37.17 lists the frequency of identified pollen types. Maize was the only cultigen identified in the botanical assemblage, and was found in only one sample. No other economic resources were identified in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 37.17), and these are discussed in detail in Smith's chapter in Volume 3.

Table 37.17. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85417 (*n* = 3)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	0
	Eriogonum	Buckwheat	1
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	3
		Grass Aggregates	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85417 (*n* = 3)
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	3
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	3
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	2
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	2
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	1
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 85417 (*n* = 3)**
Regional to Extralocal Native Trees and Shrubs	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	0
	Abies	Fir	0
	Pinus	Pine	3
		Pine Aggregates	0
	Pinus edulis type	Piñon	3
	Juniperus	Juniper	3
		Juniper Aggregates	0
	Quercus	Oak	0
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	0
	Artemisia	Sagebrush	3
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 85417 is a small one-room Coalition period fieldhouse that was constructed from both shaped and unshaped tuff blocks. The site is situated on the mesa top overlooking Rendija Canyon to the south, near LA 85861 (another Coalition period fieldhouse). One feature, a small ashpit or possible hearth, was identified at the site. However, the site is unique since it appears to have burned and therefore provides evidence of a wattle and daub structure. The presence of maize pollen indicates that the one-room structure may have been occupied during the growing season.

CHAPTER 38
RENDIJA TRACT (A-14): LA 85859

Steven R. Hoagland

INTRODUCTION

LA 85859 is a lithic scatter located on the northeast slope of a knoll situated along the north side of Rendija Canyon (Figure 38.1). The site is situated at an elevation of 2108 m (6910 ft) in an area vegetated by piñon, juniper, and ponderosa pine trees. The artifact scatter covers an area of approximately 368 m^2.

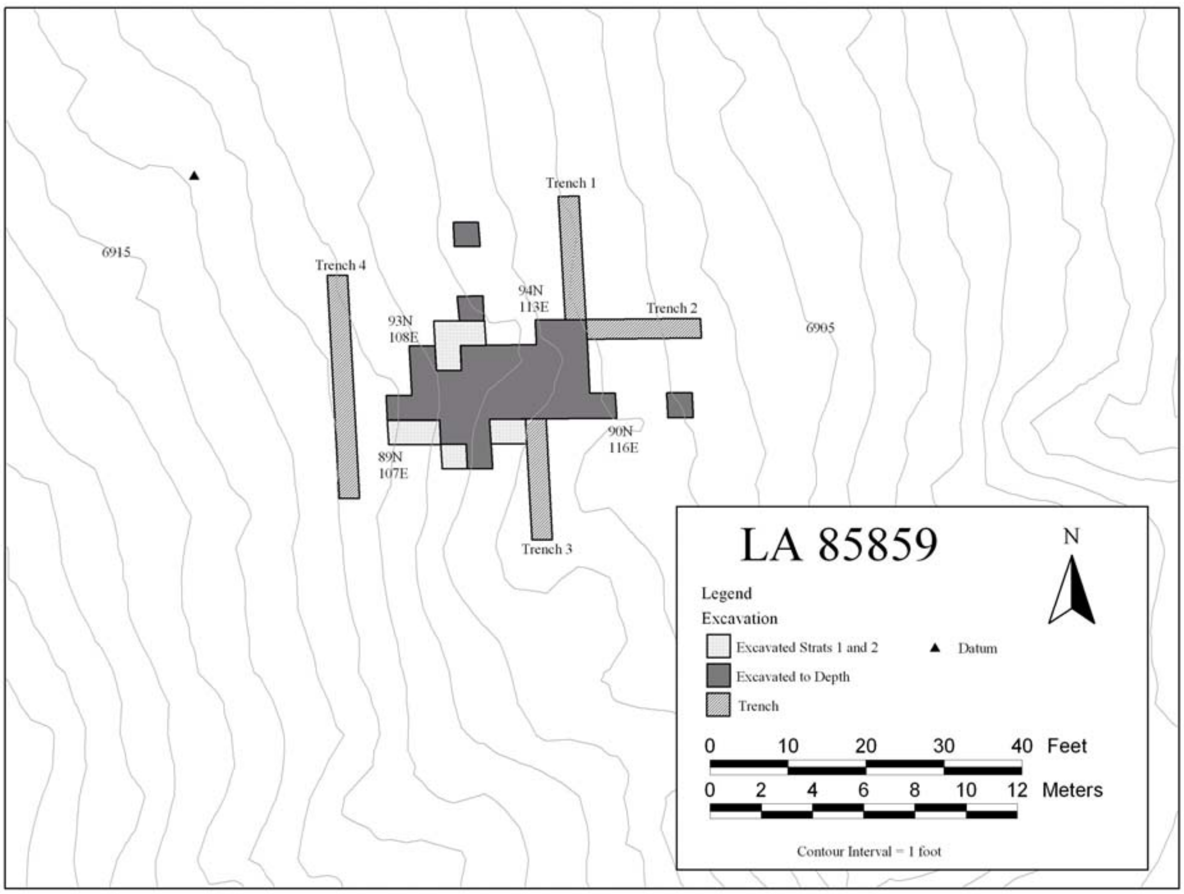

Figure 38.1. Schematic of the excavations at LA 85859.

Soils in the vicinity of LA 85859 are associated with the Sanjue-Arriba Complex. These are deep, well-drained soils that weathered in materials derived from pumice (Sanjue series) or dacites of the Puye Conglomerate (Arriba series) (Nyhan et al. 1978:61). The local stratigraphy consists of a 4- to 23-cm-thick layer of late-Holocene colluvium overlying late-Pleistocene colluvium. Pumice gravels or carbonate cemented pumice underlie the colluvium at depths ranging from 30 to 95 cm from south to north across the site. The pumice gravels are associated with Cerro Toledo Rhyolite deposits, which is "a series of post-collapse rhyolite domes, obsidian, tuffs, and tuff breccias associated with the 1.4-Myr-old Toledo caldera" (Burton 1982).

PREVIOUS INVESTIGATIONS AT LA 85859

LA 85859 was originally documented in September of 1991 by TFA, Inc., during the Basin Land Exchange survey (Hill 1991). It was described as a campsite of unknown cultural affiliation. The campsite was indicated by less than 100 lithics situated within a 225-m² area. The obsidian or chalcedony lithics were either biface thinning flakes or resharpening flakes.

Archeological Research, Inc., subsequently tested LA 85859 for National Register eligibility in August of 1992. The site was described as a small concentration of lithic tools and debitage situated within a 225-m² area. In addition to the lithics, two plain utilityware sherds were observed.

Archeological Research, Inc., excavated two 1- by 1-m test units at the site. Unit A was placed at the edge of the artifact scatter and Unit B was placed upslope. Unit A was excavated to a depth of 60 cm, with obsidian debitage being recovered from all but the first level. Unit B was excavated to a depth of 30 cm and no cultural materials were recovered. In support of the testing, surface artifacts were collected from a 1-m-wide by 15-m-long transect that was laid out across the center of the site. Two San Jose style projectile point bases were also collected as in a grab sample.

A total of 224 pieces of obsidian debitage were recovered from the Unit A excavations and 15 pieces were recovered from the surface collection transect. All of the recovered debitage was the result of secondary or tertiary reduction. This suggested that partially shaped lithic materials (e.g., core or preforms/bifaces) were transported to the site and were further reduced in the course of tool manufacture. Twenty of the flakes found on the site exhibit use wear or retouch. The presence of utilized flakes suggested that some type of processing activity occurred at the site, however, no materials were located that would identify what type, or types, of processing might have been conducted. Based on the diagnostic projectile points, the site dated to the Early Archaic period. Based on this testing, Archeological Research, Inc., recommended that LA 85859 be included as a Register-eligible property.

FIELD METHODS

Fieldwork began with an assessment of the site. The assessment consisted of the crew systematically walking the site at 2 to 3 m intervals. All observed artifacts were pin-flagged to delineate the site boundary and to establish artifact concentrations.

Upon completion of the assessment, the main site datum (Datum A) and baselines for a 1- by 1-m grid system were established. The datum that was placed in the southwest corner of the site was designated as grid point 100N/100E and assigned an elevation of 10.0 m. Several 100-m tapes were used to set up the grid system and to collect all the site surface artifacts. The observed lithics and sherds were collected and provenienced by 1- by 1-m grid units. All collected materials were documented within a Field Specimen (FS) Catalog form. The southwest corner intersection of each grid unit determined its coordinate.

The site excavation involved the hand excavation of 1-m grid units. This technique was used to define the extent, depth, and character of subsurface deposits. Grid level excavation designations started with 0 at the surface, then from 1 to n from the top to bottom of each grid unit (regardless of whether the level is natural or arbitrary). The excavation was conducted by hand using shovels, trowels, and picks when the clay content was high, thus the soil was compact. With the exception of pollen, soil, and macrobotanical samples, all hand-excavated materials were passed through 1/8-in. mesh screens.

A Grid Level Excavation Form was completed for each excavation level. Documented information included the depth of the excavation level, description of the sediment matrix, recovered cultural materials, and the nature and reason for samples collected. A minimum of one pollen sample and one flotation sample was collected from each separate stratum. Macrobotanical samples were also collected from the site.

As the natural stratigraphy had not yet been established, the first excavation units were excavated in arbitrary 10-cm levels. Once established, the remaining grids were excavated by natural stratigraphic units with those being thicker than 10 cm excavated in arbitrary 10-cm levels. Toward the end of the excavation, grids were excavated by natural stratigraphic units regardless of thickness. A stratum is defined as a distinct depositional unit. To facilitate vertical control, subdata containing the same 10-m elevation as Datum A were established close to excavation units and/or blocks. Grid levels were measured from the subdata using string and line levels.

Upon completion of the grid system, a systematic series of auger probe locations were established across the site. The probes were placed at 4-m intervals east to west across the site and every 2 m north to south with each subsequent east to west row offset by 2 m. The 3-in.-diameter auger probes were generally excavated down to the Cerro Toledo pumice horizon or were terminated by rock. The soils extracted from each auger cylinder were described in the Auger Form as were any cultural materials recovered from screening the extracted soil through a 1/8-in. mesh screen. After excavation of a half dozen auger holes, a decision was made to halt further augering until the local stratigraphy could be established from the grid excavation units. The site-wide augering program was continued to completion after the first four grid excavation units were completed.

Geomorphic evaluations were conducted throughout the excavation process with the first assessment conducted after completion of the first four grid units. The assessment for geomorphic context and integrity was conducted by Steve Reneau and Paul Drakos (see Chapter 57, Volume 3).

An overall site map was assembled during the course of excavation. It depicted the site boundary, site datum, subdata, surface collection grids, excavation units, and test trenches. The site map was created with locational information generated by a total station that was backed up with geographic positioning system unit locational points. The final contour map of the site was generated from the geographic information system locational information. The site and its components were photographed with a color digital camera and a 35-mm camera with black-and-white film (ASA 100).

STRATIGRAPHY

The stratigraphy at LA 85859 includes cultural materials bearing pockets of preserved late-Pleistocene to early-Holocene colluvium that has been removed by erosion throughout much of the surrounding area. The site is situated on the northeast-facing slope of a knoll with runoff draining down to the northeast. The site stratigraphy infers that the upper knoll slope contains a thin (less than 25 cm thick) late-Holocene colluvium overlying Cerro Toledo pumice deposits and the lower knoll slope has a thin Holocene colluvium overlying up to 81 cm of late-Pleistocene to early-Holocene colluvium and Cerro Toledo pumice. The upper and lower knoll slopes are separated by an area with bedrock at or near the surface. It is inferred from the stratigraphy that the upper knoll slope was eroded during the late Pleistocene to early Holocene and that colluvium derived from the Cerro Toledo was deposited on the concave portion of the knoll slope situated at and below LA 85859. At the base of this colluvium is a series of dacite clasts, up to small boulder size, that represents a lag left after almost complete erosion of an older alluvial unit. A second period of erosion likely occurred sometime during the middle or late Holocene, during which the upper knoll slope was stripped to bedrock and the late-Pleistocene to early-Holocene soils on the lower slope were truncated. The stripped Cerro Toledo on the upper knoll slope and truncated late-Pleistocene to early-Holocene soils on the lower slope were subsequently buried by a thin late-Holocene colluvium deposit (Drakos and Reneau 2004).

Upper Knoll Stratigraphy. Four stratigraphic units characterize the upper knoll slope. The surface A horizon (AC in places) (Stratum 1) is a loose, light brown, sandy loam that often contains charcoal and ash from vegetation that burned during the May 2000 Cerro Grande fire. Pumice gravels form about 20 percent to 40 percent of the fill matrix. This late-Holocene colluvium ranges from 1 to 12 cm in thickness. The BW (Stratum 2) stratum situated directly below is a soft to slightly hard, grayish-brown to brown, sandy loam with pumice gravels forming about 20 percent to 30 percent of the matrix. This late-Holocene colluvium likely has an age of less than 1000 years. This stratum also contains Cerro Grande fire-derived ash and charcoal flecks and ranges from 1 to 16 cm in thickness.

Underlying the BW stratum is an excessively bioturbated 2Btb1 stratum (Stratum 9). It is a soft to slightly hard, brown, sandy loam to sandy clay loam containing a high percentage of pumice gravels and pebbles (40% to 70%). Colloidal stains are common on the pumice clasts. The gravel and pebbles have weathered out of the upper portion of a pumice bed associated with the Cerro Toledo Rhyolite formation. This stratum ranges from 5 to 30 cm in thickness. The abrupt upper stratum boundary likely records the erosional stripping of overlying younger soils. Situated directly below is a 2Coxb1 stratum (Stratum 6) that is a light brown Cerro Toledo pumice deposit. It is 80 percent to 90 percent oxidized pumice gravels and pebbles loosely intermixed with sand. This upper knoll stratigraphy is present directly above and adjacent to LA 85859.

LA 85859 and Lower Knoll Stratigraphy. The stratigraphy for the site and the lower knoll is different from the upper knoll slope in that there is a deposit of late-Pleistocene to early-Holocene clays situated between the BW soil horizon and the weathered Cerro Toledo pumice bed (2Btb1/2Coxb1). Cultural materials bearing pockets of the late-Pleistocene to early-Holocene clays are situated at the edge of the upper knoll zone. Although truncated, this approximate 65-cm-deep pocket of fill appears to have been protected from additional erosion by an arch-shaped alignment of dacite cobbles and boulders that are part of the lag that accumulated along the lower margin of the upper knoll slope.

As revealed by the block excavation, a small Pleistocene-era drainage had traversed southwest to northeast across the eastern site area, cutting into the Cerro Toledo pumice bed. It is likely that water within this drainage also eroded some of the upslope fill, cutting the depression that subsequently retained the cultural material bearing late-Pleistocene to early-Holocene soil. More recently, erosion protection for the site area has been provided by an approximately 6-ft-deep drainage that trends southwest to northeast about 20 m to the southeast of the site and a shallow southwest-to-northeast-trending drainage located about 4 m to the east of the site.

Situated directly beneath the BW horizon within the site was a Bt1b1 horizon that was composed of silty to sandy reddish clay that contained a low amount of pumice gravel. The hard, well-formed, subangular blocky clay peds tended to be stratified by size with the larger peds (at 3 to 7 cm, Stratum 3A) situated above smaller peds (1 to 3 cm, Stratum 3B). Stratum 3A appeared to have slightly less pumice gravel (5% to 10%) than Stratum 3B (10% to 20%).

Situated beneath strata 3A/B was a Bt2b1 horizon (Stratum 3C). It was a slightly hard to hard, yellowish-brown to brown, silty clay loam that formed into small (<1 cm) subangular blocky peds. Pumice gravel formed about 20 to 30 percent of the horizon matrix. The pumice that tended to occur in small pockets, increased slightly with depth.

Stratum 4 was a Bt3b1 horizon soil. It was a slightly hard to hard, brown to strong brown, silty loam to silty clay loam. The pumice gravel content ranged from about 20 percent to 30 percent. A few dacite and pumice cobbles were present, especially toward the bottom of the horizon. Some of the clasts and peds contained a thin, discontinuous $CaCO_3$ coating, especially along the margins of the site. Rodent borrows were frequent throughout the stratum.

Stratum 5 was classified as a BKb1 or a BCb1 horizon. It was a soft to slightly hard, light to pale brown, sandy loam to sandy clay loam. The pumice gravel content ranges from about 30 percent to 50 percent. Discontinuous CaCo3 coatings were present on clasts and peds. Dacite cobbles were more abundant throughout this stratum. Rodent burrows were frequent. Table 38.1 lists and describes the strata excavated at LA 85859. Table 38.2 lists the artifact counts from each of the strata at the site.

Table 38.1. LA 85859 strata descriptions.

Strat	Horizon	Texture	Munsell Color	Thickness	Description
1	A	Sandy loam	10YR5/3	1 to 12 cm	Young colluvium (<1000 yrs). Loose, single grain with varying amounts of pea sized pumice gravels (20% to 40%); ash and charcoal present from Cerro Grande fire.
2	BW	Sandy loam	10YR6/3 to 10YR4/3; 10YR5/2	1 to 16 cm	Late-Holocene fill (<1000 yrs?). Soft to slightly hard with pea-sized pumice gravels (20% to 30%); some ash and charcoal present from Cerro Grande fire.
3A	Bt1b1	Silty to sandy clay	7.5YR4/4; 7.5YR5/3 to 7.5 YR 4/3	1 to 11 cm	Late-Pleistocene or early-Holocene fill. Hard, well-formed, large subangular blocky peds (3 to 7 cm) with a small amount of pea-sized pumice gravel (5% to 10%).
3B	Bt1b1	Silty to sandy clay	7.5YR4/4	1 to 22 cm	Late-Pleistocene or early-Holocene fill. Hard, well-formed smaller subangular blocky peds (1 to 3 cm) with about 10% to 20% pea-sized pumice gravel.
3C	Bt2b1	Silty clay loam	10YR5/4; 7.5YR5/4 to 7.5YR4/4; 7.5YR5/3	1 to 59 cm	Late-Pleistocene or early-Holocene fill. Slightly hard to hard with small subangular blocky peds (<1 cm) or, less frequently, platy peds. Pea-sized and larger pumice gravels (20% to 30%). Pumice increases with depth and is at times clustered in pockets.
4	Bt3b1	Silty loam to silty clay loam	7.5YR5/4 to 7.5YR4/4 7.5YR5/6 to 7.5YR4/6;	4 to 53 cm	Late-Pleistocene or early-Holocene fill. Slightly hard to soft with depth. Few dacite cobbles and gravel, pebbles, and cobbles of pumice especially toward bottom of stratum. Gravel content ranging from about 20% to 30%. Few thin discontinuous CaCO3 coatings on clasts and peds, especially along margins of site. Rodent burrows abundant.

Strat	Horizon	Texture	Munsell Color	Thickness	Description
5	Bkb1 or BCb1	Sandy loam to sandy clay loam	7.5YR5/4; 7.5YR6/3 to 10YR6/3	1 to 41 cm	Late-Pleistocene fill. Soft to slightly hard with abundant gravels and pebbles of pumice (30% to 50%). Dacite cobbles more abundant. Discontinuous CaCO3 coatings on clasts and peds. Rodent burrows are frequent.
6	2Coxb1 or 2CBkb2	Sand and gravel	7.5YR8/2; 7.5YR5/3; White	6+ cm	1.2 to 1.6 Ma (million years). Toledo Pumice bed. 80 plus percent pumice. Discontinuous to continuous CaCO3 coatings on clasts.
7		Silty clay loam	7.5YR7/4 to 7.5YR5/4; 7.5YR6/3	3 to 28 cm	Late-Pleistocene fill. Lenses of carbonate cemented silt and pumice. 40% to 60% pumice gravels. Generally, a cemented Stratum 5 located along the north side of the excavation block.
8		Silty clay loam	10YR5/3	62 cm	Disturbed soil from previous test pit (Strata 1, 2, and 3A-C).
9	2Btb1	Sandy loam to sandy clay loam	7.5YR5/3 to 7.5Yr4/3; 7.5YR4/4	5 to 17 cm	1.2 to 1.6 Ma. Soft to slightly hard colluvium with abundant pumice gravels and pebbles (40% to 70%). Colloidal stains common on pumice clasts.
10		Sand	7.5YR8/2	2 to 8 cm	Fine-grained sand predominantly formed from pumice. Associated with a SW-to-NE-trending drainage that cuts into the Toledo Pumice within the lower east side of the excavation block.

Table 38.2. LA 85859 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	0	27	0	0	27
1	2	457	0	0	459
2	0	944	3	0	947
3	0	95	0	0	95
3A	0	749	0	0	749
3B	0	1402	0	0	1402
3C	0	1004	0	0	1004
4	0	671	1	16	688
5	1	115	0	12	128

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
6	0	13	0	0	13
7	1	52	0	0	53
8	0	27	0	0	27
9	0	35	0	0	35
Total	**4**	**5591**	**4**	**28**	**5627**

SITE EXCAVATION

Based on the surface artifact collection where the majority of surface artifacts were located between grids 87 to 95N and 110 to 119E and the results of the testing phase excavation units, it was determined to begin excavations in unit 90N/110E. This grid was located directly east of Test Excavation Unit A that contained 224 pieces of obsidian debitage. Using 90N as an intersite baseline, excavation units were also initiated a few m above and below 90N/110E (90N/101 and 118E) to establish the eastern and western site boundary (Figure 38.2). Unit 90N/110E contained numerous subsurface flakes of obsidian (584) of which 95 percent were recovered from within the upper five soil strata (upper four soil horizons). As the first grid unit was excavated, the fill was removed in arbitrary 10-cm levels. Upon excavation, the soil profile was used to establish the primary soil strata used to stratigraphically excavate all other grid units. Unfortunately, the arbitrary levels did not correspond well with the observed stratigraphy sequence, especially within the upper four strata. A summary of the excavation levels as they correspond to soil strata and artifact content is presented in Table 38.3.

Table 38.3. Excavation levels in 90N/110E.

Level	Stratum	Soil Horizon	No. Lithics	Faunal Remains
1	1/2	A/Bw	123	
2	2/3A	Bw/Bt1B1	205	
3	3A/3B	Bt1b1	81	
4	3B/3C	Bt1b1/Bt2b1	114	
5	3C	Bt2b1	28	
6	4	Bt3b1	4	
7	5	Bkb1	1	
8	5	BkB1	17	10 (rodent)
9	5	Bkb1	11	

The late-Holocene soils (A and Bw) contained at least 123 lithics (21%), while the Bt1b1 and Bt2b1 Bt soils contained up to 428 lithics (73.3%). The lithic totals dropped off drastically within the lower two soil horizons with four lithics recovered from the Bt3b1 horizon (0.7%) and 29 lithics from the BKb1 horizon (5%). All of the lithics were chipped stone debris.

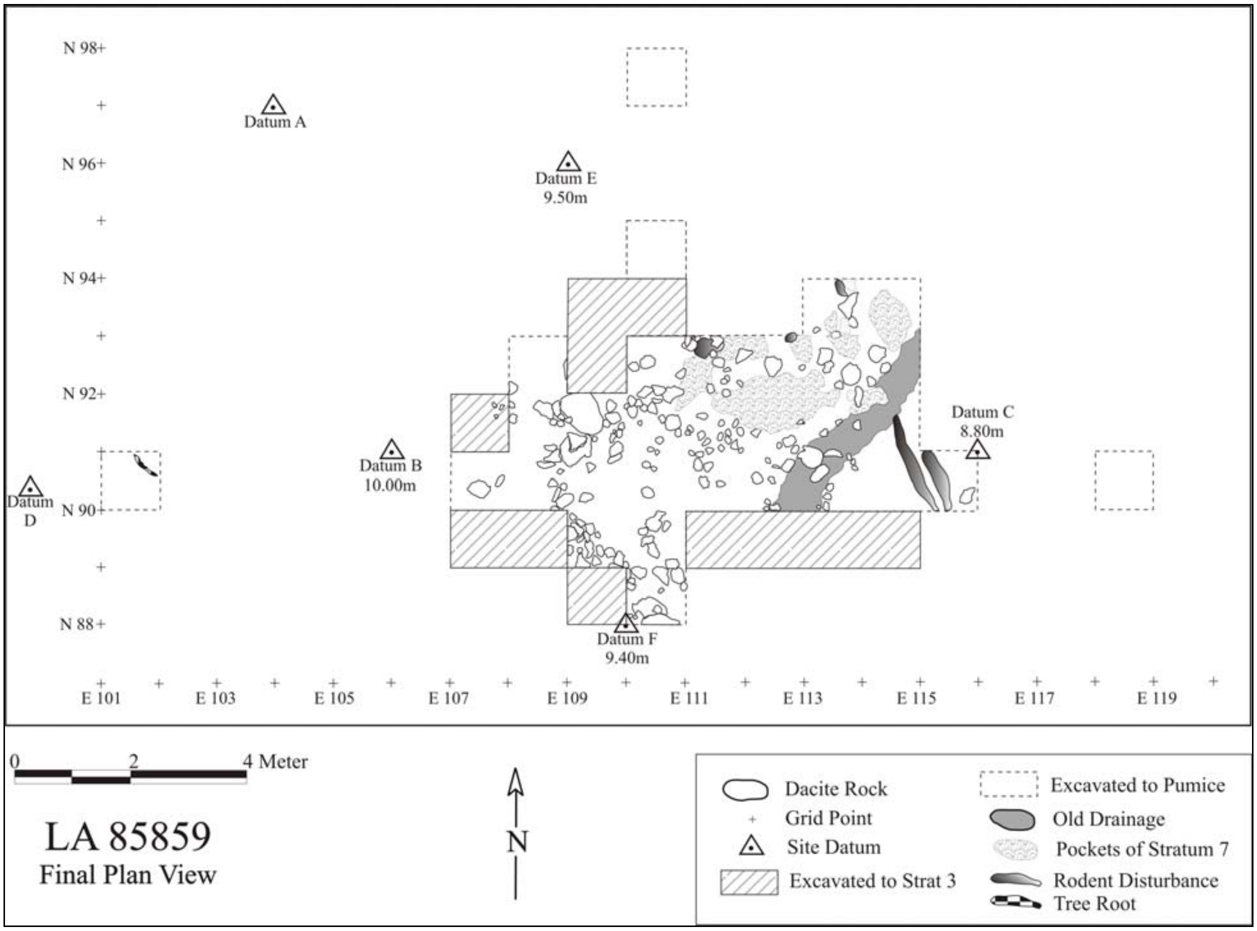

Figure 38.2. Schematic of grid unit excavations at LA 85859.

Conversely, unit 90N/101E contained neither cultural materials nor any of the late-Pleistocene to early-Holocene clays within which approximately 75 percent of the 90N/110E artifacts were located. Cerro Toledo pumice deposits were encountered at a depth of between 4 and 7 cm below the surface. Unit 90N/118E contained a total of 28 lithics with 22 of these (79%) recovered from the late-Holocene soil horizon and six (21%) from the late-Pleistocene or early-Holocene Bt1b1 horizon. The assumption based on these first three grid unit excavations was that 90N/101E was located above the site, 90N/110E was within the heart of the site, and 90N/118E was situated at the lower (eastern) edge of the site.

Based on the above excavations units, 90N/107E and 90N/114E were excavated to provide additional information concerning the eastern and western extent of the site. Although the late-Pleistocene to early-Holocene clays were encountered within 90N/107E (a mixed Strata 3 and Stratum 4), only one lithic was recovered and that was from Stratum 4. Unit 90N/107E was assessed to be located just above or along the upper western margin of the site.

The upper portion of the Bt1b1 horizon (Stratum 3A) was missing from 90N/114E. This grid unit contained a total of 73 lithics and one sherd that was recovered from the A soil horizon. Forty-nine percent of the lithics were recovered from the late-Holocene horizon. Most of the remaining lithics were recovered from the Bt horizons (35, 48%) with about half of these recovered from the Bt1b1 horizon (Stratum 3b). Although the artifact density dropped significantly from upslope (90N/110E), this unit was within the southern site boundary.

Much of the late-Holocene strata (Strata 1 and 2) within the site boundary contained charcoal and ash from the 2000 Cerro Grande fire. As a precautionary measure, the decision was made to excavate these strata in areas surrounding locations proposed for excavation. This measure was intended to prevent Cerro Grande charcoal from contaminating excavations that extended down into the late-Pleistocene or early-Holocene horizons. Most of this soil stripping was conducted in grids located in the vicinity of 90N/110E. Also at this time the disturbed fill from previously excavated Test Unit A was removed.

With the eastern and western site limits becoming clearer, a decision was made to excavate three units out to the north in an attempt to define the site boundary. The excavations were conducted at 92N/108E, 94N/110E, and 97N/110E. At this point, the small drainage located about 4 m to the south of the 90N gridline was assumed to form a natural site boundary. The excavation of 92N/108E ended up being fairly shallow with few lithics present. The 15- to 28-cm-thick late-Holocene horizon overlaid a shallow Bt horizon (7 to 12 cm) that appeared to be a truncated Bt3b1 soil (Stratum 4). Erosion apparently removed any Bt1b1 and Bt2b1 soils before the late-Holocene depositional period. Two lithics were recovered from the late-Holocene soils, one flake from the Bt soil and two lithics from weathered Cerro Toledo Pumice gravels (Stratum 5). The lack of Bt1b1 and Bt2b1 soils that were present only 1 to 2 m to the east infers that the northwestern edge of the site is located in this vicinity.

A truncated lens (3 to 7 cm thick) of late-Pleistocene to early-Holocene soil (Stratum 3B?) was encountered beneath the late-Holocene soil horizons (Strata 1 and 2) in 94N/110E. This horizon rapidly graded into a weathered pumice gravel deposit (2Btb1, Stratum 9). Three flakes were recovered from the early-Holocene deposits and 35 flakes were recovered from the combined 3/9 Stratum. Unit 97N/110E was excavated to an approximate depth of 50 cm below surface. The late-Holocene soils that increased in pumice gravels with depth occupied the upper 20 to 25 cm. Situated below was an approximate 20-cm-thick Bt horizon that appeared to be a highly mixed Bt1b1 through Bt3b1 deposit. This horizon graded into a 2- to 10-cm-thick 2btb1 deposit that in turn overlaid Cerro Toledo pumice deposit (Stratum 6). This grid unit was assessed to be situated beyond the northern site boundary as only six flakes were recovered from the late-Holocene horizons and one flake recovered from the Bt horizon.

The next phase involved excavating the units situated directly east and west of 90N/110E and the unit located directly west of 90N/114E. These grid units were excavated to further establish the cultural context in the eastern and western site areas. All three grids contained the complete soil horizon series as established in 90N/110E (Figure 38.3). Unit 90N/109E contained 330 lithics of which 117 (35.5%) were within the late-Holocene horizon, 203 (61.5%) within the Bt soils (Strata 3A-C and 4), and 10 lithics (3%) within the weathered Toledo pumice deposit (Stratum 5). Within the Bt horizon, 65.5% of the lithics (133) were located within the Bt1b1 horizon (83 in 3A and 50 in 3B). The artifact content within unit 90N/111E was fairly similar with a total of 333 lithics being recovered. The late-Holocene horizon contained 134 lithics (40%) and the Bt horizon contained 199 lithics (60%). Within the Bt horizon, 79 percent of the lithics (158) were in the Bt1b1 horizon (79 in 3A and 79 in 3B). Downslope, unit 90N/113E contained 179 lithics. Nearly 29 percent (51) of these lithics were recovered from the late-Holocene horizon and 66 percent (118) from the Bt horizons. Within the Bt horizons, 96 of the lithics (81%) were recovered from the Bt1b1 horizon (54 in 3A and 42 in 3B) and 8 from within the Bt2b1 horizon (7%).

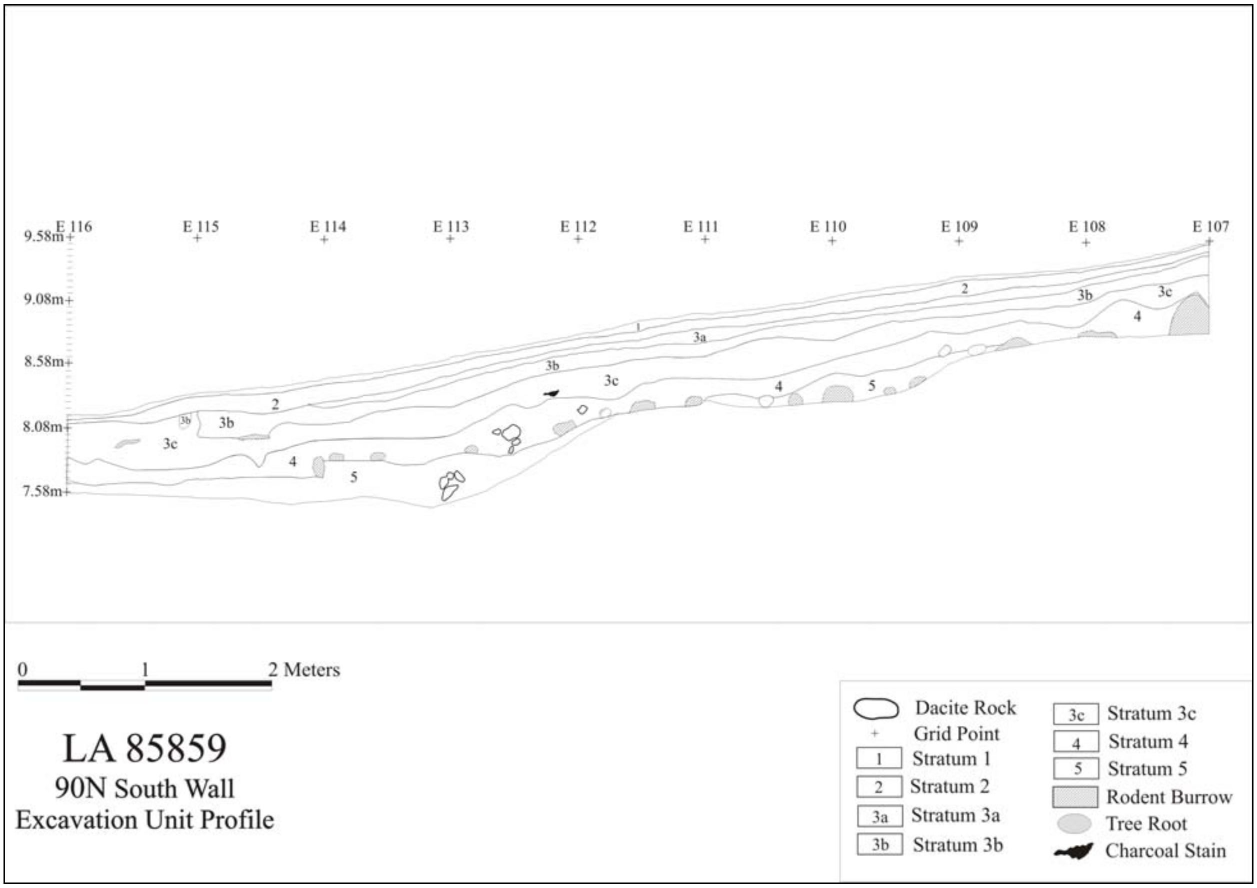

Figure 38.3. Profile of the 90N grid line.

Although the grid units located directly to the east and west of 90N/110E exhibit a 40 percent drop in total lithics, their relatively high artifact count infers that this location is a major activity area associated with the site. The 60 percent increase in total artifacts moving up 1 m from 90N/114E to 90N/113E suggests that this location may be the eastern edge of the same activity area.

Based on the limited number of cultural materials recovered from the two westernmost excavation units (90N/107E and 92N/108) and abundant lithic materials located 1 m to the east and southeast, respectively (90N/109E), a decision was made to excavate the units situated between these two areas in an attempt to understand this discrepancy. As a result, units 90N108E and 91N/108E were subsequently excavated.

Unit 91N/108E contained two distinct stratigraphic sequences. Within the northern half of the unit, a 10-cm-thick late-Holocene deposit directly overlaid a weathered Cerro Toledo pumice gravel deposit (Bkb1). The southern half of the unit contained a 10-cm-thick, undifferentiated Bt horizon that was situated between the Holocene and weathered pumice deposit. All six lithics were recovered from the pumice deposit. About 15 dacite cobbles or small boulders that were set slightly into the Bkb1 soil deposit were scattered across the unit, especially along the eastern edge. Directly south in unit 90N/108E, the Bt horizon was much more intact, ranging in depth from about 8 to 50 cm below surface. All three Bt soil horizons were present. Recovered artifacts included five lithics from the late-Holocene horizon and 14 lithics from the late-Pleistocene to early-Holocene Bt soil horizons. Within the Bt horizon, eight lithics were recovered from the Bt1b1 soil (six in 3A and two in 3B), one lithic from the Bt2b1 soil, and five from the Bt3b1 soil. The cluster of dacite cobbles observed in 91N/108E continued along the eastern edge of this unit. The surface of the Bkb1 soil deposit slopes down 30 to 40 cm between the eastern edge of 91N/108E where the dacite cobbles are concentrated and the eastern edge of 90N/109E and drops 1.2 m between the eastern edge of 90N/108E and 90N/114E.

To gain a better understanding of the site formation process and to explore the potential that the recently encountered dacite cobbles and small boulders were the remains of a cultural feature, unit 91N/109E was excavated. As two shallow boulders that were left in place along the western half of the unit (0 to 25 cm), most of the excavation occurred in the eastern portion. The eastern half of the unit contained the complete range of Bt soils. The Bt soils that were situated between 10 and 50 cm below surface dropped in depth and thickened toward the southeast corner of the unit. Dacite cobbles were also encountered within the eastern half of this unit at depths ranging from 30 to 70 cm. In all, 85 lithics were recovered from 91N/109E. Eighteen of the lithics (21%) were recovered from the late-Holocene horizon, 60 (71%) from the Bt soils, and seven (8%) from the weathered pumice gravels. Within the Bt horizon, 44 lithics (73%) were recovered from the Bt1b1 soil, 11 (18%) from the Bt2b1 soil, and five from the Bt3b1 soil horizon.

A discernable difference exists between the soil stratigraphy located west (upslope) of the dacite cobble and boulder cluster located along the 108E to 109E grid boundary and that located to the east. The excavations conducted upslope from the dacite cluster revealed shallow soils with no or thin, truncated Bt soils. When Bt soils were encountered within this area, they were highly mixed and contained few associated cultural materials. Conversely, directly east of the cobble and small boulder concentration the Bt soils became thicker, well-defined, and contain a relatively high lithic artifact count. The dacite cobble and boulder cluster appears to form a functional western boundary for an activity area located directly to the east (Figure 38.4). The cultural material bearing soils sit on a weathered Toledo pumice deposit that drops in depth and slopes significantly downslope from west to east.

Based on the change in stratigraphy and artifact content observed along the 108E gridline, the decision was made to excavate the undisturbed soils situated below Test Unit A (91N/110E), and to excavate adjacent unit 92N/110E. Test Unit A corresponded well with unit 91N/110E with only a 10-cm-wide soil lens located along the western edge of the grid that was not previously excavated. The undisturbed soils beneath Test Unit A (60 cm below surface) included an approximate 15-cm-thick Bt3b1 (Stratum 4) deposit overlaying a weathered, 10-cm-thick Cerro Toledo pumice deposit (Bkb1). Approximately 10 dacite cobbles were situated within the northwest portion of the unit. The previously noted 224 lithics that were recovered during site testing would have been situated within the late-Holocene A and BW soil horizons and the late-Pleistocene to early-Holocene Bt1b1 and Bt2b1 horizons. An additional 27 lithics were recovered from the back dirt used to refill the test unit and nine lithics were recovered from the unexcavated 10-cm-wide west-side soil lens (Stratum 3). The previously undisturbed Stratum 4 (Bt3b1) deposit contained 19 lithics, and the Bkb1 weathered pumice deposit contained four lithics.

Figure 38.4. Dacite cobble and boulder outcrop forming western site occupation boundary.

Adjacent to the west, unit 92N/110E was excavated down to the Toledo pumice deposit (2CBkb2), which was encountered at depths ranging from 33 cm in the northwest corner to 76 cm in the southeast corner. As the depths indicate, the Cerro Toledo pumice bed, as well as the overlying weathered pumice gravel deposit (Bkb1), slope significantly from northwest to southeast. The upper portion of the Bt1b1 soil horizon is missing, otherwise, the Bt soil formations are similar to the horizon sequence located directly east in the assumed activity area. A total of 312 lithics were recovered from this unit. Of these, 55 (18%) lithics were within the late-Holocene deposit, 251 (80%) within the Bt horizon, and six (2%) in the weathered Cerro Toledo pumice stratum. Within the Bt horizon, 149 lithics (59%) were within the Bt1b1 soil, 91 (36%) within the Bt2b1 soil, and 11 (5%) within the Bt3b1 soil.

These two units provide more information concerning the stratigraphy situated within the northwestern portion of the site. The slope of the Cerro Toledo pumice deposits indicate that there is a low area situated directly east and south of an arching, fairly linear, cluster of dacite cobbles and small boulders (Figure 38.5). This low area or possible hollow has retained late-Pleistocene to early-Holocene soil deposits that appear to have eroded out on the hillslope to the west and north. The hollow soils were likely sheltered from erosional activities by the upslope dacite rock deposit. The vast majority of artifacts associated with this site appear to be situated within Bt1b1 and/or Bt2b1 located within the hollow.

Figure 38.5. Dacite cobble and boulder barrier (upper center) with a hollow situated directly downslope to the east.

The next series of grid units to be excavated were within the southeastern portion of the site. Grids 90N/112E and 90N/115E were excavated to continue defining the soil stratigraphy and associated artifact distribution from west to east, down through the site. Grids 91N/114E and 92N/114E were also excavated to further establish the nature of the cultural remains within the eastern portion of the site. Grid 90N/112E had the same well-developed upper Bt soil horizon as found directly upslope to the west, although the upper portion of the Bt1b1 (Stratum 3A) was fairly thin (2 to 8 cm). The lower portion of this horizon appeared to have much greater disturbance due to bioturbation, as there was no clear boundary between Bt2b1 (Stratum 3C) and Bt3b1 (Stratum 4). A total of 202 lithics were recovered from 90N/112E. Sixty-four of the lithics (32%) were recovered from the late-Holocene horizon, 136 (67%) from the Bt soils, and two from the weathered pumice gravels. Within the Bt horizon, 87 lithics (64%) were recovered from the Bt1b1 soil (42 from 3A and 45 from 3B), 14 (10%) were within the Bt2b1 soil, nine (7%) from a Bt2b1/Bt3b1 mix, and 26 (19%) from Bt3b1.

The Bt horizon appears to have been impacted by erosion in unit 90N/115E as the Bt1b1 soil is not present. This erosion was also apparent in the adjacent upslope unit (90N/114E) where the upper portion of the Bt1b1 soil was missing (Stratum 3A). Ten lithics were recovered from the late-Holocene horizon, 15 from the Bt horizon (Strata 3C and 4), and one from the Cerro Toledo pumice gravels. Thirteen (87%) of the Bt horizon lithics were recovered from the Bt2b1 soil. The Bt horizon in units 91N/114E and 92N/114E had also been impacted by erosion as indicated by the upper Bt1b1 soil being absent and by bioturbation as a fairly thick, mottled, Bt1b1/Bt2b1 (Stratum 3B/3C) deposit overlaid by a pocket of Bt2b1 soil in 92N/114E and the Bt3b1 (Stratum 4) soil deposit throughout the rest of the two units. Lithic debitage was fairly abundant in both units with 220 flakes recovered from 91N/114E and 307 recovered from 92N/114E. Forty-five of the 91N/114E lithics (20%) were recovered from the late-Holocene horizon and 139 (80%) from the Bt soils. Within the Bt horizon, 175 lithics (63%) were recovered from the Bt1b1/Bt2b1 soil stratum and 36 (16%) were within the Bt3b1 soil. Forty-eight of the 92N/114E lithics (16%) were recovered from the late-Holocene horizon, 236 (77%) from the Bt soils, and 23 (7%) from the weathered pumice gravels. Within the Bt horizon, 43 lithics (14%) were recovered from the Bt1b1/Bt2b1 soil stratum, 95 (31%) from the Bt2b1 horizon, and 98 (32%) were within the Bt3b1 soil. Based on the upslope soil stratum artifact densities, it was assumed that the cultural occupation occurred in the Bt1b1 soil horizon and that artifacts within underlying Bt horizons were mixed into these soils by bioturbation. As the Bt1b1 soil has been eroded and/or highly mixed into underlying strata, the potential for encountering undisturbed remains was thought to be poor.

To establish the southern boundary of the site, unit excavations were initiated in 89N/109E and 89N/110E. A small drainage that parallels these grids was located about 3 m to the south. The encountered stratigraphic sequence was similar to the grids located directly to the north with Strata 3A, 3B, and 3C represented. Both units were terminated directly above a dacite rock and Toledo pumice deposit (Stratum 6), which was situated directly below Stratum 3C in Grid 89N/109E and below Stratum 4 in 89N/110E. The associated artifact densities were significantly less than that observed in the units directly to the north. Thirty-eight lithics were recovered from 89N/109E and 95 from 89N/110E. Only one flake was recovered from the late-Holocene horizon, and the rest from the Bt soils in 89N/109E. The Bt horizon artifacts included 14 lithics (37%) from the Bt1b1 horizon and 23 (60.5%) from the Bt2b1 soil horizon. Within 89N/110E, 14 (15%) of the lithics were recovered from the late-Holocene horizon, 73 (77%) from the Bt soils, and eight (8%) from the weathered pumice gravels (Bkb1). Bt horizon artifacts included 65 lithics (89%) from the Bt1b1 horizon, three from the Bt2b1 horizon, and five from the Bt3b1 horizon.

As a good stratigraphic sequence with a fairly large number of associated artifacts was encountered in 89N/110E, the excavation was extended into 88N/110E. Stratum 3A only extended across the northern two-thirds of the unit and Stratum 3B tapered out in the southeast corner. It appears that erosion associated with the small south-side drainage removed portions of the Bt1b1 soil horizon from this unit and is assumed to have also removed it from units further to the south. Although Stratum 3C still extended across the unit, its interface with Stratum 4 was extremely mottled. Rodent disturbance was extensive throughout the lower stratigraphic horizons. Stratum 4 overlaid a culturally sterile, plated clay deposit that appeared to be a water deposited lens of Stratum 3C. This deposit suggests that subsurface water movement has been a factor in forming the south-side site stratigraphy. The reduction in soil-horizon-associated artifacts observed in adjacent north-side units continued into 88N/110E as only 31 lithics were recovered. Nine of the lithics (29%) were recovered from the late-Holocene horizon and 22 (71%) from the Bt soils. The Bt1b1 horizon contained 10 lithics, all from the 3B Stratum. Three flakes were recovered from the Bt2b1 horizon and nine from the Bt3b1 horizon of which all but one were associated with rodent disturbances.

The drainage associated with the removal of Bt1b1 soils and the likely removal of Bt2b1 horizon soils a short distance further to the south, along with the decrease in associated artifacts, led to the conclusion that the potential for intact cultural remains was extremely limited to the south of the 90N grid line.

To continue exploration of the eastern and northeastern site area, units 91N/111E, 91N/112E, and 91N/113E were excavated. Units 92N/111E, 92N/112E, 92N/113E, 93N/113E, and 93N/114E were subsequently excavated. Stratum 3A was present in only two of the eight units (91N/111E and 91N/112E), and lower strata mixing was noted along the 91N grid line with Strata 3B and 3C mottling observed in all three units. Within grids 91N/112E and 91N/113E, the mixing was so severe that Strata 3B and 3C were mottled into one combined stratum (3B/3C). Strata 3B and 3C were present as distinct units within the 92N and 93N grid line units, although they were becoming mottled along the northern half and coexisted as one mottled stratum along the northern edge of the 93N units. The artifact density remained fairly high within the eight grids, primarily ranging from 200 to 300 per unit (Table 38.4). The artifacts were spread throughout the Holocene and late-Pleistocene soil horizons. Increased soil horizon vertical mixing was indicated by the continued high number of artifacts associated with the late-Holocene deposits and a sharp increase in the number of lithics recovered from the Bt3b1 soil horizon (Stratum 4). Rodent burrows were abundant throughout the Bt3b1 and Bkb1 soil horizons (Figure 38.6). Along with the absence of the upper Bt1b1 soil horizon, the lower portion of the horizon (Stratum 3B) exhibited a significant drop in artifact content in the locations where it was still discernable from the Bt2b1 horizon. In three units situated in the northeast corner of the block excavation, artifacts associated with the Bt1b1 soil horizon only numbered in the teens. Conversely, Stratum 3C as well as the Stratum 4 lithics increased in the northeast corner of the excavation. Overall, Stratum 4 lithics increased in number from southwest to northeast across the excavation block.

Table 38.4. East and northeast unit artifact tallies.

Grid	Total No. of Lithics	Strata	Soil Horizon	No. of Lithics	Percent of Lithics
91N/111E	361	1/2	A and Bw	44	12
		3A	Bt1b1	119	33
		3B	Bt1b1	84	23
		3B/3C	Bt1b1/Bt2b1	57	16
		3C	Bt2b1	30	8.5
		4	Bt3b1	27	7.5
91N/112E	318	1/2	A and Bw	66	21
		3A	Bt1b1	106	33

Grid	Total No. of Lithics	Strata	Soil Horizon	No. of Lithics	Percent of Lithics
		3B/3C	Bt1b1/Bt2b1	79	25
		3C/4	Bt2b1/Bt3b1	34	11
		4	Bt3b1	33	10
91N/113E	281	1/2	A and Bw	50	18
		3B/3C	Bt1b1/Bt2b1	168	60
		4	Bt3b1	63	22
92N/111E	320	1/2	A and Bw	83	26
		3B	Bt1b1	162	50.5
		3C	Bt2b1	38	12
		4	Bt3b1	25	8
		7	Cemented Bkb1 or BCb1	12	3.5
92N/112E	252	1/2	A and Bw	66	26
		3B	Bt1b1	55	22
		3C	Bt2b1	20	8
		4	Bt3b1	72	28.5
		4/7	Bt3b1/Cemented Bkb1 or BCb1	32	12.5
		7	Cemented Bkb1 or BCb1	7	3
92N/113E	259	1/2	A and Bw	43	16.5
		3B	Bt1b1	13	5
		3C	Bt2b1	127	49
		4	Bt3b1	69	26.5
		5	Bkb1 or BCb1	7	3
93N/113E	152	1/2	A and Bw	36	24
		3B	Bt1b1	18	12
		3C	Bt2b1	57	37.5
		4	Bt3b1	40	26
		7	Cemented Bkb1 or BCb1	1	0.5
93N/114E	217	1/2	A and Bw	36	17
		3B	Bt1b1	19	9
		3C	Bt2b1	79	36
		4	Bt3b1	83	38

With the removal of fill overlying the Toledo pumice deposit, it became apparent that a southwest-to-northeast-trending drainage had traversed the hillslope in the site area (Figure 38.7). The drainage is evidenced by a shallow trough that cut into the pumice deposit and by small pockets of almost pure pumice sand (Stratum 10) that occurred within the overlying fill along and slightly above the trough. This drainage cuts across the southeastern corner of the block excavation, entering in units 90N/112E and 90N/113E and exiting in units 92N/114E and 93N/114E. The upslope hollow containing the site focus was likely formed as a channel funneling runoff into this larger southeast-to-northeast-trending drainage. The increase in Strata 3 and 4 lithics that generally increase from southwest to northeast across the block excavation appear to reflect some subsurface soil movement along these old drainages. With the absence of

Stratum 3A, significant reduction of artifacts associated with Stratum 3B, the mottling of Strata 3B and 3C, and the increase in artifact movement down into Stratum 4, the assessed potential for encountering intact cultural remains within additional area units was assessed to be extremely low, thus the excavation was ended.

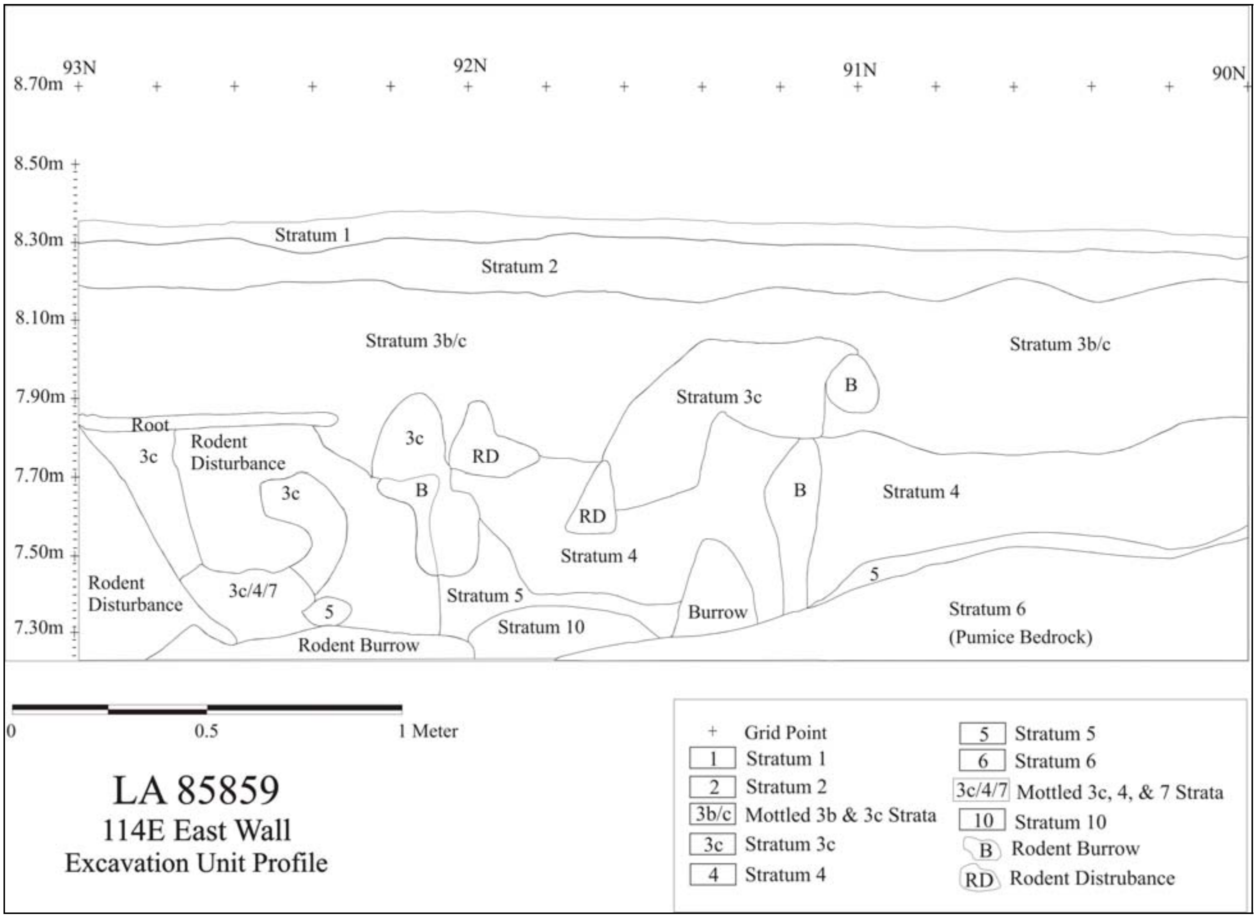

Figure 38.6. Profile of the 114E grid line.

To verify the assumptions concerning the site stratigraphy, four backhoe trenches were excavated. Trenches 1 through 3 were excavated out from the east end of the block excavation and Trench 4 was located above the block excavation. Trench 1 was 5 m long running north from 94N/114.2E through 98N/114.2E, Trench 2 was 4.5 m long running east from 93.16N/115E through 93.16N/119.5E, Trench 3 was 5 m long running south from 89N112.4E through 85N/112.4E, and Trench 4 was a 9-m-long north-to-south-trending trench that ran from 87N/104.9E through 95N/104.9E. The southern 1.7 m of Trench 1 was similar to that observed in the northern edge of 93N/114E where a mottled Bt1b1/Bt2b1 (3B/3C) deposit underlay the late-Holocene horizon soils (see Figure 38.1). The approximate 50-cm-thick Bt1b1/Bt2b1 mix overlaid a Stratum 7 deposit that appeared to be a sandy, water-deposited sediment, likely representing an old drainage channel. From units 94.7N through 95N the trench deposit contained the Bt1b1 through Bt3b1 horizon sequence (Stratum 3B through 4), which transitioned into a Bt1b1/Bt2b1 mix that directly overlaid a Toledo pumice deposit. The upper part of the

Bt1b1 soil horizon was not present within the trench and. other than a 1.3-m-long segment within the central portion of the trench, the Bt soils were highly mixed when present.

Figure 38.7. Grid unit excavation with dacite barrier (center) and southwest-to-northeast-trending drainage channel slightly above.

The first meter heading east out of the block excavation in Trench 2 (93N/114E) also displayed a mottled Bt1b1/Bt2b1 horizon, which overlaid a thick, sandy drainage channel deposit. From 93.16N/116E through to the end of the trench, intact Bt1b1 through Bt3b1 soil horizons (Strata 3B and 3C) were again present. Directly south of 90N/112E, Trench 3 contains a mixed Bt1b1/Bt2b1 stratum that overlays a weathered Toledo pumice deposit (Bkb1). Approximately 1.5 m east of the block excavation, a Bt3b1 horizon soil appears beneath the Bt1b1/Bt2b1 horizon. The Bt3b1 soil continued eastward through the trench, whereas the Bt1b1/Bt2b1 soil pinched out about 2.5 m east of the block excavation. The trench appears to verify that the small drainage situated just south of the block excavation has removed the upper Bt soils from the area. Trench 4 revealed the presence of a pocket of Bt horizon soil between 91.5N and 88N. This pocket included a 3-m-long wedge of Bt1b1 (Stratum 3) overlying a 4-m-long wedge of Bt2b1/Bt3b1 that tapers and likely terminates just beyond the trench in 87N/105.7E.

The large deposit of Stratum 7 colluvial sand in Trenches 1 and 2 supports the assessment that a drainage traversed down through the northeast corner of the block excavation. These trenches also support the assessment that the Bt soils within the northeast corner of the block excavation have been significantly mixed through bioturbation. Trench 3 and the southern end of Trench 4 support the assessment that the small south-side drainage has removed the Bt soils within its vicinity. The lack of the Bt soil series along the north side of Trench 4 also supports the assessment that much of these soils along the upper hillslope above LA 85859 have been removed through erosion. Table 38.5 shows the distribution of artifacts recovered from grid units at LA 85859.

Table 38.5. LA 85859 artifact counts by grid unit.

	E101	E107	E108	E109	E110	E111	E112	E113	E114	E115	E118
N97					7						
N94					39						
N93				10	33			158	217		
N92			6	36	312	320	252	259	308		
N91		4	6	85	61*	363	319	281	229		
N90	0	1	19	330	584	333	201	181	74	26	28
N89		0	1	38	95	49	38	44	17		
N88				4	31						

*224 lithics recovered from previously excavated test unit.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 2059 artifacts were analyzed from LA 85859. In addition, flotation and pollen samples were selected for analysis from Strata 1 to 7 (Table 38.6). Charcoal was submitted for radiocarbon dating from Strata 3A, 3B, and 3B/C, and 15 pieces of obsidian for hydration dating from Strata 1 to 5. The results of the artifact and sample analyses are presented in the following sections.

Table 38.6. Samples selected for analysis from LA 85859.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	Hydration
1	310	333		40
2	311	334		
3A	108, 348, 353	107, 339, 356	360	109, 118
3B	349, 354	122, 339, 357	225, 359	148, 169, 172
3C	312, 350, 355	135, 142, 180, 340, 358		144, 147
3B/C	313	335	363	
4	123, 314, 351	309, 336, 341		166
5	136, 352	342		285
6	143, 308			
7	346	329		
10	315	337		

Chronology

Radiocarbon Dating

Four charcoal samples were submitted for accelerator mass spectroscopy dating. Sample FS 360 from Stratum 3A provided a date of 570±40 BP (Beta-183759), with a calibrated intercept of AD 1410 and a two-sigma range of AD 1300 to 1430. FS 225 from Stratum 3B yielded a date of 6010±40 BP (Beta-183757), with calibrated intercepts of 4900 BC, 4890 BC, and 4860 BC, and a two-sigma range of 4990 to 4790 BC. FS 359 was also taken from Stratum 3B and provided a date of 6310±40 BP (Beta-183758), with a calibrated intercept of 5300 BC and a two-sigma range of 5370 to 5220 BC. Lastly, FS 363 was derived from Stratum 3B/C and yielded a date of 6140±40 BP (Beta-221840), with a calibrated intercept of 5050 BC and a two-sigma range of 5220 to 4940 BC. Therefore, the three samples from the lower contexts all provided Early Archaic dates ranging from about 5300 to 4860 BC.

Obsidian Hydration

Ten obsidian artifacts from LA 85859 were submitted to the Diffusion Laboratory for age determination using the obsidian hydration dating method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rim, was measured. Second, the high-temperature hydration-rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site was estimated in order that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 38.7).

Table 38.7. Obsidian hydration dates for LA 85859.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
40	2006-1	Valle Grande	n/a		
109	2006-2	Valle Grande	3.61	1673	16
118	2006-3	Valle Grande	4.04	1410	27
144-2	2006-4	Valle Grande	3.52	-2880	278
147	2006-5	Valle Grande	3.83	-3673	297
148	2006-6	Valle Grande	4.83	-71	85
166	2006-7	Valle Grande	4.44	-5510	340
169-2	2006-8	Valle Grande	5.29	426	58
172	2006-9	Valle Grande	4.48	-2171	186
285	2006-10	Valle Grande	4.07	-4542	323

The obsidian hydration dates appear to span a 7000-year time span, ranging from AD 1673 to 5510 BC. The earlier part of this range corresponds with the Early Archaic radiocarbon date of 5050 BC; however, the dates continue for several more millennia. The two youngest dates are from a similar context in Stratum 3A, and indeed correspond with the radiocarbon date of circa AD 1410 from the same stratum. Therefore, these upper levels appear to exhibit some recent mixing of materials. On the other hand, the three oldest dates are derived from the lower Strata 3C, 4, and 5, which also correspond with the Early Archaic radiocarbon dates obtained from Strata 3B and 3B/C. Otherwise, the remaining dates are primarily Late Archaic and are situated in the upper levels of the site in Strata 1, 2, 3A, and 3B.

Ceramic Artifacts (Dean Wilson)

Two smeared-indented corrugated sherds were analyzed from the excavations. Both were recovered from the upper levels of the site.

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 2057 artifacts were analyzed from LA 85859, consisting of one core, 2046 pieces of debitage, 10 retouched tools, and one mano. This represents a 37 percent sample of the 5595 total lithic artifacts recovered during the site excavations. Table 38.8 presents the data on lithic artifact type by material type. The majority of the debitage is made of obsidian, with a few items of other materials. The presence of cortex on 6.5 percent of the debitage indicates that most of these materials were collected from primary nodular sources (96.9%), with some from secondary waterworn sources. The obsidian and rhyolite is present at nearby sources in the Jemez Mountains, but two obsidian flakes did exhibit waterworn cortex. In contrast, chalcedony, Pedernal chert, and quartzite are available from local Rio Grande Valley gravel sources.

Table 38.8. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Other	Total
Cores	Core	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Debitage	Angular debris	0	0	0	0	0	0	43	1	0	2	0	0	0	46
	Core flake	0	0	1	0	0	0	406	2	0	0	0	0	0	409
	Biface flake	0	0	0	0	0	0	679	2	0	0	0	0	0	681
	Notching flake	0	0	0	0	0	0	3	0	0	0	0	0	0	3
	Core trim. flake	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Outrepasse	0	0	0	0	0	0	4	0	0	0	0	0	0	4
	Microdeb.	0	0	1	0	0	0	771	1	0	0	0	0	0	773

Artifact Type		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Other	Total
	Und. flake	0	0	0	0	0	0	129	0	0	0	0	0	0	129
	Subtotal	0	0	2	0	0	0	203 6	6	0	2	0	0	0	2046
Retouched Tools	Retouched piece	0	0	0	0	0	0	4	0	0	0	0	0	0	4
	Biface	0	0	0	0	0	0	6	0	0	0	0	0	0	6
	Subtotal	0	0	0	0	0	0	10	0	0	0	0	0	0	10
Ground Stone	One-hand mano	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Subtotal	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Total		**0**	**0**	**2**	**0**	**0**	**0**	**2046**	**6**	**0**	**3**	**0**	**1**	**0**	**2057**

Ten pieces of debitage and eight retouched tools were submitted for X-ray fluorescence analysis. All of these artifacts were from the Valle Grande source (Table 38.9). The Valle Grande (Cerro del Medio) source area is located about 17 km (11 mi) as the "crow flies" to the west of the site.

Table 38.9. Obsidian source samples.

FS #	Artifact	Color	Source
30	Tool	Translucent	Valle Grande rhyolite
38	Tool	Translucent	Valle Grande rhyolite
40	Debitage	Translucent	Valle Grande rhyolite
109	Debitage	Translucent	Valle Grande rhyolite
118	Debitage	Translucent	Valle Grande rhyolite
124	Tool	Translucent	Valle Grande rhyolite
144-1	Tool	Translucent	Valle Grande rhyolite
144-2	Debitage	Gray	Valle Grande rhyolite
147	Debitage	Translucent	Valle Grande rhyolite
148	Debitage	Translucent	Valle Grande rhyolite
166	Debitage	Translucent	Valle Grande rhyolite
169-1	Tool	Translucent	Valle Grande rhyolite
169-2	Debitage	Translucent	Valle Grande rhyolite
172	Debitage	Translucent	Valle Grande rhyolite
222	Tool	Translucent	Valle Grande rhyolite
235	Tool	Translucent	Valle Grande rhyolite
257	Tool	Translucent	Valle Grande rhyolite
285	Debitage	Translucent	Valle Grande rhyolite

Lithic Reduction

The core consists of a bidirectional, bifacial core made on a chalcedony cobble (Figure 38.8). It exhibits waterworn cortex indicating that it was obtained from secondary gravel sources. The core was classified as still useable when discarded. Table 38.10 presents the metric information on this core.

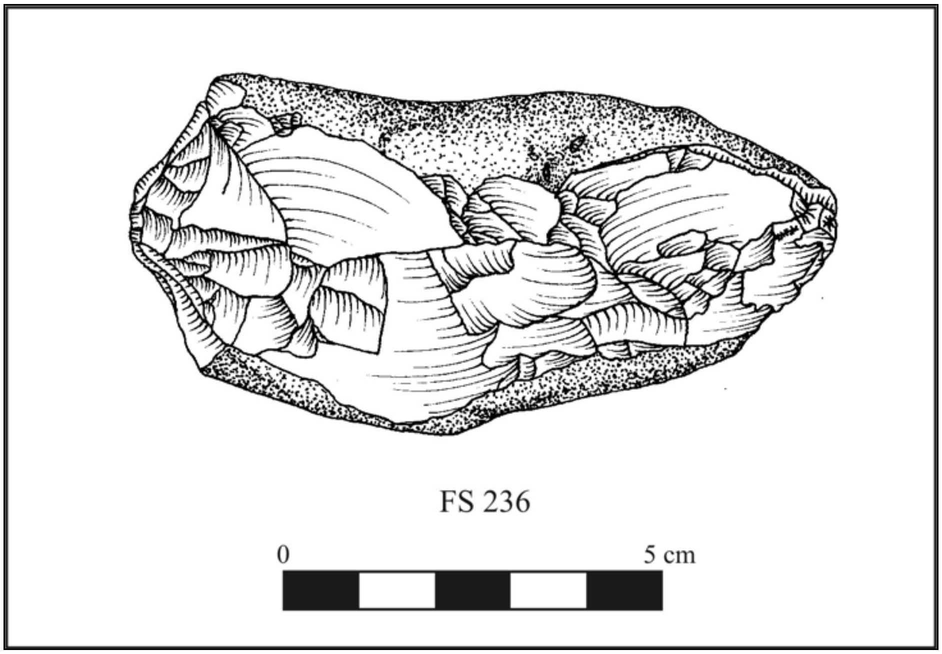

Figure 38.8. Bifacial core from LA 85859.

Table 38.10. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Bi-directional	97	74	48	374.0

The debitage mainly consists of microdebitage (37.7%) and biface flakes (33.2%), with some core flakes (19.9%), undetermined flake fragments (6.3%), and other items. Table 38.11 summarizes the various stages of reduction represented by the whole core and biface (tertiary) flakes. The overall cortical:non-cortical ratio of 0.13 reflects this emphasis on the tool production. The presence of notching and *outrepasse* flakes also indicate the presence of biface production activities at the site.

Table 38.11. Debitage reduction stages.

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Rhyolite	0	0	1	0	---
Obsidian	0	16	23	92	0.13
Chalcedony	0	0	1	0	---

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Total	**0**	**16**	**25**	**92**	**0.13**
Percentage	0	12.0	18.7	69.1	---

The majority of the flakes exhibit crushed platforms (*n* = 176; 54.1%), with cortical (*n* = 3), single-faceted (*n* = 58), multi-faceted (*n* = 54), and collapsed (*n* = 34) platforms. Ninety six (29.8%) of the flake platforms exhibit evidence of preparation, with most of these being abraded/crushed and only two ground platforms.

The majority of the core flakes consist of distal fragments (*n* = 242; 59.1%), with fewer whole (*n* = 46), proximal (*n* = 35), midsection (*n* = 84), and lateral flake fragments (*n* = 2). Most of the biface flakes are also distal fragments (*n* = 330; 48.4%), with fewer whole (*n* = 92), proximal (*n* = 152), midsection (*n* = 99), and lateral flake fragments (*n* = 8). The whole core flakes have a mean length of 24.2 mm (*std* = 12.7), whereas the whole biface flakes exhibit a mean length of 25.9 mm (*std* = 11.9). Lastly, angular debris have a mean weight of 0.5 g (*std* = 0.5).

The retouched tools consist of a mix of expedient flakes and retouched pieces, while the formal tools consisted primarily of bifaces (Figure 38.9). The retouched pieces exhibit one (*n* = 1), two (*n* = 2), and three (*n* = 1) marginally retouched edges. Table 38.12 presents the information on retouch type by edge outline.

Table 38.12. Retouched pieces.

Retouch Type	Edge Outline						
	Straight	Concave	Convex	Straight/ concave	Straight/ convex	Concave/ convex	Projection
Unid. Ventral	1	0	0	0	0	0	0
Unid. Dorsal	2	0	0	0	0	0	0
Bidirectional	1	0	0	0	0	0	0
Total	**4**	**0**	**0**	**0**	**0**	**0**	

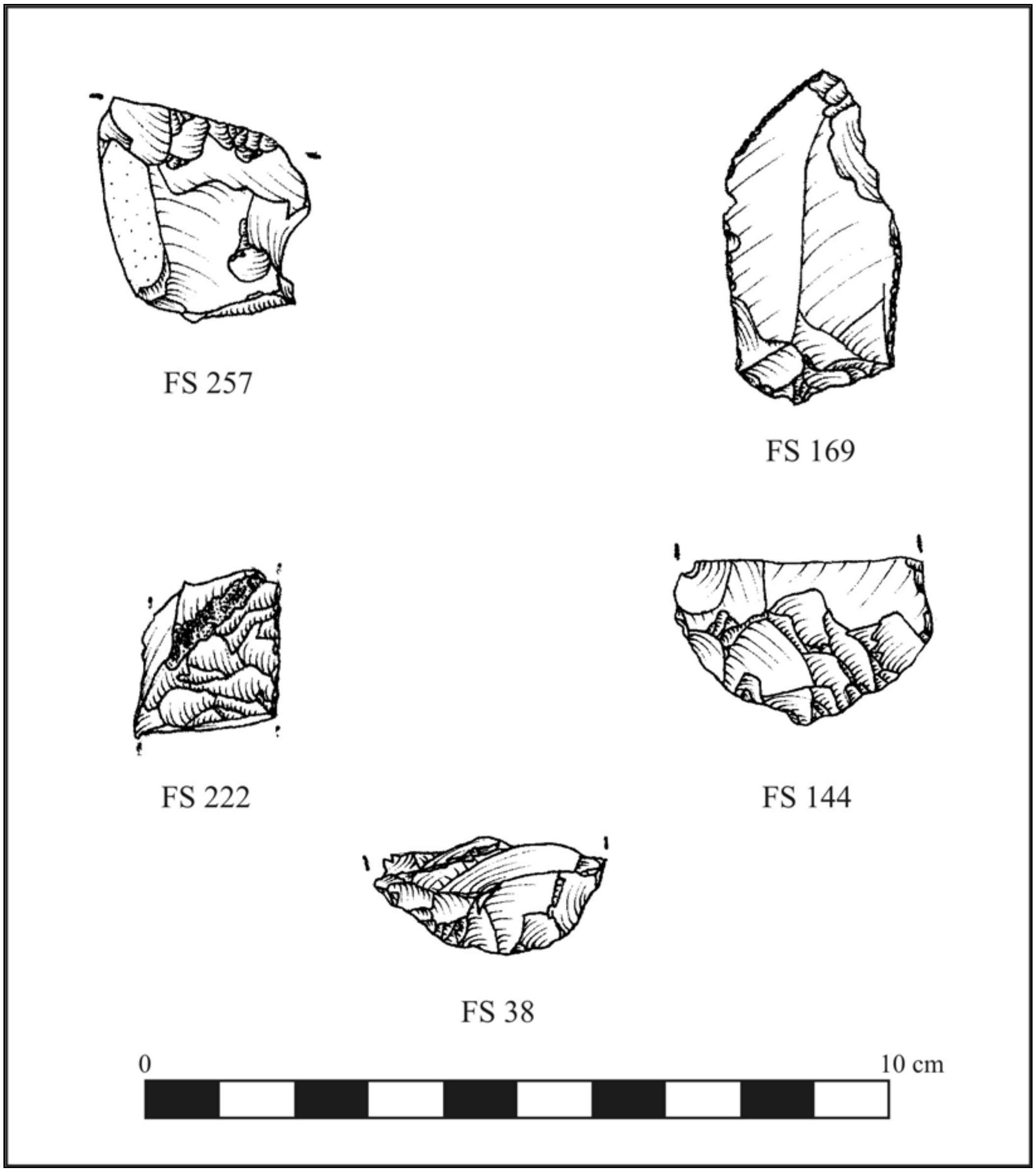

Figure 38.9. Retouched flakes (top) and biface fragments (bottom).

All the retouched edges exhibit straight outlines. The edge angles range from 40 to 50 degrees, with a mean of 42.5 degrees (*std* = 5.0). This reflects an emphasis on the use of more acute edge angles.

All six bifaces are broken, consisting of two distal, one lateral, and three undetermined fragments. Therefore, platform angles were measured on biface flakes (*n* = 82) to provide information on the stages of biface production represented at the site. The angles range from 45 to 85 degrees, with a mean of 65 degrees (*std* = 6.1). However, Figure 38.10 indicates a bimodal distribution with peaks at 75 and 60/65 degrees. This indicates that early-middle stage bifaces, and possibly bifacial cores, were being reduced at the site. This corresponds with the presence of the *outrepasse* flakes.

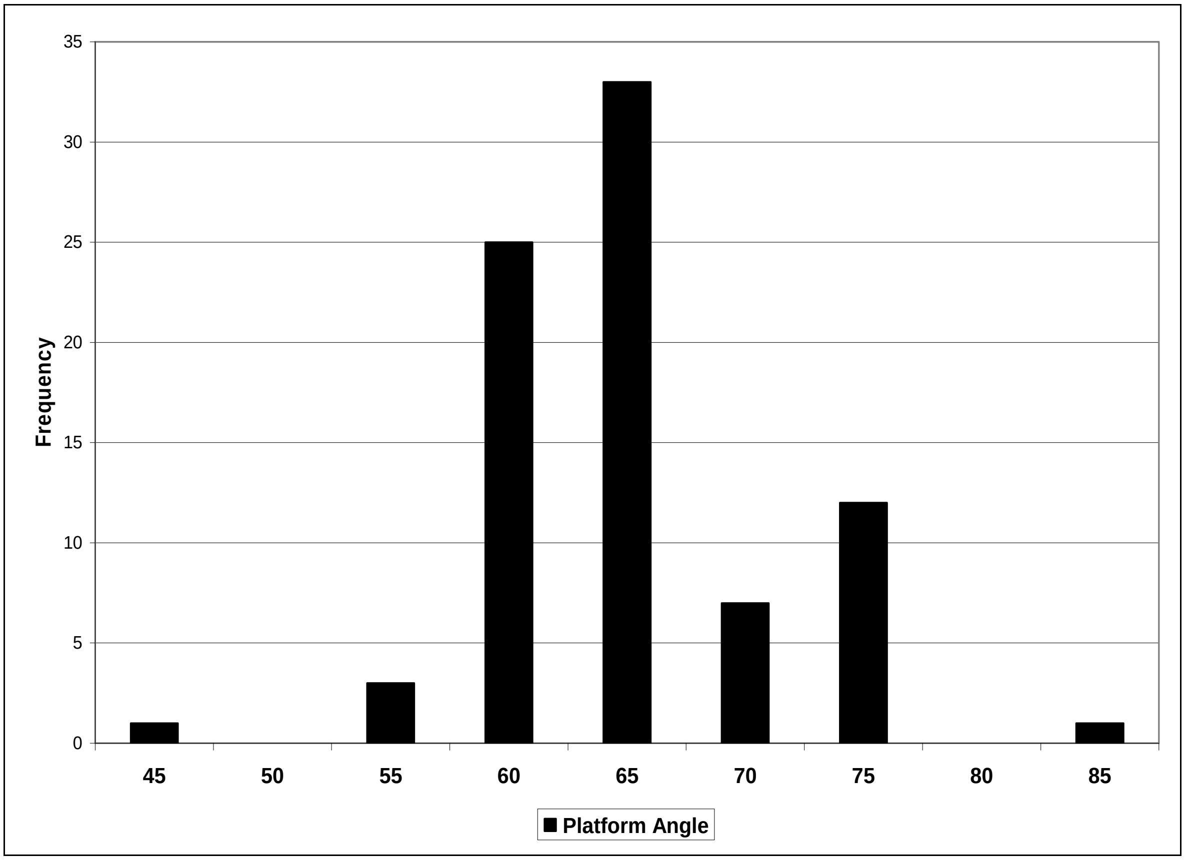

Figure 38.10. Biface flake platform angles.

Tool Use

Only two flakes (0.04%) exhibit evidence of damage that could be attributed to use-wear. These are obsidian biface flakes with damage situated along a straight lateral edge with angles of 40 degrees. They too have an acute angle like that exhibited by the retouched tools and were presumably removed from large bifacial cores.

Two of the retouched flakes exhibit evidence of use-wear, whereas, all the biface fragments appear to have been broken during manufacturing. A composite tool includes two retouched lateral edges with acute angles and a steeply angled edge at the distal end of the flake. Use-wear is present along these edges indicating use as both a cutting and scraping tool (see Figure 38.9).

A single one-hand quartzite cobble mano was analyzed. It exhibits two well-worn opposing surfaces and has some battering along one end (Figure 38.11).

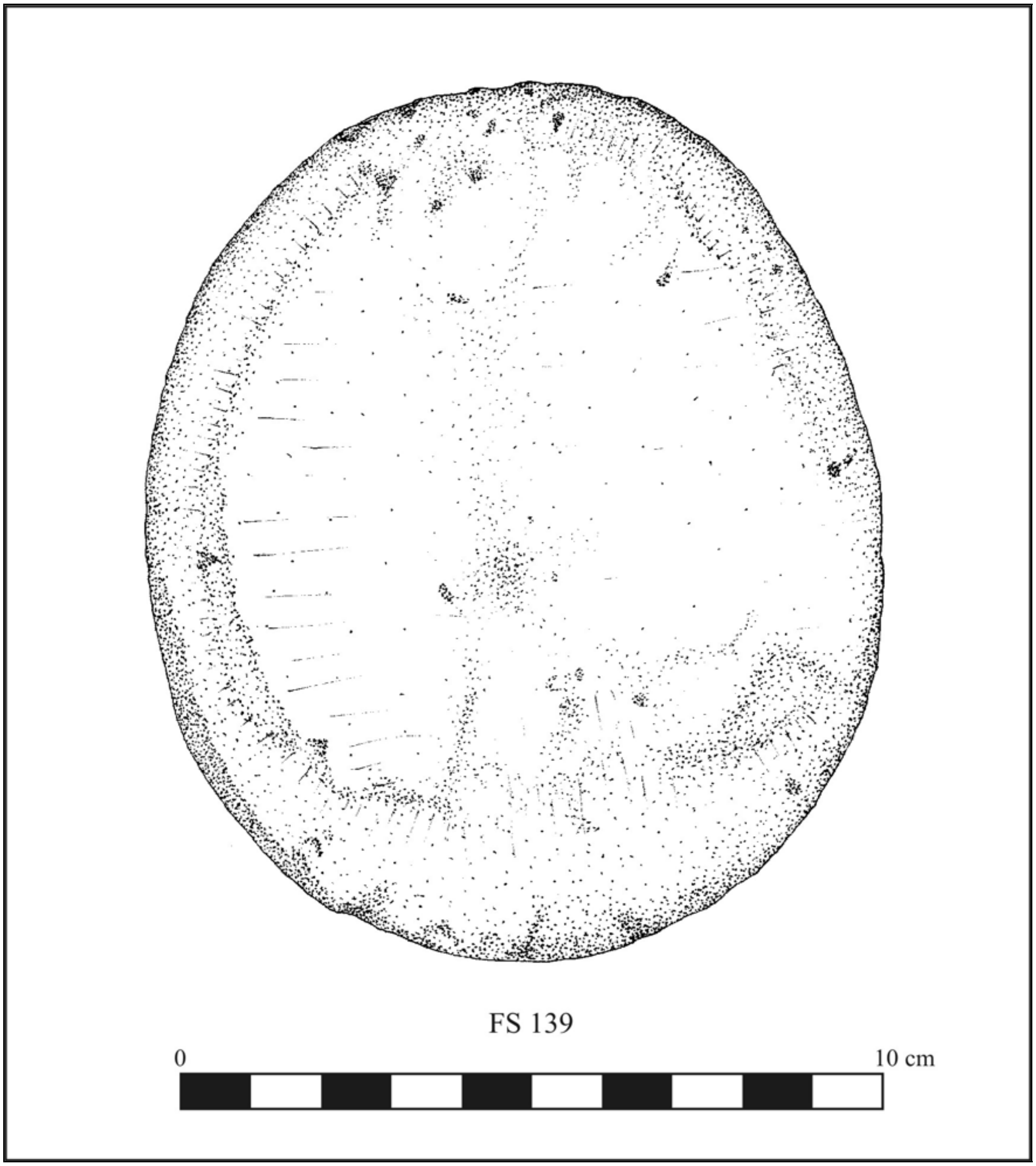

Figure 38.11. One-hand cobble mano.

Faunal Remains (Kari Schmidt)

Fourteen pieces of bone were recovered from this site. All of the bones were modern, and all are pocket gopher (*Thomomys bottae*) remains. None of the bones were burned, and none showed signs of weathering. Bones were recovered throughout the excavated levels. Methods used in the analysis of the bone are detailed in Volume 3 (Schmidt, Chapter 64).

Archaeobotanical Remains (Pamela McBride)

The majority of flotation and vegetal samples were from the center of the main activity area (grid 90N/109E) from strata that yielded the highest number of lithic artifacts. One of these samples produced a goosefoot seed fragment. The remaining assemblage consisted of burned and unburned conifer duff including pine cone fragments, piñon and ponderosa needles, and juniper twigs (Table 38.13). Samples from that part of the site along the upper western margin (FS 353) and from the northeastern portion of the site (FS 310) also contained unburned weed seeds of goosefoot, spurge, bean family, composite family, and the knotweed family.

Table 38.13. Flotation sample plant remains from LA 85859.

FS No.	**108**	**123**	**136**	**143**	**310**	**311**	**348**
Feature	90.9/ 109.7 strat 3a, level 3	90.95/109.7 strat 3b, level 4	90.95/109.8 strat 3c, level 5	90.95/109.85 strat 3c, level 6	92/11 4 strat 1	92/114 strat 2	90/112 strat 3a
Cultural							
Annuals							
Goosefoot				1(0)			
Perennials							
Juniper					twig +		
Pine					poss. ♂ cone +, umbo +	umbo +	
Ponderosa pine	needle + pc		needle +		needle +	needle +	
Non-Cultural							
Annuals							
Goosefoot					+		
Spurge					+		
Other							
Bean family					+		
Composite family					+		
Perennials							
Juniper		twig +			+, twig +	twig +	
Pine					umbo +		
Piñon		needle +			nutshe ll +		

FS No.	108	123	136	143	310	311	348
Feature	90.9/ 109.7 strat 3a, level 3	90.95/109.7 strat 3b, level 4	90.95/109.8 strat 3c, level 5	90.95/109.85 strat 3c, level 6	92/11 4 strat 1	92/114 strat 2	90/112 strat 3a
Ponderosa pine	needle +	needle +	needle +		needle +	needle +	needle +

Table 38.13 (continued). Flotation sample plant remains from LA 85859

FS No.	351	353	354	355
Feature	90/112 strat 4	90/107 strat 3a, level 3	90/107 strat 3b, level 4	90/107 strat 3c, level 5
Perennials				
Pine		umbo +		
Ponderosa pine		needle +		
Non-Cultural				
Annuals				
Goosefoot		+		
Spurge		+		
Other				
Composite family		+		
Knotweed family		+		
Perennials				
Pine		umbo +		
Ponderosa pine	needle +	needle +	needle +	needle +

+ 1-10/liter, pc partially charred.

Wood charcoal was entirely coniferous and piñon was the only taxon identified as charcoal was very fragmented and sparse (Tables 38.14 and 38.15). Unknown conifer and undifferentiated pine were also part of the record. The archaeobotanical remains from LA 85859 could be remnants of vegetation that burned during the Cerro Grande fire, especially those from Strata 1 and 2 that both contained material burned during the fire. Strata 4 and 5 displayed frequent rodent burrows indicating floral material from the fire could have been deposited by bioturbation.

Table 38.14. Flotation sample wood charcoal taxa by count and weight in grams from LA 85859.

FS No.	108	310	311	315	348
Context	90.9/109.7 strat 3a, level 3	92/114 strat 1	92/114 strat 2	92/114 sand	90/112 strat 3a
Conifers					
Piñon		1/<0.1 g, 1 pc/<0.1 g			
Unknown conifer	1/<0.1 g		1/<0.1 g	1/<0.1 g	2/<0.1 g
Totals	**1/<0.1 g**	**2/<0.1 g**	**1/<0.1 g**	**1/<0.1 g**	**2/<0.1 g**

Table 38.15. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 85859.

FS No.	138	361	362	363
Feature	90/109.95 strat 3c, level 5	90308/119 strat 3b	87.8/112.4 strat 3c	89.6/112.4 strat 3bc
Conifers				
Pine	12/0.2 g			
Piñon		1/<0.1 g	1/<0.1 g	
Unknown conifer				1/<0.1 g
Totals	**12/0.2 g**	**1/<0.1 g**	**1/<0.1 g**	**1/<0.1 g**

Pollen Remains (Susan Smith)

Nineteen pollen samples were analyzed from LA 85859. Table 38.16 lists the frequency of identified pollen types. No cultigens were identified in the botanical assemblage. Beeweed and lily family were identified as other economic resources in the assemblage. Several other potential economic resources were identified in the assemblage (Table 38.16), and these are discussed in detail in Smith's chapter in Volume 3.

Table 38.16. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85859 (*n* = 19)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	0
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85859 (*n* = 19)
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	2
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	1
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	6
		Grass Aggregates	1
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, Shrubs & Subs. Resources	Cheno-Am	Cheno-Am	10
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	1

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85859 (*n* = 19)
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	7
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	2
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	2
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	1
	Pinus	Pine	11
		Pine Aggregates	0
	Pinus edulis type	Piñon	8
	Juniperus	Juniper	9
		Juniper Aggregates	0
	Quercus	Oak	1
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	2

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85859 (*n* = 19)
	Artemisia	Sagebrush	7
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

EXCAVATION SUMMARY

LA 85859 is an Early Archaic lithic scatter located on the northeast slope of a knoll situated along the north side of Rendija Canyon. The implemented data recovery plan resulted in a block excavation from which 5595 lithics were recovered. The vast majority of the lithics were debitage made of obsidian, with a few items of other materials also present.

The least disturbed portion of the site is located in the west-central portion of the block excavation, directly east of a dacite cobble outcropping. With removal of the overlying soil, it was apparent that a hollow had formed in the Toledo Pumice deposit directly downslope from a cascade of dacite rocks and cobbles. The bottom of the hollow sloped down to the east for 4 to 5 m until it merged with a drainage that ran from southwest to northeast across the knoll slope. The drainage is evidenced by a shallow trough that was cut into the pumice deposit. It is likely that the hollow originally functioned as a drainage channel that funneled runoff into the lower southwest-to-northeast-trending drainage.

The dacite cobble outcropping apparently formed a barrier that allowed the preservation of soils within the hollow. The stabilized soils included an intact Bt1b1 through Bt3b1 sequence from which the majority of cultural remains were located. As indicated by the systematic site augering and selective test units, the Bt soil horizons are virtually non-existent above (west) and patchy when present out to either side of the hollow. It is inferred from the site stratigraphy that the upper hillslope was eroded during the late Pleistocene or early Holocene and that colluvium derived from Toledo bedrock or Toledo soils was deposited in the concave part of the hillslope (Drakos and Reneau 2004). The complete Bt soil sequence is limited to an approximately 3- by 4-m area located directly east of the dacite rock barrier as the upper Bt1b1 soil horizon is missing from the northern and eastern sides of the block excavation. The lower Bt1b1 and Bt2b1 soils are present throughout the hollow; however they are so heavily mixed that they are indistinguishable through the east-central portion of the excavation. It appears that many of the cultural materials originally retained in the hollow have gradually moved downslope toward the east and northeast in concert with the original hillside drainages. Significant vertical displacement of cultural materials also appears to be a byproduct of this depositional movement and significant bioturbation. Although the artifact density remains fairly high throughout the eastern half of the excavation, the context becomes more blurred with an increase in artifacts in lower soil horizons due to post-occupation mixing.

The maximum artifact concentration at the site was found in unit 90N/110E, and the majority of these artifacts were recovered from the Bt1b1 soil horizon. The lack of artifacts recovered from the Bt soils within 90N/107E provides evidence that the artifacts were not transported from upslope, but were originally deposited in the vicinity of 90N/110E. Although the artifact content in grids to the north and east of 90N/110E decreases somewhat, the similar artifact distribution pattern leads to the assessment that this general area is the focus for site activities.

No occupation surface was encountered during excavations. This lack of a surface is likely due to significant post-occupational mixing of cultural materials between strata as is indicated by the large number of artifacts scattered throughout the soil horizons. The relatively high Bt1b1 artifact content suggests that the site occupation surface was within this upper late-Pleistocene or early-Holocene colluvium, and likely within the upper half of this horizon (Stratum 3A). This infers that the artifacts found in the late-Holocene colluvium were supplied from local bioturbation of the underlying b1 soils. As evidence of extensive burrowing was observed in the Bt3b1 and Bkb1 soil horizons, associated artifacts are assessed to have been transported into these deeper deposits through rodent burrowing. Bioturbation that occurred after abandonment is also the likely source of artifact movement into the Bt2b1 soil horizon. The fact that the maximum artifact density occurs in the best-developed soil horizon (Bt1b1) suggests that most of the bioturbation occurred relatively soon after deposition of the colluvium and site abandonment, before development of these soil horizons. As the peak artifact density occurs in the upper part of the b1 soil, site occupation also apparently occurred late in the period of deposition (Drakos and Reneau 2004).

The drop in artifact totals observed in units 90N/115E and 90N/118E suggests that the site focus is located in the hollow and that several artifacts have eroded east into the area situated below the hollow. The good soil development in the focus area infers that the site has been relatively stable since the period of high bioturbation that occurred shortly after abandonment. Although bioturbation has obliterated the site structure, including the spatial relationship of artifacts and charcoal, the sheltered environment provided by the hollow allowed the majority of cultural remains to be retained in relative proximity to their original setting. The good assemblage composition should facilitate an assessment as to the site function(s) and to establish the general period(s) of site occupation. Charcoal was fairly rare below the late-Holocene deposits that contained charcoal associated with the Cerro Grande fire. Seventeen charcoal samples were recovered from the Bt soils. Approximately half of the charcoal samples were submitted for radiocarbon dating from which four dates were obtained. Three of the samples date to the Early Archaic period and one from the Ancestral Pueblo Classic period, which indicates that some stratigraphic mixing was occurring throughout the history of the site. The Classic period date likely corresponds to use of the area during the Ancestral Pueblo era as indicated by sites LA 85861 and LA 85415 located approximately 150 and 300 ft upslope to the southwest and south-southwest, respectively. The range of obsidian hydration dates for the site tend to support the two distinct periods of site activity with the three oldest dates derived from lower strata corresponding with the Early Archaic radiocarbon dates and the two youngest dates corresponding with the Classic period radiocarbon date. The remaining four obsidian hydration dates suggest that site activities also occurred between the Late Archaic and Classic periods. Unfortunately, with bioturbation obscuring the spatial relationship of the cultural remains, there are no distinct cultural lenses or use surfaces from which to establish a specific occupational sequence at the site, nor to establish the number of occupations that it took to build the site.

CHAPTER 39
RENDIJA TRACT (A-14): LA 85861

Gregory D. Lockard

INTRODUCTION

LA 85861 is the remains of a one-room Late Coalition period fieldhouse located on an east-facing slope on the mesa between Rendija and Guaje canyons. The site is located in the east-central portion of the Rendija Tract. Vegetation on the site consists of piñon, juniper, and ponderosa pines. The site is situated at an elevation of 2103 m (6900 ft).

LA 85861 was first recorded on September 12, 1991, by David Hill (1991) during a survey for the Bason Land Exchange Project. Hill interpreted the site as a campsite or possible fieldhouse. A diffuse artifact scatter at the site included obsidian, chalcedony, and siliceous rhyolite lithics and ceramics. The ceramics in the scatter included Wiyo and Santa Fe Black-on-white sherds, which led Hill (1991) to conclude that the site was occupied during the Late Coalition period. On July 20, 1992, Archaeological Research, Inc., was awarded the contract to conduct archaeological testing of the Bason Land Exchange sites. John Peterson and Christian Nightengale (1993) supervised the excavations, which took place between July 27 and August 23 of 1992.

A single 1- by 1-m test pit (Unit A) was excavated at LA 85861. Unit A was placed within a diffuse scatter of rocks that measured 4 by 5 m, which was designated Feature 1. No clear rock alignments were visible in the scatter of rocks. For this reason, Peterson and Nightengale believed the scatter to be the foundation stones of a structure built primarily of perishable materials. Unit A was excavated to a maximum depth of 55 cm below the ground surface. No clear rock alignments or living surfaces were encountered in the excavation. Ten sherds, however, were recovered from the unit. In addition, six lithics (including a chert core/chopper) and 20 sherds were recovered during a surface collection of the site. The ceramics recovered from the excavation and surface collection consist of one Black-on-red decorated sherd (possibly Glaze A or White Mountain Redware), five Wiyo Black-on-white, three Biscuit B, one Biscuit A, four smeared-indented, and 16 other utilityware sherds. Finally, a rock alignment located a few m to the northeast of Feature 1 was recorded. No excavations were conducted of this rock alignment, which was designated Feature 2.

FIELD METHODS

Before excavation, the site and surrounding area were cleared of trees and large undergrowth. The site was then visible as a diffuse scatter of rocks approximately 4 by 5 m in area, designated Area 1 (Peterson and Nightengale's Feature 1), and a small concentration of rocks to the northeast, designated Area 2 (Peterson and Nightengale's Feature 2) (Figure 39.1). An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the southwestern portion of the site. The site was then covered with a 1- by 1-m grid that extended 9 m to the north, 7 m to the east, and 3 m to the west of the site datum. Four subdata (A-D) were set up for taking elevations. The site was then photographed. Artifacts visible on the surface were then collected by grid unit. The location of artifacts outside of the grid was determined with tape measures. A 6- by 1-m east-west trench (units 104N/99-104E) was initially excavated across Area 1.

Figure 39.1. Pre-excavation photograph of LA 85861.

Because there were no clear rock alignments on the surface, the primary purpose of this trench was to determine if the rocks in the area were the remains of a structure. The trench also served to expose a profile of the site's stratigraphy. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. No living surface was encountered in any of the trench units. Excavation of these units therefore proceeded down to Cerro Toledo bedrock. A concentration of several rocks was encountered in units 104N/100-101E, and two rocks were encountered in unit 104N/99E. These rocks, however, did not form any obvious alignments. It was therefore unclear whether they were part of the walls of a structure. The later excavation of units to the north, however, revealed that they were in fact the remains of the disturbed southernmost portion of a one-room fieldhouse, which was designated Room 1. After the excavation of the trench units, the north profile of the trench was drawn and photographed. The rest of the area was subsequently excavated, again by strata and arbitrary levels for thicker strata.

In all, 36 units were excavated in Area 1. During the excavation of these grid units, the diffuse scatter of rocks in Area 1 was determined to be a one-room fieldhouse, and the walls of the fieldhouse were defined. Patches of a poorly preserved living surface were only encountered in two units (105N/99-100E). The units that were excavated before Room 1 was discovered (105N/103E and 106N/103E and 104E) were excavated to bedrock. Subsequently, units were excavated to the level of the base of the foundation of the room's walls, or the living surface in the case of units 105N/99-100E. Excavation of Area 1 focused on defining the room's walls, removing wallfall, and locating features. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended at least 1 m beyond the structure in all directions to locate external features and/or outdoor activity areas. The small concentration of rocks in Area 2 was excavated in four units (107-108N/105-106E). The excavations revealed the rocks to be superficial, and no clear alignments were detected. If the concentration of rocks was a cultural feature, its function is therefore unknown. After the excavation of Areas 1 and 2 was complete, the site was mapped (Figure 39.2) and photographed (Figure 39.3).

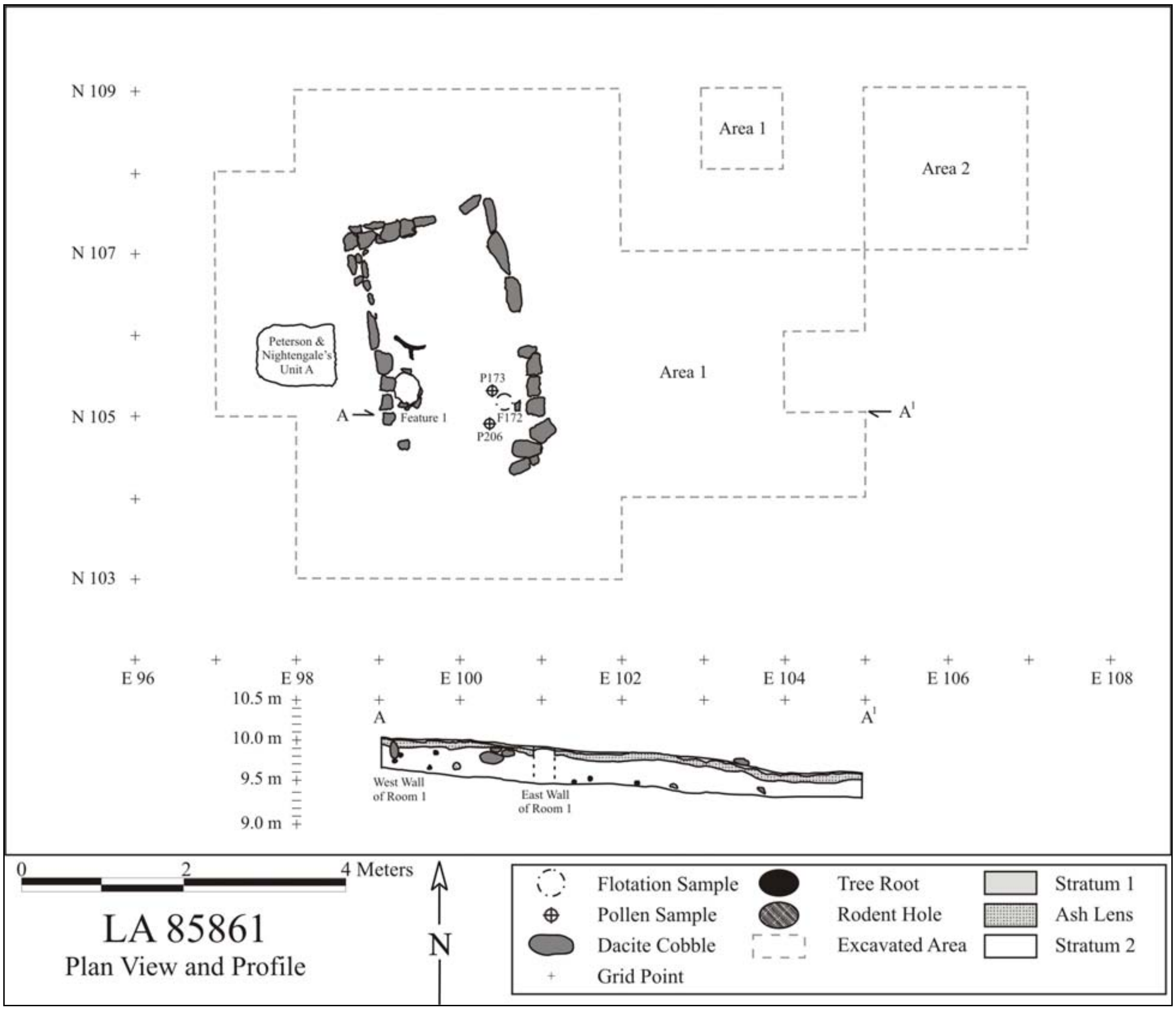

Figure 39.2. Plan view and profile of the fieldhouse at LA 85861.

Figure 39.3. Post-excavation photograph of the fieldhouse at LA 85861.

The excavation of the site was supervised by Greg Lockard. The field crew included Michael Dilley, Alan Madsen, Brian Harmon, Jen Nisengard, Sandi Copeland, and Bettina Kuru'es. Timothy Martinez and Aaron Gonzalez served as site monitors from San Ildefonso Pueblo and as screeners. Jeremy Yepa was the site monitor representing Santa Clara Pueblo, as well as an additional excavator.

STRATIGRAPHY

Stratum 1 is composed of loose surface sediment. It is uniformly 2 to 7 cm thick across the site and is part of the A horizon (topsoil). Stratum 2 is post-occupational fill and ranges from 20 to 40 cm in thickness in Area 1 and 20 to 25 cm in thickness in Area 2. Stratum 2 is more or less equivalent to the Bw and Bwb1 horizons. Stratum 3 is the backfill removed from Peterson and Nightengale's Unit A. Stratum 3 is therefore a disturbed context. Stratum 4 is the ashy fill removed from Feature 1 (hearth). Tables 39.1 through 39.5 summarize and describe the strata excavated at LA 85861.

Table 39.1. LA 85861 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface

Stratum	Color	Texture	Thickness (cm)	Description
1	10YR 5/4	Loamy sand	2–7	Surface sediment
2	10YR 4/4	Sandy loam	20–40	Post-occupational fill
3	10YR 4/4	Sandy loam	20	Backfill from P & N test pits
4	10YR 4/2	Sandy loam	9	Feature 1 (hearth) fill

Table 39.2. LA 85861 soil horizon descriptions from the north profile of unit 106N/104E.

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 5/4	Sandy loam	0–13	Topsoil
Bw	10YR 4/4	Sandy loam	13–26	Late-Holocene soil
Bwb1	7.5YR 4/6	Sandy loam	26–39	Middle/late-Holocene soil
Rk	-	-	39+	Cerro Toledo bedrock

Table 39.3. LA 85861 soil horizon descriptions from the north profile of unit 108N/106E.

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 5/4	Loamy sand	0–5	Topsoil
Bw	10YR 4/3	Sandy loam	5–15	Late-Holocene soil
Bwb1	7.5YR 4/6	Sandy clay loam	15–27	Middle/late-Holocene soil
Rk	-	-	27+	Cerro Toledo bedrock

Table 39.4. LA 85861 soil horizon descriptions from the exterior face of the north wall of Room 1 (within unit 107N/99E).

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 4/3.5	Loam	0–16	Topsoil
Bw	7.5YR 4/6	Loam	16–31	Late-Holocene soil
Bwb1	7.5YR 4/6	Sandy clay loam	31–50	Middle/late-Holocene soil
Rk	-	-	50+	Cerro Toledo bedrock

Table 39.5. LA 85861 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	6	6	0	0	**12**
1	42	8	1	0	**51**
2	386	86	12	1	**485**
3	0	0	0	0	**0**
4	0	1	0	4	**5**
Total	**434**	**101**	**13**	**5**	**553**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a small rectangular structure that probably functioned as a fieldhouse. The walls in the southernmost portion of the room have been severely disturbed, and many of the rocks are missing in this area. The room measures approximately 3.05 m in length (north to south) by 1.70 m in width (east to west), with approximately 5.19 m^2 of interior space. Excavation of the room began with an east-west trench that extended across the diffuse scatter of rocks visible on the surface of Area 1 (units 104N/99-104E). The excavation of this trench served to define the room's stratigraphy, as well as to locate several rocks that turned out to be the extant portions of the walls that formed the southernmost portion the room. These rocks were not determined to be part of the walls of a structure, however, until grid units to the north of the trench were excavated. No living surface was encountered in any of the trench units. The poorly preserved remains of the room's living surface were encountered, however, in two grid units to the north of the trench (105N/99-100E). The room's only internal feature, a small, stone-lined hearth, was also encountered in unit 105N/99E. No living surface was encountered within Room 1 in the units to the north (106-107N/98-100E). The excavation of these grid units therefore terminated at the base of the foundation of the room's walls.

Fill. The interior of Room 1 was filled with 2 to 7 cm of surface sediment on top of 20 to 35 cm of post-occupational fill. A flotation sample (Field Specimen [FS] 98) and a pollen sample (FS 99) were taken from the Room 1 fill, but these samples were not analyzed.

Floor. During the excavation of unit 105N/99E, a small elliptical hearth was encountered. A few very small patches of a poorly preserved living surface were encountered in the area surrounding the hearth. These small patches of living surface were presumably preserved as a result of being slightly hardened by the heat from the hearth. A compact surface relatively devoid of rocks was also encountered in the unit directly to the east (105N/100E). This surface extends into the northernmost portion of unit 104N/100E. By itself, it was not a convincing living surface. Due to the fact that it was at about the same level as the top of the hearth and the small patches of living surface in unit 105N/99E, however, it probably was in fact the very poorly preserved remains of the Room 1 living surface. A flotation sample (FS 172) and two pollen samples (FS 173 and FS 206) were taken from directly on top of this presumed living surface. The flotation sample was not analyzed, and taxa identified in FS 173 included rose family, cheno-ams, grass family, sunflower family, piñon pine, juniper, oak, and sagebrush. No living surface of any kind was encountered in other areas of the room. For this reason, these areas were excavated to the base of the foundation of the room's walls.

Wall Construction. The extant portions of the Room 1 walls were composed of dacite rocks, many of which are tall, thin, upright slabs (Table 39.6). The elevation of the living surface encountered in the southern half of the room, as well as staining on some of the rocks, indicates that the room's foundation was placed in a trench approximately 15 cm deep. The remains of a second course of rocks were preserved in all but the west wall. The rocks that form this second course tend to be tabular dacite cobbles placed flat on top of the foundation rocks. There is a 30-cm gap in the eastern half of the northern wall. This gap is most likely the result of a missing foundation rock. There is also a gap in the east wall, which is 55 cm wide. Due to its width and the fact that the fieldhouses excavated in the Rendija Tract during the Conveyance and Transfer Project tend to have entryways to the east, this gap was most likely the room's entryway. Just south of the entryway, a patch of burned daub was encountered on the east wall's exterior face. A piece of this burned daub was collected as a thermoluminescence (TL) sample (FS 249) and dated to 1193±53. Much of the walls that form the southernmost portion of the room have been severely disturbed. Several rocks appear to be missing from the southernmost portion of the west wall, and all but the easternmost 35 cm of the south wall is missing. It is therefore possible that the room's entryway was located in the south wall instead of the east wall.

Judging from the amount of wallfall removed during the excavation of the area in and around Room 1, the masonry portions of the room's walls were originally considerably higher than they were at the time of excavation. In order to estimate the original height of the walls, all of the rocks removed as wallfall during the site's excavation were placed in two stacks, which were then measured. The stacks measured 1.60 by 0.88 by 0.60 m and 1.80 by 0.55 by 0.37 m, for a total of approximately 1.21 m^3 of wallfall. Based on this volume of wallfall and the overall length, average thickness, and average height of the extant portions of the walls, the masonry portions of the room's walls were originally approximately 1.10 m in height. The uppermost portions of the walls, as well as the ceiling, were most likely composed of wattle and daub. A number of pieces of burned adobe were in fact recovered from the site.

Table 39.6. LA 85861 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.70	0.18–0.32	0.10–0.26	1 to 2
South	~1.60	0.25–0.30	0.10–0.26	1 to 2
East	2.45 (3.00)	0.08–0.35	0.10–0.23	1 to 2
West	>2.56	0.15–0.25	0.10–0.20	1

Notes: The exact prehistoric length of the south and west walls could not be determined; the length of the east wall including the possible entryway is given in parentheses; the wall height measurements for the north, south, and east walls were measured from the base of the walls instead of from a living surface.

Feature 1

Feature 1 is a shallow, elliptical hearth located just inside the west wall of Room 1 (Figures 39.4 and 39.5). A large, flat rock forms the base of the hearth. Much of the perimeter of the southern half of the hearth is formed by three small rocks. A fourth rock defines the northern edge of the hearth. Three of the rocks are dacite, and the fourth is tuff. The rest of the hearth's perimeter appears to have been formed by an adobe lining. This lining, however, is now only preserved on the east wall and in a small patch on the west wall of the hearth. The adobe lining on the east wall extends down and partially covers the rock at the base of the hearth. This indicates that the adobe lining probably originally covered the entire interior of the hearth, including the base. The hearth was filled with ashy sediment. A medium- to large-sized mammal bone awl (FS 196) and a lithic (FS 197) were recovered from the upper portion of this fill. The rest of the fill was collected in four flotation samples (FS 191, FS 192, FS 193, and FS 194). Carbonized taxa from these samples included beeweed, unknown conifer, piñon pine, cheno-ams, mint family, unidentified pine, ponderosa pine, and maize. Three additional faunal remains were recovered from the heavy fraction of two of these samples. In addition, a pollen sample (FS 195) was taken from the base of the hearth. Identified taxa included maize, buckwheat, grass family, cheno-ams, sunflower family, evening primrose, ragweed/bursage, unidentified pine, piñon pine, and sagebrush.

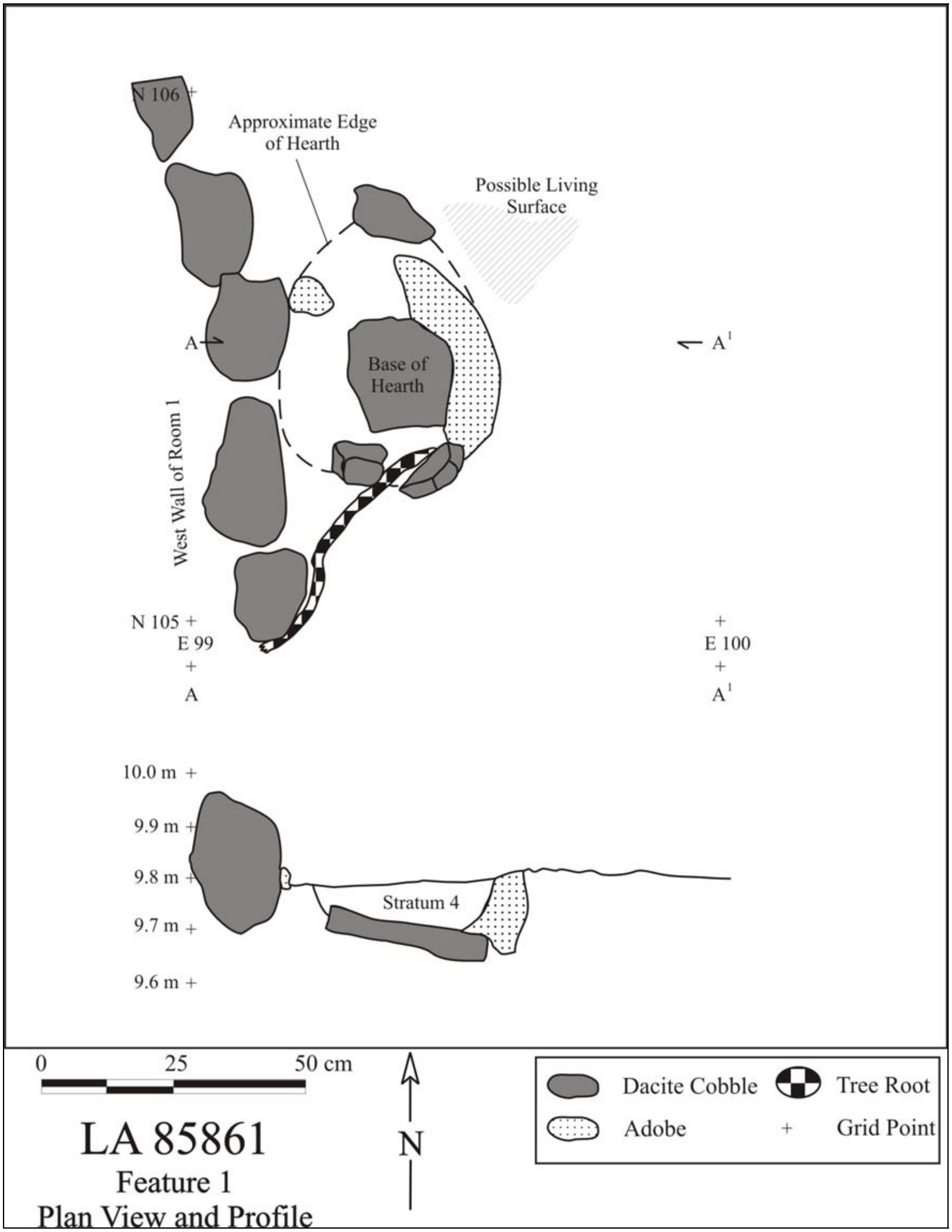

Figure 39.4. Plan view and profile drawing of Feature 1, a hearth.

Figure 39.5. Post-excavation photograph of Feature 1, a hearth.

Geological Analysis

Geologists Paul Drakos and Steven Reneau conducted a full analysis on three profiles (see Tables 39.2 through 39.4) and a partial analysis on a fourth profile at LA 85861. The profiles that were fully analyzed were the north profile of unit 106N/104E, the north profile of unit 108N/106E, and the exterior face of the north wall of Room 1 (within unit 107N/99E). The partially analyzed profile was the north profile of unit 108N/99E. All four profiles contained a soil sequence consisting of an A horizon (topsoil), a Bw horizon (a late Holocene soil), a Bwb1 horizon (a middle- to late-Pleistocene soil), and a Rk horizon (Cerro Toledo bedrock).

Artifact Distribution

The grid units with the highest number of artifacts in Area 1 at LA 85861 include the unit in which Feature 1 is located (105N/99E) and the unit immediately to the east (105N/100E) (Table 39.7). The high number of artifacts in these units is therefore most likely due to activities that took place around the hearth. The other units with a high number of artifacts in Area 1 are located to the east of Room 1 (104-106N/101-104E). This indicates that the area to the east of the room was most likely an outdoor activity area. This conforms to the pattern for most of the fieldhouses excavated in the Rendija Tract during the Conveyance and Transfer Project. Furthermore, it supports the interpretation that the gap in the east wall of Room 1 is the room's entryway, as outdoor activity areas also tend to be located directly in front of the entryway.

Table 39.7. LA 85861 artifact counts by grid unit.

	E97	E98	E99	E100	E101	E102	E103	E104	E105	E106
N108	--	2	11	7	6	--	6	--	19	24
N107	--	**4**	**6**	**7**	11	--	--	--	14	0
N106	5	**5**	**5**	**7**	12	40	22	26	--	--
N105	5	17	**31**	**26**	37	14	20	--	--	--
N104	--	5	11	**8**	13	26	28	21	--	--
N103	--	10	9	13	7	--	--	--	--	--

Note: Does not include 10 artifacts found outside of the excavated area during surface collection; bold numbers indicate grid units that are located completely or partially within Room 1.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 537 artifacts were analyzed from the excavations conducted at LA 85861. In addition, flotation and pollen samples were selected for analysis from the post-occupational fill (Stratum 2) and Feature 1 hearth fill (Stratum 4) (Table 39.8). Maize was submitted for radiocarbon dating, and a sherd and piece of burned adobe wall plaster were selected for TL dating. The results of the artifact and sample analyzes are presented in the following sections.

Table 39.8. Samples selected for analysis from LA 85861.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL
1				
2		173, 184		142, 249
3				
4	191, 192, 193, 194	195	193	

Chronology

Radiocarbon Dating

One maize sample was submitted for accelerator mass spectroscopy dating. This specimen was derived from a flotation sample taken from the Feature 1 hearth fill (FS 193). The sample provided a date of 930±40 BP (Beta-221842), with calibrated intercepts of AD 1050, AD 1100, and AD 1140 and a two-sigma range of AD 1020 to 1200.

Thermoluminescence Dating

A single smeared plain corrugated sherd and a piece of burned adobe wall plaster were submitted for TL dating from LA 85861 (Table 39.9). All derived ages are given in years BP, which refers to years before 2003. Both TL dates correspond to the two-sigma range of the radiocarbon dates.

Table 39.9. TL dates from LA 85861.

FS#	Lab #	Context	Burial depth (cm)	Years BP	% error	Years AD
142	UW1508	Sherd, Room 1, Stratum 2	33	795	9.2	1211±73
249	UW1509	Burned plaster, Room 2, Stratum 2	30	813	6.6	1193±53

Archaeomagnetic Dating

A single surface room with a hearth was the only candidate for archaeomagnetic sampling at this site. The surface room was a fieldhouse, and associated pottery suggested an Early Classic period occupation to the field excavators. The hearth itself was rock lined, and the interstitial plaster was too weakly burned and too disturbed for normal sample definition and collection. Four specimens were prepared and were submitted for measurement as ADL 1307. An experimental approach was used during the collection of this sample, and although these results are not helpful for the dating of the LA 85861 structure, they do validate the experimental field sampling approach used in this case (see Blinman and Cox, Volume 3 for further details).

Ceramic Artifacts (Dean Wilson)

A total of 439 ceramics were analyzed from LA 85861. The majority of the pottery consists of smeared plain corrugated and Santa Fe Black-on-white sherds. These types, in conjunction with the presence of Wiyo Black-on-white, would indicate a Late Coalition period date during the 13th century (Table 39.10). However, the radiocarbon date reflects an Early Coalition period occupation dating to the 12th century, and the TL dates overlap both the 12th and 13th centuries. Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 39.11 through 39.13. The graywares and whitewares appear to have been locally made from tuff temper while the Sapawe Micaceous sherds contained a non-local micaceous temper. All of the grayware and micaceous ceramics were jars while the whiteware sherds consisted solely of bowl sherds.

Table 39.10. Ceramic types from LA 85861.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	28	6.4
Indeterminate organic	11	2.5

Ceramic Type	Frequency	Percent
Unpainted white undifferentiated	1	0.2
Santa Fe Black-on-white	40	9.1
Wiyo Black-on-white	2	0.5
Jemez/Santa Fe/Vallecitos Black-on-white	1	0.2
Biscuit unpainted one side slipped	3	0.7
Biscuit B	2	0.5
Biscuit B/C body	1	0.2
Northern Rio Grande Utilityware		
Plain gray body	2	0.5
Clapboard neck	1	0.2
Smeared plain corrugated	270	61.5
Smeared-indented corrugated	71	16.2
Alternating corrugated	1	0.2
Sapawe Micaceous	3	0.7
Total	**439**	**100.0**

Table 39.11. Tradition by ware for LA 85861 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	345	100.0	91	100.0	0	0.0	0	0.0	426	99.3
Rio Grande (Tewa Micaceous)	0	0.0	0.0	0.0	0	0.0	3	100.0	3	0.7
Middle Rio Grande	0	0.0	0.0	0.0	0	0.0	0	0.0	0	0.0
Total	**345**	**100.0**	**91**	**100.0**	**0**	**0.0**	**3**	**100.0**	**429**	**100.0**

Table 39.12. Temper by ware for LA 85861 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Sherd and sand	0	0.0	1	1.0	0	0.0	0	0.0	1	0.2
Fine tuff or ash	0	0.0	10	10.9	0	0.0	0	0.0	10	2.3
Fine tuff and sand	0	0.0	78	85.7	0	0.0	0	0.0	78	11.1
Anthill sand	345	100.0	0	0.0	0	0.0	0	0.0	345	80.4
Oblate shale and tuff	0	0.0	2	2.0	0	0.0	0	0.0	2	0.4
Sapawe Micaceous temper	0	0.0	0	0.0	0	0.0	3	100.0	3	0.6
Total	**345**	**100.0**	**91**	**100.0**	**0**	**0.0**	**3**	**100.0**	**429**	**100.0**

Table 39.13. Vessel form by ware for LA 85861 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	3	0.8	7	7.6	0	0.0	0	0.0	10	2.3
Bowl rim	0	0.0	15	16.4	0	0.0	0	0.0	15	3.5

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Bowl body	0	0.0	69	75.8	0	0.0	0	0.0	69	16.0
Jar neck	36	10.4	0	0.0	0	0.0	0	0.0	36	8.3
Jar rim	23	6.6	0	0.0	0	0.0	0	0.0	23	5.3
Jar body	283	82.0	0	0.0	0	0.0	3	100.0	286	66.6
Total	**345**	**100.0**	**91**	**100.0**	**0**	**0.0**	**3**	**100.0**	**429**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 108 artifacts were analyzed from LA 85861, consisting of two cores, 79 pieces of debitage, 10 retouched tools, 14 ground stone artifacts, and three hammerstones. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 39.14 presents the data on lithic artifact type by material type. The debitage is primarily made of chalcedony, with less Pedernal chert, obsidian, and other materials. The presence of cortex on 10.1 percent of the debitage indicates that these materials were collected from waterworn (n = 7) and nodule (n = 1) sources. The chalcedony, Pedernal chert, and quartzite are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 39.14. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Other	Total
Cores	Core	0	0	0	0	0	0	1	0	0	1	0	0	0	2
	Subtotal	0	0	0	0	0	0	1	0	0	1	0	0	0	2
Debitage	Angular debris	1	0	0	0	0	0	1	8	0	3	0	0	0	13
	Core flake	0	0	1	0	0	0	4	24	0	17	0	1	0	47
	Biface flake	0	0	0	0	0	0	9	3	0	2	0	0	0	14
	Microdeb.	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Und. flake	0	0	0	0	0	0	1	3	0	0	0	0	0	4
	Subtotal	1	0	1	0	0	0	15	39	0	22	0	1	0	79
Retouched Tools	Retouched piece	0	0	0	0	1	0	0	1	0	2	0	1	0	5
	Biface	0	0	0	0	0	0	3	0	0	0	0	0	0	3
	Uniface	0	0	0	0	0	0	1	0	0	1	0	0	0	2
	Subtotal	0	0	0	0	1	0	4	1	0	3	0	1	0	10

Artifact Type		**Material Type**													
		Basalt	**Vesic. Basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Sil. Wood**	**Quartzite**	**Other**	**Total**
Ground Stone	One-hand mano	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Und. mano fragment	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Und. metate fragment	0	0	0	0	4	0	0	0	0	0	0	0	0	4
	Polishing stone	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	Grooved abrader	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Hoe	0	0	0	0	2	0	0	0	0	0	0	0	0	2
	Und. ground stone	0	0	0	0	3	1	0	0	0	0	0	0	0	4
	Subtotal	1	0	0	0	10	2	0	0	0	0	0	0	0	14
Other	Hammer stone	0	0	0	0	0	0	0	3	0	0	0	1	0	3
	Subtotal	0	0	0	0	0	0	0	3	0	0	0	0	0	3
Total		**2**	**0**	**1**	**0**	**11**	**2**	**20**	**43**	**0**	**26**	**0**	**3**	**0**	**108**

Nine pieces of obsidian debitage, an obsidian biface, and a single basalt flake were submitted for X-ray fluorescence analysis. The obsidian artifacts are mostly made from Valle Grande obsidian, however, two artifacts are made of Cerro Toledo obsidian (Table 39.15). The Valle Grande (Cerro del Medio) and Cerro Toledo (Obsidian Ridge/Rabbit Mountain) source areas are located about 17 km (11 m) and 19 km (12 mi) to the west and southwest. Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present on the mesa as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval. The single basalt flake is actually dacite derived from a local source.

Table 39.15. Obsidian source samples.

FS #	Artifact	Color	Source
1	Debitage	Translucent	Valle Grande rhyolite
3	Debitage	Translucent	Valle Grande rhyolite
5	Biface	Translucent	Valle Grande rhyolite
8	Debitage	Translucent	Valle Grande rhyolite
59	Debitage	Translucent	Cerro Toledo rhyolite
78	Debitage	Translucent	Valle Grande rhyolite
79	Debitage	Translucent	Cerro Toledo rhyolite
87	Debitage	Translucent	Valle Grande rhyolite
175	Debitage	Translucent	Valle Grande rhyolite

FS #	Artifact	Color	Source
225	Debitage	Translucent	Valle Grande rhyolite

Lithic Reduction

The cores were reduced using a bidirectional, bifacial, and 90 degrees reduction technique (Figure 39.6). They were classified as still useable and discarded due to extensive hinging/stepping. Table 39.16 presents the metric information on the cores.

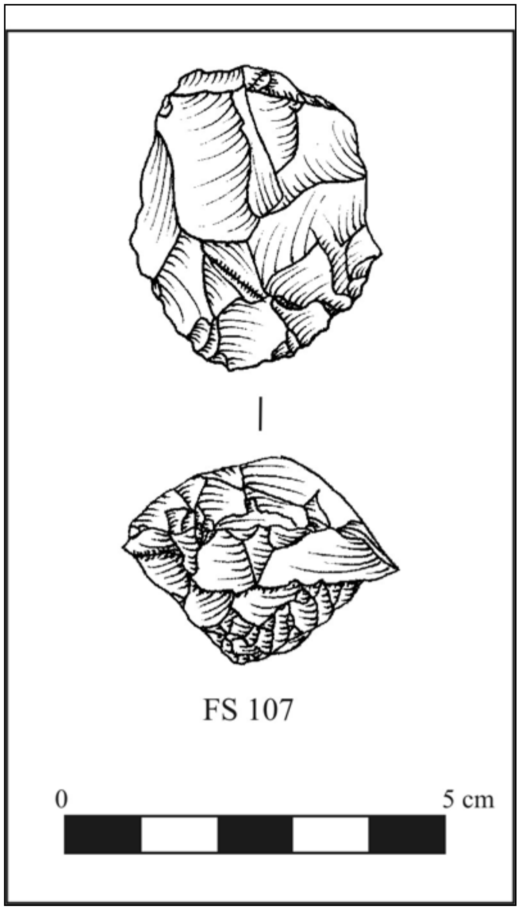

Figure 39.6. Bifacial core.

Table 39.16. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Bi-directional	41	52	95	196.7
Bi-directional	42	35	26	30.1

The debitage consists of core flakes, with fewer biface flakes, angular debris and other items. The overall cortical:non-cortical ratio of 0.14 reflects a slight emphasis on the later stages of core reduction and biface production/maintenance. The flakes mostly have single-faceted platforms (*n* = 19), with fewer cortical (n = 1), multi-faceted (n = 1), collapsed (*n* = 5), and crushed (*n* = 8) platforms. Four of the platforms exhibit obvious evidence of preparation by abrading/crushing. The majority of the core flakes are whole (*n* = 20), with fewer proximal (*n* = 6), midsection (*n* = 3), and distal (*n* = 18) fragments. Most of the biface flakes are also whole (*n* = 7), with fewer proximal (*n* = 1), midsection (*n* = 2), and distal (*n* = 4) fragments. The whole core flakes have a mean length of 20.2 mm (*std* = 8.9), the biface flakes a mean length of 28.7 mm (*std* = 7.6), and the angular debris a mean weight of 4.0 g (*std* = 5.7).

The retouched tools consist of retouched pieces, bifaces, and unifaces (Figure 39.7). The retouched pieces can be differentiated between small and large retouched flakes. The small flakes include a fragment with unidirectional dorsal retouch along two edges that produces a slight project where the edges intersect. Another retouched piece is a wedge-shaped flake fragment that also exhibits unidirectional dorsal retouch along a lateral edge. The three large flakes are made of dacite, chalcedony, and quartzite and exhibit marginal unidirectional dorsal or ventral retouch along their lateral sides or ends with edge angles of 65 to 75 degrees.

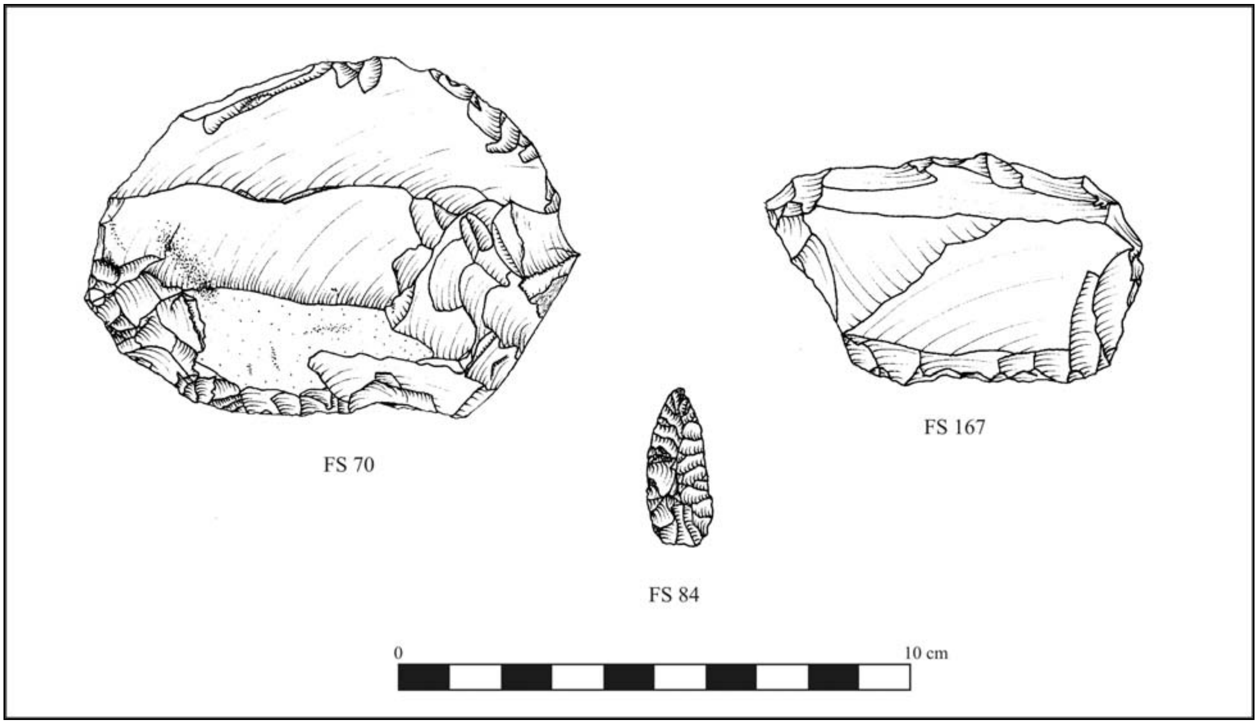

Figure 39.7. Retouched flake, biface, and uniface from LA 85861.

The bifaces include a whole lanceolate-shaped late-stage biface. This item presumably represents a preform with a thickness of 5 mm and edge angle of 50 degrees. The other biface is a distal fragment. The unifaces are flakes with unidirectional dorsal retouch along most of their perimeters, with steep edge angles of 70 and 75 degrees. One has a slightly denticulated edge that could represent both a scraper and graving tool.

Tool Use

A single flake exhibits evidence of edge damage that could be attributed to use. This flake has some rounding and microscarring on its lateral edge with an edge angle of 55 degrees. Three of the five retouched pieces exhibit some round, polish, or microscarring that could be attributed to use and both unifaces also exhibit use-wear consisting of microscarring.

The ground stone includes manos, a metate, a polishing stone, a grooved abrader, and a hoe (Figure 39.8).

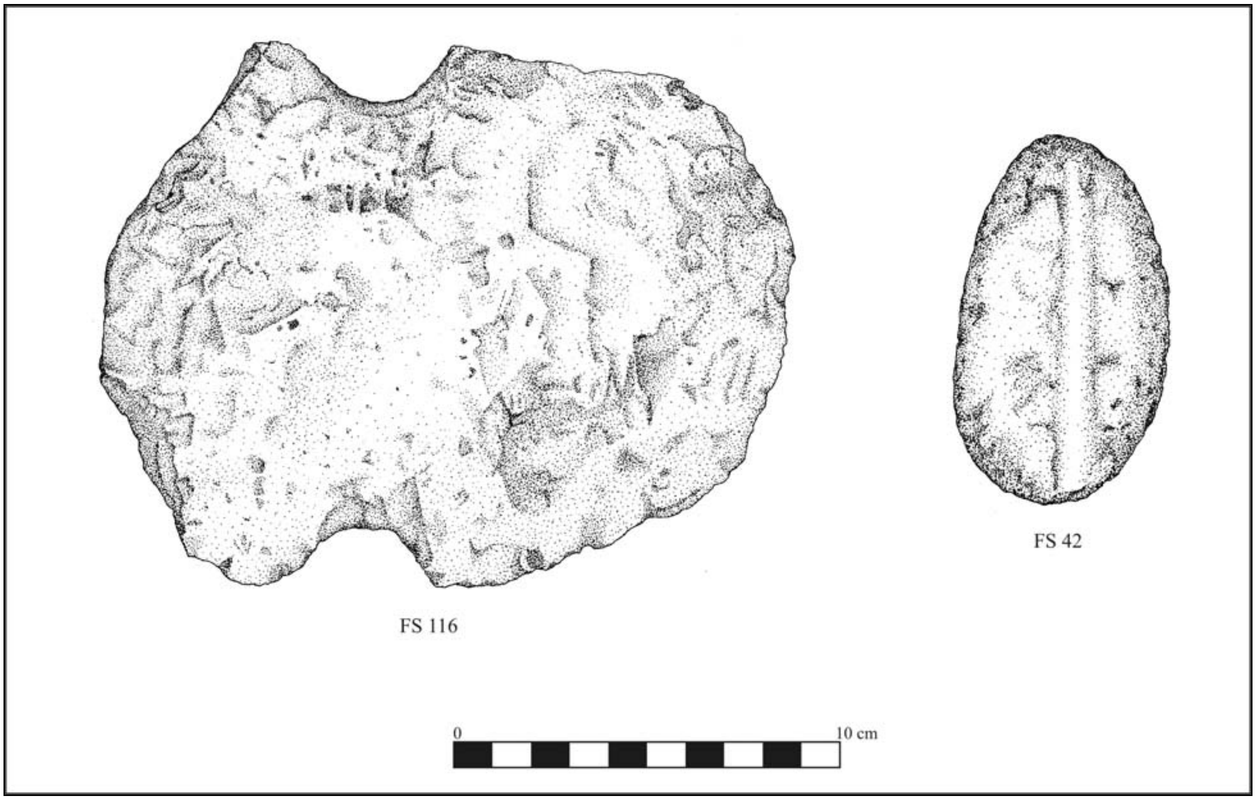

Figure 39.8. Hoe and grooved abrader from LA 85861.

The manos consist of a one-hand cobble with two opposing ground surfaces and a cobble fragment with a single ground surface. The metate is a large piece of dacite with a single flat ground surface. This item could represent a millingstone. The polishing stone is a small basalt pebble that is highly polished and exhibits multiple striations. The grooved abrader is a tuff cobble with a ground central groove**.** The hoe is a large thin piece of basalt that has been notched along both sides for hafting and the bit has been slightly shaped into a convex outline. It seems more likely that the artifact represents a hoe rather than an axe because it does not exhibit scarring along the edge, but polish on the high spots of both opposing blade surfaces. The undetermined ground stone consists of a dacite cobble fragment with a single ground surface and battered end. It could represent a mano that was also used as a hammerstone. The second ground stone item is a tuff slab fragment with a flat ground surface that could be part of a metate.

Lastly, the other two fragments are pieces of dacite that refit and have a single slightly concave grinding surface.

Faunal Remains (Kari Schmidt)

Five pieces of bone were recovered during excavations of this Late Coalition/Early Classic period fieldhouse. One piece of bone was recovered from Stratum 2 (post-occupational fill). This bone was identified as an unidentified mule deer (*Odocoileus hemionus*) second phalanx. The remaining four bones were recovered from the hearth (Feature 1, Stratum 4) and included a leporid molar and small-sized, small/medium-sized, and medium/large-sized mammal long bone fragments. None of the remains were burned. The medium/large-sized mammal long bone fragment was manufactured into an awl fragment.

Archaeobotanical Remains (Pamela McBride)

Although lacking the diversity of some of the other Rendija Canyon fieldhouses, the hearth in this fieldhouse contained beeweed seeds. A cheno-am seed fragment, a mint family seed, and unidentifiable plant part fragment, piñon needles, and two maize cupules comprise the balance of the cultural plant material recovered (Table 39.17). Unburned piñon needles were the only modern plant parts present. Small quantities of pine, piñon, ponderosa pine, and unknown conifer charcoal were also identified (Table 39.18).

Table 39.17. Flotation plant remains, count, and abundance from Feature 1 (hearth).

FS No.	191	192	193	194
Cultural				
Annuals				
Beeweed	3(3), 2(2) pc	6(5)		
Cheno-Am		1(0)		
Cultivars				
Maize			2(2) c	
Other				
cf. Mint family		1(1)		
Unidentifiable	1(0) pp			
Perennials				
Piñon				needle +
Non-Cultural				
Perennials				
Piñon				needle +

+ 1-10/liter, c cupule, cf. compares favorably, pc partially charred, pp plant part.

Table 39.18. Wood charcoal taxa by count and weight in grams from Feature 1 (hearth).

FS No.	**191**	**192**	**193**	**194**
Conifers				
Pine		2/<0.1 g		
Piñon	1/<0.1 g		1/<0.1 g	
Ponderosa pine				1/<0.1 g
Unknown conifer	2/<0.1 g	2/<0.1 g		
Totals	**3/<0.1 g**	**4/<0.1 g**	**1/<0.1 g**	**1/<0.1 g**

Pollen Remains (Susan Smith)

Three pollen samples were analyzed from LA 85861. Table 39.19 lists the frequency of identified pollen types. Maize was the only cultigen identified in the botanical assemblage and was found in only one sample. Beeweed, which is also an economic resource, was identified in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 39.19), and these are discussed in detail in Smith's chapter in Volume 3.

Table 39.19. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85861 (*n* = 3)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	1
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 85861 (*n* = 3)**
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	1
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	1
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	3
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	3
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	3
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	2
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85861 (*n* = 3)
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	1
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	2
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	1
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	0
	Abies	Fir	0
	Pinus	Pine	2
		Pine Aggregates	0
	Pinus edulis type	Piñon	3
	Juniperus	Juniper	2
		Juniper Aggregates	0
	Quercus	Oak	1
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	0
	Artemisia	Sagebrush	3
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 85861 is a small one-room Late Coalition period fieldhouse that was constructed from both shaped and unshaped tuff blocks. The site is situated on the mesa above Rendija Canyon near LA 85417 (another Coalition period fieldhouse). One feature, a small hearth, was identified at the site. The presence of maize cupules and pollen indicates that the one-room structure may have been occupied during the growing season. Unlike most the fieldhouses which emphasize core reduction activities, this site also included evidence of biface production/maintenance.

CHAPTER 40
RENDIJA TRACT (A-14): LA 85864

Steven R. Hoagland

INTRODUCTION

LA 85864 is a tipi or wickiup ring situated on the tip of a ridge finger situated between two 2- to 3-m-deep, narrow arroyos. The site is located at an elevation of 2127 m (6980 ft) in an area dominated by piñon-juniper woodland. The site has been severely impacted by erosion with the east side and most of the north side tipi ring rocks apparently having washed down into the adjacent arroyos. The north side arroyo, which has a 30-degree side slope, has cut into the tipi ring, and the south-side arroyo is located from 2 to 3 m south of the tipi ring. Most of the remaining site surface slopes down toward the south-side arroyo. This southern slope is subject to sheet washing. The two arroyos intersect approximately 12 m east of the site. The extensive erosion along the northern and eastern sides of the site is estimated to have washed away about 40 percent of the rock ring. The site has also been impacted by five trees growing in the northern half of the tipi ring.

PREVIOUS INVESTIGATIONS

The site was originally documented in 1991 for the Bason Land Exchange Project as a curvilinear alignment of large rocks spaced between 0.4 and 0.75 m apart (Hill 1991). The rocks that originally formed the eastern half of the tipi ring had eroded down into the site-cutting arroyos before its recordation. The original tipi ring was assumed to have measured 4.5 m in diameter. Two sherds were found near the structure; one was located in the arroyo south of the cobble ring and the other located on the ridge approximately 8 m west of the tipi ring. One sherd had a micaceous black paste and the other had a gray paste and tuff temper. A chalcedony core was also observed near the structure. A rhyolitic tuff slab with a grounded surface was located 20 m east of the structure.

A 1- by 1-m test unit (Unit A) and two shovel tests were excavated in 1992 during testing conducted for the Bason Land Exchange Project (Peterson and Nightengale 1993). Unit A, which was placed within the rock ring, was excavated to a depth of 22 cm. The southwest quadrant of a hearth was exposed at a depth of 16 cm. The hearth was represented by a concentration of ash and charcoal with burned clay beneath. It appeared that the hearth was built on the ground surface with no pit or enclosing rock ring. Charcoal submitted for radiocarbon analysis was dated to 130±60 BP (AD 1820/AD 1740 to 1900). Five small unidentified pieces of burned bone were recovered from a flotation soil sample collected from the hearth. No cultural materials were located in the shovel tests that were placed just beyond the tipi ring rocks to the west and south.

During site testing, four surface artifacts were observed and collected (Peterson and Nightengale 1993). The sherds included a Biscuit A decorated sherd and two utilitywares (one broken into two pieces). One of the utilityware ceramics was a smeared-indented sherd. The remaining artifact was a chalcedony core/chopper. With the exception of the Biscuit A sherd, these artifacts were found in eroded areas of the site.

Before the 2003 excavations, the site consisted of a semi-circular alignment of 11 dacite rocks spaced from 0.1 to 1.7 m apart. The rocks that appeared to form the western half of a tipi ring ranged from about 15 to 40 cm in diameter. Based on the location of the existing rocks, the tipi ring would have been 4.5 to 5 m in diameter.

FIELD METHODS

Fieldwork at LA 85864 began on December 8, 2003, with an initial assessment of the site. The crew, which initially consisted of Steve Hoagland, Bettina Kuru'es, Michael Kennedy, Mark Hungerford, and Aaron Gonzales, walked over the site area and delineated the site boundary. As the fieldwork progressed, Alan Madsen, Greg Lockard, and Mia Jonsson aided in the excavations. The assessment consisted of the crew systematically walking the site at 2- to 3-m intervals. No surface artifacts were located close to the tipi ring.

After the site assessment was completed, the main site datum (Datum A) and baselines for a 1- by 1-m grid system were established. The datum was placed 2 m west of the western edge of the tipi ring on top of the ridge finger. It was designated as grid point 100N/100E and assigned an elevation of 8.0 m. One-hundred-meter tapes were used to set up the grid system. The southwest corner intersection of each grid unit determined its coordinates. Before initiation of the site excavation, the grid system was used to complete a comprehensive metal detector survey of the site (see Appendix N for results).

The site excavation involved the hand excavation of 1- by 1-m grid units. This technique was used to define the extent, depth, and character of the subsurface deposits. Grid level excavation designations started with zero at the surface, then from 1-n from the top to bottom of each grid unit (regardless of whether the level was natural or arbitrary). The excavation was conducted using shovels and hand trowels. With the exception of pollen, soil, and macrobotanical samples, all hand-excavated materials were screened through 1/8-in. mesh screens. All collected materials were documented within a Field Specimen (FS) Catalog form.

A Grid Level Excavation Form was completed for each completed excavation level. Documented information included the depth of the excavation level, description of the sediment matrix, recovered cultural materials, and the nature and reason for samples collected. Pollen and flotation samples were collected from selected strata. Macrobotanical samples were also collected from the site.

Grids were excavated by natural stratigraphic units. Those units thicker than 10 cm were excavated in arbitrary 10-cm levels. A stratum was defined as a distinct depositional unit. To facilitate vertical control, subdata containing the same 8-m elevation as Datum A were established close to the excavation units. Grid levels were measured from the datum or subdata using string and line levels. An assessment for geomorphic context and integrity was conducted by Steve Reneau and Paul Drakos, and results can be found in Chapter 57 in Volume 3.

An overall site map was assembled during the course of excavation (Figure 40.1). It depicted the site boundary, site datum, subdata, and excavation units. The site map was created with 100-m tapes. The site and components that make up the sites were photographed with a color digital camera and a 35-mm camera with black-and-white film (ASA 100).

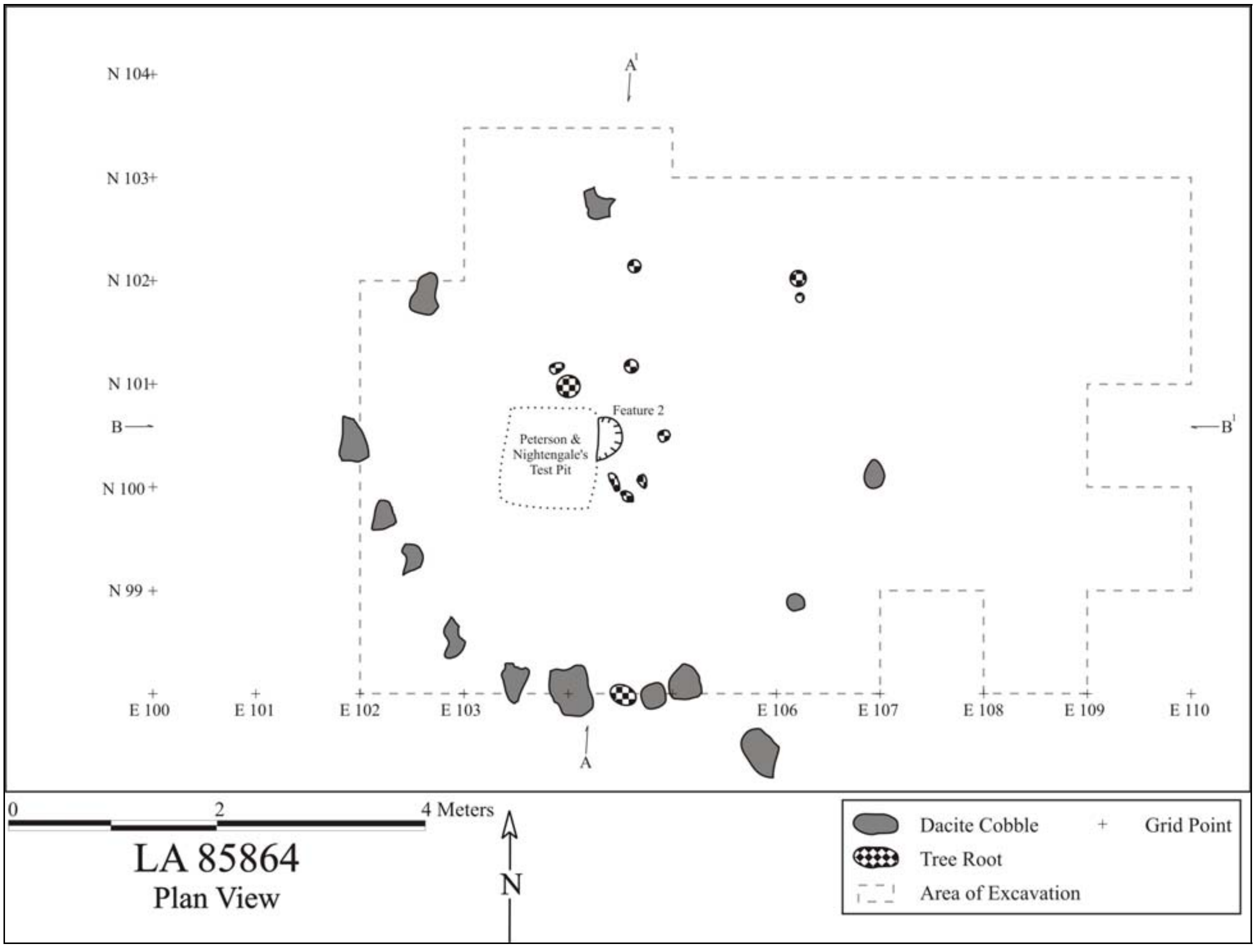

Figure 40.1. Post-excavation plan view of the structure at LA 85864.

STRATIGRAPHY

LA 85864 is situated on a preserved valley bottom remnant between two 2- to 3-m-deep southeast-sloping gullies. The soil at the site includes a 1- to 18-cm-thick A horizon overlying a 10-plus-cm-thick Ab1 horizon. The tipi ring rocks are set on top of or slightly within the Ab1 horizon. No distinct occupational surface was encountered during the excavation, however, based on the stratigraphy, it was likely established on top of the Ab1 horizon. The A horizon post-dates construction of the tipi ring.

The A horizon soil is a loose to lightly compact sandy to silty loam (10YR 4/4) that was divided into and excavated in two distinct stratums. Stratum 1 was the upper loose surface component that contained varying amounts of duff. Stratum 2 was the lightly compacted lower A horizon component that ranged in thickness from 0 to 15 cm. The compaction of Stratum 2 increases slightly with depth. The areas of greater A horizon thickness were located adjacent to trees growing out of the center of the tipi ring. The trees tended to minimize erosion and stabilize the adjacent soil. A few small pockets of A horizon soil containing from 10 percent to 40 percent pumice gravels were noted along the south side of the block excavation.

The Ab1 horizon (Stratum 4) is a fairly compact and often friable silty clay loam (10YR3/4). The Ab1 soil texture became friable where it had apparently been impacted by water erosion. The horizon boundary between A and Ab1 is abrupt and smooth within the west-central portion of the excavation (in the vicinity of the tree cover) and patchy elsewhere. The patchy nature of the deposit suggests that post-occupational erosion cut into and around sections of the Ab1 deposit with A horizon soils filling the resulting voids. As a result, the remaining Ab1 deposits extend up into the lower portion of the A horizon. The abrupt horizon boundary noted in the west-central portion of the tipi ring suggests that the horizon surface was subject to erosion before the occupational episode. Stratum 3 was the charcoal and ash fill located in the remainder of the hearth that was partially excavated in 1992 during the Bason Land Exchange Project. Table 40.1 summarizes the stratigraphic blocks that were excavated at LA 85864.

Table 40.1. Stratigraphic summary for LA 85864.

Prov	Strat	Hori-zon	Texture	Munsell Color	Thickness	Description
Area 1	1	A	Sandy to silty loam	10YR4/4	1 to 5 cm	Post-occupation late-Holocene loose surface deposit with pea-sized pumice gravels (10% to 40%), increasing in content toward the eastern end of the ridge finger. Surface and upper few cm contained varying amounts of duff.

Prov	Strat	Hori-zon	Texture	Munsell Color	Thickness	Description
	2	A	Lightly compact sandy to silty loam	10YR4/4	0 to 15 cm	Late-Holocene soft to slightly hard deposit with pea-sized pumice gravels (20% to 30%), increasing in content toward the eastern end of the ridge finger. Compaction increased slightly with depth. A few flecks of charcoal presumably associated with the site hearth were scattered throughout the deposit. Stratum 2 has been removed through erosion along the northern edge of the site. Other than degree of compaction, stratum is extremely similar to Stratum 1.
	3	Hearth deposit	Slightly compact ash and charcoal deposit	7.5YR3/4	1 to 5 cm	Charcoal and ash mix concentrated within a 40- by 25-cm basin-shaped area. Western third of hearth previously removed during testing phase.
	4	Ab1	Compact silty clay loam	10YR6/3	1 to 8+ cm	Pre-occupation late-Holocene deposit. The boundary between Strata 2 and 4 is abrupt and smooth, suggesting that erosion occurred between depositional episodes.

SITE EXCAVATION

The excavation at LA 85864 was initiated along the south and west edges of the tipi ring, which was the area that appeared to have minimal erosional damage. It was anticipated that the outlining tipi ring rocks could be used as an aid in locating an associated occupational surface. The excavation revealed that the majority of outlining rocks had been set on the top of the Ab1 soil horizon; however, no occupational surface was encountered. As a result, unit 100N/104E, which contained the remaining portion of the test phase that encountered hearth, was excavated to determine its relationship to the soil deposition and to ascertain whether an occupation surface was associated.

Remnants of the hearth were encountered at the interface of the A and Ab1 soil horizon, although the hearth was not clearly defined until 1 to 2 cm of the upper Ab1 soil were removed (Figure 40.2). Post-occupational erosion apparently impacted the upper level of the hearth. The top of the hearth was situated at a depth of 17 to 19 cm below the surface with charcoal flecking first noted at a depth of 14 cm below the surface. Concentrated charcoal flecking extended out into a 70-cm-diameter area surrounding the hearth. A few small charcoal chunks and flecks were also noted sporadically throughout the excavation, suggesting that erosion spread some of the upper hearth remains after the site was abandoned.

The hearth was evidenced by a 40- by 25-cm area with a 1- to 5-cm-deep deposit of charcoal and ash (Figure 40.3). Before the testing phase excavation, the hearth would have been approximately 40 cm in diameter. The shape and the fact that the charcoal and ash extended down into the pre-occupational Ab1 soil horizon indicated that the hearth was situated within a shallow basin that would have been scooped out during construction. The surface sediment of the basin exhibited alteration due to a significant amount of heat with the clay content having been partially oxidized (Figure 40.4).

Figure 40.2. Feature 2 (hearth) exposed with 1993 test pit located directed to the west.

Up to 6 cm of Ab1 soil was excavated from within and around unit 100N/104E to explore for an occupation surface associated with the hearth. The Stratum 4 excavations indicated that the soil within the Ab1 horizon was culturally sterile. As both the outlining rocks and the hearth appeared to have been situated on top of the Ab1 soil horizon, it was assumed to be the occupational surface associated with the tipi ring. However, no evidence of cultural modification or use was encountered to support this assumption. The excavation was then continued to the north and south with the remaining units terminated at the A/Ab1 soil horizon. The continued excavation resulted in the exploration of most of the grid units in a 5- by 8-m area situated around the tipi ring (Figure 40.5). The excavation extended to the east about 3 m beyond the assumed eastern edge of the rock ring and continued to the north to include about 1 to 1.5 m of the drainage slope that has cut into the site to check for eroding cultural materials (Figure 40.6). A compact lens of A horizon soil was situated directly above the Ab1 soil horizon in the excavated units located to the west and immediately north of the hearth (Figure 40.7). It was also speculated that this lens was the occupation surface associated with the tipi ring. However, as with the top of the Ab1 horizon, no evidence of cultural modification or use was encountered. The Ab1 soil situated in the eastern half of the excavation became friable and softer, suggesting that the area was affected by water erosion (Figure 40.8). The east-side excavation resulted in the uncovering of two previously buried dacite cobbles that appear to extend the circular cobble alignment out to form the southeastern section of the tipi ring.

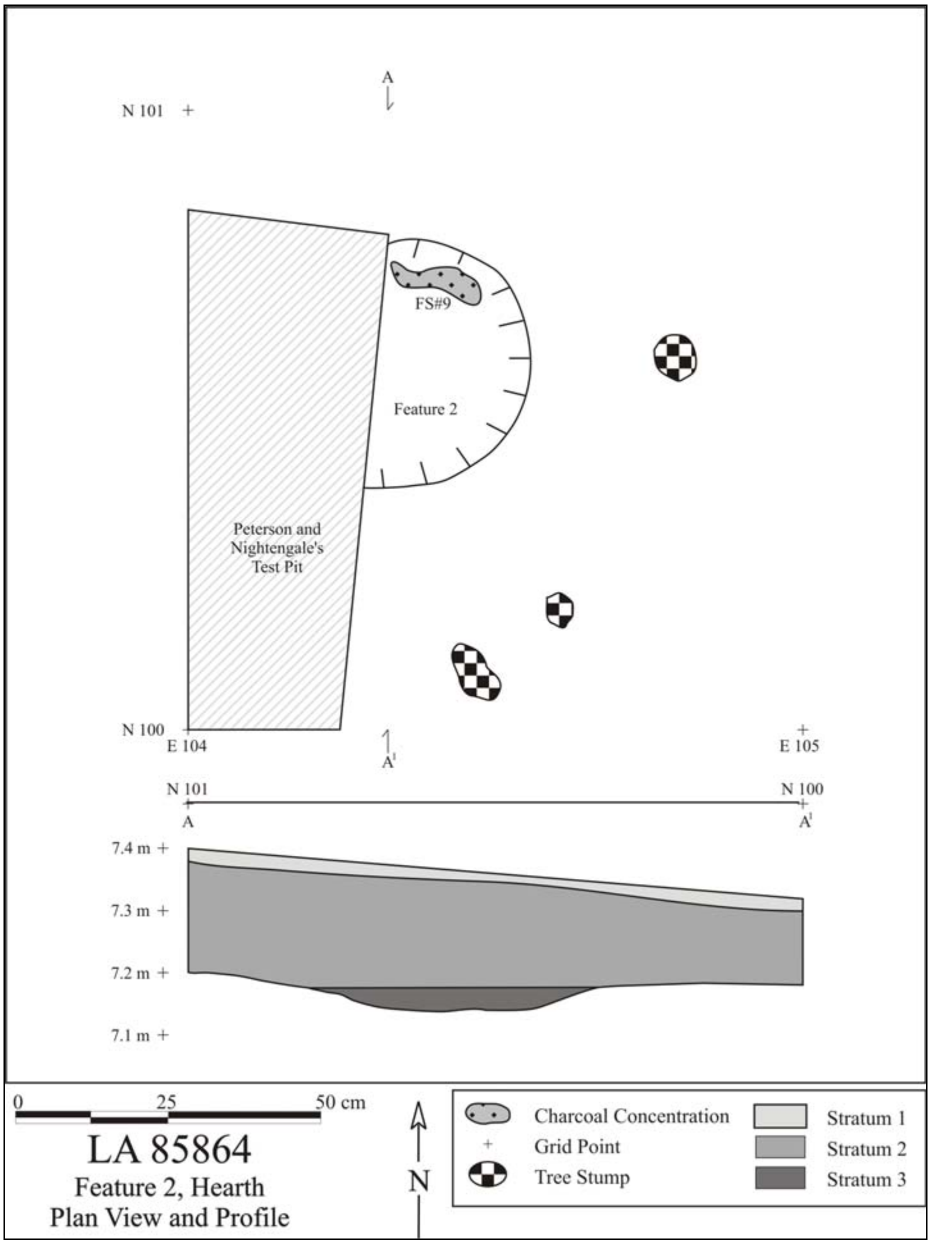

Figure 40.3. Feature 2 plan view and profile.

Figure 40.4. Post-excavation photo of the hearth excavated in the tipi ring at LA 85864.

Figure 40.5. Post-excavation photo of LA 85864 looking east.

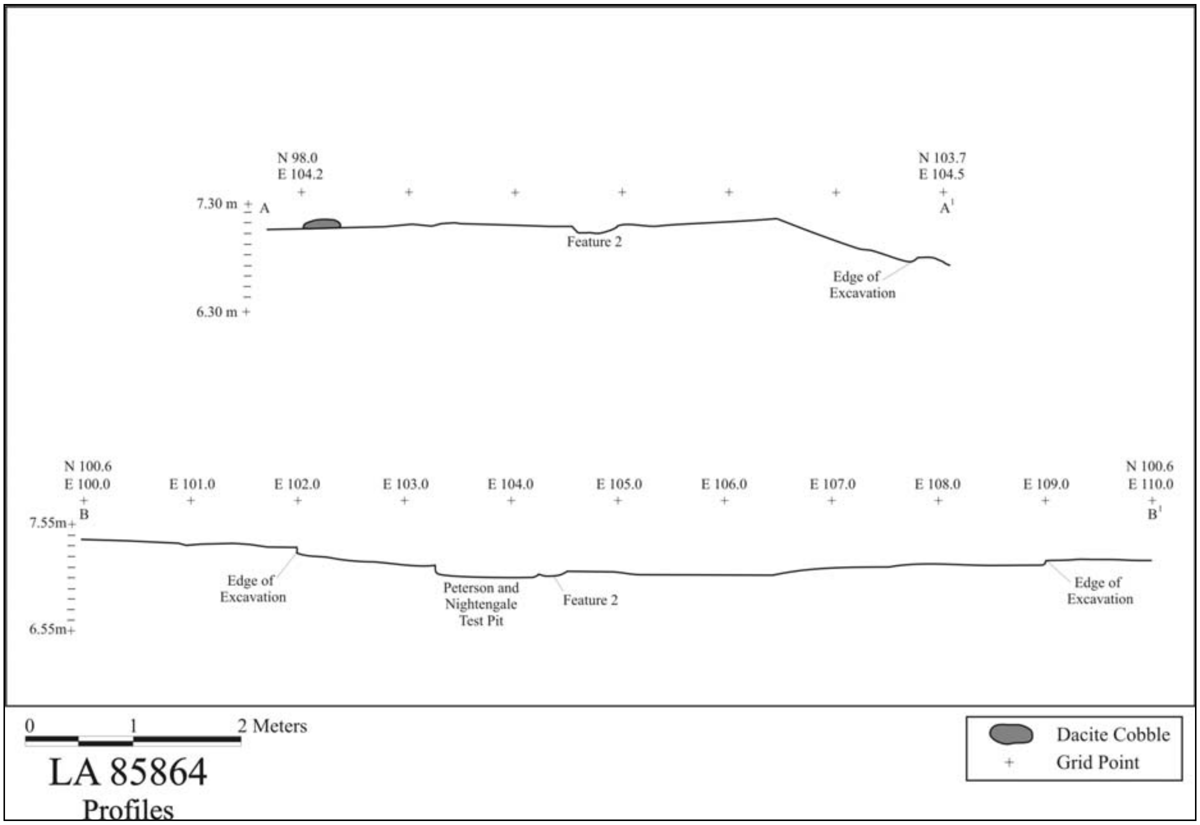

Figure 40.6. LA 85864 site excavation surface profiles.

Only six artifacts were recovered from the excavation phase at LA 85864. These included two ceramics and four heavily burned and unidentified pieces of bone (FS 11) that were recovered from the hearth. A smeared-indented corrugated utilityware sherd (FS 1) was collected from the surface of unit 97N/95E, which is located about 9 m west-southwest of the southwestern outer edge of the tipi ring. The other ceramic was a Santa Fe Black-on-white sherd (FS 16) located in Stratum 2 of 100N/102E, which would be about 1 to 2 m west of the hearth. Stratum 2 in this area was situated between 1 and 3 cm below the surface and was from 2 to 7 cm thick. No metallic artifacts were recovered. The only other potential cultural item recovered during the excavation was a badly eroded possible wheat seed recovered from a flotation sample collected from the hearth (FS 10). Table 40.2 lists the artifacts by stratum.

Table 40.2. Artifact count by stratum.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	1	0	0	0	1
1	0	0	0	0	0
2	1	0	0	0	1
3	0	0	0	4	4
4	0	0	0	0	0
Total	**2**	**0**	**0**	**4**	**6**

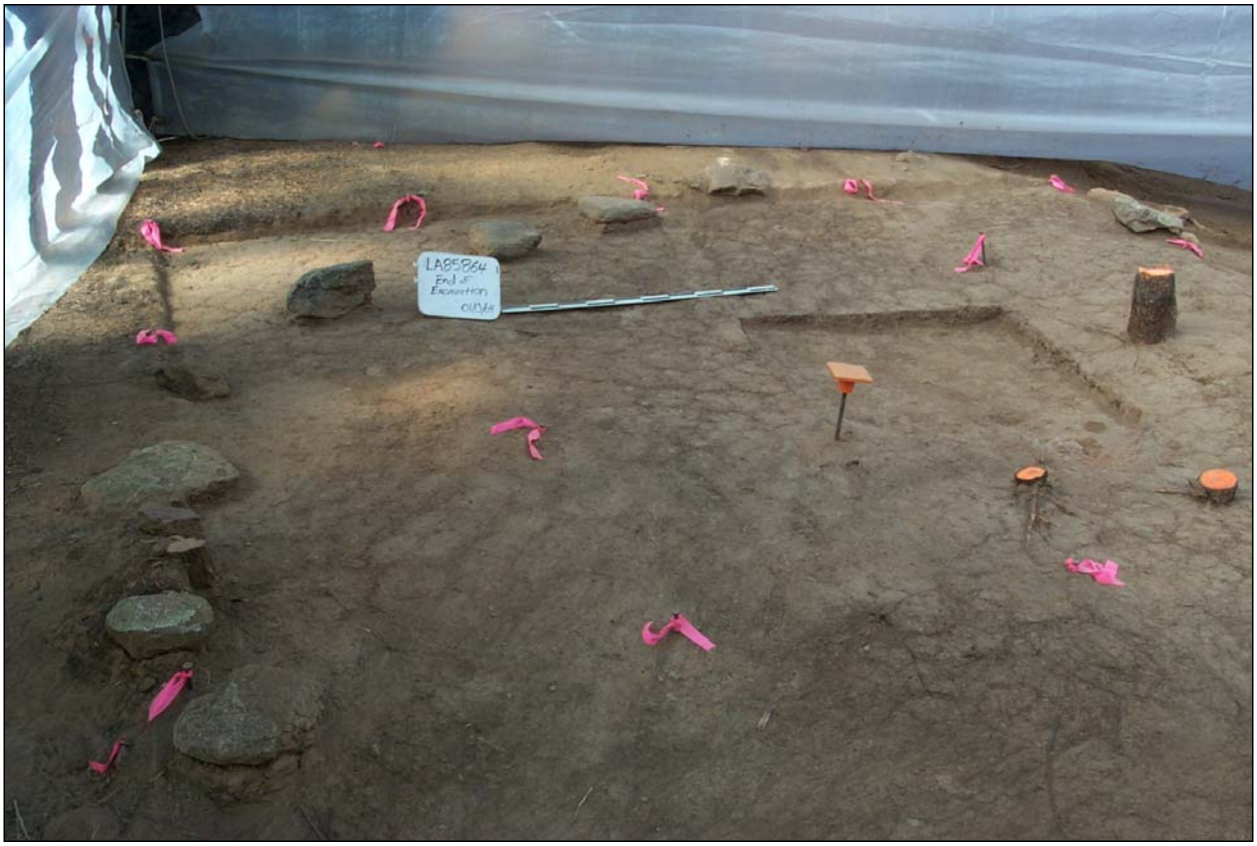

Figure 40.7. Post-excavation photo of the western end of LA 85864.

Other than rocks forming the tipi ring, the fairly well-preserved hearth at the center of the rock ring, the sherd situated in Stratum 2 of 100N/102E, and the four burned bone fragments recovered from the hearth, no cultural materials were encountered during the excavation. The lack of cultural materials is likely due to the extensive erosion that has impacted the site. Several small juniper trees in the vicinity of the hearth have reduced the amount of erosion in the immediate vicinity and upslope to the north and west. Although erosional activity could explain the lack of cultural materials from the southern and eastern portions of the tipi, the area to the west and within 1.5 m to the north of the hearth retain two surfaces that could be associated with the occupation. One potential occupation surface is the compact A horizon lens situated directly on top the Ab1 soil horizon that also could have been the occupation associated surface. As the soil deposition in this area appears to be intact, it seems likely that cultural materials located within the area would still be present if they were ever deposited. It therefore is speculated that the site represents a very short occupation from which very few cultural materials were discarded or lost.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of five artifacts (ceramics) were analyzed from the excavations conducted at LA 85864. In addition, flotation, and pollen samples were selected for analysis from Strata 2 and 3 (Table

40.3). Charcoal was submitted for radiocarbon dating from Stratum 3 and an archaeomagnetic sample was taken from the hearth (Feature 2). The results of the artifact and sample analyses are presented in the following sections.

Figure 40.8. Post-excavation photo of the eastern end of LA 85864.

Table 40.3. Samples selected for analysis from LA 85864.

Stratum	Sample Type		
	Flotation	Pollen	Radiocarbon
1			
2	4, 5, 6, 14	3	
3	10	8	10

Chronology

Radiocarbon Dating

A single charcoal (piñon pine) sample was submitted for radiocarbon dating. It yielded several possible intercepts that range from AD 1680 to 1950 (Table 40.4).

Table 40.4. Radiocarbon data from LA 85864.

FS	Laboratory (Beta)#	Conventional radiocarbon age	Intercept of radiocarbon age	Two-sigma calibrated result
10	199371	170±40 BP	AD 1680 AD 1770 AD 1800 AD 1940 AD 1950	AD 1650 to 1890 or AD 1910 to 1950

Archaeomagnetic Dating

A single archaeomagnetic sample was taken from the hearth in the tipi ring. Blinman (see Chapter 66, Volume 3) indicates that the sample likely dates to the late 19th century, although the date estimates provide a range from AD 1730 to the present.

Table 40.5. Archaeomagnetic date for LA 85864.

Sample Number	Feature	VGP Curves and Date Estimates (AD)	
		Wolfman	SWCV2000
1234	Hearth	AD 1600–1820 1730–present	ca. 1675–1840 ca. 1850–present

Ceramic Artifacts (Sunday Eiselt)

The four ceramics collected during the testing and excavation phases were analyzed by Sunday Eiselt. Three of the ceramics were micaceous sherds representing two vessels (one sherd apparently broke into two pieces some time after collection) and one was a Biscuit A body sherd. The two sherds from the same vessel displayed characteristics most similar to a Jicarilla Apache Cimarron Micaceous ceramic dating from AD 1730 to present. The moderate amount of mica along with rosy quartz and magnetite temper indicate a Cordova-Truchas Source District origin for the clay. The exterior and interior sherd surfaces were burnished and compacted, unlike Tewa vessels. The other sherd appeared to be made from alluvial clay containing mica rather than primary micaceous clay. The origin of the clay is unknown, although micaceous clays are present north of Abiquiu. The ethnic affiliation for the ceramic could not be determined.

Although the type identifications are tentative, the three micaceous sherds likely represent Cimarron Micaceous vessels based on paste characteristics and surface finish. The Cordova-Truchas source district was used extensively by the Jicarillas (Eiselt 2006). The vessel surfaces are also highly compacted through burnishing and polishing; traits that are likewise commonly found 19th century Cimarron Micaceous sherds (Eiselt 2005). The Biscuit A sherd and the Santa Fe Black-on-white and smeared-indented corrugated sherds recovered during the excavation may represent earlier activities conducted in the site vicinity.

Faunal Remains (Kari Schmidt)

Four unidentified pieces of bone (FS 11) were recovered from this site. The bones were heavily burned (calcined) and were recovered in Stratum 3 in Feature 2.

Archaeobotanical Remains (Pamela McBride)

The sample from the base of the informal central hearth in the tipi ring produced charred conifer duff (juniper twigs, pine needles, and bark) along with an unusual find: a badly eroded possible wheat caryopsis (or seed). The caryopsis appeared to have two attributes characteristic of wheat: a crease running longitudinally for the length of the grain and the germ. The distal end of the seed was the most eroded and the general condition of the seed led to a tentative identification. As wheat had been around a long time before the occupation of LA 85864, it would not be unusual for it to have been part of the Jicarilla Apache diet. The Mescalero Apache would obtain wheat from raids in Mexico or from early settlers; wheat was planted in sandy loam, harvested by beating it with a stick, and subsequently used to make bread (Castetter and Opler 1936). Aside from wood, the remainder of the archaeobotanical assemblage consisted of unburned goosefoot seeds and burned and unburned conifer duff (Table 40.6).

Table 40.6. Flotation sample plant remains from LA 85864.

FS No.	**4**	**5**	**6**	**10**	**14**
Feature	2 Hearth, strat 2, level 3			2 Hearth, strat 3, level 4	1 Tipi ring
	100.5/104.35	100.65/104.5	100.9/104.4	100.6/104.4	strat 2, lvl 3
Cultural					
Cultigens					
Possible Wheat				1(1)	
Perennials					
Juniper		twig +			
Pine	bark +			bark +	
Ponderosa pine		needle +			
Non-Cultural					
Annuals					
Goosefoot	+				
Perennials					
Juniper	+	twig +		twig +	twig +
Pine	bark +		umbo +		
Piñon	needle +	needle +	needle +	needle +	needle +
Ponderosa pine					needle +

\+ 1-10/liter

Flotation and vegetal sample wood charcoal was primarily piñon, present in 84 percent and 89 percent respectively by weight (Tables 40.7 and 40.8). Juniper, pine, cf. ponderosa pine, and unknown conifer were also recovered. The occupants of LA 85864 were probably incorporating the Old World grain wheat into their diet and burning local conifers for fuel.

Table 40.7. Flotation sample wood charcoal taxa by count and weight in grams from LA 85864.

FS No.	4	5	6	10	Totals	
Feature	2 Hearth, strat 2, level 3			2 Hearth, strat 3, level 4	Weight	%
	100.5/104.35	100.65/104.5	100.9/104.4	100.6/104.4		
Conifers						
Juniper				4/0.2 g	0.2 g	11%
Pine		2/<0.1 g			<0.1 g	<1%
Piñon	20/0.5 g	18/0.5 g	13/0.1 g	14/0.5 g	1.6 g	84%
Unknown conifer			1/<0.1 g	2/0.1 g	0.1 g	5%
Totals	**20/0.5 g**	**18/0.5 g**	**14/0.1 g**	**20/0.8 g**	**1.9 g**	**100%**

Table 40.8. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 85864.

FS No.	7	9	12	Totals	
Feature	1 Tipi ring strat 2, level 3	2 Hearth	2 Hearth	Weight	%
		100.76/104.4 strat 3, level 4	100/104 strat 2, level 3		
Conifers					
Juniper	1/<0.1 g	7/0.5 g		0.5 g	7%
Piñon	10/0.5 g	50/4.8 g	19/1.5 g	6.8 g	89%
cf. Ponderosa pine	3/<0.1 g	4/0.3 g		0.3 g	4%
Totals	**14/0.5 g**	**61/5.6 g**	**19/1.5 g**	**7.6 g**	**100 %**

cf. compares favorably

Pollen Remains (Susan Smith)

Two pollen samples were analyzed from LA 85864. Table 40.9 lists the frequency of identified pollen types. No cultigens were identified in the botanical assemblage. Beeweed and sunflower type were the only other taxa identified as other economic resources in the assemblage. Several other potential economic resources were also identified in the assemblage (Table 40.9), and these are discussed in detail in Smith's chapter in Volume 3 (Chapter 63).

Table 40.9. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85864 (*n* = 2)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	0
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	1
	cf. *Helianthus*	Sunflower type	1
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	2
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	1

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 85864 (*n* = 2)**
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	2
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	2
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	1
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	1
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	0
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	0
	Abies	Fir	1
	Pinus	Pine	2

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85864 (*n* = 2)
		Pine Aggregates	0
	Pinus edulis type	Piñon	2
	Juniperus	Juniper	2
		Juniper Aggregates	0
	Quercus	Oak	2
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	0
	Artemisia	Sagebrush	2
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

The site contained an approximate 5-m-diameter tipi ring that was located on a narrow ridge finger between two deep drainages. The tipi ring had been significantly affected by erosional processes. Other than the rock tipi ring and an associated hearth, one ceramic, four burned bone fragments, and a possible wheat seed were recovered during the excavation. The lack of cultural materials is likely due somewhat to the extensive erosion that has impacted the site with several small juniper trees in the vicinity of the hearth having reduced the amount of erosion in the immediate vicinity. Although erosional activity could explain the lack of cultural materials from the southern and eastern portions of the tipi, the area to the west and within 1.5 m to the north of the hearth retain remnants of two stratigraphic lenses, either one of which may represent the occupation surface. One potential surface is the compact A horizon lens situated directly on top of the truncated Ab1 soil horizon that also could have been the occupation surface. As the soil deposition in this area appears to at least be partially intact, it seems likely that cultural materials located within the area would still be present if they were ever deposited. It is therefore speculated that the site represents a very short occupation from which very few cultural materials were discarded or lost.

Based on the site type, the three micaceous ceramics, and the cultural history of the area, the tipi ring is assessed to be associated with a Jicarilla Apache occupation dating to the 19th century. As wheat had been around a long time before the occupation of LA 85864, it would not be unusual for it to have been part of the Jicarilla Apache diet (Chapter 62, Volume 3).

CHAPTER 41
RENDIJA TRACT (A-14): LA 85867

Gregory D. Lockard

INTRODUCTION

LA 85867 is the remains of a one-room Classic period fieldhouse and several small features located on a south-facing slope on the mesa between Rendija and Guaje canyons. The site is located in the eastern quarter of the Rendija Tract. A two-track dirt road passes through the site. Vegetation consists of piñon-juniper woodland with a grass understory. The site is situated at an elevation of 2114 m (6935 ft).

LA 85867 was first recorded on September 14, 1991, by David Hill (1991) during a survey for the Bason Land Exchange Project. According to Hill, the site consisted of two one-room fieldhouses. The first fieldhouse was located within and adjacent to a modern roadbed. A chalcedony core, two eroded biscuitware sherds, and a micaceous sherd with black paste were the only artifacts observed in the area. The presence of the biscuitware sherds led Hill to tentatively date the site to the Classic period. The second fieldhouse was located 35 m to the northeast of the first. A micaceous sherd with black paste and an eroded whiteware sherd were the only artifacts observed in the area. Hill also noted the presence of two smaller rock concentrations that he interpreted as possible hearths located halfway between the fieldhouses.

On July 20, 1992, Archaeological Research, Inc., was awarded the contract to conduct archaeological testing of the Bason Land Exchange Project sites. John Peterson and Christian Nightengale (1993) supervised the excavations, which took place between July 27 and August 23 of 1992. Three 1- by 1-m test pits (Units A-C) were excavated at LA 85867.

Unit A was placed within the fieldhouse by the road, which was designated Feature 1. A floor was encountered 27 cm below the surface in this unit. The floor was described as "a very hard packed clay surface" (1993:184). Several smeared-indented sherds and two Biscuit A sherds were recovered from the floor surface. A sample of charcoal was taken from the floor and submitted to Beta Analytic for radiocarbon analysis. The sample produced a date of 430 ±60 BP. The excavation of the unit continued below the floor to a maximum depth of 72 cm below the ground surface. No features or artifacts were encountered below the floor.

Unit B was located in one of the small rock concentrations noted by Hill. According to Peterson and Nightengale, the concentration, which they designated Feature 3, was 21 m northwest of Feature 1. The unit was excavated to a maximum depth of 20 cm below the ground surface. The excavation revealed that the rock concentration was a single course of stones, and no cultural materials were recovered. According to Peterson and Nightengale, the only other rock concentration in the area was a recent firepit, which they did not test.

Unit C is located in the remains of the second structure that Hill interpreted as a fieldhouse. The unit was excavated to a maximum depth of 30 cm below the ground surface. No living surface or cultural materials of any kind were encountered. As a result, Peterson and Nightengale suggest that any structural remains that may have existed in this location have been eroded down slope. Due to the fact that they found no cultural materials of any kind in Units B and C, Peterson and Nightengale argue that the research potential of Features 2 and 3 was exhausted by their excavations. As a result, only Peterson and Nightengale's Feature 1, which was re-designated Room 1, was excavated during the Conveyance and Transfer (C&T) Project.

FIELD METHODS

Before excavation, the site and surrounding area were cleared of trees and large undergrowth. Area 1 was then visible as a small rubble mound approximately 4 by 4.5 m in area and approximately 30 cm in height (Figure 41.1). An arbitrary site datum (100N/100E, 10.00 m elevation) was set up in the southwest corner of the area. The area was then covered with a 1- by 1-m grid that extended 6 m north and 5 m east of the site datum. Two subdata (A and B) were set up for taking elevations, and the site was photographed. Artifacts visible on the surface were collected by grid unit, and the location of artifacts outside of the grid was determined with tape measures. A 5- by 1-m east-west trench (103N/100-104E) was initially excavated across the structure in Area 1. The purpose of this trench was to expose a profile of the site stratigraphy, as well as to determine the location of the room's east and west walls. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels.

Figure 41.1. Pre-excavation photograph of LA 85867.

Peterson and Nightengale's Unit A was encountered while excavating the trench. Unit A occupies all but the westernmost 30 cm of unit 103N/102E. It extends eastward approximately 25 cm into unit 103N/103E and northward approximately 5 cm into units 104N/102-103E. The backfill within Unit A, which was excavated to a maximum depth of 72 cm, was removed as a separate stratum (Stratum 3). A poorly preserved living surface was encountered to the east and west of Unit A within the trench. The room's east wall was encountered in unit 103N/103E, and the west wall was encountered along the border between units 103N/100-101E. After the excavation of the trench units, the north profile of the trench was drawn and photographed. The rest of the area was subsequently excavated, again by strata and arbitrary levels for thicker strata.

In all, 23 units were excavated. Within the structure, excavation proceeded down to the living surface encountered while excavating the trench. Outside the structure, excavation proceeded down to the top of the sterile Bw2 horizon. Excavation focused on defining the room's walls, removing wallfall, and locating features. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended at least 1 m to the south, east, and west of the structure to locate external features and/or outdoor activity areas. The excavation area extended to the north of only the eastern half of the structure. The area to the north of the western half of the structure was not excavated because it had been severely impacted by the presence of a two-track dirt road. The structure was then mapped (Figure 41.2) and photographed (Figure 41.3).

The excavation of the site was supervised by Greg Lockard. The field crew included Michael Dilley, Alan Madsen, Brian Harmon, Bettina Kuru'es, Margaret Dew, and Rhonda Robinson. Timothy Martinez and Aaron Gonzalez served as site monitors from San Ildefonso Pueblo and as screeners. Jeremy Yepa was the site monitor representing Santa Clara Pueblo, as well as an additional excavator.

STRATIGRAPHY

Stratum 1 is composed of loose surface sediment. It is uniformly 1 to 6 cm thick across the site and is more or less equivalent to the A horizon (topsoil). Stratum 2 is post-occupational fill and ranges from 3 to 25 cm in thickness. The post-occupational fill was thickest in and around the collapsed walls and thinned away from the walls and towards the center of the room. It was particularly thin (in fact, almost non-existent) in the grid units to the north of Room 1 that are located within and/or near the two-track dirt road. Stratum 2 is more or less equivalent to the Bw1 horizon. Stratum 3 is the backfill removed from Peterson and Nightengale's Unit A. Stratum 3 is therefore a disturbed context. Stratum 4 is the Room 1 living surface. Tables 41.1 through 41.3 summarize and describe the strata that were excavated at LA 85867.

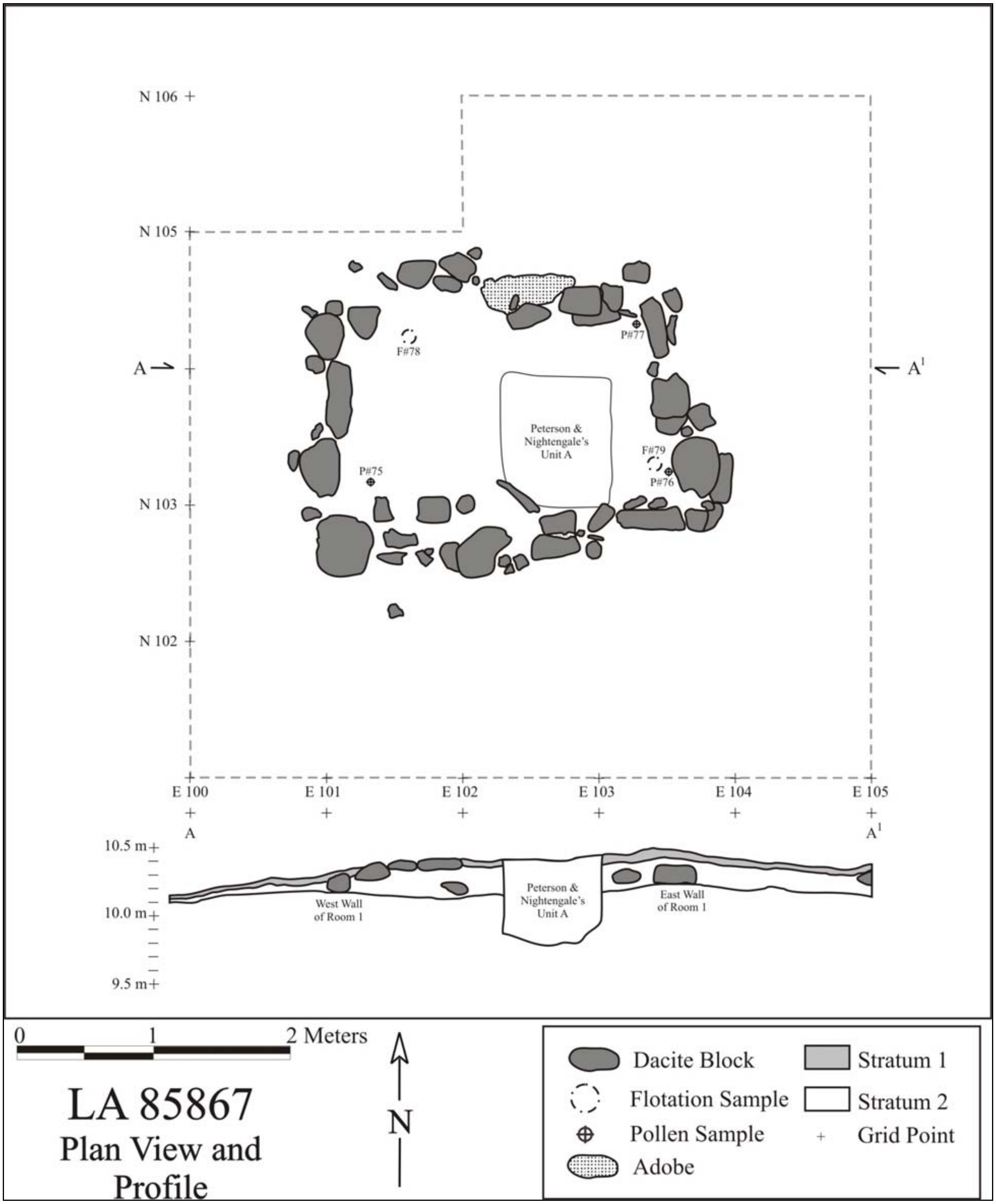

Figure 41.2. Plan view and profile map of LA 85867.

Figure 41.3. Post-excavation photograph of LA 85867.

Table 41.1. LA 85867 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 5/4	Silt loam	1–6	Surface sediment
2	10YR 4/3	Silty clay loam	3–25	Post-occupational fill
3	10YR 4/3	Silty clay loam	60	Back fill from P & N test pit
4	10YR 4/3	Clay loam	-	Room 1 living surface

Table 41.2. LA 85867 soil horizon descriptions from the south profile of Peterson and Nightengale's Unit A (within unit 103N/102E).

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 5/4	Silt loam	0–5	Topsoil
Bw1	10YR 4/3	Silty clay loam	5–25	Late-Holocene soil
Bw2	10YR 4/4	Silty clay loam	25–75	Holocene soil
Bw3	10YR 4/3	Silt loam	75–110+	Holocene soil

Table 41.3. LA 85867 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	1	3	0	0	**4**
1	13	13	0	0	**26**
2	53	37	2	2	**94**
3	0	0	0	0	**0**
4	0	0	0	0	**0**
Total	**67**	**53**	**2**	**2**	**124**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a small rectangular structure that probably functioned as a fieldhouse. The room measures approximately 1.25 m in width (north to south) by 2.27 m in length (east to west), with approximately 2.84 m^2 of interior space. Excavation of the room began with an east-west trench that extended across Area 1 (units 103N/100-104E). The excavation of this trench served to define the room's stratigraphy, as well as to locate the room's east and west walls. Most of Peterson and Nightengale's Unit A was located within the trench (units 103N/102-103E). To the east and west of Unit A, a poorly preserved living surface was encountered. After the excavation of the trench, the rest of the room was excavated down to the living surface. This living surface was slightly burned and thus better preserved in the northwest corner of the room (see below).

Fill. The interior of Room 1 was filled with 1 to 4 cm of surface sediment on top of 15 to 25 cm of post-occupational fill. Flotation (Field Specimen [FS] 3 and FS 26) and pollen (FS 4 and FS 27) samples were taken of the Room 1 fill, but they were not analyzed.

Floor. The Room 1 living surface is a poorly preserved layer of compact, clay-rich sediment. This surface takes the form of a fairly large patch of burned floor in the northwest corner of the room. Even in this location, however, there is no evidence that the floor was plastered. Elsewhere, the living surface is marked by black staining and charcoal inclusions, as well by an absence of rocks. As noted above, Peterson and Nightengale reportedly found a well-preserved clay floor in Unit A, upon which they recovered several sherds, many of which appear to have come from the same vessel (a possible pot drop). The living surface encountered during the C&T Project does not appear to have been as well preserved as that described by Peterson and Nightengale. The living surface, however, is located at about the same depth as the floor reported by Peterson and Nightengale. In addition, several sherds were encountered near Unit A at about the same level. None of these sherds, however, were in direct contact with the living surface. It is possible that the Room 1 living surface was best preserved in the area where Unit A was excavated. Because the excavation of this unit continued well below floor level, nothing remains of the floor described by Peterson and Nightengale.

A pollen sample (FS 66) was taken from below a masonry block that was sitting directly on top of or just above the living surface in the north-central portion of the room. Taxa identified in this sample included maize, beeweed, locoweed, grass family, cheno-ams, sunflower family, ragweed/bursage, chicory tribe, spurge family, evening primrose, unidentified pine, piñon pine, juniper, oak, and sagebrush. Additional pollen samples were scraped from directly on top of the living surface in the southwest (FS 75), southeast (FS 76), and northeast (FS 77) corners of the room. Taxa identified in these samples included prickly pear, cactus family, beeweed, sunflower type, purslane, rose family, buckwheat, mustard family, locoweed, grass family, willow, cheno-ams, sunflower family, globemallow, evening primrose, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush. Flotation samples were taken of the living surface matrix in the northwest (FS 78) and southeast (FS 79) corners of the room. Charred taxa identified in these samples included unknown conifer and ponderosa pine.

Wall Construction. The walls in Room 1 are constructed of dacite cobbles and upright slabs. The rocks that form the foundation of the walls appear to have been placed in a shallow trench excavated into the Bw2 horizon, which is a compact, reddish, clay-rich soil that predates the site's occupation. Some of the foundation stones are upright slabs, and others are cobbles. In some places, the walls are formed by a single row of large dacite cobbles. In other places, the wall is formed by two rows of rocks. When this is the case, one or both of the rocks are usually upright slabs. In the western half of the south wall, there are three rows of rocks. This portion of the wall, however, is probably at least partially disturbed.

The western half of the north wall has been disturbed by the two-track dirt road. Some dacite cobbles were encountered in this area of the site. It is highly unlikely, however, that these rocks are *in situ*. One of these is a thin, flat rock located just east of the northernmost rock in the west wall. This rock appears to have been an upright slab that was pushed over to the south during the grading or subsequent use of the road. If this is the case, the northwest corner of the rock defines the far northwest corner of the room. The other rocks that formed the western half of the north wall appear to have been pushed to the north of their original location. The foundation of the eastern half of the north wall appears to be largely intact. The western half of this section of the wall is formed by a large, linear concentration of compact adobe. This adobe may have been a doorsill. If this is the case, the entryway into Room 1 was located in the center of the north wall. A thin, flat rock was encountered directly south of the adobe. This rock may be an upright slab that was pushed over onto its side. Alternatively, it could be a southward extension of the adobe doorsill.

Judging from the amount of wallfall removed during the excavation of the area in and around Room 1, the masonry portions of the room's walls were originally considerably higher than they were at the time of excavation (Table 41.4). In order to estimate the original height of the walls, all of the rocks removed as wallfall during the site's excavation were placed in three stacks, which were then measured. The stacks measured 1.57 by 1.42 by 0.47 m, 1.93 by 1.05 by 0.53 m, and 1.74 by 1.05 by 0.50 m, for a total of approximately 3.04 m^3 of wallfall. Based on this volume of wallfall and the overall length, average thickness and average height of the extant portions of the walls, the masonry portions of the room's walls were originally approximately 1.63 m high. This is considerably higher than wall heights calculated for other fieldhouses excavated in the Rendija Tract during the C&T Project, excluding those in areas that are naturally rocky. Although at least some of the rocks recovered during the excavation of LA 85867 probably do not represent wallfall, the site does not appear to be located in an area with a lot of naturally occurring rocks. Some of the rocks may have been pushed onto the excavated portion of the site during the grading and/or use of the two-track dirt road. These factors, however, do not appear to fully account for the wall height presented above. The masonry portions of the walls were therefore probably at least a little bit higher than those of the average fieldhouse in the Rendija Tract. The uppermost portions of the walls, as well as the ceiling, were most likely composed of wattle and daub. These materials are rarely preserved at archaeological sites on the Pajarito Plateau. In fact, only two pieces of burned adobe (FS 20 and FS 54) were recovered from the site.

Table 41.4. LA 85867 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	2.22	0.02–0.29	0.14–0.33	1 to 2
South	2.30	0.12–0.27	0.25–0.55	1 to 2
East	1.24	0.15–0.26	0.19–0.40	1
West	~1.25	0.06–0.25	0.17–0.35	1

Geological Analysis

Geologists Paul Drakos and Steven Reneau utilized a single profile to reconstruct the natural soil horizons at the site (see Table 41.2). The profile that they utilized was the south profile of Peterson and Nightengale's Unit B, located in about the same location as the south profile of unit 103N/102E. The profile includes the interior face of the south wall of Room 1, as well as significant sub-floor deposits. The profile contained a soil sequence consisting of an A horizon (topsoil) and three Bw horizons (a late-Holocene soil and two Holocene soils).

Artifact Distribution

The grid units with the highest number of artifacts are those located within and to the east of Room 1 (Table 41.5). The artifacts within Room 1 are concentrated in the western half of the room. This is almost certainly a result of the fact that many of the artifacts in the eastern half of the room were recovered during the excavation of Peterson and Nightengale's Unit A. In fact, 32 sherds (30 smeared-indented and two Biscuit A sherds) were recovered from Unit A. The higher concentration of artifacts to the east of the fieldhouse follows a pattern observed at many of the fieldhouses in the Rendija Tract excavated during the C&T Project. Presumably, the people who utilized the fieldhouses tended to choose the area to the east as a work area to best take advantage of the warmth and/or sunlight from the morning sun. The room's entryway, however, appears to be located in the north wall, rather than the east wall. Although there is a slight tendency for entryways to be located in the east wall, it is not as strong as the tendency for activity areas (indicated by a higher concentration of artifacts) to be located in the area to the east of the fieldhouse.

Table 41.5. LA 85867 artifact counts by grid unit.

	E100	E101	E102	E103	E104
N105	--	--	1	2	9
N104	0	**6**	**7**	**7**	11
N103	1	**18**	**9**	**1**	8
N102	0	1	5	4	5
N101	3	2	5	1	16

Note: Does not include two artifacts found outside of the excavated area during surface collection; bold numbers indicate grid units that are located completely or partially within Room 1.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 122 artifacts were analyzed from the excavations conducted at LA 85867. In addition, flotation and pollen samples were selected for analysis from the post-occupation fill (Stratum 2) and the Room 1 living surface (Stratum 4) (Table 41.6). The results of the artifact and sample analyses are presented in the following sections.

Table 41.6. Samples selected for analysis from LA 85867.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2		66		
3				
4	78, 79	75, 76, 77		

*thermoluminescence

Ceramic Artifacts (Dean Wilson)

A total of 68 ceramics were analyzed from LA 85867. The majority of the pottery consists of Sapawe Micaceous and Biscuit A sherds, which presumably date to the Early Classic period (14th century) (Table 41.7). Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 41.8 through 41.10. The grayware and whiteware pottery appear to have been locally made from tuff temper, however, the micaceous pottery is a non-local type. Otherwise, all of the grayware and micaceous ceramics consist of jar vessel forms, whereas the whiteware sherds are derived from bowls.

Table 41.7. Ceramic types from LA 85867.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Biscuit unpainted slipped on one side	2	2.9
Biscuit A	12	17.6

Ceramic Type	Frequency	Percent
Northern Rio Grande Utilityware		
Plain gray body	4	5.9
Sapawe Micaceous	50	73.5
Total	**68**	**100.0**

Table 41.8. Tradition by ware for LA 85867 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	4	100.0	14	100.0	0	0.0	0	0.0	18	26.4
Rio Grande (Tewa Micaceous)	0	0.0	0.0	0.0	0	0.0	50	100.0	50	73.6
Middle Rio Grande	0	0.0	0.0	0.0	0	0.0	0	0.0	0	0.0
Total	**4**	**100.0**	**14**	**100.0**	**0**	**0.0**	**50**	**100.0**	**68**	**100.0**

Table 41.9. Temper by ware for LA 85867 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Fine tuff and sand	0	0.0	14	100.0	0	0.0	0	100.0	14	20.5
Mostly tuff with phenocrysts	2	50.0	0	0.0	0	0.0	0	0.0	2	2.9
Large tuff fragments	2	50.0	0	0.0	0	0.0	0	0.0	2	2.9
Sapawe Micaceous temper	0	0.0	0	0.0	0	0.0	50	100.0	50	73.5
Total	**4**	**100.0**	**14**	**100.0**	**0**	**0.0**	**50**	**100.0**	**68**	**100.0**

Table 41.10. Vessel form by ware for LA 85867 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Bowl rim	0	0.0	6	43.8	0	0.0	0	0.0	6	8.8
Bowl body	0	0.0	8	57.2	0	0.0	0	0.0	8	11.7
Jar neck	0	0.0	0	0.0	0	0.0	2	4.0	2	2.9
Jar rim	0	0.0	0	0.0	0	0.0	3	6.0	3	4.4
Jar body	4	100.0	0	0.0	0	0.0	45	90.0	49	72.0
Total	**4**	**100.0**	**14**	**100.0**	**0**	**0.0**	**50**	**100.0**	**68**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 54 artifacts were analyzed from LA 85867, consisting of six cores, 45 pieces of debitage, one retouched tool, and two ground stone artifacts. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 41.11 presents the data on lithic artifact type by material type. The debitage is primarily made of chalcedony, with less Pedernal chert, greenstone, obsidian, and other materials. The presence of cortex on 26.6 percent of the debitage indicates that these materials were collected from waterworn (*n* = 11) and nodule (*n* = 1) sources. The chalcedony, Pedernal chert, and greenstone are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the Pajarito Plateau.

Table 41.11. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	**Vesic. Basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Sil. wood**	**Quartzite**	**Greenstone**	**Total**
Cores	Core	0	0	0	0	0	0	0	1	0	4	0	0	0	5
	Cobble uniface	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	Subtotal	1	0	0	0	0	0	0	1	0	4	0	0	0	6
Debitage	Angular debris	1	0	0	0	0	0	0	5	0	0	0	0	1	1
	Core flake	5	0	1	0	1	0	2	15	0	7	0	0	5	36
	Biface flake	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Microdeb.	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	6	0	1	0	1	0	3	21	0	7	0	0	6	45
Retouched Tools	Retouched piece	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Ground Stone	Two-hand mano	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Und. mano fragment	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Subtotal	0	0	0	0	0	1	0	0	0	0	0	1	0	2
Total		**7**	**0**	**1**	**0**	**1**	**1**	**3**	**23**	**0**	**11**	**0**	**1**	**6**	**54**

Three pieces of obsidian and three pieces of basalt debitage were submitted for X-ray fluorescence analysis. The obsidian artifacts are solely made from Cerro Toledo obsidian (Table 41.12). The Cerro Toledo (Obsidian Ridge/Rabbit Mountain) source area is situated about 19 km (12 mi) to the southwest. Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present on the mesa as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval. One of the basalt flakes appears to be made of basalt, however, the other is dacite, which is derived from a local source.

Table 41.12. Obsidian source samples.

FS #	Artifact	Color	Source
23	Debitage	Translucent	Cerro Toledo rhyolite
35	Debitage	Translucent	Cerro Toledo rhyolite
39	Debitage	Translucent	Cerro Toledo rhyolite

Lithic Reduction

Four of the five cores were reduced using a single-directional reduction technique that involved either a single or multiple faces; whereas, the fifth core was reduced using a bidirectional, bifacial technique (Figure 41.4). Otherwise, flakes were also removed from a cortical platform on a cobble uniface. Three of the cores were classified as still having been discarded due to a break along a material flaw, whereas, the other cores were considered exhausted and the cobble uniface as still useable. Table 41.13 presents the metric information on the cores.

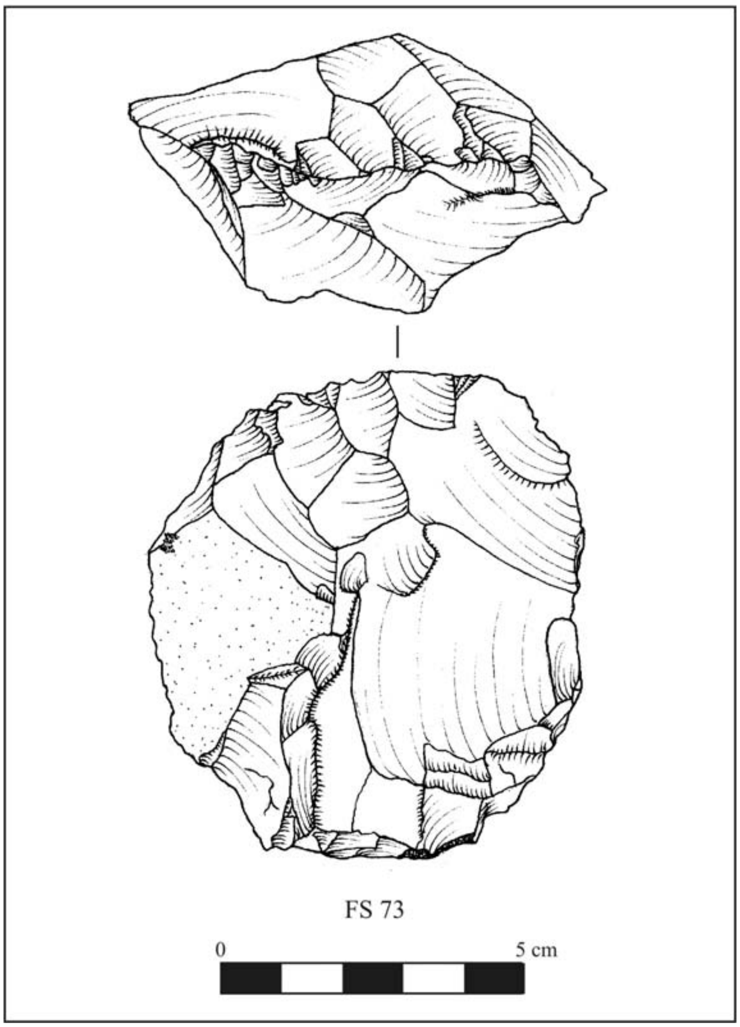

Figure 41.4. Bifacial core from LA 85867.

Table 41.13. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Single-directional	106	91	60	600.9
Single-directional	34	68	52	124.6
Single-directional	48	58	74	182.3
Single-directional	41	77	73	268.7
Bidirectional	79	72	43	243.7
Cobble Uniface	51	103	99	544.1

The debitage mostly consists of core flakes, with a few other items. The overall cortical:non-cortical ratio of 0.50 reflects an emphasis on the later stages of core reduction. The flakes mostly have single-faceted platforms (*n* = 14), with fewer cortical (*n* = 7), multi-faceted (*n* = 1), collapsed (*n* = 2), and crushed (*n* = 3) platforms. Only one of the platforms exhibits abrading/crushing. The majority of the core flakes are whole (*n* = 21), with fewer proximal (*n* = 5), midsection (*n* = 3), and distal (*n* = 9) fragments. Most of the biface flakes are also whole (*n* = 7), with fewer proximal (*n* = 1), midsection (*n* = 2), and distal (*n* = 4) fragments. The whole core flakes have a mean length of 27.8 mm (*std* = 16.2) and the angular debris a mean weight of 6.5 g (*std* = 7.6).

The retouched tools consist of a single retouched piece of angular debris. It has a bidirectionally retouched edge with an angle of 75 degrees.

Tool Use

A single flake exhibits evidence of edge damage that could be attributed to use. It exhibits rounding and polish at the distal end, with an edge angle of 50 degrees. The retouched piece also exhibits some rounding and scarring along a lateral edge with an angle of 75 degrees.

The ground stone assemblage consists solely of manos. The two-hand mano is a loaf-shaped, elongated tuff cobble with a single flat grinding surface (Figure 41.5). The undetermined mano fragment is a quartzite cobble fragment on one surface and appears to be fire-cracked.

Faunal Remains (Kari Schmidt)

One piece of bone was recovered during excavations of this Classic period fieldhouse. This bone was identified as an unburned, unidentified large-sized mammal rib fragment.

Archaeobotanical Remains (Pamela McBride)

Two samples from the living surface of this one-room fieldhouse yielded charred ponderosa pine needles and uncharred hedgehog cactus seeds. Fourteen pieces of ponderosa pine and 12 pieces of unknown conifer, weighing 0.5 g round out the cultural plant material recovered.

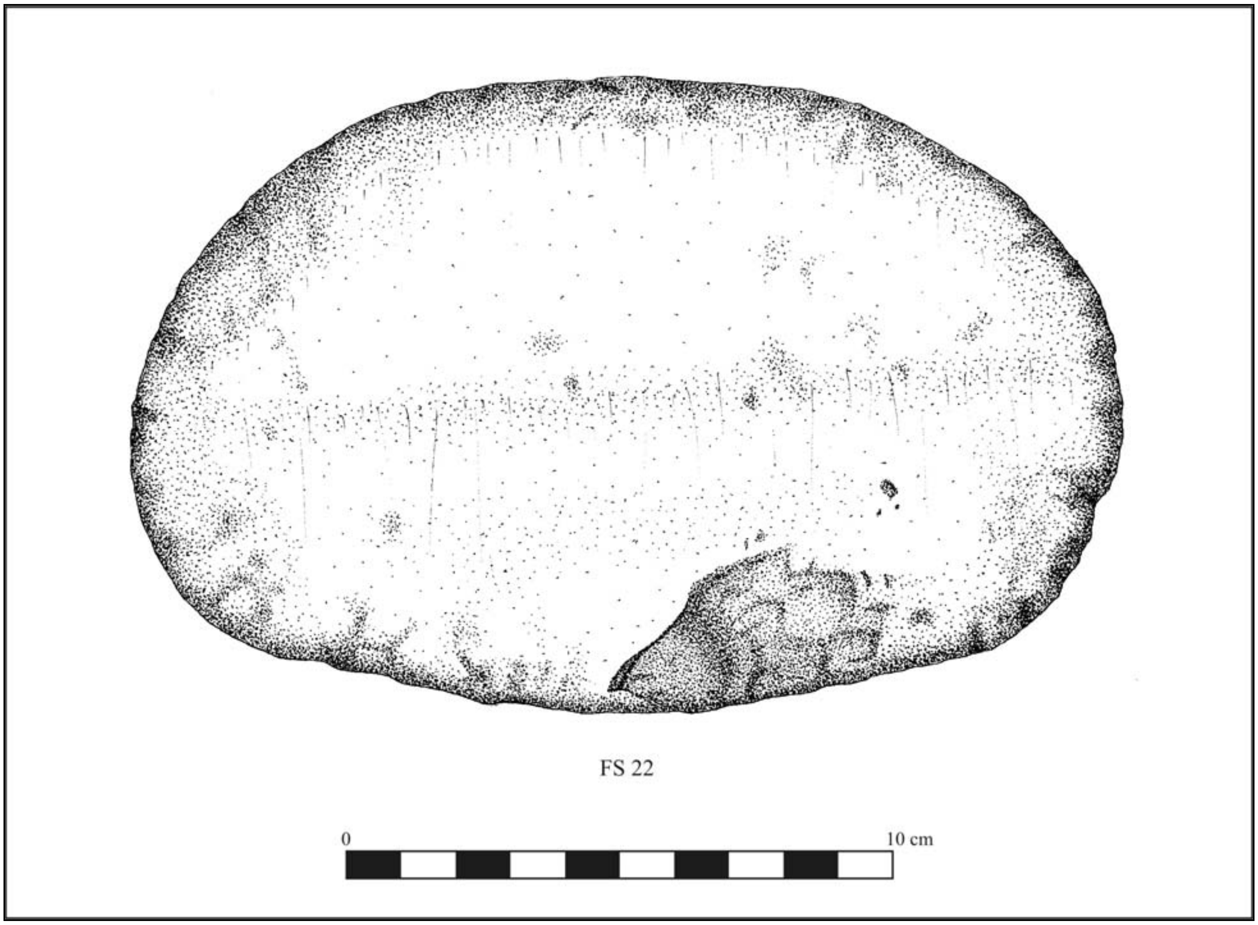

Figure 41.5. Two-hand mano.

Pollen Remains (Susan Smith)

Four pollen samples were analyzed from LA 85867. Table 41.14 lists the frequency of identified pollen types. Maize was the only cultigen identified in the botanical assemblage and was found in only one sample. Prickly pear, cactus family, beeweed, sunflower type, and purslane were all identified as economic resources in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 41.14), and these are discussed in detail in Smith's chapter in Volume 3.

Table 41.14. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85867 (*n* = 4)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 85867 (*n* = 4)**
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	1
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	1
	Cactus Family Aggregates	Cactus Family Aggregates	1
	Cleome	Beeweed	3
	cf. *Helianthus*	Sunflower type	2
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	1
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	2
	Brassicaceae	Mustard Family	3
		Mustard Aggregates	2
	cf. *Astragalus*	Locoweed	3
		cf. Locoweed Aggregates	1
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	3
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	1

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85867 (*n* = 4)
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	4
		Cheno-Am Aggregates	3
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	4
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	1
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	1
	Sphaeralcea	Globemallow	2
		Globemallow Aggregates	1
	Euphorbiaceae	Spurge Family	1
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	2
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	0
	Abies	Fir	0
	Pinus	Pine	4
		Pine Aggregates	0
	Pinus edulis type	Piñon	3
	Juniperus	Juniper	4
		Juniper Aggregates	0
	Quercus	Oak	1

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 85867 (*n* = 4)
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	1
	Artemisia	Sagebrush	3
		Sagebrush Aggregates	1
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY

LA 85867 is a small one-room Classic period fieldhouse that was constructed from both shaped and unshaped tuff blocks. The site is located on a south-facing slope on the mesa between Rendija and Guaje canyons. No features, other than the fieldhouse, were identified at the site. The presence of maize pollen indicates that the one-room structure may have been occupied during the growing season.

CHAPTER 42
RENDIJA TRACT (A-14): LA 85869

Brian C. Harmon

INTRODUCTION

LA 85869 is a late 19th/early 20th century Jicarilla Apache tipi ring site situated on the northeast-facing slope of a narrow ridge. A small intermittent drainage is located to the north of the site. The site is located in piñon-juniper woodland and is at an elevation of 2132 m (6994 ft). In May of 2000 the Cerro Grande fire burned 195 ha (480 ac) in the Rendija Canyon Tract. The severity of the burn at LA 85869 was low; much of the duff in the central portion of the site was burned off and some ladder fuels were consumed. LA 85869 covers and area of approximately 1500 m^2 (Figure 42.1).

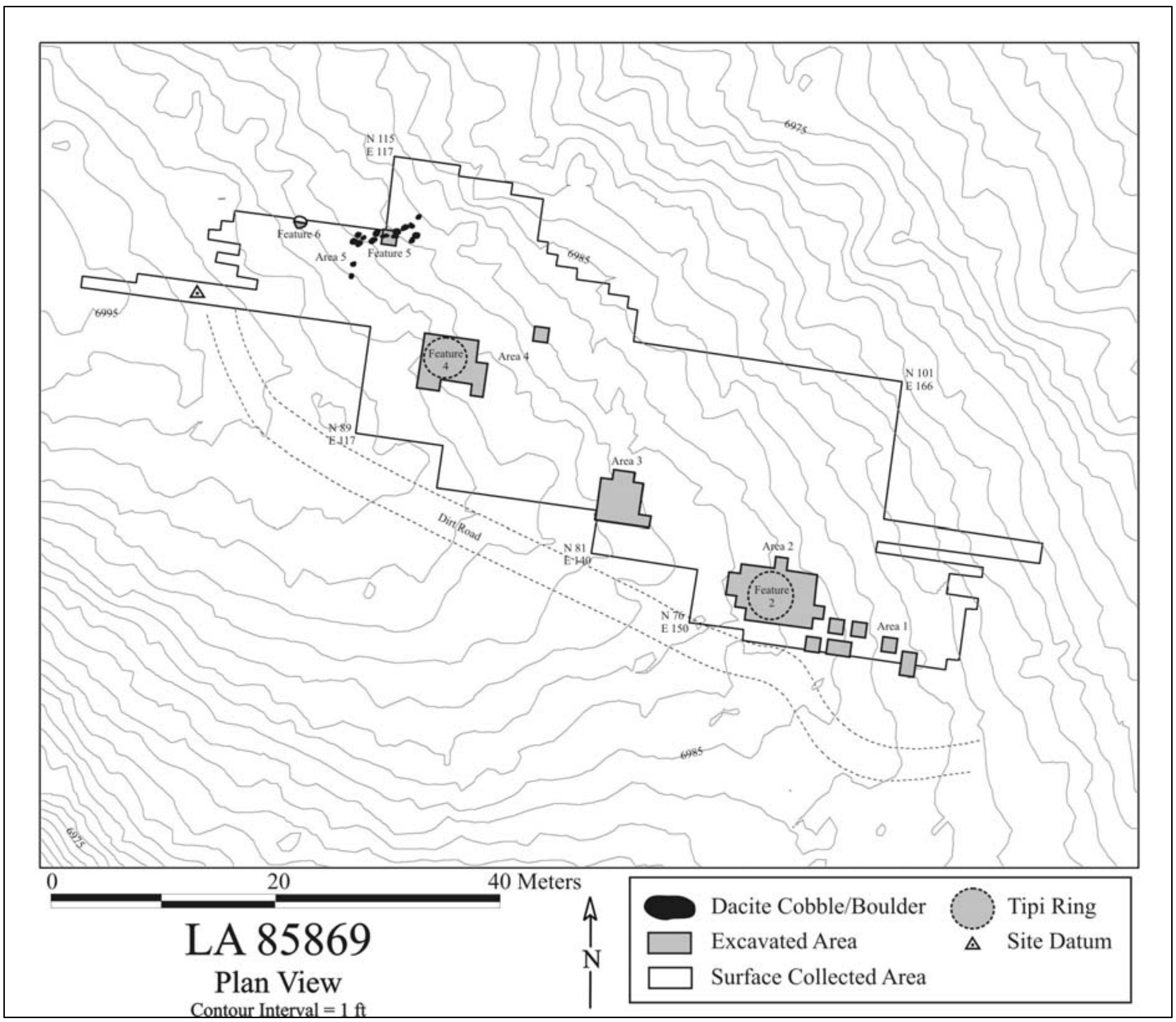

Figure 42.1. Plan view of the excavations at LA 85869.

The soil around LA 85869 is part of the Rendija-Bayo complex; a complex that "contains deep, well-drained soils weathered from materials derived from tuff (Rendija series) or pumice (Bayo series)" (Nyhan et al. 1978:54). The local stratigraphy consists of 10 to 15 cm of late-Holocene colluvium overlying Pleistocene colluvium. At the eastern edge of the site there are outcrops of dacite cobbles and small boulders.

A light scatter of modern garbage (several small automotive parts, pieces of plastic, several fragments of concrete, scraps of clothing, and bullet shells) is present across the site. A dirt road runs along the ridge top and defines the southern boundary of the site.

SITE DESCRIPTION

LA 85869 consists of two rock rings (Features 2 and 4) that mark the former locations of conical tipis. The rocks were used to weight down hides or canvases that were wrapped around a framework of interlocking poles. Both rings are approximately 4 m in diameter and are 33 m apart. Each contained a central, shallow, ash/charcoal deposit (Features 9 and 4, respectively). There is an obsidian debitage concentration immediately east of Feature 4 (the western tipi ring), and a diffuse scatter of obsidian debitage is found across the entire site. Four ceramic sherds from a single micaceous vessel were found 65 m northwest of Feature 4.

Fifteen m northwest of Feature 4 there are two rock features: an uneven alignment of boulders (Feature 5) and a small ring of cobbles (Feature 6). Feature 5 is modern in origin; Feature 6 could not be assigned a date.

PREVIOUS INVESTIGATIONS

LA 85869 was first recorded in 1991 by David Hill (1991:19–20) for the Bason Land Exchange Project. The site was described as consisting of a tipi ring (our Feature 2) and the remains of a possible rock structure (our Feature 5). Between these two features Hill observed a diffuse obsidian debitage scatter. One year later, as part of the same project, Peterson and Nightengale (1993:187–191) revisited the site to conduct more detailed recording. Their work consisted of mapping, in-field analysis, surface collection, and shovel testing. They could not relocate the obsidian scatter mentioned by Hill.

The tipi ring was described as a 4- to 5-m diameter rock ring composed of a surface alignment of large cobbles spaced 40 to 60 cm apart. Peterson and Nightengale excavated a 1- by 1-m unit in the center of this feature and exposed a concentration of burned soil and ash with small flecks of charcoal (our Feature 9) on the western edge of the unit.

The possible rock structure was described as a boulder concentration about 6.5 m long located in an area of erosion. No clear alignments of the boulders were discerned, and several appeared to have been moved in the not too distant past. Recent trash, including a car mirror bracket, pieces of plastic, and several fragments of concrete, had been dumped near this feature. Peterson and

Nightengale placed a 1- by 1-m unit in this feature and found only one retouched flake of Jemez obsidian. This was the only artifact Peterson and Nightengale recovered from the site. They concluded that the boulder concentration was probably not cultural in origin.

The Los Alamos National Laboratory Cultural Resources Management Team revisited LA 85869 in October 2000 as part of the Cerro Grande Fire Assessment Project (Nisengard et al. 2002) at which time the fire impacts discussed above were recorded.

FIELD METHODS

Most of the work reported here took place on September 18, 22, 23, and 30, and between November 10 to December 23, 2003; however, the site was sporadically visited until January 15, 2004. The crew consisted of Steven Hoagland (crew chief), Brian Harmon (assistant crew chief), Sandi Copeland, Michael Dilley, Aaron Gonzales, Mark Hungerford, Maria Jonsson, Bettina Kuru'es, Greg Lockard, Alan Madsen, and Bradley Vierra.

Inspection of the site before excavation revealed seven potential features, including the two that Hill and Peterson and Nightengale had previously recorded. A possible tipi ring at the east end of the site was identified as Feature 1, the original tipi ring was identified as Feature 2, two addition potential tipi rings to the west were identified as Features 3 and 4, the possible rock structure was identified as Feature 5, a possible hearth at the west end of the site was identified as Feature 6, and a possible grid garden at the east end of the site was identified as Feature 7. The obsidian scatter was relocated during the surface collection.

Based on the pre-excavation inspection at LA 85869, the site was divided into six areas. Area 1 is an area of dacite cobbles and boulders in the southeast part of the site. It encompasses Features 1 and 7. Area 2 is just west of Area 1; it encompasses Feature 2. Area 3 is located in the south central part of the site; this area encompasses Feature 3. Feature 4 and the adjacent lithic concentration define Area 4. Area 5 encompasses Features 5 and 6. The rest of the site is Area 6.

After the initial inspection at the site, most of the trees within the site boundary were cut down and cleared. This was done to facilitate the laying out of a grid based on magnetic north. Once the grid was in place, a collection of 100 percent of the surface artifacts was made. The boundaries of the surface collection coincide with the drop off of surface artifact density while also encompassing all potential features. Artifacts were collected in 1- by 1-m grid units and the surface collection consisted of 1448 units.

Two remote sensing surveys were conducted before excavation: a ground penetrating radar (GPR) survey and a metal detector survey. The GPR survey was performed by John Isaacson and Jennifer Nisengard on September 23, 2003. A 96-m^2 area (corners at 76N/150E, 84N/150E, 84N/162E, and 76N/162E) encompassing Feature 2 was surveyed. No subsurface anomalies were observed.

Since this site was known to date to the historic period and since it was large enough that only a portion of it would be excavated, a metal detector survey was carried out on September 30, 2003, to find metal artifacts that would otherwise be missed (Appendix N). The area between the dirt road and the northern boundary of the surface collection was surveyed from approximately the 105E line to the 175E line. When metal was signaled it was excavated with a hand trowel and its location marked with a pin flag. The horizontal coordinates of these artifacts were recorded with a transit. Unfortunately, this method of excavation made it impossible to determine the vertical provenience. However, it was clear that all metal artifacts were found above Stratum 5.

A second class of artifacts expected to be encountered at the site was trade beads. Some of these beads are quite small, so nearly all fill was sifted through two-level screens. The upper screen consisted of 1/8-in. mesh; the lower screen consisted of 1/16-in. mesh. Due to problems with these screens during the first days of excavations, only 20 percent of the fill from units 84N/144E, 94N/127E, 95N/122E, 100N/132E, and 107N/117E was screened through the fine mesh. One hundred percent of the fill from all other units was screened through the fine mesh.

Excavation began by focusing on Features 2, 3, and 4. The interiors and immediately adjacent exteriors of the potential tipi rings were excavated to the top of Stratum 4, the probable occupation surface. After 19 units had been excavated at Feature 3, it was apparent that this was not a cultural feature and the area was abandoned. After the interiors of Features 2 and 4 were exposed and the central ash/charcoal deposits were excavated, focus shifted to the east of the tipi rings since large, formal, thermal features are often found to the east of Jicarilla tipi rings (Anschuetz 2000:23). Eleven square meters were excavated to the east of Feature 2 and 7 m^2 were opened to the east of Feature 4. By the time excavations began outside of Feature 4, much of the ground had frozen, limiting the amount of area that could be excavated. No exterior hearths were found within 2 m of either ring. Later, units to the west of Feature 2 and to the south of Feature 4 were opened. Finally, three units inside each tipi ring were excavated down to Stratum 5 to investigate Stratum 4.

Excavation units in Features 1 and 7 were placed so as to straddle the most promising alignments, and one unit was placed in the approximate center of Feature 1. Five units placed in Feature 1 and three in Feature 7 sufficed to determine that these features were, in fact, natural deposits.

Pre-excavation observations of Feature 5 suggested that this feature is of modern origin. Nevertheless, one excavation unit was placed at the center of the feature to see several boulders in profile. Nothing in this unit suggested anything other than a modern origin and no further excavations were performed.

The southern half of Feature 6 was excavated. As no ash, charcoal, oxidized sediments, or artifacts were found, the northern half was not excavated (however, a small amount of charcoal was recovered from flotation samples).

A single excavation unit (100N/132E) was placed at the edge of the debitage concentration. This unit was excavated into Stratum 5.

STRATIGRAPHY

The stratigraphic sequence at LA 85869 consists of late-Holocene deposits overlaying Pleistocene deposits. Dacite boulders and cobbles outcrop on the eastern edge of the site. Table 42.1 summarizes the strata at the site; it, and the following discussion, draw heavily on the geomorphic descriptions in Drakos and Reneau (Chapter 57, Volume 3).

Table 42.1. Stratigraphic sequence used during excavation at LA 85869.

Provenience	Stratum	Color	Texture	Thickness (cm)	Description
Entire site	0	7.5-10 YR 4-6/3-4	sandy loam, loamy sand	0	Surface
Entire site	1	7.5-10YR 4-6/3-4	sandy loam, loamy sand	1–13	A horizon, contains organics, 10%–50% gravel
Entire site	2	7.5-10 YR 6/2-3	sandy to silty loam	1–11	Bw horizon, very fine, loose, sometimes gravelly
Entire site	3	10YR 3-5/3-5	sandy clay loam	1–17	Bw horizon, some organics, 20%–30% gravel
Entire site	4	7.5-10YR 6/2-3	sandy to silty loam	1–13	Bw horizon, similar to Stratum 2 but more consolidated
Entire site	5	7.5YR 4/4	silty clay	13+	Btb1 horizon
Feature 4	6	10YR 6/3	sandy loam	NA	Feature 4, habitation surface
Feature 8	7	7.5YR 4/3	silt loam	4	Feature 8, fill, ash/charcoal
Feature 9	8	7.5 YR 3/2	silty clay	4	Burned soil below Feature 9
Feature 10	9	7.5YR 5/3	sandy loam	7	Feature 10, fill

The A horizon (Stratum 1) is up to 13 cm deep, although it is rarely deeper than 6 cm. Stratum 1 post-dates the construction of the tipi rings. Most of the sub-surface artifacts were found in this stratum. A Bw horizon underlies Stratum 1. During excavation, three strata (Strata 2, 3, and 4) were distinguished within the Bw horizon. Strata 2 and 4 are similar; they both consist of sandy to silty loam and are light in color. What distinguished these strata from each other is their consistency and stratigraphic position; Stratum 2 is loose and when it is present it always overlays Stratum 4. Stratum 4 is soft to slightly hard. Several of the tipi ring stones and two ground stone artifacts were found on top of Stratum 4. The top of this stratum is interpreted as the surface of the site at the time of habitation. Stratum 2 and 4 are present in Areas 2, 3, and 4. Additionally, a small deposit of Stratum 4 was found in unit 107N/117E. Stratum 3 is a more clayey and darker variation within the Bw horizon. It often overlies Stratum 4 although in a few excavation units it was the only Bw horizon stratum present. Stratum 3 is found in Areas 1 and 4 and in units 100N/132E and 107N/117E. A Btb1 horizon (Stratum 5) underlies the Bw horizon. Stratum 5 is inferred to date to the Pleistocene and is culturally sterile. The other strata are discussed below in the context of the features with which they are associated. Table 42.2 gives the total artifacts recovered from each stratum.

Table 42.2. Artifact count by stratum at LA 85869.

Stratum	Ceramics	Chipped Stone	Ground Stone	Beads	Metal	Bone	Total
0	5	334	3	0	12	1	355
1	2	25	0	148	15	2	192
2	0	2	0	5	2	0	9
3	0	4	0	0	0	0	4
4	1	4	0	2	0	0	7
5	0	0	0	0	0	0	0
6	0	1	2	0	0	0	3
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
Unknown[1]	0	0	0	3	0	0	3
Total	**8**	**370**	**5**	**158**	**29**	**3**	**573**

[1]The provenience information was lost.

SURFACE COLLECTION

The surface collection covered 1448 m^2 and 334 chipped stone artifacts were recovered. Figure 42.2 shows that there is an obsidian debitage concentration to the east of Feature 4 and only a handful of debitage elsewhere at the site. This concentration is discussed in greater detail below (see Feature 4).

SITE EXCAVATION

Area 1

Dacite cobbles in this area suggested the outlines of a tipi ring (Feature 1) centered at 77N/162E and a grid garden (Feature 7) centered at 76N/169E. Units 75N/161E, 75N/163E, 75N/164E, and 77N/165E were placed to explore parts of the cobble arc thought to compose the tipi ring. Additionally, units 77-80N/159-160E and 78N/161E, which were excavated to explore the eastern exterior of Feature 2, covered an area potentially inside Feature 1. Unit 77N/163E was dug to explore the central part of the potential ring. Units 74-75N/170E and 76N/168E straddled likely alignments in the potential grid garden. All units were excavated to the top of Stratum 5. None of the potential alignments appeared to have a cultural origin once excavation was complete, and no evidence of a surface or heating feature was found in the possible tipi ring.

The stratigraphy of Area 1 consists of 1 to 13 cm (4 cm on average) of Stratum 1 overlaying 1 to 17 cm (8 cm on average) of Stratum 3. Stratum 3, in turn, overlies Stratum 5. All the strata in these units contain a great many dacite cobbles. Only three artifacts were found in this area: a .50-caliber lead rifle ball (Field Specimen [FS] 215) was recovered from Stratum 1 and two glass seed beads (FS 276) were recovered from Stratum 4. These artifacts are probably associated with Feature 2. Three pollen samples (FS 307, FS 308, and FS 314) from this area were analyzed. Taxa identified in these samples included rose family, buckwheat, grass family, cheno-ams, sunflower family, ragweed/bursage, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush.

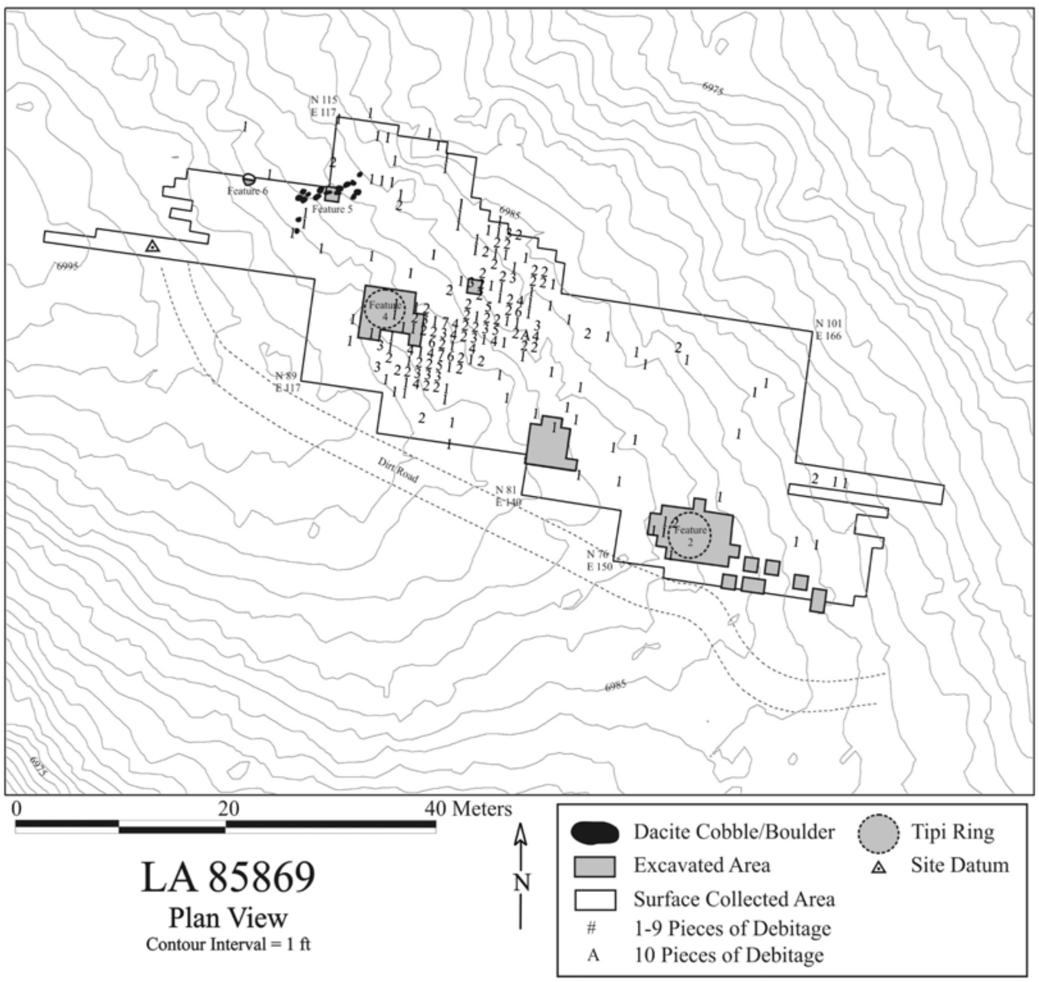

Figure 42.2. Surface debitage distribution at LA 85869.

Area 2

Area 2 was defined as Feature 2 (a tipi ring) and the area immediately around the feature. The stratigraphy outside of the feature to the west consisted of 1 to 8 cm (2.5 cm on average) of Stratum 1 overlaying 1 to 3 cm (1.5 cm on average) of Stratum 2. Stratum 4 underlies Stratum 2.

In the east, Stratum 1 is no different than has been previously noted. In units 77N/159E, 77N/160E, and 80N/159E, Stratum 1 is underlain by Stratum 3. In unit 79N/159E, Stratum 1 is underlain by Stratum 4. In all other units, Stratum 1 directly overlies Stratum 5.

Feature 2

This feature is the tipi ring identified by Hill and tested by Peterson and Nightengale (Figures 42.3 and 42.4). The tipi ring is composed of 22 dacite cobbles arranged in a circle with interior dimensions of 4.23 m north-south and 3.92 m east-west. The remains of a heating feature (Feature 9) are present in the center of the ring, and a possible posthole (Feature 10) is located outside to the southwest.

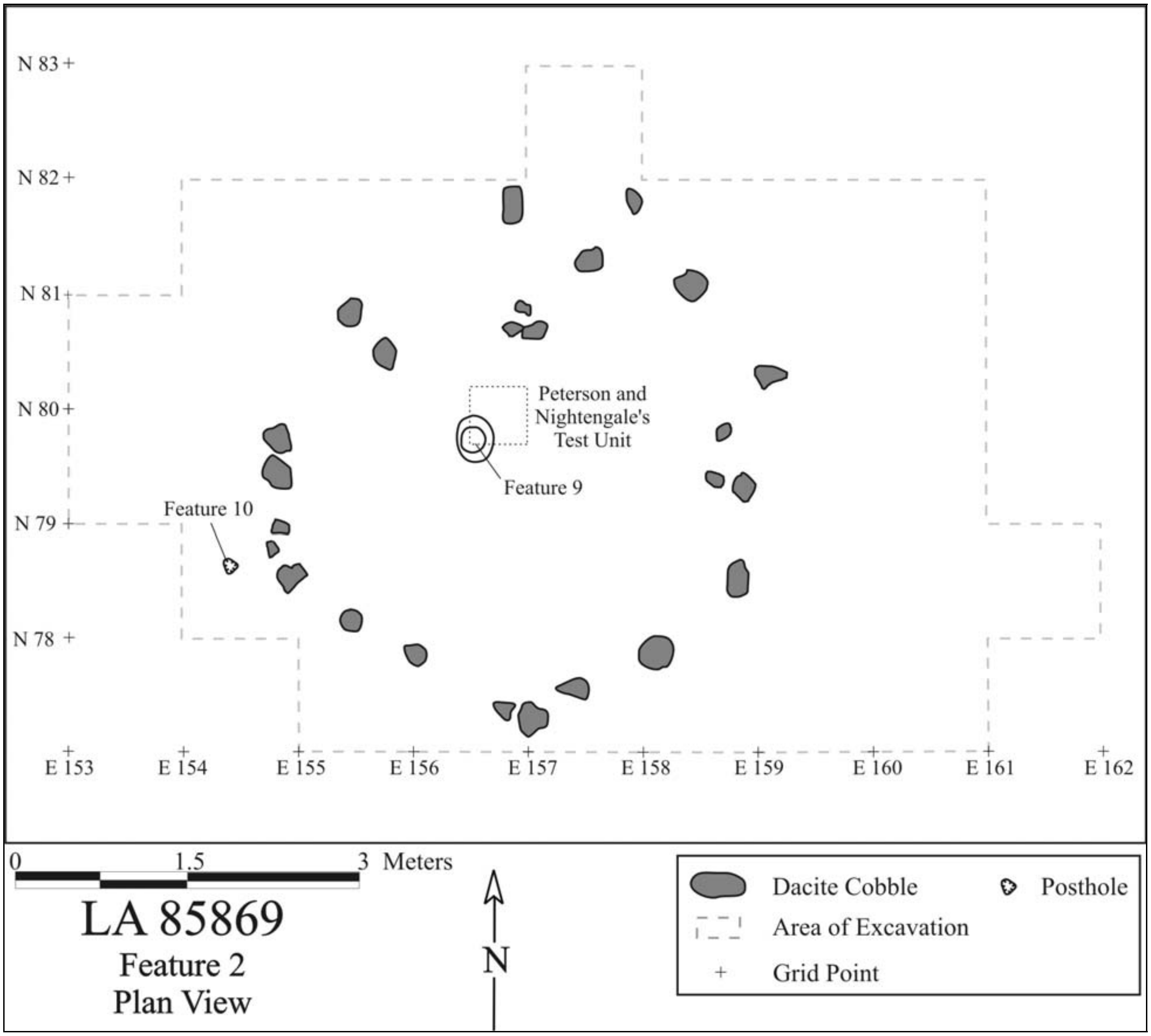

Figure 42.3. Plan view of Feature 2, a tipi ring.

Figure 42.4. Post-excavation photograph of Feature 2, a tipi ring.

Peterson and Nightengale placed a 1- by 1-m test unit in the center of Feature 2. This unit covers about 40 percent of units 79N/156E and 79N/157E and about 10 percent of units 80N/156E and 80N/157E. The test unit was excavated down to, and in places into, Stratum 5.

The stratigraphy of Feature 2 is straightforward. One to 5 cm (2.5 cm on average) of Stratum 1 overlies 1 to 4 cm (2 cm on average) of Stratum 2. Below Stratum 2 a compacted surface at the top of Stratum 4 is present in most places. The top of Stratum 4 is interpreted as the living surface at the time Feature 2 was inhabited. Stratum 4 was excavated in units 78-80N/158E. In this area Stratum 4 is 4 to 6 cm thick in most places save the western edge of 78N/158E where it is between 8 and 13 cm thick. Stratum 5 underlies Stratum 4.

Seventeen of the tipi ring cobbles were partially buried in Strata 1 and 2 and their upper surfaces were covered with lichen; the other five cobbles were completely buried. Most of the cobbles rest directly on top of Stratum 4. Three additional cobbles are located in the north-central portion of the tipi ring (80N/156E and 80N/157E). The base of these rocks is in Stratum 2 and it is not clear if these rocks were associated with the occupation of the tipi.

Since all the non-modern artifacts found in Area 2 are probably associated with Feature 2, Table 42.3 combines the artifact counts for both Area 2 and Feature 2.

Table 42.3. Area 2 and Feature 2 artifact counts by stratigraphic units.

Stratum	Ceramics	Chipped Stone	Ground Stone	Beads	Metal	Total
0	1/0/1[1]	5/1/6	0/0/0	0/0/0	0/1/1	6/2/8
1	2/0/2	2/4/6	0/0/0	54/94/148	1/0/1	59/98/157
2	0/0/0	0/0/0	0/0/0	0/5/5	0/1/1	0/6/6
3	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0
4	0/0/0	0/1/1	0/0/0	0/0/0	0/0/0	0/1/1
8	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0
9	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0
Total	**3/0/3**	**7/6/13**	**0/0/0**	**54/99/156[2]**	**1/2/3**	**65/107/175[1]**

[1] 1/0/1: 1 = outside Feature 2, 0 = inside Feature 2, 1 = total; [2] The provenience information for three beads was lost.

The three ceramic sherds (FS 129 and FS 309) are micaceous jar sherds from a single vessel. The chipped stone artifacts consist of angular debris, core fakes, and flake fragments. The material is approximately evenly divided between black translucent obsidian, Pedernal chert/chalcedony, and unspecified chert. The metal artifacts from inside Feature 2 consist of a 4.5-cm-long, 1-cm-wide tin/zinc alloy strip (FS 135) and a metal (possibly lead alloyed with tin or antimony) flake (FS 238). The metal artifact from outside the feature is a lead fishing line weight (FS 310). For a discussion of the bead artifacts see the 'Artifacts and Sample Analysis' section below.

Flotation samples were taken from Stratum 1 (FS 283) and Stratum 2 (FS 288) of Feature 2. The samples were 2.0 and 1.8 liters, respectively. The only charred material recovered was a piñon pine needle fragment from FS 283. A pollen sample from Stratum 1 (FS 282) and a pollen sample from Stratum 2 (FS 287) were analyzed. Taxa identified in these samples included grass family, cheno-ams, sunflower family, ragweed/bursage, fir, unidentified pine, piñon pine, juniper, oak, and sagebrush.

Feature 9

Feature 9 is either a small firepit or a place where heated charcoal and rocks were deposited. It is located near the center of Feature 2 at 79.75N/156.55E. Peterson and Nightengale's excavations removed most of Feature 9. Peterson and Nightengale (1993:190) describe the feature as consisting of "a concentration of burned soil and ash with small flecks of charcoal…The burned area was first hit at a depth of about 5 cm bgs [below ground surface] and the burned clay associated with the hearth [i.e., Stratum 5] extended down to a depth of about 15 cm." Stratum 5 was excavated in the northwestern part of the test unit to determine if a firepit was present. No evidence of a depression in the Btb1 horizon was found, although the soil was burned to a depth of 4 cm from the top of the stratum. Peterson and Nightengale (1993:190) concluded that, "the fire was situated on the surface that formed the floor of the structure."

During excavation, no ash or charcoal were found. However, Strata 2 and 4 were absent in the north-central portion of unit 79N/156E, just west of Peterson and Nightengale's test unit. Here Stratum 1 directly overlays Stratum 5, suggesting that a shallow depression had been dug into Stratum 4. It was also in this area that Stratum 5 was burned. The burned area measures 42 cm north-south and 11 cm east-west (truncated by the test unit). Stratum 5 was burned to a depth of 4 cm (i.e., from the top of Stratum 5 at 6.74 m to 6.70 m). The base of the burned area is about 20 cm in diameter. The burned portion of Stratum 5 was taken as a flotation sample (FS 318). No charred macrobotanical remains were recovered from this sample.

Feature 10

Feature 10 is a possible posthole located at 78.65N/154.43E (about 40 cm from the edge of Feature 2). The hole is 10 cm by 9 cm across, 7 cm deep, and triangular in shape. The upper 2 or 3 cm of the feature were filled with small pebbles and sediment that was slightly darker than the surrounding Stratum 2 matrix. The rest of the fill (Stratum 9) was collected as a pollen sample (FS 320). Taxa identified included plantain, grass family, cheno-ams, sunflower family, ragweed/bursage, spurge family, fir, unidentified pine, piñon pine, juniper, oak, and sagebrush.

Area 3

Before excavation began it seemed possible that a tipi ring (Feature 3) was present and centered on unit 86N/142E. Nineteen excavation units were dug in this area. No alignment of cobbles was found that suggested any part of a tipi ring arch, and no evidence of a heating feature was observed. The stratigraphy in Area 3 is uniform and similar to that in Area 1. Stratum 1 overlies Stratum 2 and both are usually 1 to 4 cm thick, occasionally they are up to 9 cm thick. Stratum 4 is present everywhere beneath Stratum 2. The strata and cobble deposits in Area 3 do not have a cultural origin.

The only artifacts found in Area 3 were two pieces of chipped stone debitage from Stratum 0 and four pieces of chipped stone debitage Stratum 1. A pollen sample (FS 249) from Stratum 2 was analyzed. Taxa identified included grass family, cheno-ams, sunflower family, fir, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush.

Area 4

Area 4 is defined as Feature 4 (a tipi ring) and the concentration of chipped stone debitage to the immediate east. As there is no stratigraphic difference between the interior and the exterior of the feature, the stratigraphy of Area 4 is given in the discussion of Feature 4.

The concentration of lithic debitage to the east of Feature 4 covers an area about 10 m wide (east-west) and 20 m long (north-south). The north-south dimension is parallel to the slope of the ground surface, so the length of this dimension is due, at least in part, to the movement of artifacts downslope. A single test unit (100N/132E) was placed at the edge of this artifact scatter. The stratigraphy consisted of 4 cm of Stratum 1, which contained one piece of chipped stone debitage, and 5 to 10 cm of Stratum 3, which contained two pieces of chipped stone debitage. Stratum 5 was encountered below Stratum 3. Juniper charcoal (FS 244) from Stratum 3 was submitted for accelerator mass spectroscopy analysis. FS 244 returned a post-AD 1950 date (Beta-199372).

Feature 4

This tipi ring consists of 11 dacite cobbles arranged in a circle with interior dimensions of 3.25 m north-south and 3.75 m east-west (Figure 42.5). The cobbles are unshaped and range in size from 17 by 12 cm to 30 by 25 cm. The remains of a heating feature (Feature 8) were found in the center of the ring.

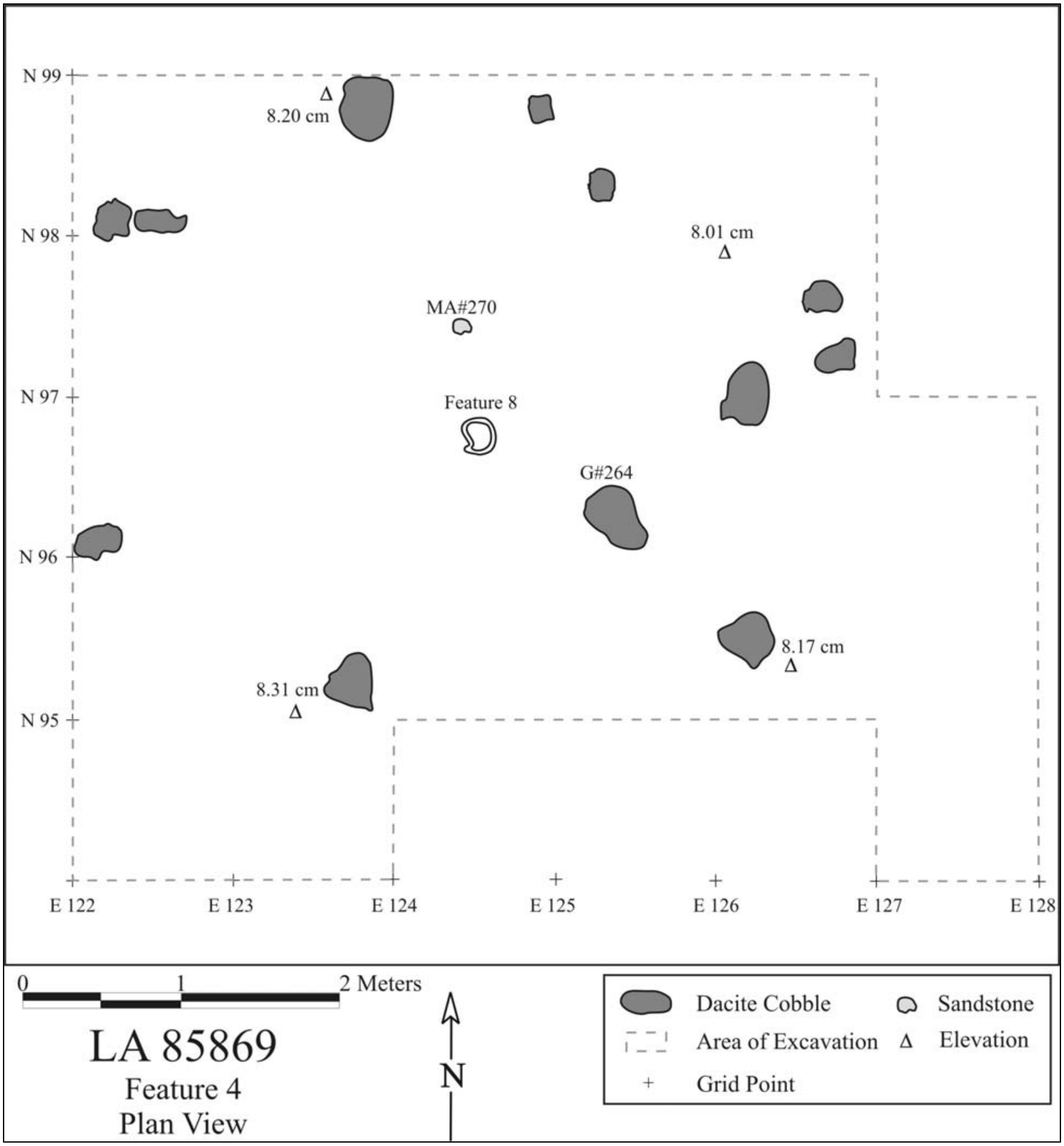

Figure 42.5. Plan view of Feature 4, a tipi ring.

Stratum 1 (1 to 6 cm) covers the entire area, but below this there is some variation. In the central and southwestern part of the tipi ring the stratigraphic sequence consists of Strata 1, 2, and 4. The sequence in the eastern part of the ring and the immediate exterior is Strata 1, 3, and 4. At the extreme east and southwest edges of the area, Stratum 1 directly overlays Stratum 4. In the northernmost units, Strata 2 and 4 are absent. Here Stratum 3 overlays Stratum 5. All of the cobbles were partially buried in Strata 1 and 2 and their upper surfaces were covered with lichen. Most of the cobbles composing the tipi ring were resting on top of Stratum 4; on this basis the top of Stratum 4 is interpreted as the living surface (the actual living surface is designated as Stratum 6). Stratum 4 was excavated in units 95N/123E and 95N/124E and 96N/124E. The stratum was 1 to 11 cm deep (3 to 5 cm deep on average). Stratum 5 underlay Stratum 4 in all three units. Since all the non-modern artifacts found in Area 4 are probably associated with Feature 4, Table 42.4 combines the artifact counts for both Area 4 and Feature 4.

Table 42.4. Area 4 and Feature 4 artifact counts by stratigraphic units.

Stratum	Ceramics	Chipped Stone	Ground Stone	Beads	Metal	Total
0	0/0/0[1]	263/2/265	0/0/0	0/0/0	0/0/0	262/2/265
1	0/0/0	4/11/15	0/0/0	0/0/0	3/7/10	7/18/25
2	0/0/0	1/1/2	0/0/0	0/0/0	0/0/0	1/1/2
3	0/0/0	2/2/4	0/0/0	0/0/0	0/0/0	2/2/4
4	1/0/1	3/0/3	0/0/0	0/0/0	0/0/0	4/0/4
6	0/0/0	0/1/1	0/2/2	0/0/0	0/0/0	0/3/3
Total	**1/0/1**	**273/17/290**	**0/2/2**	**0/0/0**	**3/7/10**	**276/26/303**

[1]0/0/0: 0 = outside Feature 2, 0 = inside Feature 2, and 0 = total

The ceramic artifact (FS 325) is an unidentified plainware sherd. The metal artifacts from inside the feature consist of a straight pin or round wire fragment (FS 210), two possible cone tinkler fragments or pieces of tinkler manufacturing debris (FS 211 and FS 212), a can fragment cut into a 3.0-cm-long strip (FS 213), a .50-caliber lead/alloy rifle ball with an impact surface (FS 214), three joined segments of a *coscojo* (FS 220), and a 4.0-cm-long rolled steel strip (FS 268). Metal artifacts from outside of the feature consist of a *coscojo* fragment (FS 209), two joined *coscojo* segments (FS 221), and a possible cone tinkler fragment (FS 219). The two ground stone artifacts consist of a sandstone mano fragment (FS 270) at 97.2N/124.55E and a dacite millingstone (FS 264) at 96.30N/125.40E. Both of these artifacts were found on the habitation surface of the tipi ring. A pollen sample (FS 263) was taken from below the millingstone. Taxa identified in the sample included grass family, cheno-ams, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, oak, Mormon tea, sagebrush, and greasewood. The chipped stone artifacts from Area 4 account for most of the chipped stone artifacts recovered from the site. Instead of being discussed here they are analyzed in the 'Artifact and Sample Analysis' section below.

Feature 8

A concentration of charcoal and charcoal-stained soil was found in the center of Feature 4 at 96.75N/124.52E. This charcoal concentration is 13 cm in diameter and 4 cm deep and is situated in a very shallow depression in Stratum 4. No burning or oxidation was present in the surrounding matrix. The contents of this feature were taken as a flotation sample (FS 272) and a pollen sample (FS 271). Charred taxa identified in the flotation sample included goosefoot and piñon pine. Taxa identified in the pollen sample included mustard family, grass family, cheno-ams, sunflower family, unidentified pine, piñon pine, juniper, and oak. Feature 8 is interpreted as a locale that served as the receptacle for heated rocks and/or charcoal from an external hearth or as a small fire pit.

Material from FS 272 was submitted for accelerator mass spectroscopy analysis. The sample returned an age of 260±40 (Beta-199373) and a date of cal AD 1650 with a two-sigma date range of cal AD 1520–1590, cal AD 1620–1670, cal AD 1770–1800, and cal AD 1940–1950. As the artifacts associated with LA 85869 indicate, the late 19^{th}/early 20^{th} century habitation date returned by this radiocarbon sample is interpreted as reflecting the use of old wood.

Area 5

Area 5 encompasses Features 5 and 6. In addition to the artifacts found in these two features, four chipped stone artifacts were found in Area 5 during the surface collection.

Feature 5

Feature 5 was the second feature tested by Peterson and Nightengale. It is a rough line of unshaped dacite boulders about 8.5 m long and 0.5 to 3.0 m wide (Figure 42.6). The boulders range in size from 25 by 20 by 15 cm to 45 by 25 by 14 cm. Lichen was observed on the bottom of several of the boulders of this feature. Additionally, $CaCO_3$ was found on the top of two other boulders. The modern trash observed by Peterson and Nightengale is still present. An excavation unit (107N/117E) was placed in the center of this feature. The only artifacts recovered were three pieces of chipped stone debitage from Stratum 3.

The upper stratum in unit 107N/117E is Stratum 1, which was about 2 cm deep. This is underlain by Stratum 3 (6 to 8 cm deep) except in the northwest and northeast corners of the unit. In these corners, Stratum 4 (4 to 6 cm deep) is immediately below Stratum 1. As Stratum 4 is only found downslope from and behind the boulders, it was probably present over a greater area in the past, but has since eroded away. The boulders of the feature sit on top of Stratum 3 or are partially buried in it (up to 5 cm in depth). Stratum 5 underlies Strata 3 and 4, and it was here that excavation stopped. A small amount of shallow rodent or root disturbance was observed at the top of this stratum. Two pollen samples (FS 252 and FS 254) from Stratum 3 were analyzed. Taxa identified in these samples included sedge, grass family, cheno-ams, sunflower family, fir, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush.

The presence of modern trash coupled with the inverted location of lichen and calcium carbonate on some boulders indicates that this feature is most probably a push pile or dump of modern origin.

Figure 42.6. Feature 5, an alignment of dacite cobbles.

Feature 6

Feature 6 consists of 12 small cobbles arranged into a rough circle 75 cm by 90 cm (Figure 42.7). Four additional cobbles are present inside the ring. A shallow rill runs north-south along the western edge of the feature. The rill may have removed a few cobbles and deposits from the western part of the feature, particularly from the northwest corner. The southern half of the interior of the ring was excavated to a depth of 10 cm. The fill consisted entirely of Stratum 1 and excavation ended at the top of Stratum 5. No artifacts were found. It was originally thought that Feature 6 was a hearth but no ash and very little charcoal was found. No evidence of burning, such as oxidation, was observed.

Three of the rocks that make up the feature were identified as ground stone artifacts: a dacite polishing stone (FS 286), a basalt one-hand mano (FS 286), and a dacite one-hand mano (FS 319). No other artifacts were found.

Three flotation samples were analyzed from Feature 6 (FS 295, FS 296, and FS 297). Each sample contained less than 0.1 g of wood charcoal. Charred taxa identified included unknown conifer, juniper, piñon pine, ponderosa pine, and unidentified pine. A pollen sample (FS 294) from this feature was analyzed and identified taxa included sunflower type, cheno-ams, grass family, sunflower family, ragweed/bursage, spurge family, spruce, fir, unidentified pine, piñon pine, juniper, oak, and sagebrush.

Figure 42.7. Feature 6, a cobble circle.

Material from FS 295 and FS 297 were submitted for accelerator mass spectroscopy delivery analysis. FS 295 returned an age of 1040±40BP (Beta-199374) and a date of cal AD 1000 with a two-sigma date range of cal AD 910–920 and cal AD 960–1030. FS 297 returned an age of 500±40 BP (Beta-199375) and a date of cal AD 1420 with a date range of cal AD 1400–1450. Given the small amount of charred material present and the disparate radiocarbon dates, it is unclear how to interpret Feature 6.

Area 6

Area 6 includes all the other unaffiliated areas of the site that have not already been discussed. A light scatter of chipped stone debitage is present in this area, and a total of 58 chipped stone artifacts were recovered from the surface. Four sherds from a single Cimarron Micaceous vessel (FS 328) were found 65 m northwest of Feature 4. Due to the paucity of artifacts and absence of cultural features, no excavation took place in this area.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 566 artifacts were analyzed from the excavations conducted at LA 85869 (Table 42.5). In addition, flotation and pollen samples were selected for analysis from Strata 1, 2, 7, and 8 (flotation) and Strata 1, 2, 3, 4, 6, 7, and 9 (pollen). Charcoal was submitted for radiocarbon dating from Strata 1, 3, and 7, and six pieces of obsidian were submitted for hydration dating from Strata 1 and 4. The results of the artifact and sample analyses are presented in the following sections.

Table 42.5. Samples selected for analysis from LA 85869.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	Hydration
1	283, 295, 296, 297	282, 294	295, 297	265, 266, 267, 277, 322
2	288	249, 287		
3		252, 254, 307, 314, 329	244	
4		308		324
5				
6		263		
7	272	271	272	
8	318			
9		320		

Chronology

Radiocarbon Dating

Four radiocarbon samples were submitted to Beta Analytic for analysis. Table 42.6 gives the results of the radiocarbon analysis. Only FS 272 is clearly associated the Apachean occupation of the site. This sample probably represents the use of old wood.

Table 42.6. Radiocarbon dates from LA 85869.

FS	Context of sample	Laboratory (Beta)#	Conventional radiocarbon age	Intercept of radiocarbon age	Two-sigma calibrated result
244	100N 132E Stratum 3	199372	155.5±0.8 pMC[1]	NA	post-AD 1950
272	Feature 8 (heating feature)	199373	260±40	AD 1650	AD 1520–1590 AD 1620–1670 AD 1770–1800 AD 1940–1950
295	Feature 6	199374	1040±40	AD 1000	AD 910–920

FS	Context of sample	Laboratory (Beta)#	Conventional radiocarbon age	Intercept of radiocarbon age	Two-sigma calibrated result
	(possible hearth)				AD 960–1030
297	Feature 6 (possible hearth)	199375	500±50	AD 1420	AD 1400–1450

[1]Percent modern carbon; results that post-date AD 1950 can only be reported in pMC.

Thermoluminescence Dating

One micaceous ceramic sherd (FS 328) was submitted for thermoluminescence dating. Table 42.7 presents the results generated from this analysis.

Table 42.7. Thermoluminescence dating.

FS	Lab #	Context	Burial depth (cm)	Age (ka)	% error	Years AD
328	UW1245	65 m NW of Feature 4	0	0.146±0.021	9.1	1859±13

Obsidian Hydration Dating

Six obsidian artifacts from LA 85869 were submitted to the Diffusion Laboratory for age determination using the obsidian hydration dating method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rim, was measured. Second, the high-temperature hydration-rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site were estimated so that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts from LA 85869 was calculated (Table 42.8).

Table 42.8. Obsidian hydration dates for LA 85869.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
265	2006-11	Valle Grande	3.26	-869	176
266	2006-12	Valle Grande	2.95	-1408	231
267	2006-13	Valle Grande	3.27	-2146	254
277	2006-14	Valle Grande	2.94	-1417	233
322	2006-15	Valle Grande	2.99	-1711	249
324	2006-16	Valle Grande	3.43	1393	33

Only the 14th century obsidian hydration dates correspond with any of the radiocarbon dates. Otherwise, they appear to be too old.

Historic Artifact Dating

Analysis of the beads and metal artifacts (Appendix N) from LA 85869 suggests that the site dates to the late 19th or early 20th century. Artifacts with known temporal associations include a .50-caliber unalloyed lead ball (FS 215), *coscojos* fragments (FS 209, FS 220, and FS 221), a pony bead (FS 304), and seed beads (multiple FS numbers). The following is summarized from Appendix N. Unalloyed lead is characteristic of firearm projectiles before circa AD 1870. *Coscojos* have been found at Apache and Ute sites in New Mexico dating to between AD 1840 and 1900+, and pony beads entered the west in quantity around AD 1800 and remained popular in some areas until the early AD 1880s. Many of the seed beads from LA 85869 are of the smallest size category (0.5 to 0.7 mm in diameter). Additionally, 11 beads are tan in color and five are pink. This size and these colors of beads did not become readily available to the Jicarilla Apache until the early AD 1880s.

The presence of 12 “sanitary seal” can fragments (FS 197 and FS 199) may indicate a post-1897 date for the site. However, these fragments were found in units 103N/114E and 104N/114E. These units are within the light scatter of modern trash around Feature 5. It is unlikely that the can fragments are associated with the Apachean occupation of the site.

Four Cimarron Micaceous sherds from a single vessel (FS 328) were identified by Eiselt (Volume 4, Chapter 75). This type dates to between circa AD 1750 and the 1900s (Gunnerson 1969:33).

Ceramic Artifacts (Sunday Eiselt)

Seven micaceous sherds (FS 129, FS 309, and FS 328) that represents two vessels and one non-micaceous plainware sherd (FS 325) were found at LA 85869. Six of the micaceous sherds were analyzed by Eiselt (Volume 4, Chapter 75) and the results are briefly summarized. Inclusions in the paste of the three jar sherds from a single vessel found near Feature 2 (FS 129 and FS 309) suggest that the clay came from Picuris, Cordova, or Guadalupita, all of which are located in New Mexico. The surface finish, which was compacted with no wipe or scrape marks visible and a mica slurry application, indicates that the vessel may be attributed to Taos, Picuris, or Jicarilla makers. Inclusions in the paste of the four jar sherds from a single vessel found to the northwest of the site (FS 328) suggest that the clay came from Petaca. The probable clay source and surface finish, which was compacted with wipe-marks present and vessel walls sanded or burnished before mica slip or slurry application, indicate that the vessel was probably made by Jicarilla Apaches and is of the Cimarron Micaceous type.

Metal Artifacts (Charles Haecker)

The metal artifacts from LA 85869 were analyzed by Haecker and are summarized in Appendix N. Table 42.9 summarizes the results of Haecker’s analysis.

Table 42.9. Metal artifacts from LA 85869.

FS	Artifact Type	No.	Provenience	Description	Dates
135	metal strip	1	Feature 2	tin/zinc alloy, 1 cm wide, 4.2 cm long, ends bent together, oxidized	unknown
197	can fragments	10	Area 5	"sanitary seal" can fragments	post-AD 1897
199	can fragments	2	Area 5	"sanitary seal" can fragments	post-AD 1897
209	*coscojo*	1	Area 4	two joined parts	circa AD 1840–1900+
210	straight pin or round wire fragment	1	Feature 4	ferrous, 3.0 cm long	19th century to present
211	trapezoidal white metal sheet	1	Feature 4	tin(?), folded, cut edges, 4.0 by 2.5 cm, possible cone tinkler or cone tinkler manufacturing debris	19th century to present
212	white metal fragment	1	Feature 4	tin(?), cut on all sides, oxidized, possible cone tinkler manufacturing debris	19th century to present
213	metal strip	1	Feature 4	can fragment, possible fastener hole, wavy in profile, 3.0 by 1.0 cm	19th century to present
214	.50-caliber lead/alloy rifle ball	1	Feature 4	cast seams visible, impact surface present	Mid/late 19th century to present
215	.50-caliber lead rifle ball	1	Area 1	mold-cast, apparently unfired, more oxidized (older) than FS 214	before circa AD 1870
216	.30-caliber brass pistol shell casing	1	Area 6	rim-fired	post-AD 1871
217	lead (bullet?) fragment	1	Area 6	possibly from a fired bullet, slightly oxidized	19th century to present
218	brass rifle shell fragment	1	Area 6	unknown caliber	20th century to present
219	white metal fragment	1	Area 4	tin(?), cut on two sides, oxidized, possible cone tinkler manufacturing debris	19th century to present
220	*coscojo*	1	Feature 4	three joined parts	circa AD 1840–1900+
221	*coscojo*	1	Area 4	two joined parts	circa AD 1840–1900+
238	metal flake	1	Feature 2	possibly lead alloyed with tin or antimony, 0.5 by 0.7 cm	unknown

FS	Artifact Type	No.	Provenience	Description	Dates
268	rolled steel strip	1	Feature 4	3.81 by 1.9 cm, three sides cut, one side showing fatigue from back-and-forth bending, wavy in profile	unknown
310	split-shot lead sinker	1	Area 2	out-of-round, 0.30-in.-diameter	unknown

While 29 metal artifacts were recovered, only the three *coscojo* fragments (FS 209, FS 220, and FS 221) can be unambiguously assigned to the Jicarilla occupation of the site, although it is likely that the .50-caliber lead ball (FS 215) was also deposited at this time. If the white metal fragments (FS 211, FS 212, and FS 219) are, in fact, cone tinkler fragments, then they are almost surely associated with the Apachean occupation. The temporal affiliation of the rest of the metal artifacts cannot be determined given that a light scatter of modern trash is present. However, the spatial association of FS 135, FS 238, and FS 310 with Feature 2, and FS 210, FS 213, FS 214, and FS 268 with Feature 4, may be indicative of a temporal association.

Beads (Charles Haecker)

All 158 glass beads from LA 85869 were analyzed; Table 42.10 summarizes the results of this analysis.

Table 42.10. Glass beads from LA 85869.

FS#	Seed Beads (Color)								Seed Bead Total	Other Beads	Total
	White	Black	Blue	Dark Blue	Green	Pink	Red	Tan			
232			1						1	1[1]	2
234	1						1		2		2
245	8	1	2		1				12		12
250	1								1		1
251	2		2			1			5		5
258	12	2	1		1	1		2	19		19
259	2								2		2
273	6		3		3			1	13		13
274	9				1			2	12		12
275	2								2		2
276	1			1					2		2
279	6		3						9		9
280	6		1						7		7
281	5	2	2		2	1		4	16		16
284	1				1				2		2
289	1							1	2		2
290	5			1		1			7		7
292	4		1						5		5

FS#	Seed Beads (Color)								Seed Bead Total	Other Beads	Total
	White	Black	Blue	Dark Blue	Green	Pink	Red	Tan			
298	8		2						10		10
300			1						1		1
301	1								1		1
303	3		3		1	1			8		8
304									0	1[2]	1
312	5		1					1	7		7
315	2		1						3		3
316	2		1						3		3
317	1								1		1
332	3								3		3
Total	**97**	**5**	**25**	**2**	**10**	**5**	**1**	**11**	**156**	**2**	**158**

[1]*Cornaline d'Aleppo* bead, red rim with a white core, 3 mm diameter; [2]"Pony" bead fragment, 20-mm-diameter when whole.

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 374 artifacts were analyzed from LA 86869, consisting of 364 pieces of debitage, four retouched tools, five ground stone artifacts, and a piece of fire-cracked rock. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 42.11 presents the data on lithic artifact type by material type. The majority of the debitage is made of obsidian, with lesser amounts of chalcedony, Pedernal chert, and other materials. The presence of cortex on 23.0 percent of the debitage indicates that these materials were collected from mostly nodule (n = 75) and fewer waterworn (n = 9) sources. Most of the nodule cortex was observed on the obsidian artifacts. Although obsidian is present at nearby primary sources in the Jemez Mountains, it is also present in the area of the site as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval and are scattered across the mesa top. The chalcedony and Pedernal chert are available from local Rio Grande Valley gravel sources and the basalt from local bedrock outcrops and stream gravels. The ground stone artifacts are made of igneous materials, which are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 42.11. Lithic artifact type by material type.

Artifact Type		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Sandstone	Total
Debitage	Angular debris	0	0	0	0	0	0	35	7	0	6	0	0	48
	Core flake	3	0	1	0	0	0	155	17	0	14	0	0	189
	Biface flake	0	0	0	0	0	0	48	2	0	1	0	0	51
	Bipolar flake	0	0	0	0	0	0	1	0	0	0	0	0	1
	Outrepasse	0	0	0	0	0	0	1	0	0	0	0	0	1
	Microdebitage	0	0	0	0	0	0	29	1	0	0	0	0	30
	Und. flake	0	0	0	0	0	0	39	2	0	3	0	0	44
	Subtotal	3	0	1	0	0	0	308	29	0	24	0	0	364
Retouched Tools	Retouched piece	0	0	0	0	0	0	2	0	0	0	0	0	2
	Biface	0	0	0	0	0	0	1	0	0	0	0	0	1
	Projectile point	0	0	0	0	0	0	1	0	0	0	0	0	1
	Uniface	0	0	0	0	0	0	0	0	0	0	0	0	0
	Subtotal	0	0	0	0	0	0	4	0	0	0	0	0	4
Ground Stone	One-hand mano	1	0	0	0	1	0	0	0	0	0	0	0	2
	Und. mano Fragment	0	0	0	0	0	0	0	0	0	0	0	1	1
	Millingstone	0	0	0	0	1	0	0	0	0	0	0	0	1
	Polishing stone	0	0	0	0	1	0	0	0	0	0	0	0	1
	Subtotal	1	0	0	0	3	0	0	0	0	0	0	1	5
Other	Hammerstone	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fire-cracked rock	0	0	0	0	1	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	0	1	0	0	0	0	0	0	0	1
Total		**4**	**0**	**1**	**0**	**3**	**0**	**312**	**29**	**0**	**24**	**0**	**1**	**374**

Six pieces of debitage and four retouched tools were submitted for X-ray fluorescence analysis. All but one of the artifacts was from the Valle Grande source, with a single biface from the Cerro Toledo source (Table 42.12). The Valle Grande (Cerro del Medio) source area is located about 17 km (11 mi) and the Cerro Toledo (Rabbit Mountain/Obsidian Ridge) source area about 19 km (12 mi) to the west and southwest of the site. However, as previously noted, there are pebbles of Cerro Toledo obsidian that are also present in the area of the site.

Table 42.12. Obsidian source samples.

FS #	Artifact	Color	Source
75	Tool	Black opaque	Cerro Toledo rhyolite
160	Tool	Translucent	Valle Grande rhyolite
184	Tool	Translucent	Valle Grande rhyolite
202	Tools	Translucent	Valle Grande rhyolite
FS #	**Artifact**	**Color**	**Source**
265	Debitage	Translucent	Valle Grande rhyolite
266	Debitage	Translucent	Valle Grande rhyolite
267	Debitage	Translucent	Valle Grande rhyolite
277	Debitage	Translucent	Valle Grande rhyolite
322	Debitage	Translucent	Valle Grande rhyolite
324	Debitage	Translucent	Valle Grande rhyolite

Lithic Reduction

Although no cores were recovered at the site, the presence of a bipolar flake indicates that both platform cores and bipolar cores were reduced at the site. The bipolar reduction technique was presumably used to reduce a small obsidian pebble that was present at the site.

The debitage mainly consists of core flakes (52.1%), with some biface flakes (14.0%), angular debris (13.1%), undetermined flake fragments (12.0%), and microdebitage (8.2%). In addition, a single bipolar flake and *outrepasse* flake were also identified. Table 42.13 summarizes the various stages of reduction represented by the whole core and biface (tertiary) flakes. The overall cortical:non-cortical ratio of 0.63 reflects an emphasis on the later stages of core reduction and tool production/maintenance, although there is relatively more cortex present on the small obsidian sample.

Table 42.13. Debitage reduction stages.

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Basalt	0	0	0	0	---
Obsidian	0	6	2	2	1.5
Chalcedony	0	1	2	0	0.50
Pedernal chert	0	0	4	1	---
Total	**0**	**7**	**8**	**3**	**0.63**
Percentage	0.0	38.8	44.4	16.6	---

The majority of the flakes exhibit single-faceted platforms (32.8%; n = 22), with cortical (n = 12), multi-faceted (n = 1), collapsed (n = 14), and crushed (n = 18) platforms. Only five (7.4%) of the flake platforms exhibit evidence of preparation and all of these were abraded/crushed.

The majority of the core flakes consist of distal fragments (n = 90; 47.6%), with fewer whole (n = 17), proximal (n = 35), midsection (n = 43), lateral (n = 1), and undetermined fragments (n =

3). Most of the biface flakes are midsection (*n* = 17) and distal fragments (*n* = 17), with fewer whole (*n* = 3) and proximal (*n* = 14) fragments. The whole core flakes have a mean length of 20.1 mm (*std* = 6.5), whereas the whole biface flakes exhibit a mean length of 18.6 mm (*std* = 3.1). Lastly, angular debris have a mean weight of 2.1 g (*std* = 2.4).

The retouched tools consist of both expedient flakes tools (i.e., retouched pieces) and formal tools (i.e., bifaces and projectile points). Both retouched pieces exhibit a single marginally retouched edge. One of these items has unidirectional dorsal retouch and the other has bidirectional marginal retouch with edge angles of 55 and 65 degrees, respectively. The biface consists of a proximal fragment with an edge angle of 45 degrees. This acute angle indicates that the artifact was probably broken late during the manufacturing process. The projectile point is an undetermined fragment that probably represents a dart point.

Tool Use

Only one flake (0.2%) exhibits evidence of damage that could be attributed to use-wear. The damage is located along the lateral edge of the flake with a concave outline and angle of 40 degrees. One of the retouched pieces does exhibit microflaking; however, this was interpreted as being the result of preparation for further reduction and not use-wear.

Five ground stone artifacts were identified during the analysis, including manos, a millingstone, and a polishing stone. The manos consist of basalt, dacite, and sandstone cobbles. Two of these are one-hand manos with single flat ground surfaces. The other is an undetermined fragment that probably represents a one-hand mano, but is ground on both sides. The millingstone is a large fragment of dacite with a single flat ground surface. Lastly, the polishing stone consists of a small dacite pebble that exhibits polish and grinding on a single surface.

Faunal Remains (Kari Schmidt)

One elk (*Cervus elaphus*) scapula (FS 161) and two small, unidentified mammal fragments (FS 241) were recovered from LA 85869. Based on their general appearance, all of the faunal material appears to be modern in origin.

Archaeobotanical Remains (Pamela McBride)

Seven of nine flotation samples and four of nine macrobotanical samples were submitted for analysis. Table 42.14 shows that little charred material was recovered from the site.

Table 42.14. Charred macrobotanical remains from LA 85869.

FS	Provenience	Charred Material
Flotation Samples		
272	Feature 8, heating feature	1 *Chenopodium* seed, 1.4 g *Pinus edulis* wood,

FS	Provenience	Charred Material
		0.1 g Gymnospermae wood
283	Feature 2, tipi ring	*Pinus edulis* needle
288	Feature 2, tipi ring	None
295	Feature 6, possible hearth	<0.1 g *Pinus edulis* wood *Juniperus* twig, *Pinus ponderosa* needle
296	Feature 6, possible hearth	<0.1 g *Pinus edulis* wood, <0.1 g *Juniperus* wood, *Pinus edulis* needle, *Juniperus* twig, two unidentified specimens
297	Feature 6, possible hearth	<0.1 g *Pinus* wood <0.1 g Gymnospermae wood, *Pinus edulis* needle, *Pinus ponderosa* needle, *Pinus* umbo, *Juniperus* twig, one unidentified specimen
318	Feature 9, heating feature	None
Macrobotanical Samples (from screen)		
237	Feature 2, tipi ring	<0.1 g *Pinus edulis* wood
244	100N 132E, Stratum 3	<0.1 g *Juniperus* wood
247	Feature 2, tipi ring	None (one uncharred *Opuntia* seed)
278	Feature 4, tipi ring	None (uncharred, unidentified fibrous mass)

Two Jicarilla Apache tipi rings and a ring of cobbles were sampled for floral material at LA 85869. A charcoal concentration in the center of the Feature 4 tipi ring was the only context where carbonized plant material that was not associated with firewood use was recovered, represented by a single goosefoot seed (Table 42.15). The balance of the recognizable plant remains consisted of charred and uncharred conifer duff. Aside from conifer twigs, needles, and cone parts, non-cultural plant material included weedy annual, dock, sweet clover, and hedgehog cactus seeds, as well as unknown dicot and oak leaves. Rodent activity was especially evident in the vegetal sample from the Feature 4 tipi ring, where sample taxa and rodent feces suggested the remains of a rodent nest (unburned juniper twigs and seeds, pine cone parts, and piñon needles). Rodent feces were also present in FS 297 from the Feature 6 cobble ring.

Table 42.15. Flotation sample plant remains from LA 85869.

FS No.	**272**	**283**	**288**	**295**	**296**	**297**	**318**
Feature	8 Charcoal concentration in center of F. 4 tipi ring	2 Eastern tipi ring		6 Ring of cobbles			9 Heating feature in F. 2 tipi ring
		strat 1, level 1	2 strat 2, level 2				
Cultural							
Annuals							
Goosefoot	1(1)						
Other							
Unident.					2(0) pp	1(0) pp	
Perennials							
Juniper				twig +	twig +	twig +	
Pine						umbo +	
Piñon		needle +			needle +	needle +	
Ponderosa pine				cf. needle +		needle +	
Non-Cultural							
Annuals							
Cheno-Am			+				
Goosefoot		+					
Spurge						+	
Other							
Composite family					+	+	
Dicot	leaf +						
Purslane family			+		+	+	
Sweet clover	+	+	+		+		
Perennials							
Dock						+	
Hedgehog cactus				+	+	+	
Juniper	♂ cone +, twig +	+, twig +		♀ cone +, twig +	♀ cone +, ♂ cone +, twig +	♀ cone +, ♂ cone +, twig +	twig +
Oak							leaf +
Pine		twig +, umbo		umbo +	umbo +	♂ cone +, twig	

FS No.	272	283	288	295	296	297	318
		+				+, umbo +	
Piñon		+, needle +	needle +	needle +	needle ++	nsg +, needle +	needle +, nutshell +
Ponderosa pine					needle +	needle +	

+ 1-10/liter, ++ 11-25/liter, cf. compares favorably, nsg needle spindle gall, pp plant part.

Wood from flotation and vegetal samples was entirely coniferous, with the most significant amount of charcoal (piñon 1.4 g and unknown conifer 0.1 g) occurring in the Feature 8 charcoal concentration (Tables 42.16 and 42.17). The site occupants were using locally available wood for fuel and kindling and possibly processing goosefoot seeds as food. However, it is unknown if the goosefoot seed represents accidental charring from food processing or of a wind blown seed.

Table 42.16. Flotation sample wood charcoal taxa by count and weight in grams.

FS No.	272	295	296	297
Feature	8 Charcoal concentration in center of F. 4 tipi ring	6 Ring of cobbles		
Conifers				
Juniper			1/<0.1 g	
Pine				4/<0.1 g
Piñon	17/1.4 g	2/<0.1 g	2/<0.1 g	
Unknown conifer	3/0.1 g			4/<0.1 g
Totals	**20/1.5 g**	**2/<0.1 g**	**3/<0.1 g**	**8/<0.1 g**

Table 42.17. Vegetal sample taxa, by count and weight in grams.

FS No.	237	247	244	278
Feature	2 Eastern tipi ring		4 Tipi ring	
	strat 2, level 2	strat 1, level 1	strat 3, level 2	strat 1, level 1
Cultural				
Conifer Wood				
Juniper			2/<0.1 g	
Piñon	1/<0.1 g			
Non-Cultural				
Perennials				
Juniper				seed +, twig +

FS No.	**237**	**247**	**244**	**278**
Feature	2 Eastern tipi ring		4 Tipi ring	
	strat 2, level 2	strat 1, level 1	strat 3, level 2	strat 1, level 1
Pine				umbo +
Piñon				needle +
Prickly pear cactus		1 seed/<0.1 g		
Totals	**1/<0.1 g**	**1/<0.1 g**	**2/<0.1 g**	**-**

Pollen Remains (Susan Smith)

Thirteen pollen samples were analyzed from LA 85869. Table 42.18 lists the frequency of identified pollen types. No cultigens were identified in the botanical assemblage. Sunflower type and sedge were the only other economic resources identified in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 42.18), and these are discussed in detail in Smith's chapter in Volume 3.

Table 42.18. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 85869 (*n* = 13)**
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	0
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	1
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	1
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Resources	Rosaceae	Rose Family	3

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 85869 (*n* = 13)**
	Eriogonum	Buckwheat	1
	Brassicaceae	Mustard Family	1
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	1
	Polygala type	Milkwort	0
	Poaceae	Grass Family	13
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	13
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	13
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	6
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 85869 (*n* = 13)**
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	3
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	5
	Pinus	Pine	12
		Pine Aggregates	1
	Pinus edulis type	Piñon	12
	Juniperus	Juniper	13
		Juniper Aggregates	0
	Quercus	Oak	11
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	4
	Artemisia	Sagebrush	11
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	1

SITE SUMMARY

LA 85869 consists of two late 19th/early 20th century Jicarilla Apache tipi rings. Most of the artifacts recovered from LA 85869 were found in the vicinity of Features 2 and 4. The artifact assemblages associated with each tipi ring are distinct. The artifacts in and around Feature 2 consist of glass beads, a few pieces of chipped stone debitage, three ceramic sherds from a single vessel, a .50-caliber rifle ball, a split-shot lead sinker, and a small fragment of metal. The artifacts in and around Feature 4 consist of two ground stone artifacts, an obsidian debitage scatter to the east of the feature, *coscojo* fragments, possible cone tinkler fragments, and several other miscellaneous metal fragments. The nearby tipi ring site at LA 85864 may be contemporaneous with LA 85869.

CHAPTER 43
RENDIJA TRACT (A-14): LA 86605

Michael J. Dilley and Bradley J. Vierra

INTRODUCTION

LA 86605 is a small one-room Late Classic period fieldhouse situated on the broad, gently sloping, east-facing shoulder of the terrace about 150 m south of the ephemeral creek in Rendija Canyon. The area is covered by a ponderosa pine forest at an elevation of 2110 m (6920 ft). The fieldhouse is located at the end of the Los Alamos Sportsmen's Club rifle range, but did not appear to have been impacted by these activities.

The site was originally recorded by Stolpe, Hoagland, and McGehee in 1991 and given the temporary site number of M-49. Stolpe et al. described the site as a one- to two-room masonry structure that was constructed from both shaped and unshaped tuff blocks within a 50-m^2 area. A total of eight pieces from a polychrome glaze bowl, four Pedernal chert flakes, and a flake made of Jemez obsidian were identified during this visit. Based on the ceramic evidence, they surmised the site dated to the Classic period.

FIELD METHODS

Fieldwork began with a reconnaissance of the area around the fieldhouse to define the nature and extent of the surface remains. The site datum was set at the southwestern corner of the site and was designated as 100N/100E and 10.00 m elevation. A 1- by 1-m grid system was laid in around the surface architecture with grid corners at 100N/100E, 100N/1007E, 107N/100E, and 107N/107E. Subdata were subsequently shot in along each of the four sides of the excavation block (A-D). The site was photographed and surface collected (Figure 43.1), and a total of 14 chipped stone and four ceramic artifacts were recovered.

An east-west trench was excavated along the 103N grid line from 101 to 105E to expose and define the walls of the structure and the site stratigraphy. The east and west walls were identified, as was a possible unprepared living surface about 35 cm below the present surface. The block excavation was, therefore, expanded to include the area bounded by 101N/101E, 101N/104E, 104N/101E, and 104N/104E, in addition to grids 102-104N/105E. A total of 19 grids were excavated in and around the one-room fieldhouse.

Excavations within the structure involved removing post-occupational fill down to the level of the possible unprepared floor surface. This surface was situated at the top of the Btb1 soil horizon. Excavations outside the structure were also conducted to the top of the Btb1 soil horizon, but the soil was much shallower in this area (ca. 20 cm). Obvious wallfall was removed so that the structure's walls and any internal or external features could be identified. The context of this wallfall was also used to help expose the level of the unprepared floor surface.

Figure 43.1. Pre-excavation photograph of LA 86605.

Pollen and flotation samples were taken from each stratigraphic unit and various locations on the possible floor surface. All excavated soil was sieved through a 1/8-in. mesh to aid in the recovery of cultural remains. The excavation area was extended approximately 1 m around the structure to locate external features and to identify outside activity areas. This actually included 2 m to the east of the structure to help isolate any activity areas. No internal or external features were identified. After the excavations were complete, the site was mapped (Figure 43.2) and photographed (Figure 43.3).

The excavation of the site was supervised by Michael Dilley. Crew members included Joseph (Woody) Aguilar, Greg Lockard, Kari Schmidt, and Bradley Vierra. Aaron Gonzalez, Timothy Martinez, and Michael Chavarria served as site monitors, representing both San Ildefonso and Santa Clara pueblos.

STRATIGRAPHY

Five stratigraphic units were defined during the excavations. These are illustrated in the profile provided in Figure 43.2 and are listed in Table 43.1. Stratum 1 is the loose topsoil that covered the site and represents most of the A soil horizon. Some of the surface organic material had been burned by the Cerro Grande fire. Stratum 2 consists of a silty loam that characterizes the post-occupational fill. This stratum is situated within the structure and represents the Bw soil horizon.

Stratum 3 is an unprepared occupational surface (upper and lower). Stratum 4 is similar to Stratum 2 except that it represents the Bw soil horizon situated outside of the structure. Lastly, Stratum 5 is the basal stratigraphic unit at the site and is composed of silty loam clay.

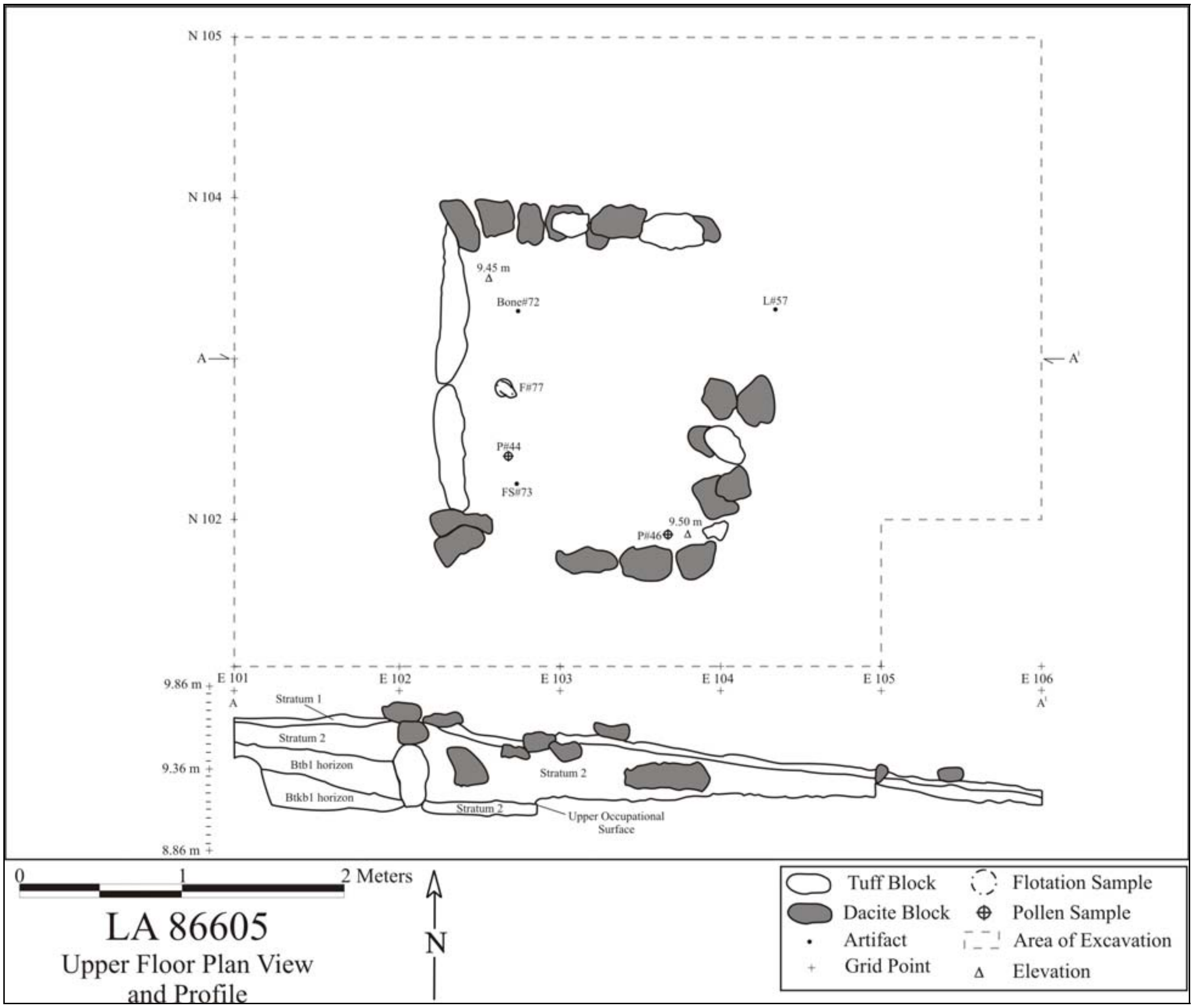

Figure 43.2. Plan view and profile map of LA 86605.

Table 43.1. LA 86605 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 4/4	Loamy sand	2–6	Surface sediment
2	7.5YR 4/4	Silty loam	5–40	Post-occupational fill within the structure
3	7.5YR 4/4	Silty loam	0	Living surface (upper and lower)
4	7.5YR	Silty loam	10–15	Post-occupational fill outside the

Stratum	Color	Texture	Thickness (cm)	Description
	4/4			structure
5	7.5 YR 5/4	Silty loam clay	35+	Pre-occupational fill outside of structure, but below the floor level

Figure 43.3. Post-excavation photograph of LA 86605.

A geomorphic test pit was excavated adjacent and outside the west wall of the structure in unit 103N/101E (see Drakos and Reneau, Volume 3). The pit was excavated to a depth of about 1 m, and five separate soil horizons were identified (Table 43.2). From top to bottom these consist of A, Bw, Btb1, and Btkb1. The characterization of the soil profile continued within the structure at 103N/102E. In contrast to the outside profile, the inside profile did not include the Btb1 soil horizon, but rather an upper A and a middle Bw, which laid on top of the Btkb1 soil (Table 43.3). The Bw horizon could be separated into upper and lower sections that were approximately 30 and 10 cm thick, respectively. These differences became important once the inside fill of the structure had been excavated. Table 43.4 provides the artifact count information by stratigraphic unit at the site, with a total of 189 artifacts being recovered.

Table 43.2. LA 86605 soil horizon descriptions from the south profile of the geological test pit located outside the structure (103N/101E).

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 4/4	Loamy sand	0–7	Topsoil
Bw	7.5YR 4/4	Silty loam	7–19	Late-Holocene soil
Btb1	7.5YR 5/4	Silty loam	19–35	Late-Pleistocene/early-Holocene soil
Btkb1	7.5YR 5/4	Silty loam	35–50+	Late-Pleistocene/early-Holocene soil
Btkb1	-	-	54–93+	Late-Pleistocene/early-Holocene soil

Table 43.3. LA 86605 soil horizon descriptions from the south profile of grid unit 103N/102E located inside the structure.

Horizon	Color	Texture	Depth (cm)	Description
A	-	-	?	Topsoil
Bw	8.75YR 4/3	Silt	? to 40–45	Late-Holocene soil
Btkb1	-	-	(40–45)+	Late-Pleistocene/early-Holocene soil

Table 43.4. LA 86605 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	5	14	0	0	**19**
1	19	10	0	0	**29**
2	85	50	3	1	**139**
Total	**109**	**74**	**3**	**1**	**187**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a single room in a small fieldhouse (see Figure 43.3). The room measures 2.0 m north-south by 1.75 m east-west, with about 3.5 m^2 of interior space. Excavation of the room began with the east-west trench that extended across the rubble area along the 103N grid line. This excavation defined the east and west walls of the structure, the internal stratigraphy, and a possible unprepared floor surface. After the trench was completed, the remainder of the room fill was removed down to the level of the possible floor.

The geologic test pit was subsequently excavated adjacent to the west wall of the structure to define the stratigraphic context of the walls and occupational surfaces. As previously noted, separate soil profiles were identified within and outside of the structure.

Floor. Approximately 20 to 30 cm of post-occupational fill was removed before exposing a possible unprepared living surface within the structure. It was difficult to discern, being mostly disturbed in the western section of the room. However, it was defined by isolating charcoal bits, burned daub, a few blocks of wallfall, and a couple of artifacts along a horizontal break in the soil profile. This break was defined between the upper Bw(1) and lower Bw(2) soil horizons within the room fill.

A flotation sample (Field Specimen [FS] 77) was taken from under a tuff block in the middle of the room. Charred taxa identified in this sample included ponderosa pine, piñon pine, maize, and unknown conifer. Two pollen samples (FS 44 and FS 46) were taken from areas adjacent to the west and south walls. Identified taxa included maize, cholla, prickly pear, beeweed, lily family, grass family, cheno-ams, sunflower family, ragweed/bursage, spurge family, spruce, fir, unidentified pine, piñon pine, juniper, oak, squawbush, Mormon tea, and sagebrush. In addition, three artifacts were found lying on the floor surface. These consist of a Pedernal chert flake (FS 57), a mule deer bone fragment (FS 72), and a piece of burned adobe (FS 73).

A second lower occupational surface was identified. This floor also consisted of an unprepared living surface that was situated about 20 cm lower than the upper floor. However, the lower floor was located at the break between the Bw and Btkb1 soil horizon. That is, the upper floor was located near the bottom of the masonry wall, whereas the lower floor was located below the level of the walls. Nonetheless, additional wallfall, bits of charcoal, and a few artifacts were also recovered from the fill between the two floors. A flotation (FS 107) and pollen (FS 106) sample were taken from the lower floor. Ponderosa pine was the only charred taxon identified in the flotation sample, while grass family, cheno-ams, sunflower family, unidentified pine, piñon pine, juniper, oak, and sagebrush were all identified in the pollen sample. In addition, a single chalcedony flake was recovered from the same level and grid (103N/103E).

The identification of these two possible floor surfaces is tentative, but do appear to correlate with breaks in the stratigraphic profile and architectural remains. Drakos and Reneau (see Volume 3, Chapter 57) suggest that these represent two distinct occupations at the site, with the later occupants reusing the building stone from the previous occupation. In addition, Drakos and Reneau relate the upper occupation to the top of the exterior Bw soil horizon and the lower occupation to the top of the Btb1 soil horizon. They speculate as to whether the lower occupation might date to the Coalition period and the upper occupation to the Classic period.

Wall Construction. The walls in Room 1 were composed of tuff blocks and dacite cobbles. The tuff is available from outcrops in the canyon and the dacite from the gravels in the nearby ephemeral drainage. Most of the north, east, and west walls are composed of dacite cobbles that are resting near the upper floor level. Some adobe was observed below the central part of the north wall, which could represent foundation; however, no other evidence of adobe was observed below or within the other wall sections. Most of the building stones were set horizontally, with a few being upright in the north, east, and south walls. These appear to be dry-laid walls, with one to two courses remaining. Two very large tuff blocks are all that represent the western wall segment. These blocks have been set into a trench that cuts down into the lower Bw(2) soil horizon inside the room and the Btkb1 soil horizon outside of the room. The trench was filled with nearby soil that contained a few artifacts.

Based on the amount of wallfall removed during the excavation (1.2 m^3), it is speculated that the original walls were only three courses high. Wall measurement information is provided in Table 43.5. The remaining sections of the north, west, and south walls appear to be *in situ*; however, the nature of the east wall is unclear. This wall only partially extends along the east side of the room, leaving an opening in the northeast corner. The remainder of the wall does not appear to be *in situ* and may actually represent a cluster of building stones. If so, then the opening may not reflect a doorway, and there may not have been any standing masonry along this side of the room.

Table 43.5. Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.74	0.09–0.25	0.17–0.30	1 to 2
South	1.60	0.13–0.40	0.13–0.17	1
East	1.15 (1.65)	0.12–0.26	0.18–0.33	1 to 2
West	2.08	0.28–0.43	0.11–0.31	1

Note: The length of the east wall including the entryway is given in parentheses.

Artifact Distribution

Table 43.6 graphically illustrates the distribution of artifacts recovered during the site excavations (i.e., ceramics, chipped stone, ground stone, and faunal remains). However, this does not include the 18 artifacts found outside of the excavated area during surface collection. The bold numbers indicate grid units that are located completely or partially within Room 1, which indicates that the majority of the artifacts were recovered from within the structure or directly to the east of the room. The latter may reflect an outside activity area that was situated in front of the fieldhouse, or possibly reflects material removed from inside the structure during cleaning episodes.

Table 43.6. Artifact distribution by grid unit.

	E101	E102	E103	E104	E105
N104	2	6	1	5	2
N103	5	**33**	**14**	13	4
N102	4	**34**	**12**	13	0
N101	2	**13**	**4**	4	--

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 189 artifacts were analyzed from the excavations conducted at LA 86605. In addition, flotation and pollen samples were selected for analysis from the post-occupational fill (Stratum 2) and the upper and lower floors (Stratum 3) in the structure. Maize that was recovered from the flotation sample on the upper floor (FS 77) was submitted for radiocarbon dating (Table 43.7).

Table 43.7. Samples selected for analysis from LA 86605.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2	94	39, 93, 95	77	
3 (upper)	77	44, 46		
3 (lower)	107	106		

*thermoluminescence

Chronology

Radiocarbon Dating

A single maize sample was submitted for accelerator mass spectroscopy dating. The sample provided a date of 360±40 BP (Beta-215551), with a calibrated intercept of AD 1500 and a two-sigma range of AD 1440 to 1640. The sample was recovered from the upper floor of the structure.

Ceramic Artifacts (Dean Wilson)

A total of 105 ceramics were analyzed from LA 86605. The majority of the pottery represents local Rio Grande decorated ceramics, with a few utilityware types (Table 43.8). These include Biscuit B, Biscuit C, Sankawi Black-on-cream, and Sapawe Micaceous. The whitewares are primarily tempered with local fine tuff or ash and the utilitywares with non-local granite and mica (Table 43.9). Most of the whitewares are represented by jar vessel forms, while all the utilitywares are jars (Table 43.10). Given the presence of Biscuit C and Sankawi Black-on-cream, the site probably dates to the Late Classic period. This corroborates the potential 16th century occupation represented by the radiocarbon date. It seems unlikely that the lower floor dates to the Coalition period given the absence of any earlier ceramic types.

Table 43.8. Ceramic types from LA 86605.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	3	2.9
Biscuit B rim	1	1.0
Biscuit C rim	2	1.9
Sankawi Black-on-cream	1	1.0
Biscuit B-C body	36	34.3
Biscuit unpainted, slipped both sides	1	1.0
Biscuit painted unspecified	8	7.6
Biscuit slipped one side	37	35.2
Biscuit undifferentiated	2	1.9

Ceramic Type	Frequency	Percent
Northern Rio Grande Utilityware		
Mica utility undifferentiated	5	4.8
Sapawe micaceous	9	8.6
Total	**105**	**100.0**

Table 43.9. Temper by ware for ceramics from LA 86605.

Temper	Ware		
	Gray	White	Total
Granite with mica	14	0	14
Sherd and sand	0	1	1
Fine tuff or ash	0	89	89
Fine tuff and sand	0	1	1
Total	**14**	**91**	**105**

Table 43.10. Vessel form by ware for ceramics from LA 86605.

Vessel Form	Ware		
	Gray	White	Total
Indeterminate	0	10	10
Bowl rim	0	4	4
Bowl body	0	8	8
Jar neck	0	2	2
Jar rim	2	1	3
Jar body	12	65	77
Flared bowl rim	0	1	1
Total	**14**	**91**	**105**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 72 artifacts were analyzed from LA 86605, consisting of 67 pieces of debitage, four retouched tools, and a ground stone artifact. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 43.11 presents the data on lithic artifact type by material type. The debitage is primarily made of chalcedony, with less Pedernal chert and other materials. The presence of cortex on 23.8 percent of the debitage indicates that these materials were collected from waterworn (n = 14) and nodule (n = 2) sources. The chalcedony, Pedernal chert, silicified wood, and quartzite are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 43.11. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	**Vesic. Basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Sil. Wood**	**Quartzite**	**Sandstone**	**Total**
Debitage	Angular debris	0	0	0	0	0	0	0	4	0	3	0	0	0	7
	Core flake	3	0	4	1	0	0	2	25	0	12	2	1	0	50
	Biface flake	0	0	0	0	0	0	2	0	0	0	0	0	0	2
	CO flake*	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Microdeb.	0	0	0	1	0	0	2	2	0	0	0	0	0	5
	Und. flake	1	0	0	0	0	0	0	1	0	0	0	0	0	2
	Subtotal	4	0	4	2	0	0	6	32	1	16	2	1	0	67
Retouched Tools	Retouched piece	0	0	1	0	0	0	1	0	2	0	0	0	0	4
	Subtotal	0	0	1	0	0	0	0	0	2	0	0	0	0	4
Ground Stone	Grinding slab	0	0	0	0	1	0	0	0	0	0	0	1	0	1
	Subtotal	0	0	0	0	1	0	0	0	0	0	0	1	0	1
Total		**4**	**0**	**5**	**2**	**1**	**0**	**6**	**32**	**3**	**16**	**2**	**1**	**0**	**72**

*Change-of-Orientation Flake

Three obsidian flakes, three basalt flakes, and a retouched piece were submitted for X-ray fluorescence analysis. The obsidian artifacts are made from Valle Grande, Cerro Toledo, and El Rechuelos obsidian (Table 43.12). The Valle Grande (Cerro del Medio) and Cerro Toledo (Obsidian Ridge/Rabbit Mountain) source areas are situated about 17 km (11 mi) and 19 km (12 mi) to the west and southwest. Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present on the mesa to the northeast of the site as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval. In contrast, the El Rechuelos (Polvadera Peak) source area is located about 27 km (17 mi) northwest of the site. Both of the basalt flakes appear to be made of dacite; however, one of these is derived from a local source and the other from the San Antonio Mountain source.

Table 43.12. Obsidian source samples.

FS #	Artifact	Color	Source
1	Debitage	Black dusty	El Rechuelos
27	Debitage	Translucent	Cerro Toledo rhyolite
41	Debitage	Translucent	Valle Grande rhyolite
59	Tool	Translucent	Valle Grande rhyolite

Lithic Reduction

The debitage mostly consists of core flakes, with a few other items. The overall cortical:non-cortical ratio of 0.37 reflects an emphasis on the later stages of core reduction. The flakes mostly have single-faceted platforms (*n* = 16), with fewer cortical (*n* = 2), collapsed (*n* = 7), and crushed (*n* = 9) platforms. None of the platforms exhibit any obvious evidence of preparation. The majority of the core flakes are proximal fragments (*n* = 22), with fewer whole (*n* = 13), midsection (*n* = 6), and distal (*n* = 9) fragments. The whole core flakes have a mean length of 23.5 mm (*std* = 6.9) and the angular debris a mean weight of 1.3 g (*std* = 8.8).

The retouched tools consist solely of retouched pieces. They exhibit both unidirectional dorsal and bidirectional marginal retouch along the lateral sides of the flake, with one situated at the distal end of the flake. These edge angles range from 55 to 70 degrees.

Tool Use

None of the flakes exhibit evidence of edge damage that could be attributed to use. In contrast, three of the four retouched pieces exhibit rounding and scarring that appears to be the result of use. The only ground stone artifact was a grinding slab fragment with a single ground surface. The ground surface is slightly concave and ovoid shape, with some of the high spots being smoothed and polished.

Faunal Remains (Kari Schmidt)

One piece of bone was recovered from Room 1 (Stratum 2, Level 5). The bone was a mule deer (*Odocoileus hemionus*) distal humerus (right) that was fairly weathered and may have been exposed to the elements for quite some time before deposition. The bone was unburned, and its location in the fieldhouse was point-plotted (103.35N/102.72E).

Archaeobotanical Remains (Pamela McBride)

Corn cupules, a grass seed fragment, and ponderosa pine needles were recovered from the two samples analyzed from the fieldhouse floor and post-occupational fill (Table 43.13). With the exception of four fragments of ponderosa pine charcoal (Table 43.14), the sample from the lower living surface contained only unburned plant material. In comparison, the wood assemblage from post-occupational fill was quite diverse, including mountain mahogany, piñon pine, ponderosa pine, cottonwood/willow, and sagebrush.

Table 43.13. Flotation plant remains, count, and abundance per liter from LA 86605.

FS No.	**77**	**94**	**107**
Feature	Floor matrix	Stratum 2 Post-occupational fill	Wallfall on lower living surface
Cultigens			

FS No.	77	94	107
Maize	1(0) c	1(0) c	
Grasses			
cf. Grass family		1(0)	
Other			
Unidentifiable	2(0) pp		
Perennials			
Ponderosa pine	+ needle	+ needle	
Non-Cultural			
Annuals			
Goosefoot	+	+	
Sunflower		+	
Grasses			
Grass family		+	
Other			
Groundcherry		+	
Purslane family	+		+
Perennials			
Hedgehog cactus	+		+
Ponderosa pine	+ needle		

+ 1-10/liter, c cupule, cf. compares favorably, pp plant part.

Table 43.14. Flotation sample wood charcoal by count and weight in grams.

FS No.	77	94	107
Feature	Floor matrix	Stratum 2 Post-occupational fill	Wallfall on lower living surface
Conifers			
Piñon	1/0.2 g		
Ponderosa pine	5/0.2 g	4/0.1 g	4/0.3 g
Unknown conifer	14/0.3 g	3/<0.1 g	
Non-Conifers			
Cottonwood/ Willow		1/<0.1 g	
Mountain mahogany		3/0.1 g	
cf. Sagebrush		1/<0.1 g	
Totals	**20/0.7 g**	**12/0.2 g**	**4/0.3 g**

Pollen Remains (Susan Smith)

Six pollen samples were analyzed from LA 86605. Table 43.15 lists the frequency of identified pollen types. Maize and cholla were the only cultigens identified in the botanical assemblage. Prickly pear, beeweed, and lily family were all identified as economic resources in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 43.15), and these are discussed in detail in Smith's chapter in Volume 3.

Table 43.15. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86605 (*n* = 6)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	2
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	1
Economic Resources	*Opuntia* (Platy)	Prickly Pear	1
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	2
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	1
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	0
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86605 (*n* = 6)
	Polygala type	Milkwort	0
	Poaceae	Grass Family	6
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	6
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	6
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	3
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	2
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86605 (*n* = 6)
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	1
	Pinus	Pine	6
		Pine Aggregates	0
	Pinus edulis type	Piñon	6
	Juniperus	Juniper	6
		Juniper Aggregates	0
	Quercus	Oak	4
	Rhus type	Squawbush type	1
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	3
	Artemisia	Sagebrush	6
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY OF SITE EXCAVATIONS

LA 86605 consists of a one-room fieldhouse. The north, west, and south walls are clearly defined, but it is unclear as to whether the east wall is *in situ* or simply represents a cluster of building stones. Excavations revealed the presence of possibly two unprepared floors that correspond to changes in the soil profile. The upper floor was situated at the base of the masonry walls, whereas the lower floor was located below the walls. No features and only a few artifacts were present on either floor, with bits of charcoal and adobe. The project geomorphologists suggested that the upper floor might date to the Classic period and the lower floor to the Coalition period; however, the radiocarbon and ceramic evidence indicates that the site was probably occupied during the Late Classic period. The presence of maize and the prevalence of storage jars reflect the agricultural function of the site, with limited core reduction and grinding activities also being represented.

CHAPTER 44
RENDIJA TRACT (A-14): LA 86606

Gregory D. Lockard

INTRODUCTION

LA 86606 is the remains of a small structure located on the tip of an east-facing ridge finger in Cabra Canyon, which is located in the northwest extension of the Rendija Tract. The site is located a few tens of m to the west and directly uphill from the end of a two-track dirt road and the Pajarito Trail (Trail #286). Vegetation on the site consists of ponderosa pine with some juniper and scrub oak. The site is situated at an elevation of 2122 m (6960 ft).

LA 86606 was first recorded on March 16, 1992, by Binzen, Hoagland, and Manz as part of the Environmental Restoration Program (McGehee et al. 1992) and given the temporary site number of B-19. The site was believed to be the remains of a one-room structure and an associated rock alignment located approximately 6 m to the west. No artifacts were visible on the surface due to the presence of a thick layer of pine duff.

FIELD METHODS

The excavation of LA 86606 began during the 2004 field season and was completed during the 2005 field season of the Conveyance and Transfer Project. In 2004, the site and surrounding area were cleared of trees and large undergrowth. The site was then visible as a mound of rubble (designated Area 1) and a short rock alignment a few m to the west (designated Area 2) (Figure 44.1). The rubble mound measured 3 by 3.5 m in area and was approximately 20 cm tall. An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the southwestern portion of Area 1. The entire site was then covered with a 1- by 1-m grid that extended 4 m north, 2 m south, 7 m east, and 3 m west of the site datum. Four subdata (A-D) were set up for taking elevations. The site was then photographed. The site was not surface collected because no artifacts were visible on the surface.

Excavation of a 5- by 1-m east-west trench (units 101N/102-106E) across the structural remains in Area 1 was begun during the 2004 field season and completed during the 2005 field season. The purpose of this trench was to expose a profile of the site stratigraphy, as well as to determine the location of the room's east and west walls. Grid units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. The room's west wall was encountered in the western half of unit 101N/103E, and the east wall was encountered in unit 101N/105E. Within Room 1, excavation of the trench units proceeded down to a poorly preserved living surface. Outside of the room, the trench units were excavated down to the top of a sterile Bw horizon. The westernmost unit in the trench was chosen to serve as a test pit for geological analysis. Excavation of this unit therefore continued for approximately 90 cm below the top of the sterile soil horizon. No artifacts were recovered during the excavation of this stratum (Stratum 4). The northern profile of the trench was then drawn and photographed.

Figure 44.1. Pre-excavation photograph of LA 86606.

The rest of Area 1 was subsequently excavated, again by strata and arbitrary levels for thicker strata. In all, 23 units were excavated. Within the structure, excavation proceeded down to the poorly preserved living surface encountered while excavating the trench. Outside of the structure, excavation proceeded down to the top of the sterile soil horizon. Excavation focused on defining the structure's walls, removing wallfall, and locating features. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended at least 1 m beyond the structure in all directions to locate external features and/or outdoor activity areas. Area 1 was then mapped (Figure 44.2) and photographed (Figure 44.3). Lastly, the geological test pit was extended to the exterior face of the west wall of Room 1. The purpose of this excavation was to determine the depth of the foundation of the room's walls.

The rock alignment in Area 2, located a few m to the southwest of Room 1 in Area 1, was fully excavated in six units (98-100N/97-98E). Grid units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. Excavation revealed that the rock alignment was a wall, which was designated Feature 1. This wall most likely functioned as a wind break for a possible hearth (see below). After the excavation of the feature was complete, Feature 1 was photographed (Figure 44.4) and mapped (Figure 44.5).

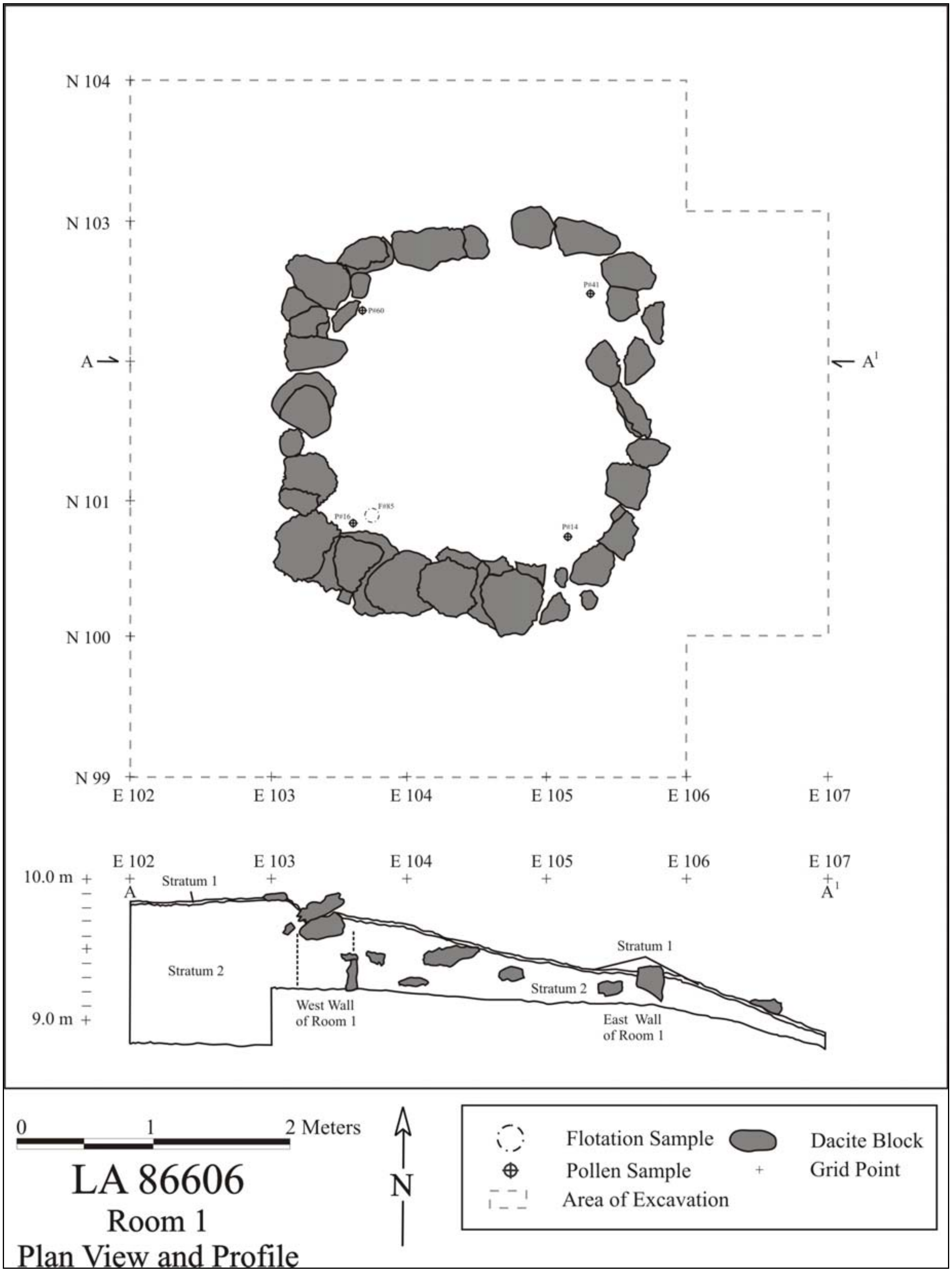

Figure 44.2. Post-excavation plan view and profile map of LA 86606.

Figure 44.3. Post-excavation photograph of the fieldhouse at LA 86606.

Figure 44.4. Post-excavation photograph of Feature 1, a rock alignment.

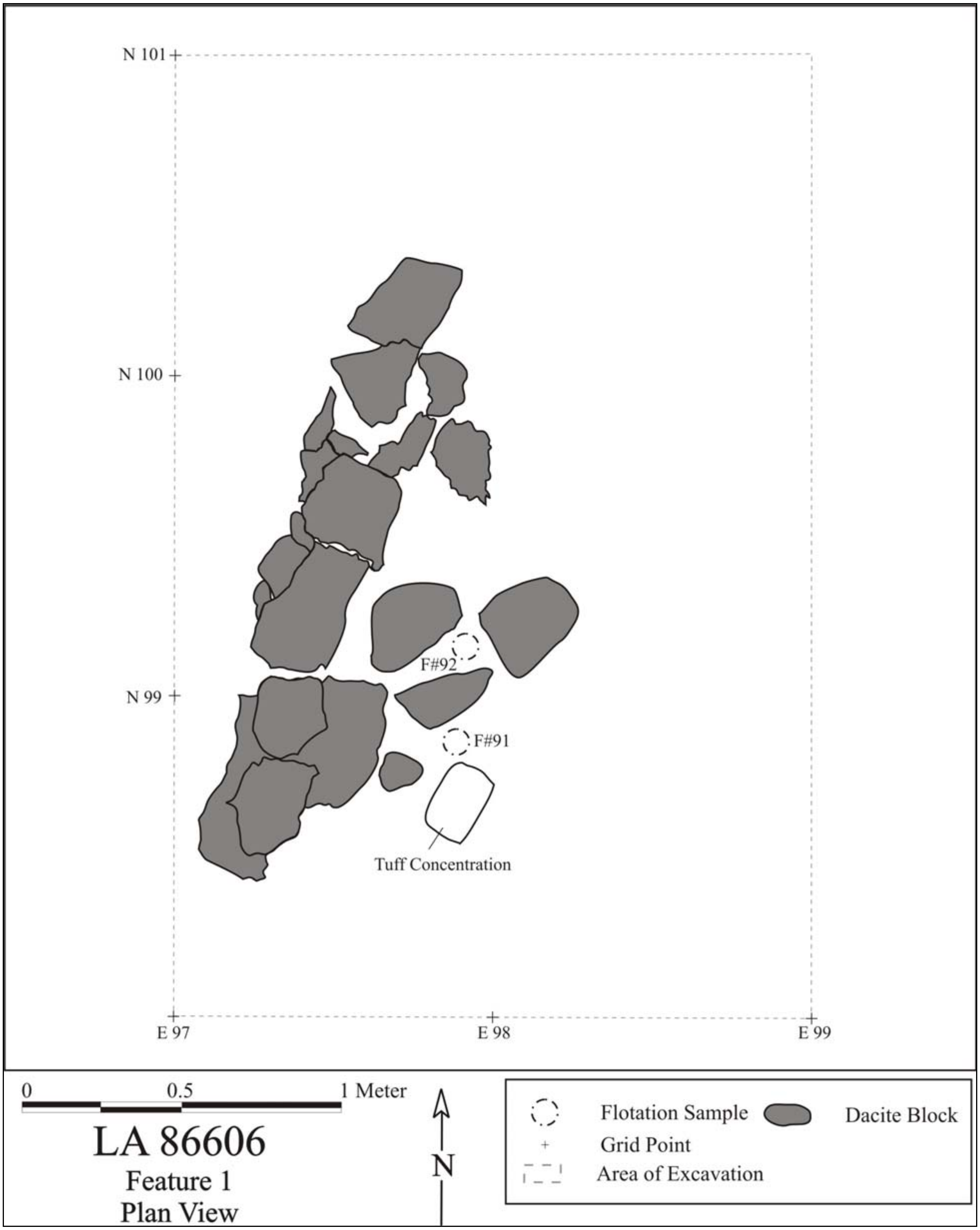

Figure 44.5. Plan view drawing of Feature 1, a rock alignment.

During the 2004 field season, the excavation of the site was supervised by Michael Dilley, and the field crew included Alan Madsen, Sandi Copeland, and Hannah Lockard. During the 2005 field season, the excavation of the site was supervised by Greg Lockard, and the field crew included Michael Dilley, Joseph (Woody) Aguilar, Brandon Gabler, and Samuel Duwe. Timothy Martinez and Aaron Gonzalez served as site monitors from San Ildefonso Pueblo and as screeners during both field seasons.

STRATIGRAPHY

Stratum 1 is composed of loose surface sediment. It is uniformly 2 to 5 cm thick across the site and is part of the A horizon (topsoil). Stratum 2 is post-occupational fill and ranges from 10 to 50 cm in thickness in Area 1 and 10 to 30 cm in Area 2. In Area 1, the post-occupational fill became progressively thinner in the eastern, downhill portion of the area. This was due to erosion of the eastern edge of the ridge finger upon which Area 1 is located. The post-occupational fill was still thicker in the western, uphill portion of Area 1, however, than it was in Area 2 to the west. This was most likely the result of aeolian sediments becoming trapped in the Room 1 wallfall. Stratum 2 corresponds with the upper substrata of the Bw horizon. Stratum 3 is the Room 1 living surface, which was very poorly preserved in all but the southwest corner of the room. Stratum 4 is the sterile soil horizon excavated in the geological test pit (unit 101N/102E) and corresponds with the lower substrata of the Bw horizon. Tables 44.1 through 44.3 describe and summarize the strata excavated at the site.

Table 44.1. LA 86606 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 4.5/3	Loamy sand	2–5	Surface sediment
2	10YR 5/3	Loamy sand	10–50	Post-occupational fill
3	10YR 5/3	Clay loam	-	Room 1 living surface
4	10YR 5/4	Sandy loam	90	Middle/late-Holocene soil

Table 44.2. LA 86606 soil horizon descriptions from the north profile of the geological test pit (unit 101N/102E) and its eastern extension (within unit 101N/103E).

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 4.5/3	Loamy sand	0–8	Topsoil
Bw1	10YR 5/3	Loamy sand	8–22	Late-Holocene soil
Bw2	10YR 5/4	Sandy loam	22–36	Middle/late-Holocene soil
Bw3	10YR 5/4	Sandy loam	36–51	Middle/late-Holocene soil
Bw4	10YR 5/3	Loamy sand	51–89	Middle/late-Holocene soil
BCk	10YR 5/3	Loamy sand	89–120+	Middle/late-Holocene soil

Table 44.3. LA 86606 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	0	0	0	0	**0**
1	26	6	0	3	**35**
2	120	13	10	0	**143**
3	0	0	0	0	**0**
4	0	0	0	0	**0**
Total	**146**	**19**	**10**	**3**	**178**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a small structure that probably functioned as a fieldhouse. The shape of the fieldhouse is square with slightly rounded corners. Room 1 measures 2.05 m in length (north to south) by 1.85 m in width (east to west), with approximately 3.79 m^2 of interior space. Excavation of the room began with an east-west trench that extended across the rubble mound in Area 1 (101N/102-106E). The excavation of this trench served to define the room's stratigraphy, as well as to locate the room's east and west walls. The room's east wall was encountered in unit 101N/105E, and the west wall in unit 101N/103E. A poorly preserved living surface was encountered between the walls. After the excavation of the trench, the rest of the room was excavated down to the living surface encountered in the trench.

Fill. The interior of Room 1 was filled with 2 to 5 cm of surface sediment on top of 25 to 40 cm of post-occupational fill. The fill was thickest just inside the room's west wall and was progressively thinner to the east. A flotation sample (Field Specimen [FS] 45) and a pollen sample (FS 44) were taken from the Room 1 fill, but were not analyzed.

Floor. No prepared floor was encountered during the excavation of Room 1. Excavation of the interior of the room proceeded to a few centimeters above the base of the room's walls. At this level, a compact surface was encountered throughout most of the room. In some locations, the compact surface took the form of a thin layer of dark, ashy sediment. This was most likely the remains of an informal (i.e., not plastered) living surface. A layer of reddish, clay-rich soil was encountered just beneath and surrounding the patches of compact, ashy sediment. When the room was first constructed, this natural surface most likely functioned as the room's living surface. The thin layer of compact, ashy sediment is therefore most likely sediment that accumulated and became compacted during the site's occupation. The flatness of the room's living surface compared to the slope of the surrounding natural hillside indicates that the living surface was most likely leveled to some degree during the room's construction. The living surface therefore appears to have been constructed by first clearing the entire surface of loose sediment and exposing the layer of reddish, clay-rich sediment beneath. Additional sediment was then removed from the western, uphill side of the room to create a level surface.

A flotation sample (FS 17) and a pollen sample (FS 16) were taken from just above the living surface in the southwest corner of the room. The flotation sample was not analyzed, but taxa identified in the pollen sample included rose family, grass family, cheno-ams, sunflower family, ragweed/bursage, fir, unidentified pine, piñon pine, juniper, oak, and sagebrush. Additional pollen samples were taken from about the floor level in the southeast (FS 14), northeast (FS 41), and northwest (FS 60) corners of the room. Taxa identified in these samples included maize, rose family, grass family, birch, cheno-ams, sunflower family, ragweed/bursage, spruce, fir, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush. Flotation samples were also taken from about floor level in the north-central portion (FS 54) and northwest corner (FS 59) of the room, but these were not analyzed. A well-preserved patch of living surface in the southwest corner of the room was also removed as a flotation sample (FS 85). Charred taxa identified in this sample included purslane, grass family, unidentified pine, and ponderosa pine.

Wall Construction. The extant portions of the Room 1 walls were composed of dacite rocks of various shapes and sizes (Table 44.4). The foundations of the north, south, and west walls were composed of large upright slabs. The base of the interior faces of these walls was formed by the flat surfaces of these slabs. Slabs with flat faces in fact appear to have been specifically chosen as foundation rocks. Almost all of the slabs are sloped slightly outwards, forming an obtuse angle between the living surface and the wall faces. The rocks in the courses above are more irregular in size and shape. Some are long rocks placed on their sides across the top of two or more foundation slabs. The base of the exterior wall faces was composed of adobe that was placed within the acute angle formed by the outward sloping foundation slabs. The east wall was considerably shorter than the other walls. The east wall may simply have been more poorly preserved than the other walls because of its location along the edge of the eroding slope to the east. It is more likely, however, that the east wall of the structure was open. If the site's occupant was farming the land at the base of Cabra Canyon, an opening to the east would have provided an ideal view of this land. If the east wall was not completely open, the room's entryway was most likely located in this wall. The extant portion of the east wall, or at least some portion thereof, therefore most likely represents a short doorsill.

Judging from the amount of wallfall removed during the excavation of the area in and around Room 1, the masonry portions of the room's walls were originally considerably higher than they were at the time of excavation. In order to estimate the original height of the walls, all of the rocks removed as wallfall during the site's excavation were placed in two stacks, which were then measured. The stacks measured 3.25 by 0.50 by 0.6 m and 3.25 by 0.40 by 0.558 m, for a total of approximately 1.69 m^3 of wallfall. Based on this volume of wallfall and the overall length, average thickness, and average height of the extant portions of the walls, the masonry portions of the room's walls were originally approximately 1.06 m in height. The uppermost portions of the walls, as well as the ceiling, were most likely composed of wattle and daub. These materials are rarely preserved at archaeological sites on the Pajarito Plateau. In fact, only three pieces of burned adobe were recovered from Area 1 (FS 9, FS 74, and FS 77).

Table 44.4. LA 86606 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.70	0.28–0.43	0.17–0.40	1 to 2
South	1.80	0.18–0.52	0.28–0.55	2
East	1.97	0.12–0.30	0.17–0.32	1
West	1.92	0.40–0.67	0.30–0.43	3 to 4

Feature 1 (Area 2)

Feature 1 is a short wall composed of unshaped dacite blocks of varying sizes. The wall was approximately 2 m in length and was two to three courses high. The foundation rocks were placed in a shallow trench dug into the sterile Bw2 horizon. The wall most likely functioned as a wind break. Five large rocks were encountered directly east of the wall. One of these is a dacite block that was placed directly adjacent to the wall. This rock was most likely a later addition that functioned to provide additional support for the base of the wall. Three of the remaining rocks formed a circular alignment. These rocks were most likely a pot rest or the remains of a hearth. A concentration of ash and charcoal was in fact encountered to the south of the three rocks.

In addition, several pieces of burned adobe were recovered from throughout Area 2. The entire area to the east of the wall has been heavily disturbed by rodents, however, and none of the burned adobe was found *in situ*. As a result, the exact location of any hearth that may have existed within Area 2 could not be determined. It may have been in the center of the three rocks. Alternatively, it may have been in the ash concentration to the south, in which case the three rocks were an adjacent pot rest. It could have even been located to the north, between the three rocks and the fifth rock encountered to the east of the wall. If there was a hearth in Area 2, it was almost certainly located to the east of the wall. The wall, therefore, appears to have functioned as a wind break to protect the hearth from easterly winds. A concentration of decomposing, laminar, soft tuff was also encountered along the northern edge of the ash concentration and to the south of the three rocks. This concentration of soft tuff was completely surrounded by post-occupational fill. In addition, nothing of its kind was found elsewhere at the site. As a result, the soft tuff was most likely brought to the site by the person who built and/or last utilized Feature 1. One possible explanation as to its function is that it was meant to be used as temper for ceramics. Lastly, several biscuitware ceramics were recovered from Area 2. This indicates that Feature 1 was contemporaneous (and thus most likely associated) with Room 1.

Two flotation samples and a pollen sample were taken from Feature 1. One of the flotation samples (FS 92) was taken from between the three rocks to the east of the wall. Charred taxa identified in the sample included unknown conifer, mountain mahogany, unidentified pine, ponderosa pine, and oak. The other flotation sample (FS 91) was taken from the area to the south of the three rocks and to the north of the concentration of soft tuff. Charred taxa identified in this sample included mountain mahogany, piñon pine, ponderosa pine, and oak. The pollen sample (FS 93) was taken from the narrow area between the wall and the three rocks, but it was not analyzed. Finally, a sample of the soft tuff (FS 89) was also taken.

Geological Test Pit

Geologists Paul Drakos and Steven Reneau analyzed the north profile of the geological test pit (unit 101N/102E) and its eastward extension (within unit 101N/103E) to reconstruct the natural soil horizons at the site. This profile contained a soil sequence consisting of an A horizon (topsoil), four Bw horizons (a late-Holocene soil and three middle/late-Holocene soils), and a BCk horizon (a middle/late-Holocene soil). The rocks that form the foundation of the west wall of Room 1 extend down into the Bw4 horizon. Just inside the west wall, the room's living surface is at or just above the top of the Bw4 horizon.

Artifact Distribution

The distribution of artifacts within Room 1 is fairly uniform. A greater number of artifacts were recovered from the units to the north and especially west of the room (Table 44.5). This is fairly surprising, as most of the fieldhouses in the Rendija Tract excavated during the Conveyance and Transfer Project had the highest concentration of artifacts to the east of the structure. There is also a tendency for there to be a higher concentration of artifacts on the side of the structure in which the entryway is located. In Room 1, the entryway appears to have been to the east. The lack of artifacts to the east of the structure is most likely the result of site formation processes. The site is located on the tip of a ridge finger. Just east of the structure, the downward slope of the natural surface becomes increasingly steep. As a result, there was very little post-occupational fill to the east of the structure. Most of the artifacts that once existed to the east of the structure have most likely eroded downhill to the east. An additional factor that helps explain the higher concentration of artifacts to the west of the structure is the location of Feature 1. If this feature was indeed a wind break for an outdoor hearth, the area surrounding the hearth was most likely an activity area. More artifacts were recovered from the units to the east of the Feature 1 wall (Table 44.6). The number of artifacts recovered from these units, however, was still smaller than the number of artifacts recovered from the units just west of Room 1 in Area 1.

Table 44.5. LA 86606, Area 1 artifact counts by grid unit.

	E102	**E103**	**E104**	**E105**	**E106**
N103	22	10	8	8	--
N102	12	**5**	**6**	**0**	0
N101	0	**4**	**2**	**3**	6
N100	15	**3**	**5**	**2**	0
N99	16	7	6	4	--

Note: Bold numbers indicate grid units that are located completely or partially within Room 1.

Table 44.6. LA 86606, Area 2 artifact counts by grid unit.

	E97	E98
N100	1	2
N99	3	8
N98	9	11

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 153 artifacts were analyzed from the excavations conducted at LA 86606. In addition, flotation and pollen samples were selected for analysis from the post-occupational fill (Stratum 2) and the Room 1 living surface (Stratum 3) (Table 44.7). The results of the artifact and sample analyses are presented in the following sections.

Table 44.7. Samples selected for analysis from LA 86606.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2	91, 92	14, 16, 41, 60		
3	85			
4				

*thermoluminescence

Ceramic Artifacts (Dean Wilson)

A total of 143 ceramics were analyzed from LA 86606. The majority of the pottery consists of smeared plain and smeared-indented corrugated, with some Santa Fe Black-on-white and Biscuitware sherds (Table 44.8). All of the Santa Fe Black-on-white and the single Wingate Black-on-red sherds were derived from Area 1 and the fieldhouse. In contrast, the biscuitwares are present in both Area 1 and Area 2. Therefore, it appears that the site is multi-component, with a Coalition period fieldhouse and a Classic period feature (Feature 1). Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 44.9 to 44.11. The graywares and whitewares appear to have been locally made from tuff temper; however, a single grayware sherd does exhibit granite with mica temper. This latter sherd is presumably associated with the Classic period occupation. The redware sherd also differs by exhibiting non-local sherd and sand temper. All of the grayware ceramics consist of jar vessel forms, while the whiteware and redware sherds derived only from bowls.

Table 44.8. Ceramic types from LA 86606.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	2	1.4

Ceramic Type	Frequency	Percent
Santa Fe Black-on-white	6	4.2
Biscuit A	1	0.7
Biscuit B	1	0.7
Biscuit C	2	1.4
Biscuit B/C body	5	3.5
Northern Rio Grande Utilityware		
Plain gray rim	3	2.1
Plain gray body	5	3.5
Smeared plain corrugated	66	46.2
Smeared-indented corrugated	50	35.0
Alternating corrugated	1	0.7
Cibola Redware		
Wingate Black-on-red	1	0.7
Total	**143**	**100.0**

Table 44.9. Tradition by ware for LA 86606 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Redware			
Rio Grande (Prehistoric)	125	100.0	17	100.0	0	0.0	0	0.0	142	99.3
Rio Grande (Tewa Micaceous)	0	0.0	0.0	0.0	0	0.0	0	0.0	0	0.0
Cibola	0	0.0	0.0	0.0	0	0.0	1	100.0	1	0.7
Total	**125**	**100.0**	**17**	**100.0**	**0**	**0.0**	**1**	**100.0**	**143**	**100.0**

Table 44.10. Temper by ware for LA 86606 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Redware			
Sherd and sand	0	0.0	0	0.0	0	0.0	1	0.0	1	0.6
Fine tuff or ash	0	0.0	8	0.0	0	0.0	0	0.0	8	5.5
Fine tuff and sand	0	0.0	7	0.0	0	0.0	0	0.0	7	4.8
Mostly tuff with phenocrysts	5	0.0	0	0.0	0	0.0	0	0.0	5	3.4
Anthill sand	119	100.0	0	0.0	0	0.0	0	0.0	119	83.2
Oblate shale and tuff	0	0.0	2	2.0	0	0.0	0	0.0	2	1.3
Granite with mica	1	0.0	0	0.0	0	0.0	0	0.0	1	0.6
Total	**125**	**100.0**	**17**	**100.0**	**0**	**0.0**	**1**	**100.0**	**143**	**100.0**

Table 44.11. Vessel form by ware for LA 86606 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Redware			
Bowl rim	0	0.0	4	23.5	0	0.0	0	0.0	4	2.7
Bowl body	0	0.0	13	76.4	0	0.0	1	100.0	14	9.7

Vessel Form	Ware								Total	
	Gray		White		Glaze		Redware			
Jar neck	6	4.8	0	0.0	0	0.0	0	0.0	6	4.1
Jar rim	6	4.8	0	0.0	0	0.0	0	0.0	6	4.1
Jar body	113	90.4	0	0.0	0	0.0	0	0.0	113	79.0
Total	**125**	**100.0**	**17**	**100.0**	**0**	**0.0**	**1**	**100.0**	**143**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 28 artifacts were analyzed from LA 86606, consisting of a core, 17 pieces of debitage, nine ground stone artifacts, and a hammerstone. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 42.12 presents the data on lithic artifact type by material type. The debitage is primarily made of chalcedony, with other materials. The presence of cortex on 23.5 percent of the debitage indicates that these materials were collected from waterworn (*n* = 4) sources. The chalcedony and Pedernal chert are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 44.12. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Other	Total
Cores	Core	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Debitage	Angular debris	0	0	0	0	0	0	1	0	0	1	0	0	0	3
	Core flake	1	0	2	2	0	0	1	6	0	1	0	0	0	13
	Core trimming flake	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Subtotal	1	0	2	2	0	0	2	7	0	3	0	0	0	17
Ground Stone	Two-hand mano	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Grinding slab	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Und. metate fragment	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Axe	0	0	0	1	0	0	0	0	0	0	0	0	0	1

Artifact Type		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Other	Total
	Und. ground stone	0	0	0	0	2	0	0	0	0	0	0	0	0	2
	Shaped slab	0	0	3	0	0	0	0	0	0	0	0	0	0	3
	Subtotal	0	0	3	1	4	1	0	0	0	0	0	0	0	9
Other	Hammerstone	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Total		**1**	**0**	**5**	**3**	**4**	**1**	**2**	**9**	**0**	**3**	**0**	**0**	**0**	**28**

(Material Type columns: Basalt through Total.)

Two pieces of obsidian and a piece of basalt debitage were submitted for X-ray fluorescence analysis. The obsidian artifacts are made from Cerro Toledo and Bear Springs Peak obsidian (Table 44.13). The Cerro Toledo (Obsidian Ridge/Rabbit Mountain) and Bear Springs source areas are situated about 19 km (12 mi) and 38 km (24 mi) to the southwest. Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present on the nearby mesa as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval. The single basalt flake appears to be made of basalt and not dacite.

Table 44.13. Obsidian source samples.

FS #	Artifact	Color	Source
47	Debitage	Translucent	Bear Springs Peak
73	Debitage	Translucent	Cerro Toledo rhyolite

Lithic Reduction

The single core was reduced using a bidirectional, discoidal reduction technique. Table 44.14 presents the metric information on the core.

Table 44.14. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Bidirectional	49	54	27	65.4

The debitage mostly consists of core flakes, with a few other items. The overall cortical:non-cortical ratio of 1.00 reflects an equal emphasis on the early and later stages of core reduction. The flakes mostly have single-faceted platforms (n = 4), with fewer cortical (n = 1) and collapsed (n = 2) platforms. None of the platforms exhibit evidence of preparation. The majority of the core flakes are distal fragments (n = 5), with fewer whole (n = 4), proximal (n = 3), and midsection (n = 1) fragments. The whole core flakes have a mean length of 28.5 mm (*std* = 7.5) and the angular debris a mean weight of 2.9 g (*std* = 2.3).

Tool Use

None of the debitage exhibit evidence of edge damage that could be attributed to use. The ground stone items included a mano, metate, and axe. The two-hand mano is a loaf-shaped, elongated tuff cobble with a single flat grinding surface (Figure 44.6). The undetermined metate is a broken fragment of tuff with a single grinding surface. In contrast, the grinding slab is a small piece of dacite with grinding present on the high spots of a single surface. The axe consists of a butt fragment from a full-grooved polished axe (Figure 44.7). The butt does exhibit some battering. Three fragments of a rhyolite slab were classified as the remnants of a possible shaped slab. The undetermined ground stone artifacts are two small pieces of fire-cracked dacite slabs. They both exhibit some grinding on the high spots of a single surface and could be parts of the same artifact (a millingstone?).

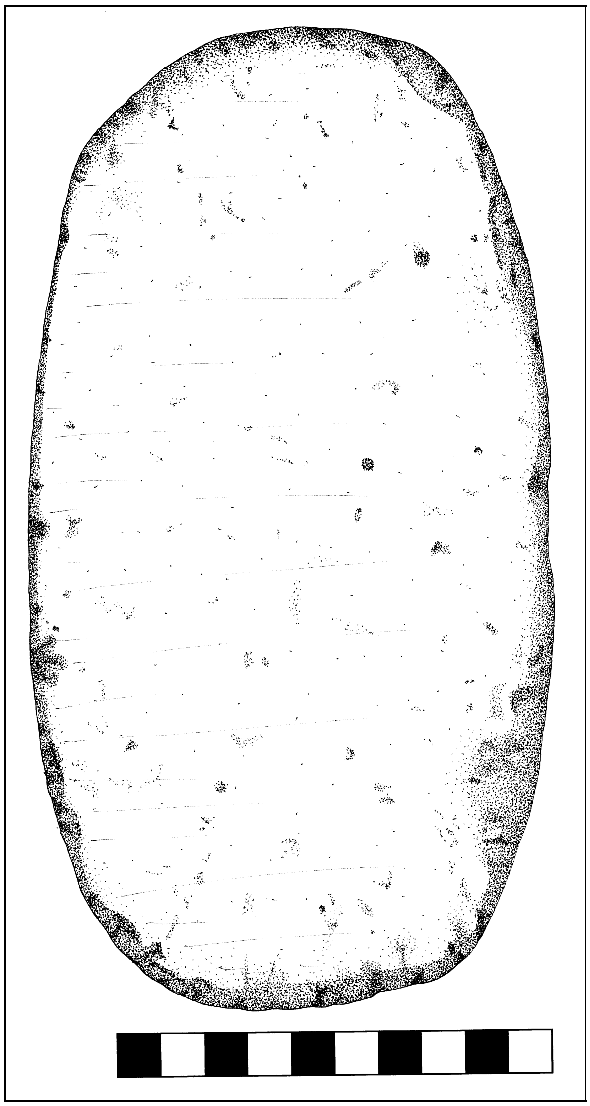

Figure 44.6. Two-hand mano from LA 86606.

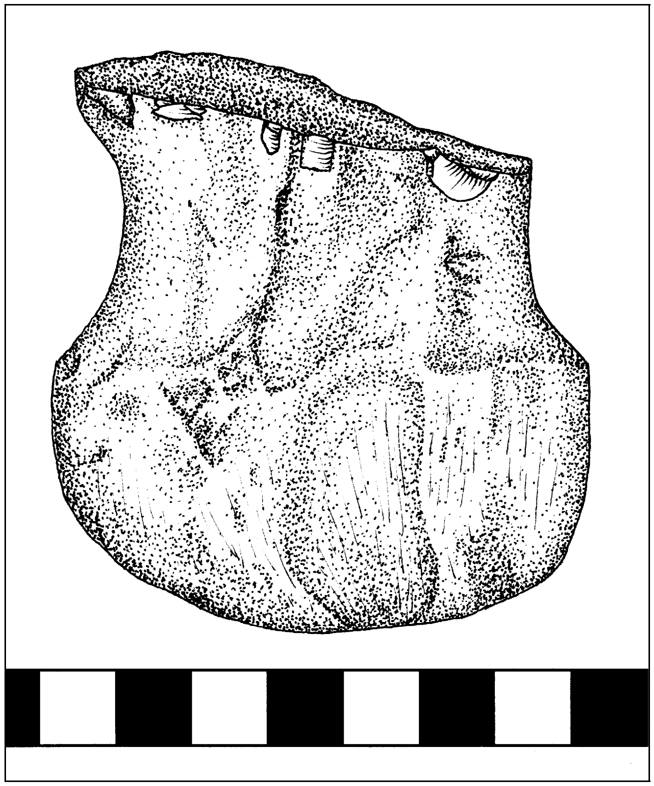

Figure 44.7. Axe fragment from LA 86606.

Faunal Remains (Kari Schmidt)

One piece of bone was recovered from this Classic period fieldhouse. The bone was identified as a heavily burned medium/large-sized mammal long bone fragment and was recovered in the post-occupational fill level (102N/104E).

Archaeobotanical Remains (Pamela McBride)

Carbonized purslane seeds, grass stems, conifer duff, and unidentifiable plant parts were found on a well-preserved patch of the living surface in the southwest corner of the fieldhouse (Table 44.15). An unidentifiable plant part and ponderosa pine needles were recovered from the fill between three rocks that may have been the remnants of an exterior hearth or pot rest next to a hearth. Ashy sediment found south of the three rocks yielded ponderosa pine needles. Ponderosa pine was the only taxon identified from the structure living surface, possibly indicating the identity of a ceiling element. Mountain mahogany was the dominant wood taxon in the ashy sediment and the possible hearth (Table 44.16). Logically, the ashy sediment (possible dump from the hearth) was the most diverse, containing ponderosa pine, piñon, mountain mahogany, and oak.

Table 44.15. Flotation plant remains, count and abundance from LA 86605.

FS No.	85	91	92
Context	Room 1 floor, SW corner	Ashy sediment south of the 3 rocks in Area 2	Fill between 3 rocks east of possible windbreak in Area 2
Cultural			
Annuals			
Purslane	1(1)		
Grasses			
Grass family	culm +		
Other			
Unidentifiable	2(0) pp		1(0) pp
Perennials			
Pine	umbo +		
Ponderosa pine	needle +	needle +	needle +
Non-Cultural			
Annuals			
Goosefoot	+	+	
Grasses			
Dropseed grass	+		

+ 1-10/liter, pp plant part.

Table 44.16. Wood charcoal taxa by count and weight in grams.

FS No.	85	91	92
Context	Room 1 floor, SW corner	Ashy sediment	Fill between 3 rocks east of wall
Conifers			
Pine			1/<0.1 g
Piñon		2/0.2 g	
Ponderosa pine	20/0.8 g	7/0.6 g	
Unknown conifer			4/0.1 g
Non-Conifers			
Mountain mahogany		10/0.6 g	12/0.2 g
Oak		1/0.1 g	3/0.1 g
Totals	**20/0.8 g**	**20/1.5 g**	**20/0.4 g**

Pollen Remains (Susan Smith)

Four pollen samples were analyzed from LA 86606. Table 44.17 lists the frequency of identified pollen types. Maize was the only cultigen identified in the botanical assemblage. No other economic resources were identified in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 44.17), and these are discussed in detail in Smith's chapter in Volume 3.

Table 44.17. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86606 (*n* = 4)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	2
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	4
		Grass Aggregates	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86606 (*n* = 4)
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	1
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	4
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	4
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	2
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	0
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86606 (*n* = 4)
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	2
	Pinus	Pine	4
		Pine Aggregates	0
	Pinus edulis type	Piñon	4
	Juniperus	Juniper	4
		Juniper Aggregates	0
	Quercus	Oak	3
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	1
	Artemisia	Sagebrush	4
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	1
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY OF SITE EXCAVATIONS

LA 86606 consists of a one-room fieldhouse and a rock alignment located on a ridge in Cabra Canyon. All four walls were intact and appeared to contain an opening to the east. No floors or prepared surfaces were identified in the fieldhouse. A single linear rock alignment just outside the fieldhouse was the only feature identified. Bits of charcoal and adobe were identified at the site. Ceramic evidence indicates that the fieldhouse was probably occupied during the Late Coalition period and that the rock alignment (Feature 1) likely dates to the Classic period. The presence of maize and the prevalence of storage jars reflect the agricultural function of the site, with limited core reduction and grinding activities also being represented. The site is situated near another Coalition period fieldhouse (LA 86607).

CHAPTER 45
RENDIJA TRACT (A-14): LA 86607

Gregory D. Lockard

INTRODUCTION

LA 86607 is the remains of a one-room Coalition period fieldhouse located on top of a ridge in Cabra Canyon to the northwest of Rendija Canyon. The site is located less than 100 m to the northwest of LA 86606, in the northwest extension of the Rendija Tract. A leg of the Pajarito Trail (Trail #286) passes through and has significantly impacted the site. Vegetation on the site consists of ponderosa pine with some piñon, juniper, and scrub oak. The site is situated at an elevation of 2146 m (7040 ft).

LA 86607 was first recorded on March 16, 1992, by Manz, Hoagland, and Binzen as part of the Environmental Restoration Program (McGehee et al. 1992) and given the temporary site number of B-20. The site was believed to be the remains of a two- to four-room structure. Two indented corrugated utilityware jar sherds and a basalt interior flake were the only artifacts visible on the surface. As Manz, Hoagland, and Binzen note, additional surface artifacts may have been collected by hikers utilizing the Pajarito Trail.

FIELD METHODS

Before excavation, the site and surrounding area were cleared of trees and large undergrowth. The site was then visible as a mound of rubble measuring 5 by 4 m in area (Figure 45.1). The mound appeared to be the remains of a one-room structure. An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the southwest corner of the site. The site was then covered with a 1- by 1-m grid that extended 6 m north and 5 m east of the site datum. Two subdata (A and B) were set up for taking elevations. The site was then photographed. The site was not surface collected because no artifacts were visible on the surface (although one sherd was later recovered from the surface of an excavated grid unit). As mentioned, the paucity of artifacts on the surface of the site may be the result of the collection of artifacts by hikers utilizing the Pajarito Trail, which passes through the site.

A 5- by 1-m east-west trench (units 103N/100-104E) was initially excavated across the remains of the structure, which was designated Room 1. The purpose of this trench was to expose a profile of the site stratigraphy, as well as to determine the location of the room's east and west walls. Grid units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. The room's west wall was encountered in the eastern half of unit 103N/101E, and the remains of the east wall were encountered in the eastern half of unit 103N/103E. Within Room 1, excavation of the trench units proceeded down to a poorly preserved living surface. Outside of the room, the trench units were excavated down to the top of a sterile Btb1 horizon. The westernmost grid unit in the trench was chosen to serve as a test pit for geological analysis.

Excavation of this unit therefore continued for approximately 30 cm below the top of the Btb1 horizon. The northern profile of the trench was then drawn and photographed.

Figure 45.1. Pre-excavation photograph of LA 86607.

The rest of the site was subsequently excavated, again by strata and arbitrary levels for thicker strata. In all, 23 units were excavated. Within the structure, excavation proceeded down to the poorly preserved living surface encountered while excavating the trench. Outside of the structure, excavation proceeded down to the top of the Btb1 horizon. Excavation focused on defining the structure's walls, removing wallfall, and locating features. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended at least 1 m beyond the structure in all directions to locate external features and/or outdoor activity areas. The site was then mapped (Figure 45.2) and photographed (Figure 45.3). Lastly, the geological test pit was extended to the exterior face of the west wall of Room 1. The purpose of this excavation was to determine the depth of the foundation of the room's walls.

The excavation of the site was supervised by Greg Lockard. The field crew included Michael Dilley, Joseph (Woody) Aguilar, Brandon Gabler, Margaret Dew, and Samuel Duwe. Timothy Martinez and Aaron Gonzalez served as site monitors from San Ildefonso Pueblo and as screeners. Jeremy Yepa was the site monitor representing Santa Clara Pueblo, as well as an additional excavator.

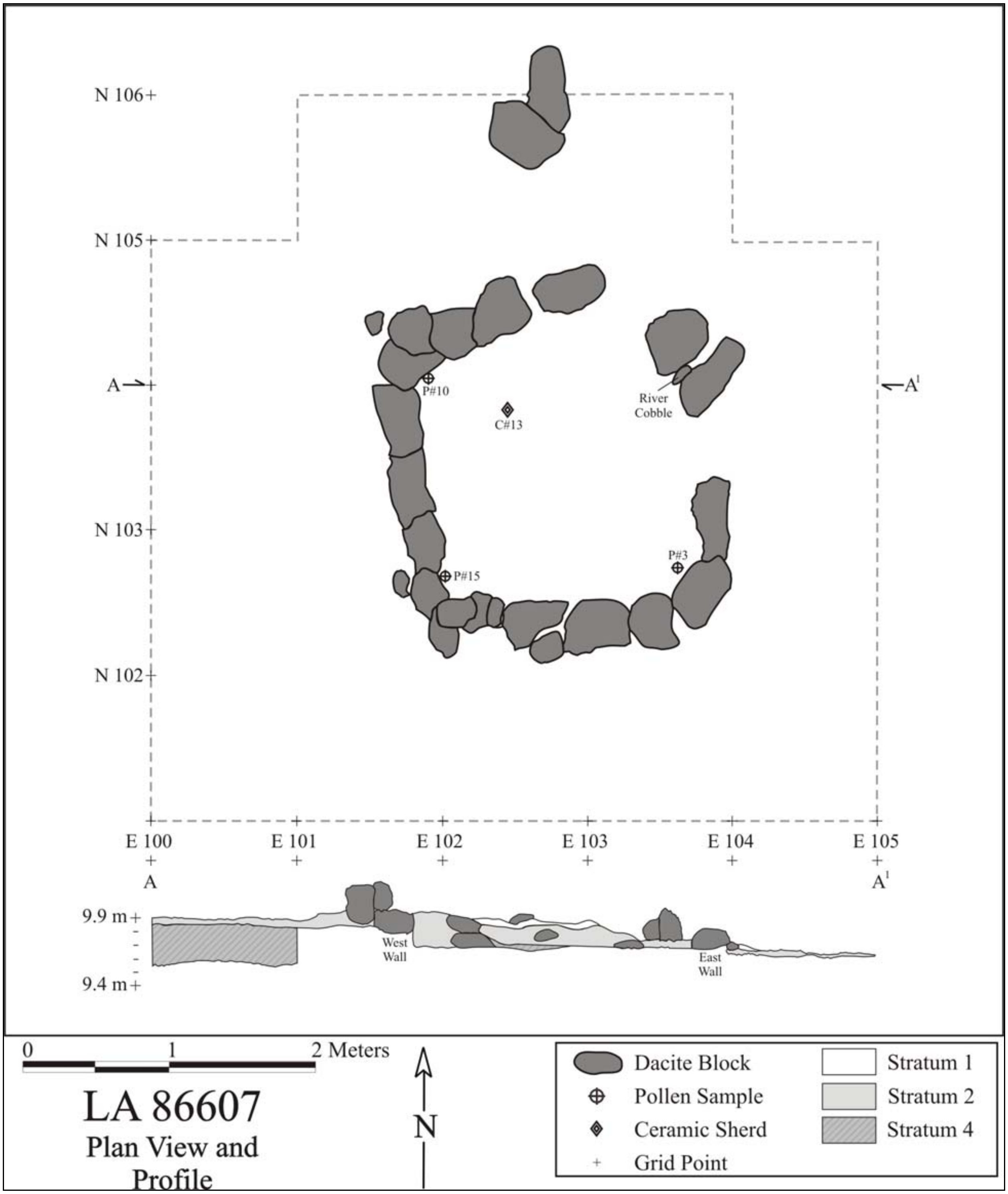

Figure 45.2. Plan view and profile of the fieldhouse at LA 86607.

Figure 45.3. Post-excavation photograph of the fieldhouse at LA 86607.

STRATIGRAPHY

Stratum 1 is composed of loose surface sediment. It is uniformly 1 to 4 cm thick across the site and is part of the A horizon (topsoil). Stratum 2 is post-occupational fill and ranges from 2 to 30 cm in thickness. The post-occupational fill was thickest just inside of the south wall of Room 1 and thinned to the north. Stratum 2 is also part of the A horizon. Stratum 3 is the Room 1 living surface. Stratum 4 is the sterile soil horizon excavated in the geological test pit (unit 103N/100E) and corresponds with the Btb1 horizon. Tables 45.1 through 45.3 summarize and describe the strata that were excavated at LA 86607.

Table 45.1. LA 86607 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 4/3	Sandy loam	1–4	Surface sediment
2	10YR 4/3	Sandy loam	2–30	Post-occupational fill
3	7.5YR 5/4	Clay	-	Room 1 living surface
4	7.5 YR 5/4	Clay	30	Pleistocene soil

Table 45.2. LA 86607 soil horizon descriptions from the north profile of the geological test pit (unit 103N/100E).

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 4/3	Sandy loam	0–4	Topsoil
Btb1	7.5YR 5/4	Clay	4–33+	Pleistocene soil

Table 45.3. LA 86607 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	1	0	0	0	**1**
1	5	0	0	0	**5**
2	1	0	0	0	**1**
3	1	0	0	0	**1**
4	1	0	0	0	**1**
Total	**9**	**0**	**0**	**0**	**9**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a small structure that probably functioned as a fieldhouse. Most of the room's northeast quadrant has been disturbed, presumably by the construction and use of the trail that passes through this area of the site. Nevertheless, it was possible to determine that the room was roughly square in shape. The room measures 2.10 m in length (north to south) by approximately 1.80 m in width (east to west), with approximately 3.78 m^2 of interior space. Excavation of the room began with an east-west trench that extended across the room (103N/100-104E). The excavation of this trench served to define the room's stratigraphy, as well as to locate the room's east and west walls. The room's east wall was encountered in unit 103N/101E and the west wall in unit 103N/103E. A poorly preserved living surface was encountered between the walls. After the excavation of the trench, the rest of the room was excavated down to the living surface encountered in the trench.

Fill. The interior of Room 1 was filled with 1 to 4 cm of surface sediment on top of 10 to 30 cm of post-occupational fill. The fill was thickest just inside the room's south wall and thinned to the north. A flotation sample (Field Specimen [FS] 5) and a pollen sample (FS 6) were taken of the Room 1 fill, but these samples were not analyzed.

Floor. No prepared floor was encountered during the excavation of Room 1. Instead, the people who constructed the room appear to have utilized the Btb1 horizon as a living surface. The Btb1 horizon is a layer of highly indurated, clay-rich soil that would have made an ideal natural living surface. The top of the Btb1 horizon is fairly flat within the room, despite the fact that it slopes upward to the west outside of the room. The surface is 20 to 25 cm lower just inside of the room's west wall as it is just outside of the wall. The surface is at about the same level, on the other hand, on either side of the east wall. This indicates that the living surface was leveled by excavating into the Btb1 horizon in the uphill (i.e., western) half of the room. The living surface is slightly convex. It is between 5 and 10 cm lower in the middle of the room than it is along the edges. The living surface is lower than the base of the walls in the western half of the room and significantly lower than the base of the west wall. In addition, there is significant coping between the living surface and the interior wall faces, especially in the northwest and southwest corners of the room. The walls therefore appear to have been constructed before the room's living surface was leveled. At the very least, the rocks that form the base of the walls were not placed on top of the excavated living surface.

A single Santa Fe Black-on-white sherd (FS 13) was encountered directly on top of the living surface in the northwest quadrant of the room. This was the only floor-contact artifact recovered from the site. A pollen sample (FS 3) was taken from near the level of the living surface in the southeast corner of the room, but was not analyzed. Additional pollen samples were taken from directly on top of the living surface in the northwest (FS 10) and southwest (FS 15) corners of the room. Taxa identified in these samples included rose family, mustard family, grass family, cheno-ams, sunflower family, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush.

Wall Construction. The Room 1 walls were constructed of unshaped dacite cobbles. The foundation rocks were placed in a shallow trench dug into the Btb1 horizon. These rocks tended to have flat surfaces that formed the interior wall faces. This was also characteristic of the foundation rocks in Room 1 at LA 86606, which is located nearby. The foundation of the south and west walls was well preserved. The foundation rocks in the western half of the north wall and the southernmost portion of the east wall also appeared to be *in situ*. The walls that form the northeast corner of the room, however, were significantly disturbed by the construction and/or use of a hiking trail that passes through this part of the site. There were two large cobbles in the approximate location of the northeast corner of the room. These rocks probably formed the northernmost portion of the east wall. The location of floor coping in this area indicated that the northern rock was probably *in situ*, while the southern rock was slightly east of its original location. A small, rounded river rock was encountered between these two rocks. This rock was unlike any other rock in the Room 1 walls. It may have therefore been deposited between the rocks after the site's occupation. Alternatively, it may have been utilized as a chinking stone.

There is a gap to the south of the two rocks in the east wall. This gap, which is 70 cm wide, was most likely the room's entryway. There is also a gap of approximately 45 cm to the west of the two rocks in the north wall. This portion of the north wall was probably disturbed by the people who constructed the trail just north of the room. There is in fact an alignment of four large dacite cobbles just north of Room 1 (the two southern rocks in this alignment appear in Figure 45.2). These rocks were placed across the trail as erosion control. It is likely that the rocks were either wallfall or *in situ* foundation rocks removed from the north wall of Room 1. The easternmost rock in the extant portion of the north wall also appeared to have been moved slightly to the north of its original location.

Judging from the amount of wallfall removed during the excavation of the area in and around Room 1, the masonry portions of the room's walls were originally considerably higher than they were at the time of excavation (Table 45.4). In order to estimate the original height of the walls, all of the rocks removed as wallfall during the site's excavation were placed in two stacks, which were then measured. The stacks measured 2.50 by 0.35 by 0.55 m and 1.70 by 0.40 by 0.50 m, for a total of approximately 0.82 m^3 of wallfall. Based on this volume of wallfall and the overall length, average thickness, and average height of the extant portions of the walls, the masonry portions of the room's walls were originally approximately 0.68 m in height. This is significantly less than the height calculated for most of the Rendija Tract fieldhouses excavated during the Conveyance and Transfer Project.

There are several possible explanations for this lower wall height. First, some of the rocks that formed the room's walls appear to have been removed by the people who constructed the nearby hiking trail. Some even appear to have been utilized in the construction of alignments across the trail designed to reduce erosion. Second, some of the rocks from LA 86607 may have been utilized in the construction of the fieldhouse at LA 86606. The latter is located nearby to and clearly postdates the former. Lastly, the masonry portions of the Room 1 walls at LA 86607 may have simply been shorter than those of the average Ancestral Pueblo fieldhouse in Rendija Canyon. Unfortunately, there is no way to test any of these hypotheses. The uppermost portions of the walls, as well as the ceiling, were most likely composed of wattle and daub. These materials are rarely preserved at archaeological sites on the Pajarito Plateau. In fact, no adobe was recovered from LA 86607.

Table 45.4. LA 86607 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.76	0.08–0.25	0.16–0.32	1 to 2
South	1.76	0.12–0.25	0.13–0.35	1 to 2
East	~1.65	0.08–0.31	0.13–0.30	1
West	1.66	0.04–0.15	0.17–0.28	1

Geological Test Pit

Geologists Paul Drakos and Steven Reneau analyzed the north profile of the geological test pit (unit 103N/100E) and its eastward extension (within unit 103N/101E) to reconstruct the natural soil horizons at the site. This profile contained a soil sequence consisting of an A horizon (topsoil) and a Btb1 horizon (a Pleistocene soil). The profile indicates that the foundation rocks were set approximately 5 cm into the Btb1 horizon.

Artifact Distribution

Very few artifacts were recovered during the excavation of LA 86607. One possible explanation for the lack of artifacts is that many, especially those visible on the surface, were collected by hikers utilizing the trail that passes through the site. The fact that very few subsurface artifacts were recovered, however, indicates that the collection of artifacts by hikers does not completely account for the lack of artifacts at the site. Another possible explanation is that the site was only used for a short period of time. Because of the small number of artifacts recovered from the site, very little can be said about the artifact distribution. There does appear to be a slight tendency for a greater number of artifacts in the grid units to the southeast, but given the small sample size, this could be incidental. Table 45.5 shows the distribution of artifacts at the site.

Table 45.5. LA 86607 artifact counts by grid unit.

	E100	E101	E102	E103	E104
N105	--	0	0	0	--
N104	0	**0**	**0**	**0**	0
N103	0	**0**	**1**	**0**	2
N102	0	**0**	**0**	**2**	0
N101	0	0	1	2	0

Note: Does not include one artifact found outside of the excavated area during surface collection; bold numbers indicate grid units that are located completely or partially within Room 1.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of nine artifacts were analyzed from the excavations conducted at LA 86607. In addition, flotation and pollen samples were selected for analysis from the post-occupational fill (Stratum 2) and the Room 1 living surface (Stratum 4) (Table 45.6). The results of the artifact and sample analyses are presented in the following sections.

Table 45.6. Samples selected for analysis from LA 86607.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2	9	3, 10		
3		15		
4				

*thermoluminescence

Ceramic Artifacts (Dean Wilson)

A total of nine ceramics were analyzed from LA 86607. The majority of the pottery consists of Santa Fe Black-on-white and smeared-indented corrugated sherds, which presumably date to the Coalition period (Table 45.7). Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 45.8 through 45.10. The grayware and whiteware pottery appear to have been locally made from tuff temper. All of the grayware sherds consist of jar vessel forms, whereas the whiteware sherds are derived from bowls.

Table 45.7. Ceramic types from LA 86607.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Indeterminate organic	2	22.2
Santa Fe Black-on-white	4	44.4
Northern Rio Grande Utilityware		
Smeared-indented corrugated	3	33.3
Total	**9**	**100.0**

Table 45.8. Tradition by ware for LA 86607 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	3	100.0	6	100.0	0	0.0	0	0.0	9	100.0
Rio Grande (Tewa Micaceous)	0	0.0	0.0	0.0	0	0.0	0	0.0	0	0.0
Middle Rio Grande	0	0.0	0.0	0.0	0	0.0	0	0.0	0	0.0
Total	**3**	**100.0**	**6**	**100.0**	**0**	**0.0**	**0**	**0.0**	**9**	**100.0**

Table 45.9. Temper by ware for LA 86607 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Fine tuff and sand	0	0.0	6	100.0	0	0.0	0	100.0	6	66.6
Anthill sand	3	100.0	0	0.0	0	0.0	0	0.0	3	33.3
Total	**3**	**100.0**	**6**	**100.0**	**0**	**0.0**	**0**	**100.0**	**9**	**100.0**

Table 45.10. Vessel form by ware for LA 86607 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Bowl body	0	0.0	6	100.0	0	0.0	0	0.0	6	66.6
Jar body	3	100.0	0	0.0	0	0.0	0	0.0	3	33.3
Total	**3**	**100.0**	**6**	**100.0**	**0**	**0.0**	**0**	**0.0**	**9**	**100.0**

Archaeobotanical Remains (Pamela McBride)

One fragment of ponderosa pine charcoal weighing less than a tenth of a gram was the sole floral material from post-occupational fill in the structure. The paucity of remains is not surprising considering the impact of trail building (Pajarito Trail #286 passes through the site); some of the rocks that were originally part of the structure walls were probably used to construct the trail and rock alignments that cross the trail, built to control erosion.

Pollen Remains (Susan Smith)

Three pollen samples were analyzed from LA 86607. Table 45.11 lists the frequency of identified pollen types. No cultigens or other economic resources were identified in the botanical assemblage. A number of potential economic resources were also identified in the assemblage (Table 45.11), and these are discussed in detail in Smith's chapter in Volume 3.

Table 45.11. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86607 (*n* = 3)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	0
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	3
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	2
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86607 (*n* = 3)
	Polygala type	Milkwort	0
	Poaceae	Grass Family	3
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	3
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	3
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	0
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	0
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 86607 (*n* = 3)
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	0
	Abies	Fir	1
	Pinus	Pine	3
		Pine Aggregates	0
	Pinus edulis type	Piñon	3
	Juniperus	Juniper	3
		Juniper Aggregates	0
	Quercus	Oak	2
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	2
	Artemisia	Sagebrush	2
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY OF SITE EXCAVATIONS

LA 86607 consists of a one-room fieldhouse located in Cabra Canyon. The south and west walls were intact, while the other walls appear to have been disturbed by the trail that runs through the site. No floors or prepared surfaces were identified in the fieldhouse. Ceramic evidence indicates that the fieldhouse was probably occupied during the Coalition period, with a second Coalition period fieldhouse (LA 86606) being situated nearby. Although no cultigens were recovered, the site was presumably occupied during the growing season when maize was cultivated.

CHAPTER 46
RENDIJA TRACT (A-14): LA 87430

Gregory D. Lockard

INTRODUCTION

LA 87430 is a small one-room Classic period fieldhouse located on the edge of an approximately 15-m-high terrace to the immediate south of the creek in Rendija Canyon. The site is situated less than 100 m east of the western boundary of the Rendija Tract, on a slope of approximately five degrees. The surrounding area is covered with ponderosa pine trees, many of which were severely burned in the Cerro Grande fire. The understory is dominated by several grass and wildflower species. The site is situated at an elevation of 2111 m (6925 ft).

The site was first surveyed on August 7, 1991, by Manz, Parish, Wallace, and Jandacek and given a temporary site number of M37. In the Site Survey Form, they interpret the site as a one-room fieldhouse. A charcoal stain visible in a nearby trail was thought to indicate the possible presence of a hearth. Artifacts encountered during a surface survey included plainware and glazeware sherds and obsidian flakes. On the basis of architecture and the artifacts present, the site was argued to be Ancestral Pueblo (AD 1200–1600).

FIELD METHODS

Before excavation, the site and surrounding area were cleared of trees and large undergrowth (Figure 46.1). An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was then set up. The site datum could not be placed in the southwest corner of the site, which was common practice, because of the steep escarpment just to the northwest of the site. The site datum was therefore placed in the center of the southern edge of the site. The site was then covered with a 1- by 1-m grid system that extended 7 m north and 8 m east of the site datum, and three subdata (A-C) were set up for taking elevations. Three additional subdata (D-F) were set up at later times. The site was then photographed and surface collected. Two ceramic sherds and a lithic were the only artifacts encountered in the surface collection.

A 5- by 1-m east-west trench was initially excavated across the middle of the rock alignments and wallfall visible on the surface of the site (103N/98-102E). The purpose of this trench was to define and present a profile of the stratigraphy both within and outside of the structure, as well as to determine the location of the east and west walls of the structure. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. During the excavation of grids 103N/98E and 103N/99E, a compact surface was encountered. Excavation within the structure thereafter proceeded down to the level of this compact surface, which was presumed to be a living surface. In the area of the trench to the east of the structure, excavation proceeded down to the top of the sterile Btb1 horizon. The north profile of the trench was then drawn (Figure 46.2) and photographed. The rest of the site was subsequently excavated. In all, 18 units were excavated in their entirety and three additional units were partially excavated.

Figure 46.1. Pre-excavation photograph of LA 87430.

Within the structure, excavation proceeded down to the compact surface encountered in the western portion of the trench, when present. When this compact surface was not encountered, excavation proceeded down to either the top of the sterile Btb1 horizon or the level of the structure's nearest perimeter wall. Outside of the structure, excavation proceeded down to the top of the Btb1 horizon except in the southeast corner of the area excavated. The stratigraphy in this area of the site has been badly disturbed by an uprooted tree. Excavation in this area proceeded down to the level of the top of the Btb1 horizon in the nearest, undisturbed area. Excavation included the removal of rocks that could be clearly identified as wallfall to define the structure's walls and locate any internal or external features.

Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area was extended approximately 1 m to the north, south, and east of the structure to locate external features and identify outside activity areas. The area to the west of the structure could not be excavated because the steep escarpment is directly adjacent to the structure's west wall. The excavations were extended 2 m to the east of the structure to investigate a charcoal lens that turned out to be associated with an external, slab-lined hearth (Feature 1). This area also contained the highest concentration of artifacts at the site. The high concentration of artifacts, coupled with the presence of an external hearth, indicates that the area to the east of the structure was an outdoor activity area. After the excavations were complete, the site was mapped (Figure 46.2) and photographed (Figure 46.3).

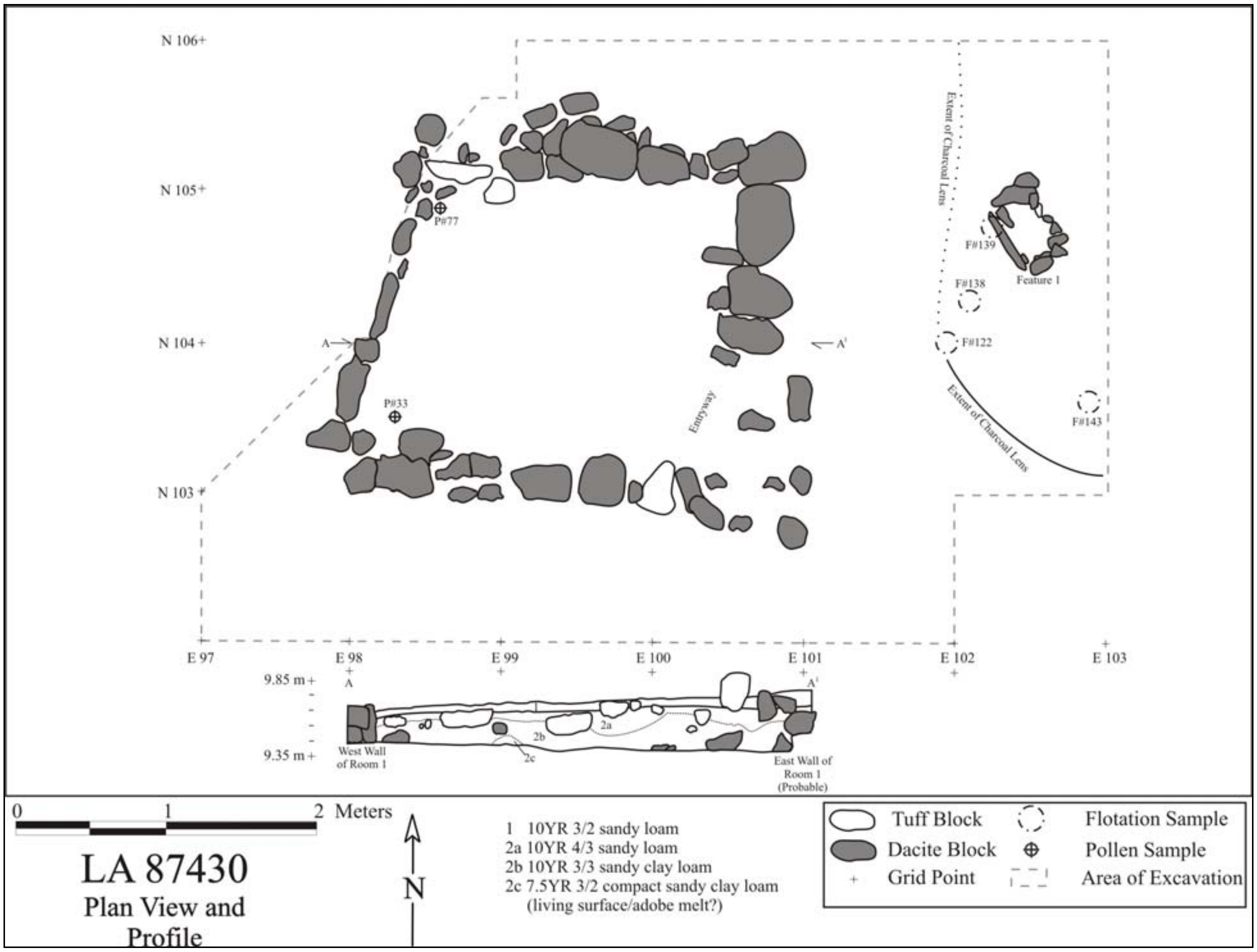

Figure 46.2. Plan view and profile drawing of the fieldhouse at LA 87430.

The excavation of the site was supervised by Greg Lockard. Crewmembers included Joseph (Woody) Aguilar, Brian Harmon, Bettina Kuru'es, and Jennifer Nisengard. Aaron Gonzalez and Michael Chavarria served as site monitors, representing San Ildefonso and Santa Clara pueblos, respectively.

Figure 46.3. Post-excavation photograph of the fieldhouse at LA 87430.

STRATIGRAPHY

Stratum 1 is composed of loose surface sediment. It is uniformly 3 to 5 cm thick across the site and is roughly equivalent to the top half of the A horizon (topsoil). Stratum 2, which ranges from 5 to 20 cm thick in the area excavated, is post-occupational fill. This fill was thickest in and around the structure, especially in the area just south (downhill) of its north wall. Stratum 2 is roughly equivalent to the lower half of the A horizon and the Bw horizon. Stratum 3 is a charcoal lens associated with a slab-lined hearth located to the east of the structure. This lens, along with the hearth, is designated Feature 1. Stratum 4 is the oxidized soil encountered directly beneath some areas of the Stratum 3 charcoal lens. Stratum 5 is the Feature 1 hearth fill. Strata 3, 4, and 5 are cultural strata. Stratum 6 is the unconsolidated soil excavated beneath the Stratum 3 charcoal lens in grid 104N/102E. Stratum 6 is part of the Bw horizon. Beneath the Bw horizon (Strata 2 and 6) is the Btb1 horizon. This horizon is a terrace that most likely dates to the middle Holocene. Beneath the Btb1 horizon is the Bcb1 horizon, which is transitional between the B and C horizons. Tables 46.1 through 46.3 summarize and describe the excavated strata at LA 87430.

Table 46.1. LA 87430 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 3/2	Sandy loam	3–5 (25–45)	Surface sediment (and organic matter and tree throw)
2	10YR 4/3	Sandy loam	15–35	Post-occupational fill
3	10YR 3/2	Sandy loam	8–10	Feature 1 charcoal deposit
4	10YR 4/4	Sandy clay loam	3	Feature 1 oxidized soil below charcoal deposit
5	10YR 4/3	Sandy loam	10	Feature 1 hearth fill
6	10YR 4/3	Sandy loam	10	Below occupation level, east of the Feature 1 hearth

Table 46.2. LA 87430 soil horizon descriptions from the south profile of 103N/102E.

horizon	Color	Texture	Depth (cm)	Description
"C"	-	-	+22–0	Organic material and tree throw
A	10YR 3/2	Sandy loam	0–6	Topsoil
Bw	10YR 4/3	Sandy loam	6–18	Late-Holocene soil
Btb1	10YR 4/4	Sandy clay loam	18–41	Middle-Holocene soil

Table 46.3. LA 87430 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	2	1	0	0	**3**
1	51	3	3	0	**57**
2	378	72	3	0	**453**
3	57	13	1	0	**71**
4	0	0	0	0	**0**
5	3	0	0	0	**3**
6	4	0	0	0	**4**
Total	**495**	**89**	**7**	**0**	**591**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is the only room in a small fieldhouse (see Figure 46.3). The room measures 1.85 m north to south by 2.10 m east to west, with approximately 3.885 m^2 of interior space. Excavation of the room began with the east-west trench that extended across the site (103N/98-102E). The excavation of this trench served to define the stratigraphy and locate the east and west walls and floor of the room. After the excavation of the trench, the rest of the room was excavated. In the western half of the room, excavation proceeded down to the level of a compact surface presumed to be the room's living surface. In the western half of the room, where this compact surface was not encountered, excavation proceeded down to the top of the Btb1 horizon or to the level of the base of the foundation of the nearest wall. The room was then photographed (see Figure 46.3). The portion of unit 104N/98E was subsequently excavated as a test pit below the presumed living surface. The purpose of this test pit was to determine whether or not there were any floors or additional living surfaces below, as well as to ascertain how deep the foundation of the west wall extends in that location. No floor or additional living surface was encountered, and the wall foundation was found to extend only a few centimeters into the Btb1 horizon.

Fill. The room was filled with 3 to 5 cm of surface sediment and 15 to 30 cm of post-occupational fill. A flotation sample (FS 26) and a pollen sample (FS 25) were taken of Room 1 fill. Charred taxa identified in the flotation sample included ponderosa pine and unknown conifer. Taxa identified in the pollen sample included grass family, cheno-ams, sunflower family, spurge family, unidentified pine, piñon pine, juniper, and sagebrush.

Floor. Room 1 does not appear to have had a prepared floor (i.e., a purposefully constructed layer of adobe and/or plaster). Nevertheless, a compact surface was encountered in much of the western half of the room. This compact surface appears to be the remains of the room's living surface. When present, it is located directly or only a few centimeters above the top of the sterile Btb1 horizon. This presumed living surface was not encountered in the eastern half of the room. In most of this area of the room, excavation proceeded down to the top of the Btb1 horizon, which is considerably more compact than the room fill. In the far southeast corner of the room, both the living surface and the integrity of the Btb1 horizon have been severely disturbed by an uprooted tree.

No artifacts were found in direct association with the presumed living surface. Two pollen samples (FS 33 and FS 77), however, were taken from directly on top of the surface. One of these (FS 33) is from the southwest corner and other (FS 77) is from the northwest corner of the room. Taxa identified in these samples included maize, grass family, cheno-ams, sunflower family, fir, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

Wall Construction. The walls in Room 1 are composed mostly of dacite cobbles and upright slabs. There are also a few tuff blocks, but only in the upper courses of the walls. All of the foundation rocks are dacite. The foundation rocks are mostly upright slabs in the western half of the room and mostly large cobbles in the eastern half. In most places, the wall is formed by a single row of rocks. In two locations, however, walls are formed by two rows of rocks (i.e., a double wall). In a small section of the western half of the south wall, a large, upright slab backed by two small, flat cobbles form a double wall. In the northwest corner of the room, several rocks form a double wall. A small, flat, upright rock backed by a large upright slab forms the westernmost portion of the north wall, and several small cobbles form the northernmost portion of the west wall.

The west wall of Room 1 is oriented at a slight angle to what it should be if the room was rectangular. If the wall extended northward at a right angle from the southwest corner of the room, however, it could not continue to the north wall because of the escarpment to the northwest of the site. Instead, it is angled inward such that the northwest corner of the room is located just east of the escarpment. This suggests that the escarpment was more or less in the same location when the room was built as it is today. Room 1 was therefore built right on the edge of a significant drop off, presumably to provide a good view of the Rendija Canyon arroyo below.

As mentioned, the southeast corner of the room has been severely disturbed by an uprooted tree. As a result, the rocks that presumably formed the foundation of the eastern half of the south wall have been slightly displaced. The foundation of southern half of the eastern wall may also have been disturbed. No *in situ* rocks were found in this area, despite the fact that the northern half of the east wall is fairly well preserved. The 73-cm-long gap in the southern half of the east wall could alternatively be an entryway. In fact, the usual pattern for prehistoric architecture on the Pajarito Plateau is for entryways to be placed in the east wall of residential rooms, presumably to take advantage of the light from the rising sun. If the gap encountered in the east wall of Room 1 is an entryway, it is almost identical in form to that of the fieldhouse (Room 1) at LA 85403. The entryway to both fieldhouses is in the southern half of the east wall. In addition, the northern boundary of both entryways is marked by a small, short rock. At LA 85403, the entryway's southern border is marked by a rock that forms a very short southern section of the east wall, as well as the southeast corner of the room. Although the southeast corner of the room is disturbed, this also appears to have been the case for Room 1 at LA 87430. Additional upright slabs and dacite cobbles were encountered in the area just east of the presumed entryway. Three of these form a north-south alignment. A fourth is an upright slab oriented east to west. These rocks may be part of an elaborate entryway (similar to that of LA 127634), but are probably wallfall disturbed by the uprooted tree.

The high quantity of wall encountered during the excavation of Room 1 indicates that the masonry portion of the walls were originally considerably higher than they are today (Table 46.4). In order to estimate how much higher, all of the rocks removed as wallfall during the excavation were placed into two stacks for measurement. One of these stacks measured 2.00 by 1.00 by 0.45 m, for a total of 0.90 m^3. The second stack measured 1.80 by 0.80 by 0.40 m, for a total of 0.576 m^3. Based on the combined volume of these stacks of wallfall (1.476 m^3) and the overall length, average thickness, and average height of the extant portions of the walls, the masonry portion of the Room 1 wall was originally only about 107 cm in height (116 cm if the possible entryway is excluded from the wall length total). The upper part of the walls and ceiling were most likely composed of vegetal material and adobe. These materials are rarely preserved at archaeological sites on the Pajarito Plateau. Two small pieces of burned adobe (FS 50 and FS 148) were the only evidence found of such a superstructure.

Table 46.4. LA 87430 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	1.90	0.17–0.40	0.22–0.40	1 to 3
South	~2.15	0.12–0.35	0.13–0.28	1 to 2

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
East	1.37 (2.10)	0.03–0.28	0.14–0.32	1 to 2
West	1.70	0.01–0.30	0.04–0.22	1 to 2

Note: The length of the east wall including the possible entryway is given in parentheses.

Feature 1

Feature 1 is an external slab-lined hearth (Figures 46.4 and 46.5) and associated charcoal lens. The interior of the hearth measures 40 cm northwest to southeast by 26 cm northeast to southwest and is 22 cm deep. Upright slabs form the north, south, and west walls of the hearth. No upright slab was encountered along the eastern border of the hearth.

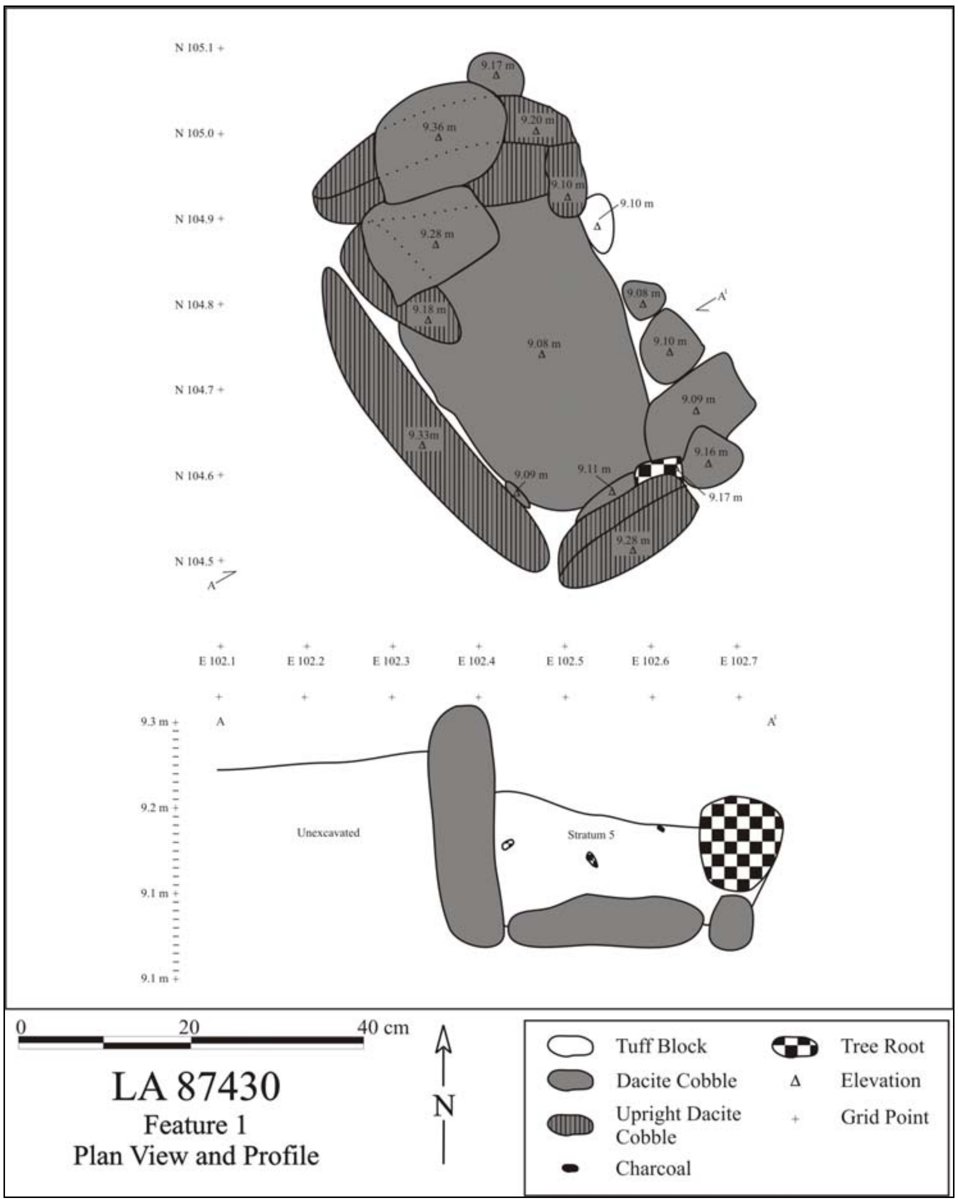

Figure 46.4. Plan view and profile drawing of Feature 1, a slab-lined hearth.

Figure 46.5. Post-excavation photograph of Feature 1, a slab-lined hearth.

The eastern border of the hearth is defined by five small cobbles. The tops of these rocks, however, are significantly lower than the tops of the upright slabs that form the other sides of the hearth. Originally, the cobbles probably functioned as a foundation for an upright slab, or at least a larger rock, that formed the east wall of the hearth. The cobbles are in fact similar in size and elevation to rocks found at the base of the slabs that form the south and west walls of the hearth. The stone that originally formed the east wall of the hearth was probably either removed by someone or displaced by root activity, which has significantly disturbed much of the surrounding area of the site. Several rocks were removed from the fill just above the hearth. Several medium-sized rocks and small cobbles were also recovered from within the hearth. Some or all of these rocks may have once formed the east wall of the hearth. None of the rocks, however, are large slabs similar to those that form north and west walls of the hearth. Some are similar, however, to the smaller slab that forms the south wall of the hearth. A large, flat slab forms the base of the hearth. No adobe or plaster was encountered within or around the hearth. All of the rocks that form the hearth walls and base and the rocks found at lower elevations within the hearth are dacite and show evidence of burning (i.e., a darkened color). The surrounding soil has not been hardened by the burning, however, suggesting that the soil has a low clay content.

Although the hearth fill contained charcoal, it appears to have contained very little ash. More ash and charcoal were encountered in the area surrounding the hearth. This charcoal deposit was present in a lens as thick as 10 cm directly around the hearth. This charcoal lens was considered to be part of Feature 1 due to its association with the slab-lined hearth. This charcoal lens (Stratum 3) was encountered in the northeast half of grid 103N/102E, all of grids 104-105N/102E, and small portions of grids 103-104N/101E. The charcoal lens also extends into unexcavated areas to the north and east. Its full extent is therefore unclear. Small patches of oxidized soil (Stratum 4) were encountered in some areas beneath the charcoal lens.

All of the fill removed from the hearth (Stratum 5) was kept as flotation (FS 170 to FS 173 and FS 175 to FS 177) and pollen (FS 169 and FS 178) samples. Charred taxa identified in the flotation samples included ponderosa pine, piñon pine, sagebrush, mountain mahogany, maize, beeweed, unknown conifer, unidentified pine, oak, purslane, and Douglas fir. Taxa identified in FS 169, which was taken from near the top of the hearth, included grass family and sagebrush. The other pollen sample (FS 178) was taken from directly on top of the rock that forms the base of the hearth. Taxa identified in this sample included maize, beeweed, grass family, cheno-ams, pea family, sunflower family, spurge family, unidentified pine, piñon pine, juniper, and sagebrush. Flotation samples (FS 138, FS 139 and FS 143) were also taken from the charcoal lens (Stratum 3) surrounding the hearth. Charred taxa identified in these samples included ponderosa pine, beeweed, unknown conifer, maize, unidentified pine, and piñon pine. Lastly, a flotation sample (FS 122) was taken of the oxidized soil (Stratum 4) directly below the charcoal lens and charred taxa included ponderosa pine and oak.

Geological Analysis

No specific unit was excavated as a geological test pit at LA 87430. Instead, geologists Paul Drakos and Steven Reneau analyzed the south profile of grid 103N/102E, the south profile of the sub-floor excavation in grid 104N/98E, and the profile of the escarpment located just to the northwest of the site (see Figure 46.3). Their analysis indicates that the upper portion of the terrace upon which the site was built is composed of a Btb1 horizon overlaying a Bcb1 horizon. As mentioned above, the sub-floor excavation in grid 104N/98E also indicates that the rocks that form the foundation of the Room 1 walls do not extend more than a few centimeters into the Btb1 horizon. Most of the foundation rocks are in fact lying directly on top of this surface.

Artifact Distribution

There are two noticeable trends in the artifact distribution at LA 87430 (Table 46.5). One of these is the result of cultural formation processes, while the other is most likely due to natural formation processes. The first trend is a higher concentration of artifacts to the east of the fieldhouse. By far the highest number of artifacts from any unit was from grid 104N/102E. This unit, located over a meter to the east of the fieldhouse, also contains the Feature 1 slab-lined hearth. Most of the artifacts from this unit are from the charcoal lens that surrounds the hearth (Stratum 3), although a large number of artifacts were also encountered in the post-occupational fill directly above. A high number of artifacts were also recovered from Strata 2 and 3 in the units directly to the north and south. The high number of artifacts and the presence of a hearth and associated charcoal lens to the east of Room 1 suggest that it was an activity area, a midden, or possibly both. Activity areas are often encountered to the east and/or directly outside the entryways of prehistoric Native American residences. If it was an activity area, the vertical distribution of artifacts into several strata is most likely the result of bioturbation. Tree roots in particular appear to have significantly affected this area of the site. If it was a midden, the depth of the deposits could instead indicate that the site was occupied for a significant period of time. The second trend in artifact distribution at LA 87430 is a higher concentration of artifacts in the northern, downslope half of the site compared to the southern, upslope half. This is most likely the result of erosion, which is a natural formation process.

Table 46.5. LA 87430 artifact counts by grid unit.

	E102	E103	E104	E105	E106	E107
N104		1	41	68	50	48
N103		**23**	**41**	**29**	30	91
N101	2	**8**	**17**	**18**	18	51
N100	12	4	6	4	28	

Note: Does not include one artifact found outside of the excavated area during surface collection; lightly shaded grid units were partially excavated; bold numbers indicate grid units that are located completely or partially within Room 1.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 583 artifacts were analyzed from the excavations at LA 87430. In addition, flotation and pollen samples were selected for analysis from the post-occupational fill (Stratum 2) and the floor (Stratum 3) (Table 46.6). The results of the artifact and sample analyses are presented in the following sections. In addition, a maize sample was submitted for radiocarbon dating.

Table 46.6. Samples selected for analysis from LA 87430.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2	26	25, 33, 77		123
3	138, 139, 143		139	
4	122			
5	170, 171, 172, 173, 175, 176, 177	169, 178	173	
6				

*thermoluminescence

Chronology

Radiocarbon Dating

Two maize samples were submitted for accelerator mass spectroscopy dating. The sample from Stratum 3 provided a date of 370±40 BP (Beta-215552), with a calibrated intercept of AD 1490 and a two-sigma range of AD 1440–1640. It was taken from a charcoal lens that surrounded the Feature 1 hearth. The second sample was taken from the fill of the hearth (Stratum 5). It yielded a date of 390±40 BP (Beta-215553), with a calibrated intercept of AD 1470 and a two-sigma range of AD 1430–1630.

Thermoluminescence Dating

A single Biscuit B sherd was submitted for TL dating from LA 87430 (Table 46.7). All derived ages are given in years BP, which refers to years before 2003. The TL date is about 100 years earlier than the radiocarbon dates, but overlaps at two-sigma.

Table 46.7. TL date from ceramics at LA 87430.

FS#	Lab #	Context	Burial depth (cm)	Years BP	% error	Years AD
123	UW1416	North wall Room 1	16	623	6.2	1384±39

Ceramic Artifacts (Dean Wilson)

A total of 487 ceramics were analyzed from LA 87430. The majority of the pottery consists of Sapawe Micaceous, Biscuit B, and Biscuit B/C (Biscuit B?), which presumably reflects a Middle Classic period occupation (Table 46.8). This corresponds with the 15th century radiocarbon date, but not the TL date. Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 46.9 through 46.11. The graywares and whitewares appear to have been locally made from smeared-indented sand or tuff, in contrast to Sapawe Micaceous, which contained a non-local micaceous temper. All of the grayware and most of the micaceous ceramics consist of jar vessel forms. Several micaceous sherds were derived from a bowl(s). The whiteware sherds include mostly bowls, but some jars are present.

Table 46.8. Ceramic types from LA 87430.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	5	1.0
Indeterminate organic	1	0.2
Santa Fe Black-on-white	1	0.2
Wiyo Black-on-white	1	0.2
Biscuit paint and slip absent	1	0.2
Biscuit unpainted one side slipped	1	0.2
Biscuit unpainted both sides slipped	6	1.2
Biscuit painted unspecified	2	0.4
Biscuit A	2	0.4
Biscuit B	10	2.1
Biscuit C	1	0.2
Biscuit B/C body	47	9.7

Ceramic Type	Frequency	Percent
Northern Rio Grande Utilityware		
Plain gray rim	6	1.2
Plain gray body	50	10.3
Smeared-indented corrugated	10	2.1
Mica utility undifferentiated	16	3.3
Sapawe Micaceous	327	67.1
Total	**487**	**100.0**

Table 46.9. Tradition by ware for LA 87430 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	25	100.0	78	100.0	0	0.0	0	0.0	144	29.5
Rio Grande (Tewa Micaceous)	0	0.0	0	0.0	0	0.0	384	100.0	343	70.5
Middle Rio Grande	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	**25**	**100.0**	**78**	**100.0**	**0**	**0.0**	**384**	**0.0**	**487**	**100.0**

Table 46.10. Temper by ware for LA 87430 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Sherd and sand	5	20.0	3	3.8	0	0.0	0	0.0	5	1.0
Fine tuff or ash	0	0.0	73	93.5	0	0.0	0	0.0	73	14.9
Fine tuff and sand	0	0.0	2	2.7	0	0.0	0	0.0	2	0.4
Anthill sand	20	80.0	0	0.0	0	0.0	0	0.0	20	4.1
Granite with mica	0	0.0	0	0.0	0	0.0	67	17.4	67	13.7
Sapawe Micaceous temper	0	0.0	0	0.0	0	0.0	317	82.6	317	65.0
Total	**25**	**100.0**	**78**	**100.0**	**0**	**0.0**	**384**	**100.0**	**487**	**100.0**

Table 46.11. Vessel form by ware for LA 87430 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	1	4.0	10	12.8	0	0.0	2	0.5	13	2.6
Bowl rim	0	0.0	1	1.2	0	0.0	5	1.3	6	1.2
Bowl body	0	0.0	41	52.5	0	0.0	1	0.25	42	8.6
Jar neck	1	4.0	3	3.8	0	0.0	7	1.8	11	2.2
Jar rim	0	0.0	1	1.2	0	0.0	19	4.9	20	4.1
Jar body	22	84.0	9	11.5	0	0.0	350	91.1	381	78.2
Miniature pinch pot body	1	4.0	0	0.0	0	0.0	0	0.0	1	0.2
Flared bowl rim	0	0.0	13	16.6	0	0.0	0	0.0	13	2.6
Total	**25**	**100.0**	**78**	**100.0**	**0**	**0.0**	**384**	**100.0**	**487**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 96 artifacts were analyzed from LA 87430, consisting of four cores, 80 pieces of debitage, five retouched tools, and seven ground stone artifacts. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 46.12 presents the data on lithic artifact type by material type. The debitage is primarily made of chalcedony and Pedernal chert with other materials. The presence of cortex on 13.7 percent of the debitage indicates that these materials were collected from waterworn (*n* = 11) sources. The chalcedony, Pedernal chert, and silicified wood are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. The igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 46.12. Lthic artifact type by material type.

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Sandstone	Total
Cores	Core	0	0	0	0	0	0	0	2	0	2	0	0	0	4
	Subtotal	0	0	0	0	0	0	0	2	0	2	0	0	0	4
Debitage	Angular debris	0	0	0	0	0	0	2	2	0	3	0	0	0	7
	Core flake	0	0	3	2	0	0	1	28	0	26	2	0	0	62
	Biface flake	0	0	0	0	0	0	7	1	0	0	0	0	0	8
	Micro-debitage	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Und. flake	0	0	0	0	0	0	0	2	0	0	0	0	0	2
	Subtotal	0	0	3	2	0	0	10	34	0	29	2	0	0	80
Retouched Tools	Retouched piece	1	0	0	0	0	0	0	0	0	1	0	0	0	2
	Biface	0	0	0	0	0	0	0	0	0	2	0	0	0	2
	Projectile point	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Subtotal	1	0	0	0	0	0	1	0	0	3	0	0	0	5
Ground Stone	Und. mano	0	0	0	1	0	0	0	0	0	0	0	3	0	4
	Millingstone	0	0	0	1	1	0	0	0	0	0	0	0	0	2
	Abrading stone	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	2	2	0	0	0	0	0	0	3	0	7
Total		**1**	**0**	**3**	**4**	**2**	**0**	**11**	**36**	**0**	**34**	**2**	**3**	**0**	**96**

Five pieces of obsidian and a piece of basalt debitage were submitted for X-ray fluorescence analysis. The obsidian artifacts are Valle Grande and Cerro Toledo obsidian (Table 46.13). The Valle Grande (Cerro del Medio) and Cerro Toledo (Obsidian Ridge/Rabbit Mountain) source areas are situated about 17 km (11 mi) and 19 km (12 mi) to the west and southwest. Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present on the nearby mesa as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval. The single basalt flake appears to be made of dacite from the Newman Dome source.

Table 46.13. Obsidian source samples.

FS #	Artifact	Color	Source
69	Debitage	Translucent	Valle Grande rhyolite
107	Debitage	Translucent	Valle Grande rhyolite
127	Debitage	Translucent	Valle Grande rhyolite
131	Debitage	Translucent	Cerro Toledo rhyolite
145	Debitage	Translucent	Valle Grande rhyolite

Lithic Reduction

All four cores were reduced using a single-directional, single-face technique (Figure 46.6). Three of these were classified as still useable when discarded and one as discarded due to a culturally induced fracture. Table 46.14 presents the metric information on the cores.

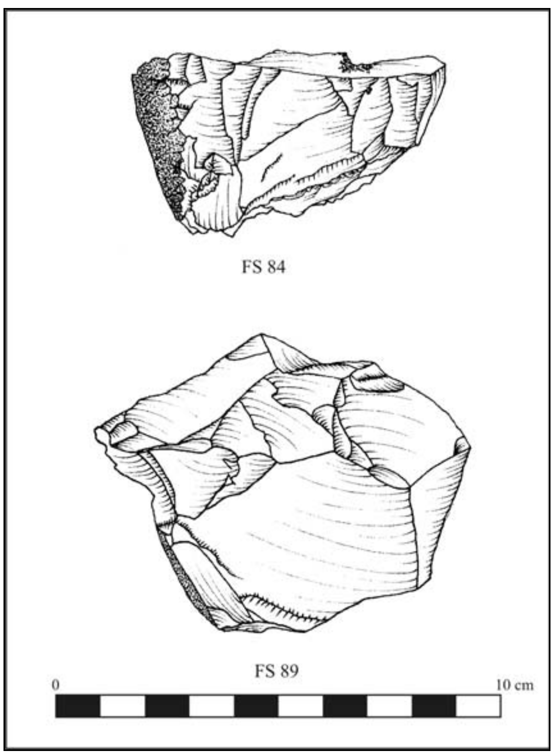

Figure 46.6. Single-directional, single-face cores.

Table 46.14. Core type dimensions (mm) and weight (g).

Core Type	Length (*std*)	Width (*std*)	Thickness (*std*)	Weight (*std*)
Single-directional	42	62	71	222.9
Single-directional	55	53	59	245.9
Single-directional	50	83	65	288.9
Single-directional	60	78	49	255.6

The debitage mostly consists of core flakes, with a few biface flakes and angular debris. The overall cortical:non-cortical ratio of 23.5 reflects an emphasis on the later stages of core reduction and tool production/maintenance. The flakes mostly have single-faceted platforms ($n = 29$), with fewer cortical ($n = 3$), multi-faceted ($n = 3$), collapsed ($n = 11$), and crushed ($n = 5$) platforms. Four of the platforms exhibit evidence of preparation by abrasion/crushing. The majority of the core flakes are proximal fragments ($n = 24$), with fewer whole ($n = 21$), midsection ($n = 2$), and distal ($n = 15$) fragments. In contrast, the biface flakes consist of six proximal and two distal fragments. The whole core flakes have a mean length of 28.6 mm (*std* = 9.4) and the angular debris a mean weight of 4.5 g (*std* = 4.6).

The retouched tools consist of retouched pieces, bifaces, and a projectile point (Figure 46.7). The retouched pieces are two flakes with unidirectional dorsal retouch along a lateral edge with angles of 70 degrees. One of the bifaces was rejected during the early stages of the reduction process with a thickness of 12 mm and edge angle of 70 degrees. It is triangular-shaped with alternate beveled edges. The other biface is a proximal fragment of a knife or spear point. Most of the blade is missing and it appears that the base was being thinned because one side is ground and the other exhibits a series of small retouch flakes. Small notches are present at the shoulder that could have been an attempt to haft the artifact. Lastly, the projectile point is the base fragment of a side-notched arrow point. Metrical and descriptive information on the point is presented in Table 46.15.

Table 46.15. Projectile point metrical (mm) and descriptive data.

FS #	Material	Condition	Overall Length	Blade Length	Neck Width	Stem Length	Stem Width	Thickness	Weight (g)	Haft Type	Blade Shape	Base Shape
146	Obsidian	Proximal	--	--	7	7	14	3	0.6	Side-notched	Und.	Straight

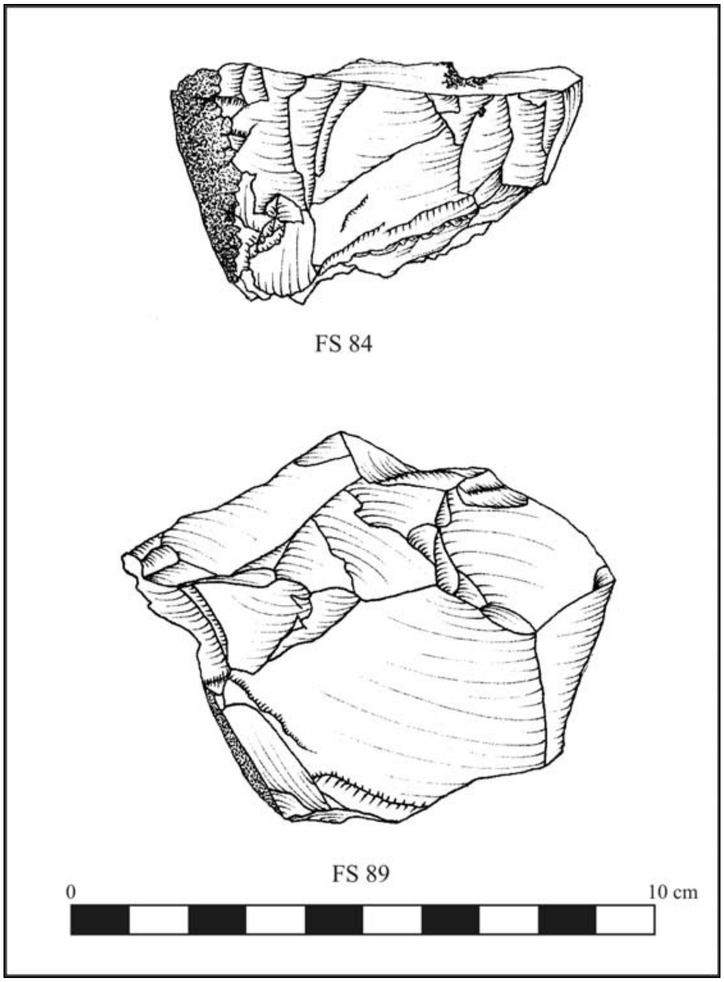

Figure 46.7. Projectile point and bifaces from LA 87430.

Tool Use

None of the debitage exhibit evidence of edge damage that could be attributed to use. Both retouched pieces exhibit rounding and scarring that reflect use and the biface fragment has rounding and polish along the remaining portion of the blade. The ground stone artifacts include a mano, millingstones, and grooved abrader. The manos consist of fire-cracked cobbles with a single grinding surface that probably represent broken one-hand manos. The millingstones are fragments of dacite and andesite with a single flat ground surface. The abrading stone is an odd-shaped dacite cobble with a flat ground surface that exhibits unidirectional striations. It could have been used as a mano, but was classified as an abrading stone due to the irregular shape and wear.

Archaeobotanical Remains (Pamela McBride)

Burned pine needles were the most common plant materials recovered from this Classic period fieldhouse, followed by corn parts (Table 46.16). Besides corn, samples from the hearth yielded charred goosefoot, purslane, and beeweed seeds. A seed that compares favorably to beeweed was also identified from the charcoal concentration in Room 1. Young beeweed plants were used as greens, eaten much like spinach. The seeds were also dried, ground, and mixed with cornmeal. The leaves of older plants were cooked down until they formed a paste, sun-dried, and made into cakes that could later be eaten with cornmeal mush or fried with fat. Another, more unusual and important use of the reconstituted cakes was as a black pigment for decorating pottery and baskets (Dunmire and Tierney 1995:182–184).

Table 46.16. Flotation plant remains, count and abundance per liter at LA 87430.

FS No.	**26**	**122**	**138**	**139**	**170**
Feature	Room 1, post-occupational fill, strat. 2, Level 3	Oxidized soil under charcoal concentration	Charcoal concentration	Charcoal concentration from Hearth	Hearth fill 104.8N/102.5 E
Cultural					
Annuals					
Beeweed			cf. 1(1)		1(1)
Cultivars					
Maize				1(0) c, 1(1) k	1(0) cf. e
Grasses					
cf. Grass family		+ stem			
Perennials					
Piñon					+ needle
Ponder-osa pine	+ needle	+ needle	+ needle	+ needle	+ needle
Non-Cultural					
Annuals					
Goose-foot	+			+	
Grasses					
Grass family	+				
Perennials					
cf. Dock	+				
Ponder-osa pine	+ needle				

Table 46.16 (continued). Flotation plant remains, count and abundance per liter at LA 87430.

FS No.	**171**	**172**	**173**	**175**	**176**	**177**
Feature	Hearth fill 104.7N/102.57E			Hearth fill 104.85N/102.5E		
Cultural						
Annuals						

FS No.	171	172	173	175	176	177
cf. Beeweed				2(2)		
Goosefoot						1(1)
Purslane		2(2)		1(1)		1(1)
Cultivars						
Maize	1(0) poss. stalk		1(0) c, 1(0) k			
Other						
Unidentifiable			1(0) pp	4(0) pp	1(0) pp	
Perennials						
cf. Douglas fir				+ needle	+ needle	
Piñon			+ needle		+ needle	
Ponderosa pine	+ needle		+ needle	+ needle	+ needle	+ needle
Non-Cultural						
Annuals						
Goosefoot		+			+	
Perennials						
Ponderosa pine		+ needle	+ needle		+ needle	+ needle

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter, c cupule, cf. compares favorably, e embryo, k kernel, pp plant part.

Piñon and ponderosa pine dominated the wood assemblage, while mountain mahogany was the most common non-conifer with small amounts of sagebrush and oak also occurring (Table 46.17). Corn, grown in nearby fields, was probably cooked on the hearth, possibly along with goosefoot, purslane, and beeweed. Locally available woods were used as fuel.

Table 46.17. Flotation sample wood charcoal by count and weight in grams.

FS No.	26	122	138	139	143
Feature	Room 1, post-occupational fill, strat. 2, Level 3	Oxidized soil under charcoal concentration	Charcoal concentration	Charcoal concentration from Hearth	Charcoal lens in hearth
Conifers					
Pine				2/<0.1 g	
Piñon					4/0.3 g
Ponderosa pine	6/0.7 g				2/1.3 g
Unknown conifer	1/0.1 g		6/0.1 g	2/<0.1 g	11/0.3 g
Non-Conifers					
Oak		11/0.2 g			
Totals	**7/0.8 g**	**11/0.2 g**	**6/0.1 g**	**4/<0.1 g**	**17/1.9 g**

Table 46.17 (continued). Flotation sample wood charcoal by count and weight in grams

FS No.	**170**	**171**	**172**	**173**	**175**	**176**	**177**
Feature	Hearth fill 104.8N/102.5E	Hearth fill 104.7N/102.57E			Hearth fill 104.85N/102.5E		
Conifers							
Pine		2/<0.1 g	3/0.2 g	1/<0.1 g			
Ponderosa pine	7/0.5 g	9/0.2 g		3/0.1g	9/0.1 g	8/0.2 g	13/0.4 g
Unknown conifer	6/0.7 g	3/<0.1 g	17/0.8 g	14/0.5 g	6/0.1 g	5/0.1 g	
Non-Conifers							
Mountain mahogany	1/<0.1 g	2/<0.1 g		1/<0.1 g	1/<0.1 g		2/<0.1 g
Oak		4/<0.1 g					
cf. Sagebrush	1/<0.1 g						
Totals	**15/1.2 g**	**20/0.2 g**	**20/1.0g**	**19/0.6 g**	**16/0.2 g**	**13/0.3 g**	**15/0.4 g**

Pollen Remains (Susan Smith)

Five pollen samples were analyzed from LA 87430. Table 46.18 lists the frequency of identified pollen types. Maize was the only cultigen identified in the botanical assemblage. Beeweed was the only other economic resource that was identified in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 46.18), and these are discussed in detail in Smith's chapter in Volume 3.

Table 46.18. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 87430 (*n* = 5)**
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	2
	Zea Aggregates	Maize Aggregates	1
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 87430 (*n* = 5)
	Cleome	Beeweed	1
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	0
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	4
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	2
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	4
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	1
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	4

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 87430 (*n* = 5)
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	0
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	2
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	0
	Abies	Fir	1
	Pinus	Pine	4
		Pine Aggregates	0
	Pinus edulis type	Piñon	4
	Juniperus	Juniper	3
		Juniper Aggregates	0
	Quercus	Oak	0
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	1
	Artemisia	Sagebrush	4
		Sagebrush Aggregates	1
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 87430 (*n* = 5)
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY OF SITE EXCAVATIONS

LA 87430 consists of a one-room fieldhouse and a slab-lined hearth. All four walls were intact and appeared to contain an opening to the east. A formal floor was not identified, but the fieldhouse did contain a compact surface. The slab-lined hearth contained bits of charcoal. Ceramic and radiocarbon evidence indicate that the fieldhouse was probably occupied during the Middle Classic period. The presence of maize and the prevalence of storage jars reflect the agricultural function of the site. This is supported by the limited core reduction represented in the lithic assemblage and by the grinding activities.

CHAPTER 47
RENDIJA TRACT (A-14): LA 99396

Brian C. Harmon

INTRODUCTION AND SITE SETTING

LA 99396 is a multicomponent site consisting of an Archaic period lithic artifact scatter and a Coalition period one-room fieldhouse. The site is situated on the broad, open southeast-facing slope of a saddle (Figure 47.1). The site covers an area of about 1385 m^2 and is at an elevation of 2110 m (6925 ft). Headwater cutting of several small washes has created an area of shallow erosion across much of the southeast portion of the site. While located within piñon-juniper woodland, the site itself is relatively clear of trees. The Cerro Grande fire did not impact this site.

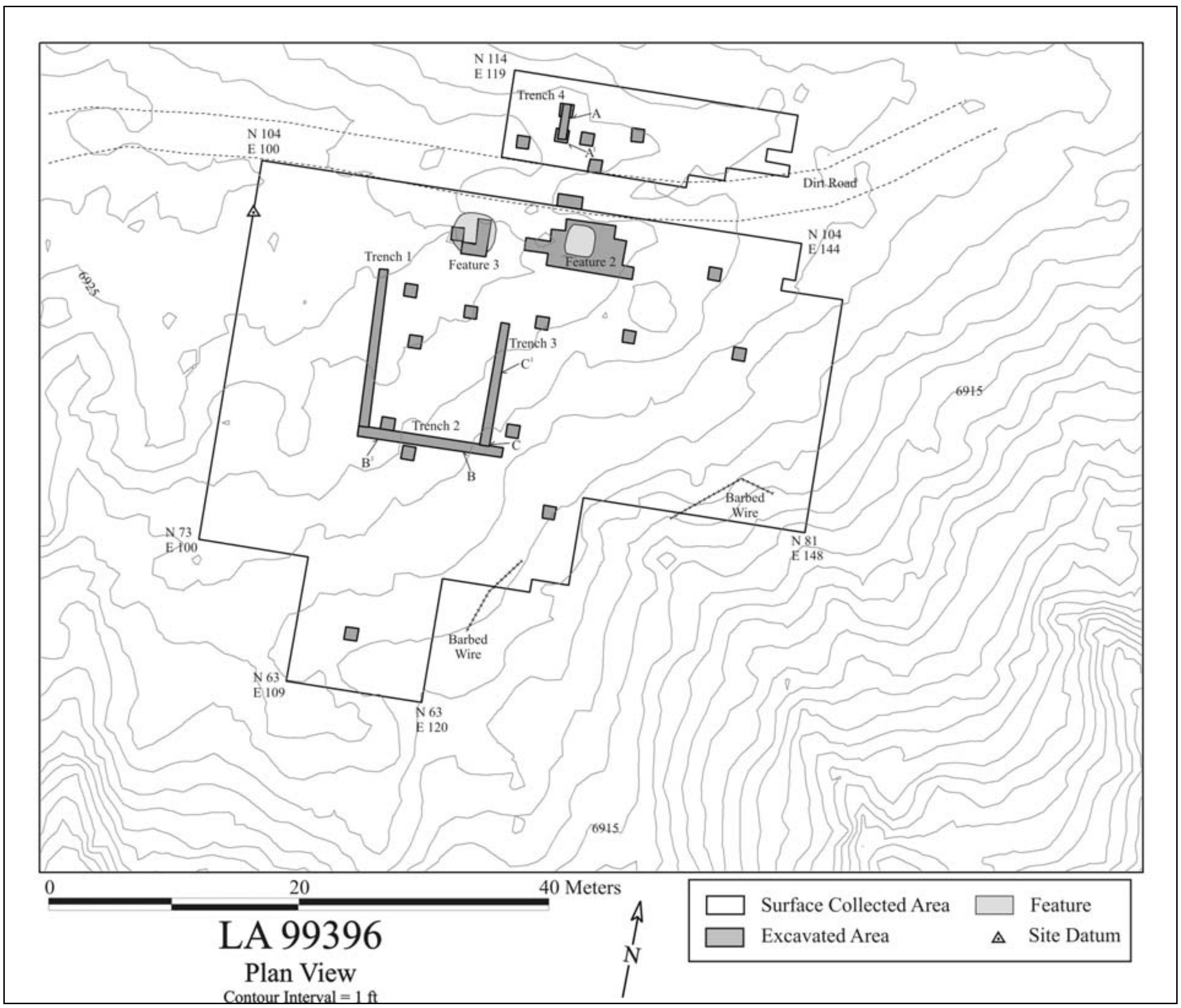

Figure 47.1. Plan view drawing of LA 99396.

The soil at LA 99396 is part of the Rendija-Bayo complex; a complex that "contains deep, well-drained soils weathered from materials derived from tuff (Rendija series) or pumice (Bayo series)," (Nyhan et al. 1978:54). The local stratigraphy consists of 2 to 37 cm of late-Holocene eolian and colluvial deposits overlying late-Pleistocene or early-Holocene eolian deposits. At the northern end of the site, Cerro Toledo or Guaje pumice (Qct or Qbog) underlies the Pleistocene deposits at about 120 cm below the surface. In the southern and central parts of the site, pumice is found 8 to 24 cm below the surface.

A dirt road runs through the northern portion of the site. This road appears to have been bladed in areas and is cut into the late-Pleistocene/early-Holocene deposits. A dirt bike track is present on the slope and valley north of the site. The edge of an old open-pit pumice mine defines the southern and southeastern boundaries of the site. In recent years the site has been used as an informal shooting range; many bullet cartridges, skeet fragments, metal and plastic fragments, and other debris are found within several meters of the dirt road. This site is located within the boundaries of the Serna Homestead patent (see Chapter 32, this volume).

SITE DESCRIPTION

The lithic artifact scatter covers an area of approximately 1385 m^2 and consists mostly of obsidian debitage. Several biface fragments, including four projectile point bases, and ground stone artifacts were also recovered. These artifacts are in a reworked context.

The one-room structure (Feature 2) is partially subterranean: a shallow pit was excavated into the late-Pleistocene/early-Holocene deposits and this forms the living surface of the structure. The walls were built of unshaped dacite and tuff cobbles. None of the walls are standing but the cobbles are still present in the form of two low mounds; one (Feature 1) directly overlays the excavated portion of the structure and the second (Feature 3) is located 7 m to the west. A light scatter of ceramic sherds and ground stone artifacts is present in and around Feature 2.

No homestead era artifacts were recovered during excavation, but the remains of a barbed wire fence, which probably marked the Serna Homestead patent boundary, is present along the southeast edge of the site.

PREVIOUS INVESTIGATIONS

LA 99396 was first recorded in 1992 by Peterson and Nightengale (1993:208–212) for the Bason Land Exchange Project. Their work consisted of mapping, infield analysis, surface collection, and shovel testing. Hoagland et al. (2000:7–38) summarized Peterson and Nightengale's results:

> Testing included 10 shovel tests, a 1- by 23.5-m-long artifact collection transect across the center of the site, plus a site-wide infield analysis of 157 [lithic] artifacts. Ceramics, all from surface finds, amounted to only three sherds: one Biscuit A, one Pajarito smeared-indented, and one gray utilityware. The majority of lithic materials

> collected from this site consisted of obsidian debitage including 15 [sic, 16] flakes recovered from [six of] the shovel tests. The few pieces of debitage that were not obsidian include a tertiary flake of a gray opaque material as well as four tertiary flakes, two secondary flakes, and two angular pieces of chalcedony. In addition to this, a broken basalt point base, that was thought to be from a Bajada projectile point, was collected. All but one of the pieces of debitage are the result of secondary or tertiary reduction suggesting that partially reduced materials were transported to the site where they were further reduced in the course of chipped stone tool manufacture and/or to obtain flakes as expedient tools. Utilized or retouched flakes comprise about 4 percent of the site debitage.

Peterson and Nightengale also recorded two small rock concentrations immediately south of the dirt road. The westernmost concentration (our Feature 3) was recorded as being approximately 3 m in diameter, and the other (our Feature 1) as approximately 1.5 m in diameter. One test unit was placed immediately south of Feature 3 and encountered the Btb1 horizon 5 cm below surface. No artifacts were found. A second test unit was placed in the center of the eastern concentration and encountered the Btb1 horizon at 20 cm below surface. One obsidian flake was found. On the basis of these tests Peterson and Nightengale (1993:208) concluded that the concentrations "were probably formed in the course of road construction and maintenance". The Los Alamos National Laboratory Cultural Resources Management Team visited LA 99396 in 2000 during the Cerro Grande Fire Assessment Project (Nisengard et al. 2002).

FIELD METHODS

Most of the work reported here took place between September 29 and December 10, 2003, although the site was sporadically visited until January 15, 2004. The crew consisted of Steven Hoagland (crew chief), Brian Harmon (assistant crew chief), Maria Jonsson, Michael Kennedy, Bettina Kuru'es, and Alan Madsen. Aaron Gonzales was the San Ildefonso tribal monitor. Leo Martinez operated the bobcat during trenching operations.

A grid was laid out at the site based on magnetic north. Investigations began with a ground penetrating radar (GPR) survey with the goal of locating potential cultural deposits associated with the lithic artifact scatter. The area between 77 to 100N and 111 to 130E was surveyed. Several anomalies were found and, in the course of excavation, four units (81N/127E, 82N/115E, 91N/114E, and 99N/124E) were dug to investigate these anomalies. No cultural features were encountered in these excavations and additional anomalies were not investigated. The GPR anomalies are interpreted to be variations in pumice depth, variability in soil characteristics, etc.

After the GPR survey, a surface collection was made of 100 percent of the artifacts within the estimated site boundaries. Collection did not take place in the dirt road. Artifacts were collected in 1- by 1-m grid units and 1566 units were included in the surface collection.

Significant erosion has occurred in the southeastern part of LA 99396. For this reason, initial excavations focused on the high areas of the site, where it was thought that intact cultural deposits would most likely be encountered. The high areas are 84-102N/113-118E and 106-

110N/120-130E. No intact cultural deposits were found. Later, several units were placed in the eroded area. Intact cultural deposits were not found here, either. Additional excavations focused on the two rock piles south of the road. Five excavation units placed in the western rock pile (Feature 3) demonstrated that it was not associated with any subsurface cultural deposits. However, the subterranean remains of a one-room structure (Feature 2) were found below the eastern rock pile (Feature 1). Initially, Feature 2 was thought to be the remains of an Archaic structure unassociated with Feature 1 (hence the separate feature numbers). The entire fill of Feature 2 was saved as flotation and pollen samples. When several ceramic sherds were encountered in the fill of the hearth, it became obvious that this was a Puebloan structure.

While Feature 2 was being excavated, an ashy deposit was observed in the road just north of the structure. Units 104N/124-125E were opened and a hearth (Feature 5) was discovered. The remains of a possible post (Feature 4) were found immediately north of Feature 2. These discoveries suggested the possibility of additional exterior features, so a 24-m^2 area was opened around the structure. No additional features were found.

After excavation, four trenches (Table 47.1.) were dug by backhoe to make long profiles of the site stratigraphy visible. Trenches 1 to 3 were placed to explore the west-central portion of the site. Trench 4 was dug to explore the high area north of the road.

Table 47.1. Trench dimensions.

Trench #	Coordinates		Dimensions	
	From	To	Length (m)	Width (m)
1	83.2N 111.3E	96.8N 110.7E	13.6	0.80
2	83.2N 111.3E	83.2N 123E	11.7	0.80
3	84N 121E	94N 121E	10	0.80
4	109.2N 123.2E	112N 123.2E	2.8	0.80

STRATIGRAPHY

The general stratigraphic sequence at LA 99396 consists of late-Holocene eolian and colluvial deposits overlaying late-Pleistocene or early-Holocene eolian deposits that, in turn, overlay Qct or Qbog pumice (see Chapter 57, Volume 3). During excavation, variations within soil horizons were given different stratum numbers. Table 47.2 summarizes the strata at LA 99396. Table 47.3 lists the artifact count by stratum.

Table 47.2. Stratigraphic sequence used during excavation.

Provenience	Stratum	Color	Texture	Thickness (cm)	Description
Entire site	0	7.5-10YR 4-5/3-4		0	surface
Entire site	1	7.5-10YR 4-5/3-4	sandy to silt loam, loamy sand	1–10	A horizon, loose consistency

Provenience	Stratum	Color	Texture	Thickness (cm)	Description
Entire site	2	7.5-10YR 4-5/3-4	sandy to silt loam, loamy sand	1–27	A horizon, soft consistency
Central and south part of site	3	5-7.5YR 3-5/2-4	silty clay	5–10	Btb1 horizon, same depositional unit as Stratum 10
Central and south part of site	3A	7.5YR 4/3.5	silty clay	1–8	Bt2b1 horizon, same depositional unit as Stratum 10A
Entire site	4	7.5YR 3/3 8.75YR 4/3	sandy to silt loam	11–21	Bk1b1 horizon
Entire site	5	8.75YR 3/3	sandy loam	16+	Bk2b1 horizon
Entire site	6	7.5YR 4/4	sandy clay loam	13–20	Bwb1 horizon, swale fill
Entire site	7	7.5YR 5/3	sandy loam	10–12	Bkb1 horizon, swale fill
Eastern half of site	8	7.5YR 4-5/6	silt loam	5–12+	Variant of Stratum 4, less compact
Entire site	9	7.5YR 7/3 and 4/4	pumice and sandy clay loam	8+	R and 2Btb2, Qct or Qbog pumice and deposits
North edge of site	10	7.5-10YR 4-5/3 (7.5YR 4/3)	silty clay loam	5–16	Bt1b1 horizon, same depositional unit as Stratum 3
North edge of cite	10A	7.5YR 4/3	silty clay loam	15–20	Bt2b1 horizon, same depositional unit as Stratum 3A
Feature 2	11	10YR 5/3-4	sandy loam	6–15	Bw horizon, fill of the feature
Feature 2	12	NA	NA	NA	Floor surface
Feature 5	13	7.5YR 2.5/1	silty clay loam	2–5	Upper fill of hearth
Feature 5	14	7.5YR 2.5/1	sandy loam	1–2	Lower fill of hearth
Entire site	15	7.5YR 5/4	silt loam	1–7	Possibly

Provenience	Stratum	Color	Texture	Thickness (cm)	Description
					disturbed Stratum 3 or 4
Feature 7	16	7.5YR 3/2	clay loam	8	Hearth fill
Feature 2	17				Combined with Stratum 11
Entire site	18	8.75YR 5/3	silt loam	21–38	Btkb1 horizon

Table 47.3. Artifact count by stratum.

Stratum	Ceramics	Chipped Stone	Ground Stone	Total	Volume of Stratum Excavated (m^3)	Artifacts per cubic meter
0	32	625	2	659	NA	NA
1	12	136	1	149	1.39	107.19
1/2	0	52	1	53	.49	108.16
2	24	461	3	488	3.68	132.61
2/5	0	4	0	4	.14	28.57
3	0	13	0	13	.49	26.53
3A	0	0	0	0	.13	0
3/4	0	0	0	0	.07	0
4	0	0	0	0	.14	0
4/5	0	0	0	0	.10	0
5	0	0	0	0	0	0
6	0	1	0	1	.29	3.45
7	0	0	0	0	.11	0
8	0	4	0	4	.47	8.51
9	0	0	0	0	.21	0
10/10A	0	9	0	9	.74	12.16
11/17	0	75	2	77	.48	160.42
12	0	0	0	0	0	0
13/14	2	0	0	2	.03	66.67
15	0	0	0	0	0	0
16	15	12	0	27	.02	1350.00
18	0	0	0	0	0	0
Total	**85**	**1392**	**9**	**1488**	**8.98**	**NA**

The uppermost soil horizon across the site is a late-Holocene A horizon consisting of eolian and colluvial deposits. During excavation, the A horizon was divided into two strata based on consistency: Stratum 1 consisted of loose surface sediments and Stratum 2 consisted of underlying soft sediments. Although there is considerable variation in the thickness of these two strata, Stratum 1 was usually about 3 cm thick and Stratum 2 was usually about 8 cm thick. Strata 1 and 2 were probably deposited within the last 1000 years.

In most places, the A horizon is underlain by late-Pleistocene or early-Holocene eolian deposits. The uppermost of these deposits is a truncated Bt1b1 horizon. This truncation indicates erosion at LA 99396 some time during the Holocene before the deposition of Strata 1 and 2. In the field, this horizon was divided into two strata (Stratum 3 and Stratum 10) based on textual, structural, and consistency differences. In Drakos and Reneau (Volume 3, Chapter 57 and Appendix L), the Bt1b1 horizon in LA 99396-1 is an example of Stratum 3; the Bt1b1 horizon in LA 99396-4 is an example of Stratum 10. Stratum 3 was encountered south of 108N, while Stratum 10 was found north of 108N. Strata 3A and 10A are Bt2b1 horizons.

Stratum 3 and 10 are underlain by sterile Bk and Btk horizons (Volume 3, Chapter 57). The deepest of these late-Pleistocene or early-Holocene deposits occur on the northern part of the site (Figure 47.2). A piece of wood charcoal (Field Specimen [FS] 774) from the Btkb1 horizon (Stratum 18) in Trench 4 was submitted for radiocarbon analysis. This sample returned an age of 33660±320 BP (Beta-199381). In the southern portion of the site, sterile horizons are considerably shallower (Figures 47.3 and 47.4). Across the site, the late-Pleistocene or early-Holocene soils are underlain by Cerro Toledo or Guaje pumice deposits.

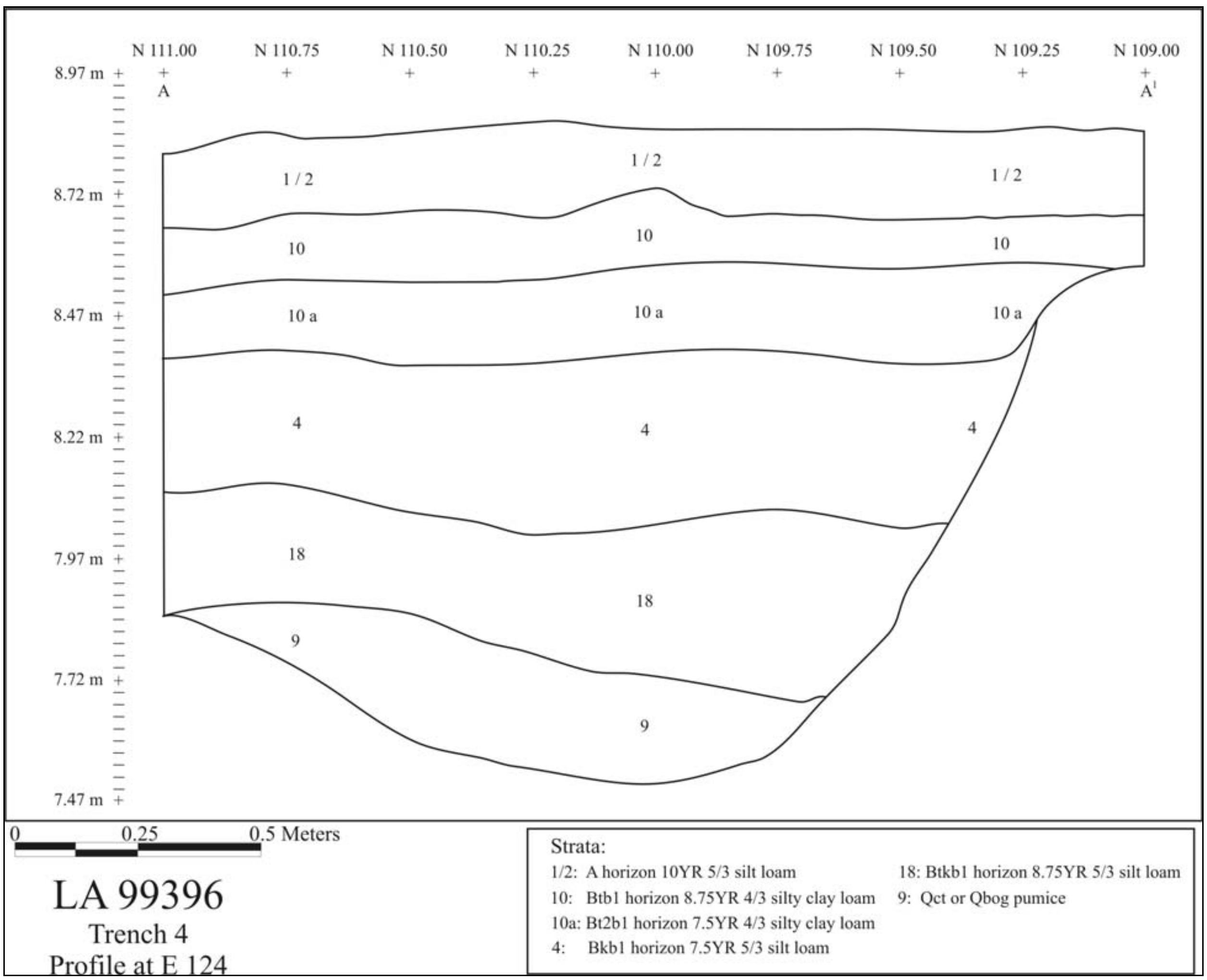

Figure 47.2. Profile of Trench 4 at LA 99396.

Swale fill (Strata 6 and 7) was observed in unit 84N/113E and in Trenches 2 and 3. Deposits are present between 114.4 to 121E and between 83.2 to 88N. The swale fill consists of a sandy clay loam Bwb1 horizon (Stratum 6) overlying a sandy loam Bkb1 horizon (Stratum 7). The swale fill deposits were likely derived from the reworking of older upslope soils some time in the middle to late Holocene. These strata are overlain by the A horizon and underlain by Stratum 4 and Stratum 9.

A piece of wood charcoal (FS 775) from Stratum 6 was submitted for radiocarbon analysis. The sample returned an age of 1000±40 BP (Beta-199382) and a date of cal AD 1020 with a two-sigma date range of AD 980–1060 and AD 1080–1150.

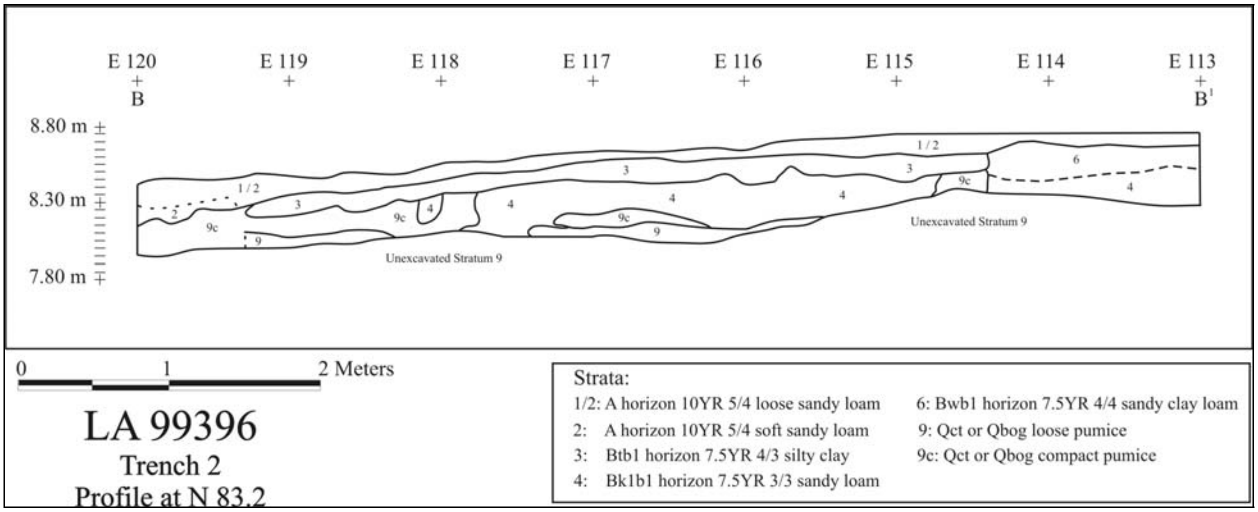

Figure 47.3. Profile of Trench 2 at LA 99396.

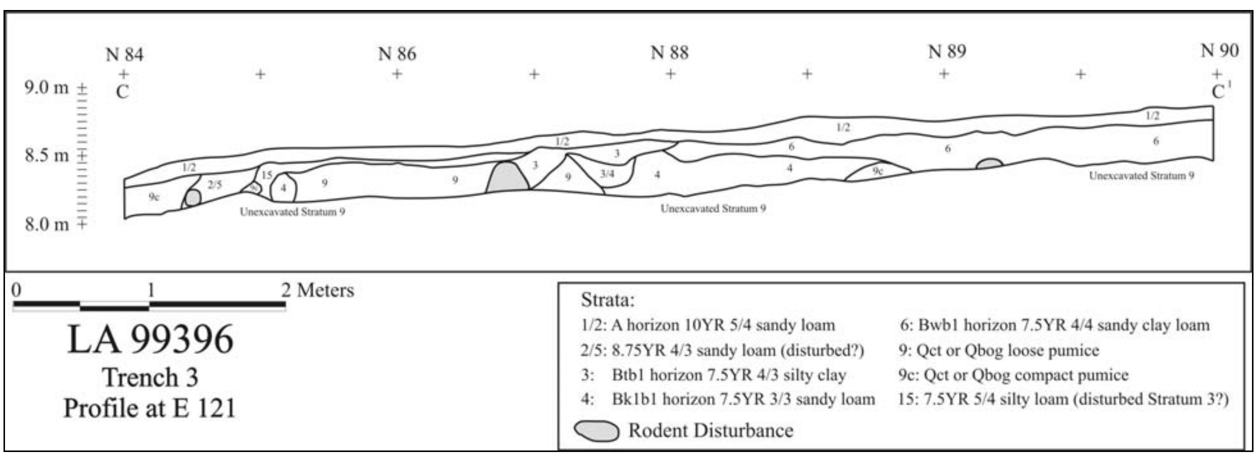

Figure 47.4. Profile of Trench 3 at LA 99396.

SURFACE COLLECTION

An area of 1566 m^2 was surface collected and 659 artifacts were recovered. Figures 47.5 and 47.6 show the distribution of surface artifacts. Most of the chipped stone debitage is found on the southeast-facing slope of the site. Headwater cutting of several small washes has created an area of shallow erosion across much of this area. In contrast to the chipped stone debitage, nearly all of the surface ceramic artifacts are found immediately east of Feature 2.

SITE EXCAVATION

Archaic Component. The Archaic component of the site consists of a moderately dense scatter of chipped stone debitage and a few stone tools. Most of these artifacts are located on a shallowly eroded southeast-facing slope. Given that the A horizon is probably not older than 1000 years and that the underlying truncated Btb1 horizon dates to the late Pleistocene or early Holocene, it is unlikely that any Archaic period habitation surface is still intact. All of the Archaic period artifacts are in a reworked context.

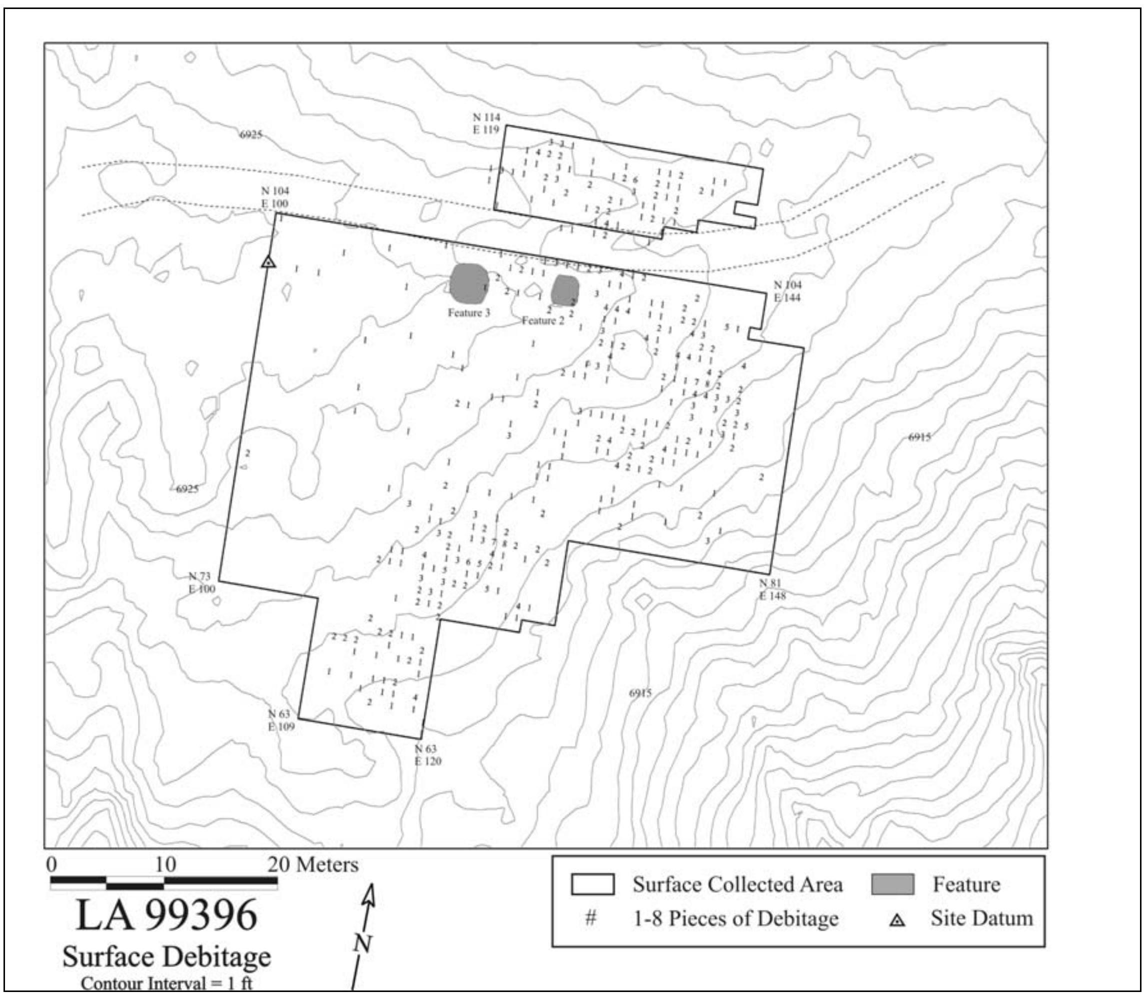

Figure 47.5. LA 99396 surface chipped stone debitage.

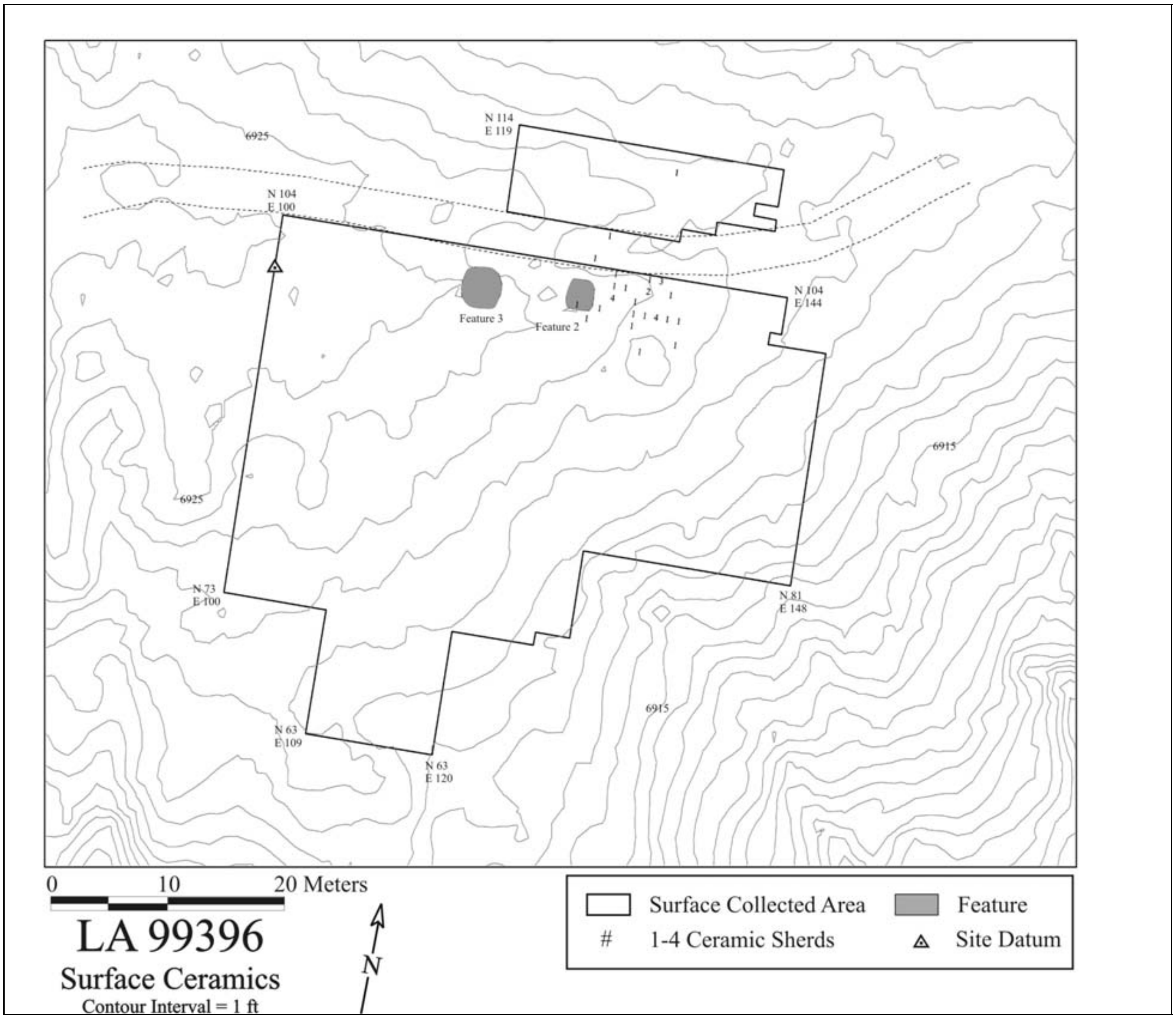

Figure 47.6. LA 99396 surface ceramic artifacts.

Coalition Period Component. This component consists of a one-room structure and associated features and artifacts.

Features 1 and 2

Feature 1 is a low mound of approximately 100 unshaped dacite cobbles and several unshaped tuff cobbles (Figure 47.7). It is approximately 3 m north-south by 2 m east-west. The cobbles range in size from 9 by 9 by 8 cm to 33 by 21 by 11 cm. The most common size is 16 by 14 by 10 cm. The matrix around these cobbles consists of Strata 1 and 2, although some cobbles extended down into Stratum 11 and two or three cobbles rested on the floor of the structure. These cobbles (and those of Feature 3) were the aboveground walls of Feature 2.

Figure 47.7. Feature 1, partially excavated.

Feature 2 (Figures 47.8 and 47.9) is the subterranean portion of a one-room structure that was excavated into Stratum 3. The structure is oriented approximately north-south. It is rectangular in shape, although the corners are rounded. The interior dimensions at the level of the floor are 2.3 m north-south by 2.1 m east-west. A hearth (Feature 7) is present at the center of the structure, and outside, to the north, a second hearth (Feature 5) and a post fragment (Feature 4) are present. In the discussion that follows, Feature 2 is used to refer to the one-room structure as a whole while Feature 1 is used to refer specifically to the cobble concentration (which is treated as a sub-feature of Feature 2).

Five (originally six) strata are associated with Feature 2. Strata 1 and 2 are associated with Feature 1, Stratum 11 (and Stratum 17, see Table 47.1) is the fill of the structure, Stratum 12 is the living surface, and Stratum 16 is the fill of the interior hearth (Feature 7) (Figure 47.10).

Strata 1 and 2 are described above. Stratum 11 is a Bw soil horizon consisting of 6 to 15 cm of sandy loam. Given the paucity of cobbles in Stratum 11, it appears that this stratum was deposited before the walls collapsed. The living surface of Feature 2 (Stratum 12) consists of smooth and compacted Stratum 3. A light scatter of ash and charcoal flecks is embedded in this surface, giving it a grayish color. No artifacts were found on the living surface.

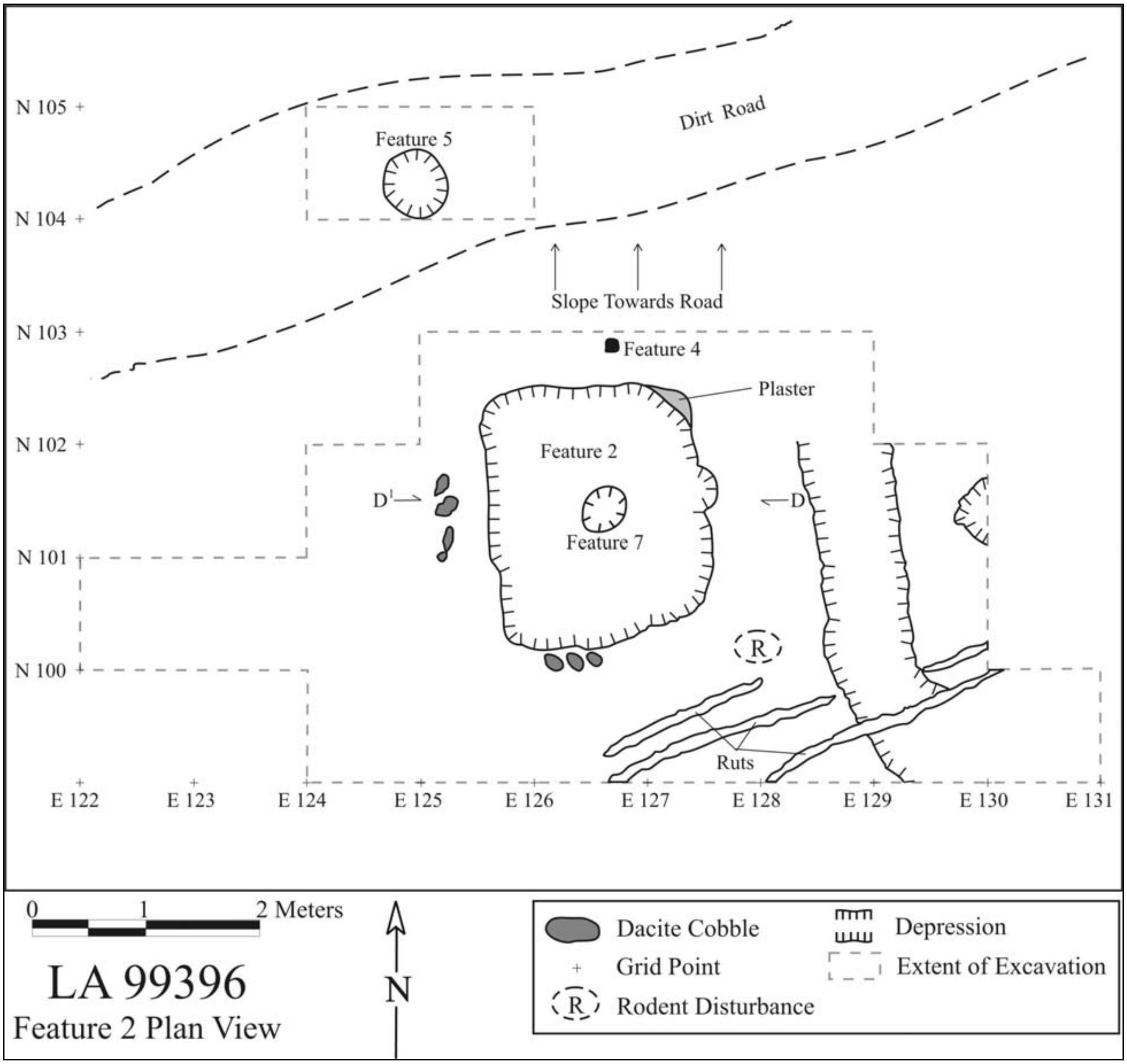

Figure 47.8. Plan view of Feature 2.

Figure 47.9. Photograph of Feature 2 at LA 99396.

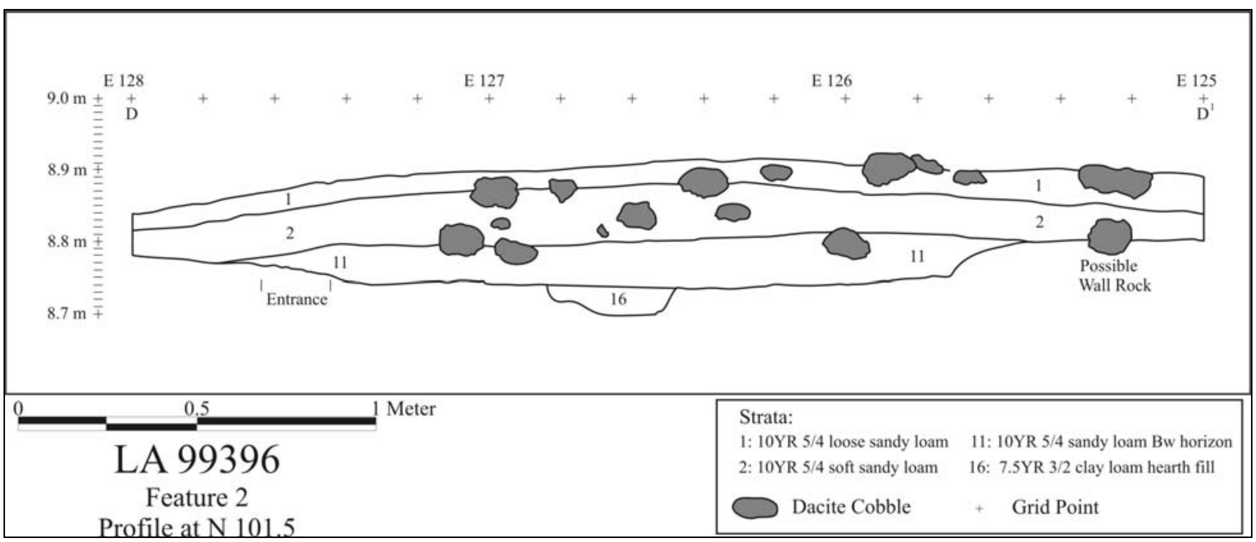

Figure 47.10. Profile of Feature 2 at LA 99396.

The subterranean walls are 5 to 12 cm high and are outwardly sloped. The western wall is slightly longer than the eastern wall; their respective lengths are 2.2 m and 1.9 m. All the walls are straight except for the east wall, which is slightly concave. A thin coat of plaster is present in the northeast corner of Feature 2. Near the center of the east wall (101.6N/127.5E), a 40-cm-wide gentle slope extends from the floor to the top of Stratum 3. The soil along this slope is highly compacted. This is the entrance of the structure.

No standing walls were encountered, but several unshaped dacite cobbles were found set into Stratum 3 just outside the subterranean portion of Feature 2. A set of three adjacent cobbles is present to the south, and a second three-cobble set is present on the west. These cobbles probably formed the base of the structure's above-ground walls, although they are separated from the subterranean walls by 5 to 30 cm.

About 1 m east of Feature 2, there is a narrow, shallow depression running roughly north-south. The depression is 70 to 80 cm wide and up to 8 cm deep. The depression runs from about 102N to 99N, and at both the north and south ends the top and base of the depression gradually converge to a single surface. Three roughly parallel narrow furrows cut across the depression, from about 100N/130E to 99.2N/126.7E. These furrows are 5 to 10 cm wide and 3 to 5 cm deep. It is not know if the depression is the result of natural or cultural activities. The furrows appear to be cultural in origin, but it is unclear if they are associated with homesteading activities (e.g., plow scars), with the creation of the road (e.g., marks from a backhoe), or with some other activity. Table 47.4 summarizes the artifacts found in Features 1, 2, and 7.

Table 47.4. Features 1, 2, and 7 artifact counts by stratigraphic units.

Stratum	Ceramics	Chipped Stone	Ground Stone	Total
0	2	6	0	8
1	7	56	0	63
2	13	179	2	194
11	0	75	2	77
16	15	12	0	27
Total	**37**	**328**	**4**	**369**

Four ground stone artifacts were found in Feature 2: a dacite two-handed mano (FS 420), a dacite ground stone fragment (FS 461), a welded tuff grinding slab (FS 697), and a dacite grinding slab (FS 723). A dacite one-handed mano (FS 467) was found just west of Feature 2 in unit 101N/124E. A small piece of mica schist (FS 380) was found just north of Feature 2 in unit 103N/125E.

Three flotation samples (FS 438, FS 493, and FS 712) were analyzed from Feature 2. Charred taxa identified in the samples included unknown conifer, piñon pine, unidentified pine bark, and juniper wood.

Feature 3

Feature 3 (Figure 47.11) is a low circular mound approximately 10 cm high and 3 m in diameter. The northern side of the feature is slightly truncated by the dirt road. The tops of about two dozen unshaped dacite cobbles were visible on the surface of the mound before excavation. Five units were excavated to explore this feature (99N/117E, 99N/118E, 100N/116E, 100N/118E, and

101N/118E). Excavation revealed a loose jumble of about 60 unshaped cobbles. Most of the cobbles are dacite; a few are tuff. The cobbles are similar in size to those in Feature 1. The stratigraphy of Feature 3 consists of 1 to 2 cm of Stratum 1 overlaying 10 to 15 cm of Stratum 2. Excavation ended at the top of Stratum 3 where considerable rodent disturbance was visible. All of the cobbles were found in Strata 1 and 2. The bases of most of the cobbles are about 10 cm above the top of Stratum 3, although a few cobbles are within 2 cm of the Btb1 horizon.

Figure 47.11. Post-excavation photograph of Feature 3.

Only six artifacts were found in or near Feature 3: a sandstone mano fragment (FS 487) and five pieces of debitage.

The cobbles of this feature formed no discernable alignments and no cultural deposits were found beneath the cobbles. The Feature 3 cobbles were probably once part of the Feature 1 walls. Feature 3 was probably formed by field clearing associated with the Serna Homestead or during road construction activities.

Feature 7

Feature 7 is a circular hearth at the center of Feature 2 (101.38N/126.66E). It measures 51 cm north-south and 44 cm east-west and is 8 cm deep. The hearth is not plastered or rock-lined, although a small rock was found at its base. The walls and base are simply exposed Stratum 3 sediment. The north wall is well-baked and a sample was taken from it for archeaomagnetic dating. In contrast, the south wall and the base of the hearth are not well defined; consequently the north-south and vertical dimensions given above may be several centimeters too large. The fill of the hearth (Stratum 16) is clay loam mixed with charcoal flecks. No ash was present. Excavation of the hearth ended at 8.53 m, but artifacts were found only as deep as 8.55 m. The artifacts recovered from Feature 7 are discussed above as part of Feature 2.

The error ellipse of the archaeomagnetic sample overlaps two segments of the Wolfman calibration curve: AD 1020–1085 and AD 1175–1260. Based on the archaeomagnetic result and on the ceramic assemblage, the later age range is the most likely (Chapter 66, Volume 3).

Two pieces of wood charcoal from flotation samples (FS 753 and FS 758) taken from Feature 7 were submitted for radiocarbon analysis. FS 753 returned an age of 930±40 BP (Beta-199379) and a date of cal AD 1050, cal AD 1000, and cal AD 1140 with a two-sigma date range of cal AD 1020–1200. FS 758 returned an age of 870±40 BP (Beta-199380) and a date of cal AD 1180 with a two-sigma date range of cal AD 1040–1260.

Two flotation samples (FS 753 and FS 758) were analyzed from Feature 7. Charred taxa identified in these samples included unknown conifer, piñon pine, and ponderosa pine.

Feature 4

Feature 4 is located just north of Feature 2 at 102.88N/126.77E. It is a chunk of charcoal that appears to be the remains of a burned post. The charcoal is roughly a half-cylinder 12 by 6 cm wide and 10 cm tall. Most of this charcoal was buried in Stratum 3; only a few fragments stuck up into Stratum 2. The wood was identified as cf. piñon pine.

A portion of this feature (FS 472) was submitted for radiocarbon analysis. The sample returned an age of 810±60 BP (Beta-199376) and a date of cal AD 1240 with a two-sigma date range of cal AD 1050–1100 and cal AD 1140–1290.

Feature 5

Feature 5 is an oval-shaped hearth located north of Feature 2 in the middle of the dirt road (Figure 47.12). The hearth is centered at 104.40N/125.00E and measures 80 cm north-south and 60 cm east-west and is 7 cm deep. A 1-cm-thick layer of Stratum 1 covered the feature.

The hearth consists of a shallow depression excavated into Stratum 3. Twenty-six unshaped dacite cobbles ranging in size from 3 by 3 cm to 20 by 9 cm were found throughout the fill of the hearth. Some of the cobbles are fire-cracked. It is not clear if all these cobbles are part of the base of the hearth, or if some of them once lined the walls. The top several centimeters of Feature 5 were destroyed when the road was created.

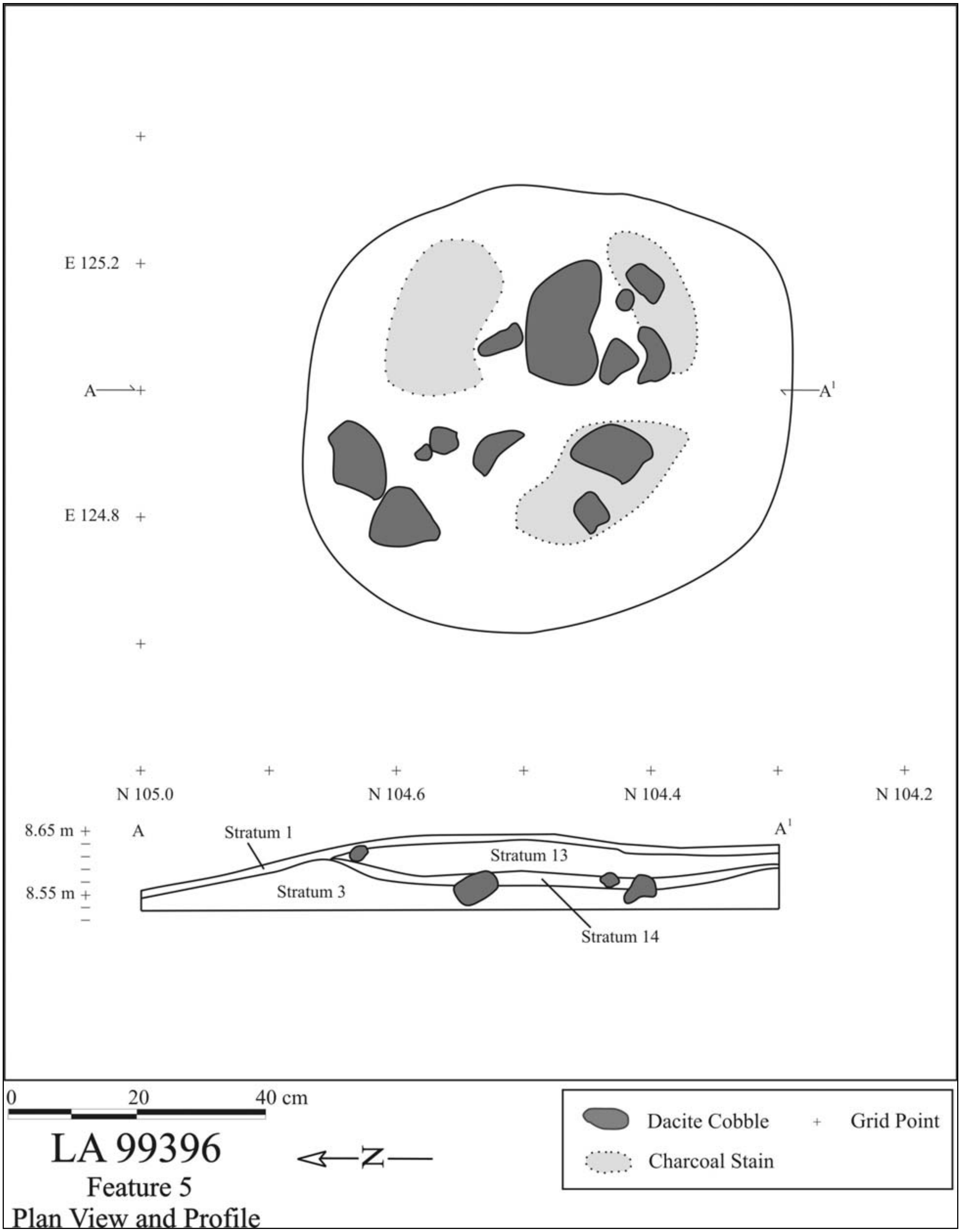

Figure 47.12. Feature 5 plan view and profile.

The upper fill of the hearth (Stratum 13) consists of 2 to 5 cm of silty clay loam. Below is a 1- to 2-cm deep deposit of sandy loam (Stratum 14). Both of these strata are charcoal-stained and contain charcoal fragments. These soils are oxidized, as is the Stratum 3 matrix surrounding the hearth. No ash was found in the hearth, nor was there evidence of a living/use surface around the feature. Two plain gray jar sherds (FS 614) were recovered from the hearth.

A piece of wood charcoal identified in a flotation sample (FS 608) from the hearth was submitted for radiocarbon analysis. The sample returned an age of 890±40 BP (Beta-199378) with a date of cal AD 1170 and a two-sigma date range of cal AD 1030–1240.

One flotation sample (FS 608) was analyzed from Feature 7. Charred taxa identified in the sample included purslane, unknown conifer, juniper, unidentified pine, and piñon pine.

Homestead Component. Approximately 20 m of several lengths of barbed wire form a rough northeast-to-southwest alignment near the southeast corner of the site. Most of the barbed wire is on the ground but occasionally it is wrapped around tree trunks. In these cases the barbed wire has been partially enveloped by the tree. The line defined by the barbed wire is parallel to the homestead patent boundary and is within 20 m of it. Since most of the southeastern patent boundary is located on a slope, it is not surprising that the fence-line is located on the nearest level ground. No other Homestead Era artifacts were found.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 1488 artifacts were analyzed from the excavations conducted at LA 99396. In addition, flotation and pollen samples were selected for analysis from Strata 1, 2, 11, 13/14, and 16. Charcoal was submitted for radiocarbon dating from Features 1, 4, 5, and 7 and Strata 6 and 18. A burned piece of the hearth was submitted for archaeomagnetic dating, two sherds were submitted for thermoluminesence (TL) dating, and 14 pieces of obsidian were submitted for hydration dating (Table 47.5). The results of the artifact and sample analyses are presented in the following sections.

Table 47.5. Samples selected for analysis from LA 99396.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL
1	438	439		
2	493	411, 450, 506, 532, 555	493	414, 612
3			472	
6			775	
11	712	562, 676		
13/14	608	615	608	
16	753, 758	769	753, 758	
18			774	

Chronology

Radiocarbon Dating

Five burned piñon pine samples and two burned juniper samples were submitted for radiocarbon dating (Table 47.6). Most of the dates are associated with the occupation of the one-room structure (Feature 2); however, two samples were also submitted from geologic contexts (Strata 6 and 18). The calibrated intercepts are between circa AD 1140 to 1240, reflecting an Early to Middle Coalition period occupation. Geologic dates were derived from Stratum 6 (a swale fill Bwb1 soil horizon) and Stratum 18 (a Btkb1 soil horizon).

Table 47.6. Radiocarbon dates from LA 99396.

FS	Context of sample	Laboratory (Beta)#	Conventional radiocarbon age	Intercept of radiocarbon age	Two-sigma calibrated result
472	Feature 4 (Post)	199376	810±60	AD 1240	AD 1050–1100 AD 1140–1290
493	Feature 1, Stratum 2	199377	860±40	AD 1190	AD 1040–1260
608	Feature 5 (Hearth)	199378	890±40	AD 1170	AD 1030–1240
753	Feature 7 (Hearth)	199379	930±40	AD 1050 AD 1100 AD 1140	AD 1020–1200
758	Feature 7 (Hearth)	199380	870±40	AD 1180	AD 1040–1260
774	Stratum 18	199381	33660±320	N/A	N/A
775	Stratum 6	199382	1000±40	AD 1020	AD 980–1060 AD 1080–1150

Archaeomagnetic Dating

A single archaeomagnetic sample was taken from the hearth (Feature 7) in the one-room structure (Feature 2). Blinman and Cox (Volume 3, Chapter 66) state that the best date for the last burning of the hearth is AD 1175–1260, which corresponds with the radiocarbon dates (Table 47.7).

Table 47.7. Archaeomagnetic date from LA 99396.

Sample Number	Feature	VGP* Curves and Date Estimates (AD)	
		Wolfman	**SWCV2000**
1233	Feature 7, Hearth	1175–1260 1020–1085	1010–1125 1155–1320

*Virtual Geomagnetic Pole

Thermoluminescence Dating

A Santa Fe Black-on-white (FS 414) and incised corrugated sherd (FS 612) were submitted for TL dating (Table 47.8). Both sherds came from within the one-room structure. The age for the Santa Fe Black-on-white sherd seems quite early, whereas, the corrugated sherd fits the range provided by the radiocarbon and archaeomagnetic dates.

Table 47.8. Thermoluminescence dates from LA 99396.

FS	Lab #	Context	Burial depth (cm)	Age (ka)	% error	Years AD
414	UW1246	Feature 1, Stratum 2	10	1.169±0.134	11.5	836±134
612	UW1247	Feature 1, Stratum 2	22	0.847±0.062	7.4	1158±63

Figure 47.13 shows all the dates derived from within and around Feature 2. The radiocarbon dates, the archaeomagnetic date, and one of the TL dates are in agreement.

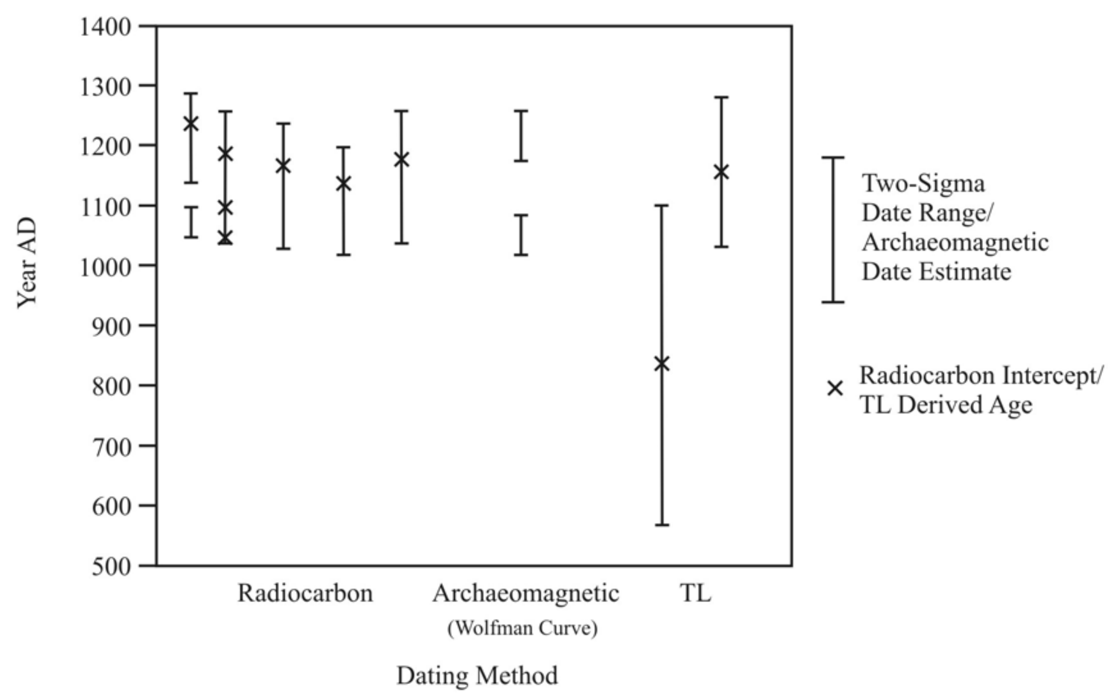

Figure 47.13. Dating methods comparison from LA 99396.

Obsidian Hydration Dating

Fourteen obsidian artifacts from LA 99396 were submitted for age determination using the obsidian hydration dating method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rim, was measured. Second, the high-temperature hydration-rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the site were estimated so that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 47.9).

Table 47.9. Obsidian hydration dates from LA 99396.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
38	2006-17	Cerro Toledo	5.56	-10,245	443
48	2006-18	Cerro Toledo	3.95	-4244	317
54	2006-19	Cerro Toledo	3.88	-4009	311
126	2006-20	Cerro Toledo	4.44	-5599	344
186	2006-21	Cerro Toledo	3.32	-2228	256
289	2006-22	Valle Grande	4.16	-4803	328
318	2006-23	Valle Grande	3.30	-365	143
354	2006-24	El Rechuelos	n/a		
385	2006-25	Cerro Toledo	2.88	-1350	233
397	2006-26	El Rechuelos	n/a		
402	2006-27		3.75	-3646	302
430	2006-28	El Rechuelos	2.95	-1422	233
501	2006-29	Valle Grande	3.39	-2610	273
546	2006-30	El Rechuelos	2.13	187	169

The obsidian artifacts were selected from the surface scatter on the site. The obsidian hydration dates range from 10,245 BC to AD 187; however, most are distributed between from 5599 to 1350 BC. Excluding the 10,000 BC date, the remainder consists of four Early Archaic, three Middle Archaic, and four Late Archaic dates. This corresponds with the presence of several Archaic projectile point bases that were recovered from the same area of the site. This includes a possible Bajada point recovered during the initial test excavations by Peterson and Nightengale.

Ceramic Artifacts (Dean Wilson)

Eighty-five ceramic artifacts were analyzed from LA 99396; most of these artifacts were found near or in the one-room structure (Feature 2). The majority of the pottery consists of smeared-indented corrugated and Santa Fe Black-on-white sherds, which indicate a Coalition period occupation (Table 47.10). The utilitywares and whitewares are primarily tempered with anthill sand and tuff, respectively, and most of the utilitywares are jars and all the whitewares are bowls. One of the utilityware sherds is classified as a bowl rim and two sherds are from a miniature pot (Tables 47.11 and 47.12).

Table 47.10. Ceramic types from LA 99396.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	12	14.1
Santa Fe Black-on-white	9	10.6
Northern Rio Grande Utilityware		
Plain gray	11	13.0
Indented corrugated	1	1.2
Incised corrugated	1	1.2
Smeared-indented corrugated	51	60.0
Total	85	100.0

Table 47.11. Temper by ware for ceramics from LA 99396.

Temper	Ware		
	Gray	White	Total
Fine tuff or ash	2	19	21
Anthill sand	62	0	62
Oblate shale and tuff	0	2	2
Total	64	21	85

Table 47.12. Vessel form by ware for ceramics from LA 99396.

Vessel Form	Ware		
	Gray	White	Total
Bowl rim	1	0	1
Bowl body	0	20	20
Jar neck	2	0	2
Jar rim	4	0	4
Jar body	52	1	53
Indeterminate coil, strap handle	3	0	3
Miniature pot rim	1	0	1
Miniature pot body	1	0	1
Total	64	21	85

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 1401 artifacts were analyzed from LA 99396, consisting of two cores, 1366 pieces of debitage, 23 retouched tools, nine ground stone artifacts, and a hammerstone. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Tables 47.13

and 47.14 present the data on lithic artifact type by material type. Table 47.13 represents the surface artifact assemblage at the site, and Table 47.14 consists of the lithic artifacts recovered during the excavation of Features 2 and 7. In both cases, the majority of the debitage is made of obsidian, with lesser amounts of chalcedony, Pedernal chert, and other materials. The retouched tools are also primarily made of obsidian. The presence of cortex on 6.4 percent of the debitage indicates that these materials were collected from mostly nodule (*n* = 80) with some waterworn (*n* = 8) sources. Most of the nodule cortex was observed on the obsidian artifacts. Although obsidian is present at nearby primary sources in the Jemez Mountains, it is also present on the mesa to the north of the site as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval. For example, the obsidian core is a pebble that might have been obtained from this local source. On the other hand, the chalcedony and Pedernal chert are available from local Rio Grande Valley gravel sources. Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 47.13. Lithic artifact type by material type from the surface scatter.

Artifact Type		Material Type													
		Basalt	**Vesic. Basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Sil. Wood**	**Quartzite**	**Sandstone**	**Total**
Cores	Core	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Subtotal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Debitage	Angular debris	0	0	0	0	0	0	73	10	0	7	0	0	0	90
	Core flake	0	0	0	0	1	0	334	19	0	10	0	1	0	365
	Biface flake	0	0	0	1	0	0	261	7	0	1	0	0	0	270
	Bipolar flake	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Core trim. flake	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Outrepasse	0	0	0	0	0	0	2	0	0	0	0	0	0	2
	Microdeb.	0	0	0	0	0	0	300	12	0	2	0	0	0	314
	Und. flake	0	0	0	1	1	0	66	5	0	3	0	0	0	176
	Subtotal	0	0	0	2	2	0	1138	53	0	23	0	1	0	1219
Re-touched Tools	Retouched piece	0	0	1	0	0	0	3	0	0	1	0	0	0	5
	Biface	0	0	0	0	0	0	11	0	0	0	0	0	0	11
	Projectile point	0	0	0	0	0	0	4	0	0	0	0	0	0	4
	Uniface	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Endscraper	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Ret. piece/ perforator	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	1	0	0	0	18	1	0	3	0	0	0	23

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Sandstone	Total
Ground Stone	One-hand mano	0	0	0	0	1	1	0	0	0	0	0	0	0	2
	Two-hand mano	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Und. mano frag.	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Grinding slab	0	0	0	0	1	1	0	0	0	0	0	0	0	2
	Und. metate	0	0	0	0	2	0	0	0	0	0	0	0	0	2
	Und. ground stone	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	0	6	2	0	0	0	0	0	0	1	9
Other	Hammer-stone	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Total		**0**	**0**	**1**	**2**	**9**	**2**	**1156**	**54**	**0**	**26**	**0**	**1**	**1**	**1252**

Table 47.14. Lithic artifact type by material type from Features 2 and 7.

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Sandstone	Total
Cores	Core	0	0	1	0	0	0	1	0	0	0	0	0	0	2
	Subtotal	0	0	1	0	0	0	1	0	0	0	0	0	0	2
Deb-itage	Angular debris	0	0	0	0	0	0	6	2	0	1	0	0	0	9
	Core flake	0	0	0	1	0	0	14	3	0	14	0	0	0	27
	Biface flake	0	0	0	0	0	0	31	1	0	1	0	0	0	33
	Uniface flake	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Pot lid	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Microdebitage	0	0	0	0	0	0	29	0	0	12	0	0	0	41
	Und. flake	0	0	0	0	0	0	22	3	0	5	0	0	0	30
	Subtotal	0	0	0	1	0	0	102	9	0	35	0	0	0	97
Total		**0**	**0**	**1**	**1**	**0**	**0**	**103**	**9**	**0**	**35**	**0**	**0**	**0**	**149**

Fourteen pieces of debitage, a core, and nine retouched tools were submitted for X-ray fluorescence analysis. The artifacts represent a mixture of Valle Grande, Cerro Toledo, and El Rechuelos obsidian types (Table 47.15). The Valle Grande (Cerro del Medio) source area is located about 17 km (11 mi) and the Cerro Toledo (Rabbit Mountain/Obsidian Ridge) source area about 19 km (12 mi) as the "crow flies" to the west and southwest of the site. However, as previously noted, there are pebbles of Cerro Toledo obsidian that are also present on the mesa top, and the pebble core is made of Cerro Toledo obsidian. The El Rechuelos (Polvadera Peak) source area is located approximately 27 km (17 mi) to the northwest.

Table 47.15. Obsidian source samples.

FS	Artifact	Color	Source
48	Debitage	Black opaque	Cerro Toledo ryholite
54	Debitage	Translucent	Valle Grande rhyolite
84	Tool	Translucent	Valle Grande rhyolite
117	Tool	Translucent	Valle Grande rhyolite
126	Debitage	Black opaque	Cerro Toledo rhyolite
183	Tool	Translucent	Cerro Toledo rhyolite
186	Debitage	Translucent	Valle Grande rhyolite
189	Point	Black dusty	El Rechuelos
201	Point	Black opaque	Cerro Toledo rhyolite
229	Debitage	Translucent	Valle Grande rhyolite
240	Tool	Translucent	Valle Grande rhyolite
289	Debitage	Translucent	Valle Grande rhyolite
318	Debitage	Black dusty	El Rechuelos
354	Debitage	Black dusty	Cerro Toledo rhyolite
376	Point	Green	Cerro Toledo rhyolite
385	Debitage	Black dusty	El Rechuelos
397	Debitage	Translucent	Valle Grande rhyolite
402	Debitage	Black opaque	Unknown
430	Debitage	Black dusty	El Rechuelos
474	Point	Translucent	Cerro Toledo rhyolite
501	Debitage	Translucent	Valle Grande rhyolite
546	Debitage	Black dusty	El Rechuelos
568	Tool	Translucent	Cerro Toledo rhyolite
695	Core	Translucent	Cerro Toledo rhyolite

Lithic Reduction

The two cores were reduced using a bidirectional, multi-face technique. One is a small obsidian pebble core and the other is a large rhyolite cobble core. The presence of an obsidian bipolar flake indicates that this technique was also being used to reduce small pebbles. Table 47.16 presents the metric information on these cores.

Table 47.16. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Bi-directional	36	27	17	18.2

Core Type	Length	Width	Thickness	Weight
Bi-directional	86	98	52	376.9

The debitage mainly consists of core flakes, biface flakes, and microdebitage, with less angular debris and undetermined flake fragments. In addition, a single bipolar flake, core trimming flake, *outrepassé* flake, and uniface flake were also identified. Table 47.17 summarizes the various stages of reduction represented by the whole core and biface (tertiary) flakes. The overall cortical:non-cortical ratio of 0.30 reflects the emphasis on the later stages of core reduction and tool production/maintenance. However, the presence of primary and secondary cortical obsidian flakes corroborates the possible use of local pebbles.

Table 47.17. Debitage reduction stages.

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Obsidian	1	5	8	9	0.35
Chalcedony	0	0	2	2	---
Pedernal chert	0	2	5	0	0.40
Total	**1**	**7**	**15**	**11**	**0.30**
Percentage	2.9	20.5	44.1	32.3	---

The majority of the flakes exhibit crushed platforms (n = 94; 56.9%), with cortical (n = 9), single-faceted (n = 7), multi-faceted (n = 31), and collapsed (n = 24). The large number of crushed and collapsed platforms is associated with the reduction of obsidian. Forty-six (27.8%) of the flake platforms exhibit evidence of preparation. Most of these are abraded/crushed, with two ground and a single abraded/ground platform.

The majority of the core flakes consist of distal fragments (n = 167; 42.0%), with fewer whole (n = 23), proximal (n = 51), midsection (n = 131), lateral (n = 6), and undetermined fragments (n = 19). Most of the biface flakes are proximal (n = 112) and midsection (n = 103) fragments, with fewer whole (n = 11), distal (n = 71), lateral (n = 1), and undetermined (n = 5) fragments. The whole core flakes have a mean length of 18.6 mm (*std* = 5.6), and the whole biface flakes exhibit a mean length of 18.5 mm (*std* = 6.8). Lastly, angular debris have a mean weight of 1.8 g (*std* = 3.9).

The retouched tools primarily consist of formal tools like bifaces and projectile points, with fewer informal tools such as retouched pieces. Three of the retouched pieces exhibit a single marginally retouched edge, whereas two exhibit double retouched edges. The former consist of unidirectional ventral retouch along straight edge outlines with angles ranging from 55 to 65 degrees. The other two artifacts have unidirectional ventral, unidirectional dorsal, and alternate retouch along straight, straight/concave, and a projection with angles ranging from 60 to 75 degrees. Two uniface/scrapers were also identified during the analysis (Figure 47.14). Both are distal fragments with all or a portion of the working edge present and angles of 60 and 75 degrees.

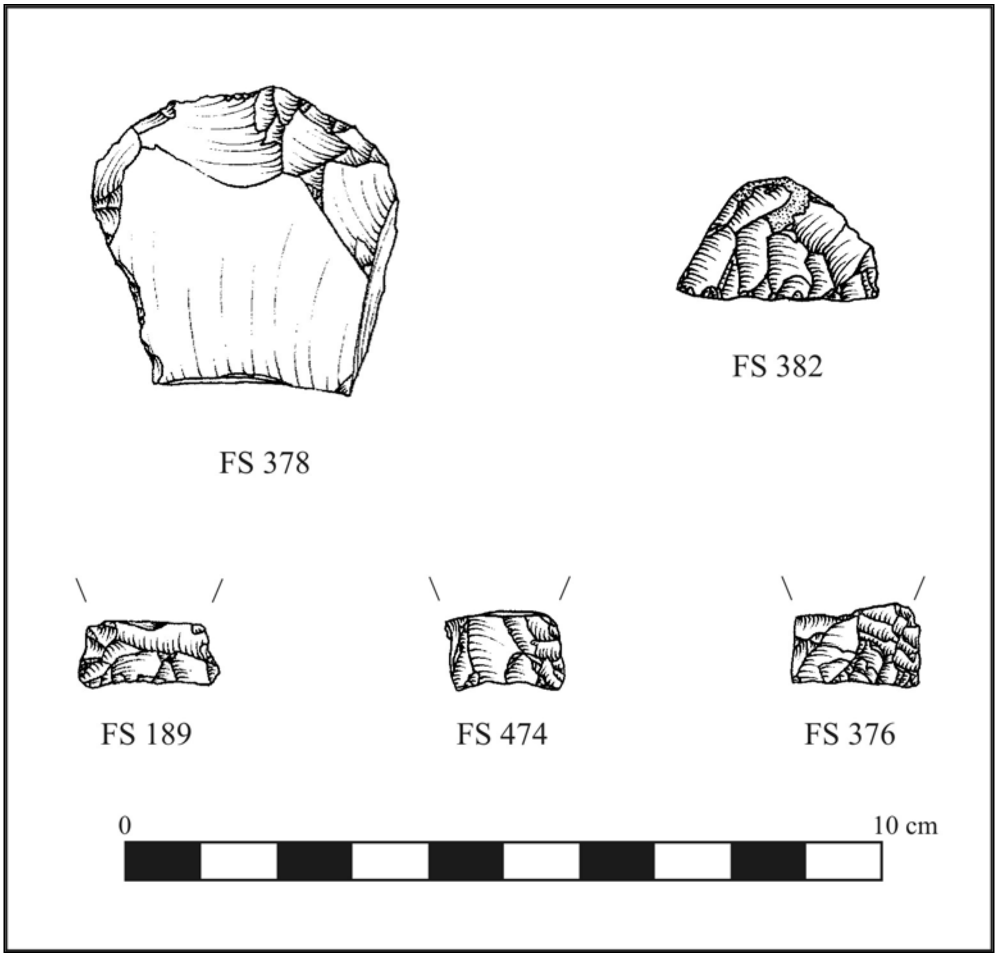

Figure 47.14. Uniface, endscraper, and projectile points.

The bifaces primarily consist of undetermined fragments, with a single piece being identified as distal fragment. Most of these appear to be early- to middle-stage bifaces that were presumably broken during manufacturing and therefore have edge angles ranging from 45 to 65 degrees. All four of the projectile points are proximal fragments with stems that contract towards the neck and have slightly concave bases that could represent either Middle or Late Archaic dart points (see Figure 47.14).

Tool Use

Only three flakes (0.8%) exhibit evidence of damage that could be attributed to use-wear. Two are flakes with damaged lateral edges and angles of 50 and 55 degrees. The other is a utilized projection on flake. Four of the five retouched pieces exhibit edge damage that could reflect use-wear and both of the scrapers have rounding and polish along the working edge. These lateral items were presumably broken during use. On the other hand, the biface fragments appear to have been broken during manufacturing, and the projectile points due to use.

Nine ground stone artifacts were identified during the analysis, including manos, a grinding slab, and undetermined fragments. The one-hand manos consist of a dacite cobble with a single ground surface and what appears to be a metate fragment that had been reworked into a mano. The possible two-hand mano consists of a broken dacite cobble with opposing grinding surfaces. The grinding slabs are made of tabular tuff and a large piece of dacite. The former item is rectangular-shaped with striations along the long axis and a slightly concave grinding surface. The latter artifact also has a slightly concave surface with evidence of grinding and polish. The undetermined metate fragment is also a large piece of dacite, but with a well-worn and slightly concave grinding surface. Lastly, the single undetermined piece of ground stone is a tabular piece of dacite with grinding and polish present along several high spots of one surface.

Archaeobotanical Remains (Pamela McBride)

Evidence from the use of the one-room structure, an extramural hearth, and the central hearth of the structure consisted of pine bark, piñon and ponderosa pine needles, an unidentifiable plant part, and one purslane seed (Table 47.18). Non-cultural plant material included weedy annual and dropseed grass seeds and juniper duff. The charred bark and needles are probably artifacts of firewood use. Piñon dominated the wood assemblage (present in 70% of samples by weight; Table 47.19). Small amounts of juniper, unknown conifer, and unknown non-conifer were also present. The post fragment from the structure was most likely piñon (Table 47.20). Economic activity at the site is reflected in the use of locally available wood taxa for fuel and building materials and the possible use of purslane for food although one charred seed could have been burned in the exterior hearth after being deposited there by vectors other than humans. Samples were not taken from the Archaic component.

Table 47.18. Flotation sample plant remains from LA 99396.

FS No.	438	493	608	712	753	758
Feature	1 Cobbles of structure walls		5 Extramural hearth north of structure	2 Subterranean portion of one-room structure	7 Hearth in structure	
	strat 1, level 1	strat 2, level 2				
Cultural						
Annuals						
Purslane			1(1)			
Other						
Unidentifiable		1(0) pp				
Perennials						
Pine			bark +	bark +		
cf. Piñon					needle +	
Ponderosa pine					needle +	needle +
Non-Cultural						
Annuals						
Amaranth			+			

FS No.	438	493	608	712	753	758
Goosefoot	+	+	+	+		
Grasses						
Dropseed grass			+			
Grass family			+	floret +		
Other						
Composite family				+		
Purslane	+	+				
Purslane family	+	+				
Perennials						
Juniper			♂ cone +, twig +			

+ 1-10/liter, cf. compares favorably, pp plant part.

Table 47.19. Flotation sample wood charcoal taxa by count and weight in grams from LA 99396.

FS No.	438	493	608	712	753	758	Totals	
Feature	1 Cobbles of structure walls		5 Extramural hearth north of structure	2 Subterranean portion of one-room structure	7 Hearth in structure		Weight	%
	strat 1, level 1	strat 2, level 2						
Conifers								
Juniper	1/<0.1 g		3/0.1 g				0.1 g	5%
Piñon		5/0.3 g	11/0.6 g	15/0.3 g	7/0.1 g	5/0.1 g	1.4 g	70%
Unknown conifer	3/<0.1 g	2/<0.1 g	6/0.4 g	5/0.1 g	2/<0.1 g		0.5 g	25%
Non-Conifers								
Unknown non-conifer					1/<0.1 g		<0.1 g	<1%
Totals	**4/<0.1 g**	**7/0.3 g**	**20/1.1 g**	**20/0.4 g**	**10/0.1 g**	**5/0.1 g**	**2.0 g**	**100%**

Table 47.20. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 99396.

FS No.	472	774	775
Feature	4 Post fragment	110N/123E	84.7/114E
Conifers			
Juniper		1/<0.1 g	1/<0.1 g
Pine	20/3.5 g		

FS No.	472	774	775
cf. Piñon	77/46.3 g		
Unknown conifer	5/0.6 g		
Non-Conifers			
Mountain mahogany	6/0.3 g		
Totals	**108/50.7 g**	**1/<0.1 g**	**1/<0.1 g**

Pollen Remains (Susan Smith)

Ten pollen samples were analyzed from LA 99396. Table 47.21 lists the frequency of identified pollen types. No cultigens were identified in the botanical assemblage. Prickly pear and lily family were the only other economic resources that were identified in the assemblage.

Table 47.21. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 99396 (*n* = 10)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	0
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	1
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	1
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	2
	Eriogonum	Buckwheat	1
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 99396 (*n* = 10)
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	8
		Grass Aggregates	2
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	9
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	9
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	5
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	1
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	2

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 99396 (*n* = 10)
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	2
	Pinus	Pine	8
		Pine Aggregates	0
	Pinus edulis type	Piñon	9
	Juniperus	Juniper	9
		Juniper Aggregates	0
	Quercus	Oak	4
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	1
	Ephedra	Mormon Tea	7
	Artemisia	Sagebrush	8
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SITE SUMMARY

LA 99396 is a multicomponent site consisting of an Archaic period lithic artifact scatter and a Coalition period one-room fieldhouse. The artifact scatter probably represents a Middle to Late Archaic period campsite. The Coalition period fieldhouse was inhabited some time between the late 12th century and middle 13th century AD; however, evidence for cultigens is lacking from the site.

CHAPTER 48
RENDIJA TRACT (A-14): LA 99397

Brian C. Harmon

INTRODUCTION, SITE SETTING, AND SITE DESCRIPTION

LA 99397 is a Middle to Late Archaic period chipped stone debitage scatter that may have been a habitation site. The site may have been reused in the Classic period. LA 99397 is situated on the gentle east-facing slope of a narrow ridge at an elevation of 2136 m (7008 ft). The site covers an area of approximately 1500 m^2 (Figure 48.1) and is centered on a small clearing surrounded by dense piñon-juniper woodland. In May of 2000 the Cerro Grande fire burned 195 ha (480 ac) in the Rendija Tract. The central portion of LA 99397 was unburned, but severe burning occurred on the northern and northwestern periphery of the site. A dirt road runs east-west through the site.

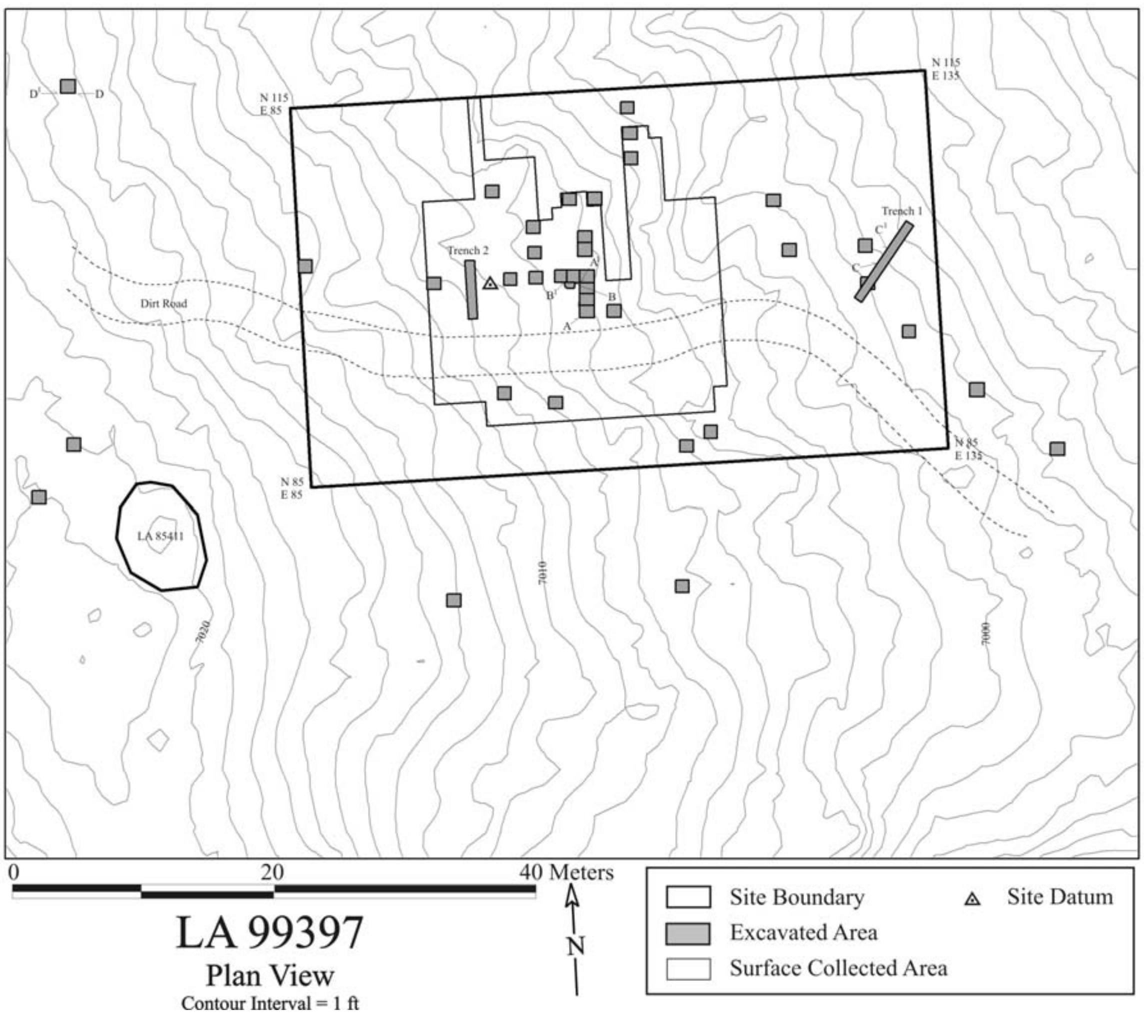

Figure 48.1. Plan view map of LA 99397.

The soil around LA 99397 is part of the Rendija-Bayo complex; a complex that "contains deep, well-drained soils weathered from materials derived from tuff (Rendija series) or pumice (Bayo series)," (Nyhan et al. 1978:54). The sediment consists of late-Holocene colluvial and eolian deposits, sporadically capped by surface gravel or a weak desert pavement. In most places, the late-Holocene deposits are 10 to 20 cm thick and overlay truncated late-Pleistocene or early-Holocene colluvium. Cerro Toledo gravels (Qct) underlie the soil on the ridge top just west of the site. Bedrock was not encountered within the site boundary.

Several large rills run through the site, generally trending to the east. The largest of these is in the eastern half of the site. It runs northeast from the dirt road for about 10 m before turning to the east. The north-running portion of the drainage is about 4.5 m wide and 0.4 to 0.5 m deep. Peterson and Nightengale (1993:212) defined this as the eastern boundary of the site.

Nearly all of the artifacts at LA 99397 were recovered from strata that post-date the Archaic period, indicating that they are in a reworked context. No cultural features were encountered and it is unlikely that any aspects of culturally derived site structure are present.

A Classic period fieldhouse (LA 85411) is located upslope and to the southwest of the site (Chapter 34, this volume). It is possible that some of the artifacts at LA 99397 are derived from this site.

PREVIOUS INVESTIGATIONS

LA 99397 was first recorded in 1992 by Peterson and Nightengale (1993:212–215) for the Bason Land Exchange Project. The initial site recording consisted of mapping, in-field analysis, surface collection, and shovel testing. Hoagland and Vierra (2002:5-18) summarize Peterson and Nightengale's testing as follows:

> The site covers an area of about 900 m^2. Fourteen shovel tests were dug at the site, with 10 pieces of debitage being recovered from six of the tests. These were located in the central area of the site with the highest surface artifact densities. These items were recovered from depths of up to about 40 cm. Artifacts were also collected from a 1- x 38-m transect laid out across the center of the site; [a total of 31 pieces of debitage were collected from the surface, and in-field observations were made on an additional 104 pieces of debitage]. Except for one metate fragment, all of the lithic artifacts observed were either debitage or chipped stone tools. Obsidian constituted 76 percent of the lithics with chalcedony forming the remaining 24 percent. A dusty obsidian similar to Polvadera Peak obsidian was most abundant (75%). The vast majority of the lithic debitage were tertiary flakes. In addition, three formal tools or tool fragments were collected from the site. They consist of a retouched Polvadera Peak obsidian tertiary flake, a crude lanceolate chalcedony biface, and the distal fragment of a Polvadera Peak obsidian biface or projectile point. A fragment of a metate was also observed on the site. Based on the high percentage of obsidian tertiary flakes and the lack of ceramics at the site, it presumably represents an Archaic period occupation.

The Los Alamos National Laboratory Cultural Resources Management Team visited LA 99397 in October of 2000 as part of the Cerro Grande fire Assessment Project (Nisengard et al. 2002).

FIELD METHODS

Most of the work reported here took place between August 12 and September 17, 2003; however, the site was sporadically visited until January 15, 2004. The crew consisted of Steven Hoagland (crew chief), Brian Harmon (assistant crew chief), Hannah Dodd, Mark Hungerford, Maria Jonsson, Michael Kennedy, Bettina Kuru'es, and Alan Madsen. Aaron Gonzales was the San Ildefonso tribal monitor. Leo Martinez operated the bobcat during trenching operations.

Work began at LA 99397 by establishing a grid based on true north (in actuality, the grid is about four degrees west of north). Once the grid was in place, a surface collection was made of 100 percent of the artifacts in the area that was clear of pine duff and trees. Artifacts were collected in 1- by 1-m grid units, and 457 units were included in the surface collection. Surface artifacts extend outside of the surface collection area, but the heavy duff and tree cover prevented collection in these areas. Excavation units were used to assess artifact densities in these areas.

Excavation units were initially placed in non-drainage areas that had the highest density of surface artifacts. Unit placement proceeded to move outwards, ending when units yielded two or fewer artifacts. Three units (85N/63E, 89N/66E, and 117.1N/67.3E) were not placed according to this strategy. During excavation it became apparent that many of the artifacts had likely been reworked into the A and Bw horizons, so the higher elevation to the west was investigated to determine if any *in situ* Archaic deposits were present. After the three units mentioned above failed to produce any artifacts, excavation in this area was discontinued. Excavation of the first several units indicated that while Stratum 3 (the Bt1b1 horizon) contained artifacts, Stratum 4 (the Bt2b1 horizon) did not. For this reason later excavation units were ended once Stratum 4 was reached.

After the site boundaries had been determined by excavation of 1- by 1-m units, two 0.80-m-wide trenches were dug by backhoe to expose long profiles of the site stratigraphy. Trench 1 was excavated to more clearly define the stratigraphy at the eastern end of the site. The western wall of Trench 1 was 7.15 m long and ran from 97.50N/128.50E to 103.25N/132.75E. The high density of the trees in this area prohibited the trench from being aligned with the grid. Trench 2 was located to expose the stratigraphy of the central portion of the site. It was 4.75 m long and ran from 97.50N/98E to 102.25N/98E.

STRATIGRAPHY

This section draws on Drakos and Reneau's geomorphological summary of the site (Chapter 57, Volume 3). Table 48.1 summarizes the stratigraphy at LA 99397; the individual strata are discussed in more detail below. Table 48.2 lists the artifact count by stratum.

Table 48.1. Stratigraphic summary of LA 99397.

Stratum	Provenience	Thickness (cm)	Color	Texture	Comment
0	Entire site	0	10YR 5/3	loam, sandy loam, loamy sand	Modern surface, sporadic gravel cap or weak desert pavement
1	Entire site	1–18	10YR 5/3	loam, sandy loam, loamy sand	A to Av horizon, late Holocene
2	Entire site	1–29	10YR 5/3	loamy sand, sandy loam	Bw horizon, late Holocene
3	Entire site	7–30	7.5YR 3.5/3.5	silty clay, sandy clay, clayey silt	Bt1b1 horizon, truncated, late Pleistocene or early Holocene, roots and rodent disturbance prevalent
3A	Entire site	1–10	7.5YR 3/3	silty clay, sandy clay	Same as Stratum 3 but texture is fine and granular. Only found sporadically at top of Stratum 3. Probably result of bioturbation
4	Entire site	30–45	7.5-10YR 5/4		Bt2b1 horizon, rodent disturbance prevalent
5	Excavation unit 117.1N 67.3E	1–6	10YR 3/2	loamy sand	AC horizon, pumice and abundant Cerro Grande fire charcoal
6	Excavation unit 117.1N 67.3E	6+	10YR 6/6	fine gravel, & cemented granules	R horizon, Cerro Toledo gravel, 1.2-1.6 Ma
7	Excavation unit 117.1N 67.3E	10–12	10YR 4/3	sand	Bw horizon, late Holocene, part of the same depositional unit as Stratum 2
8	98N 129E	10–12	10YR 4/3	silt loam	Bw horizon, middle to late Holocene, swale fill
9	98N 129E	22+	10YR 4/3	silt loam	Bw horizon, middle to late Holocene, swale fill
10	Entire site	30–40	7.5YR 5/3	sandy loam, silty clay loam	Btkb1 horizon, late Pleistocene to early Holocene
11	Entire site	Unknown	8.75YR 3/3	sandy loam	Btkb1 horizon, late Pleistocene to early Holocene

Table 48.2. Artifact count by stratum.

Stratum[1]	Ceramics	Chipped Stone	Ground Stone	Total	Volume of Stratum Excavated (m^3)	Artifacts per cubic meter
0	2	540	3	545	NA	NA
1	1	282	0	283	1.74	162.64
1/2	0	3	0	3	0.16	18.75
2	0	183	0	183	1.52	120.39
2/8	0	22	0	22	0.22	100.00
3	0	53	0	53	3.38	15.68
3A	0	4	0	4	0.09	44.44
Total	**3**	**1087**	**3**	**1093**	**7.11**	**NA**

[1]No cultural material was found below Stratum 3A.

The stratigraphy of LA 99397 consists of late-Holocene colluvial and eolian deposits (A and Bw horizons, Strata 1 and 2, respectively) with a discontinuous cover of desert pavement. Below the late-Holocene deposits are strata of late-Pleistocene or early-Holocene colluvium (Btb and Btk horizons). Stratum 3 (a Bt1b1 horizon) is truncated, indicating erosion at the site some time during the Holocene, before the deposition of the late-Holocene deposits (see Drakos and Reneau 2003; Figure 23). Artifacts were not found below Stratum 3.

The stratigraphic column of the west and central portions of the site (between 85E and 120E) consists of Strata 1 (mean thickness of 6 cm), 2 (mean thickness of 6 cm), 3 (mean thickness of 13 cm), and 4 (mean thickness of 20 cm), and 10 (40+ cm thick). In a few places, Stratum 3A is present above Strata 3. In this area, both Strata 1 and 2 are soft loamy sands and are approximately 20 percent and 5 percent gravel, respectively. Figure 48.2 shows the profile to the base of Stratum 3 along the 107E line.

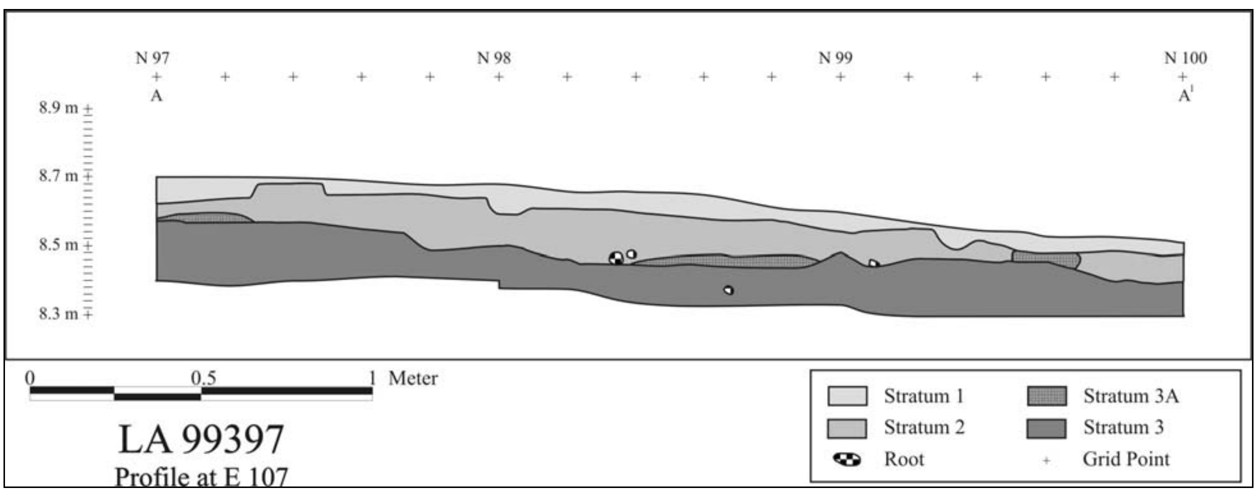

Figure 48.2. 107E profile at LA 99397.

The remains of a burned stump, consisting of fragments of charcoal and charcoal stained soil, were found at 100N/106.2E (Figure 48.3). Analysis of the charcoal indicated that the tree was likely a ponderosa pine (Chapter 62, Volume 3). The tree grew after the deposition of Stratum 3 and before the deposition of Stratum 1. The stump hole of the tree was filled with Stratum 2.

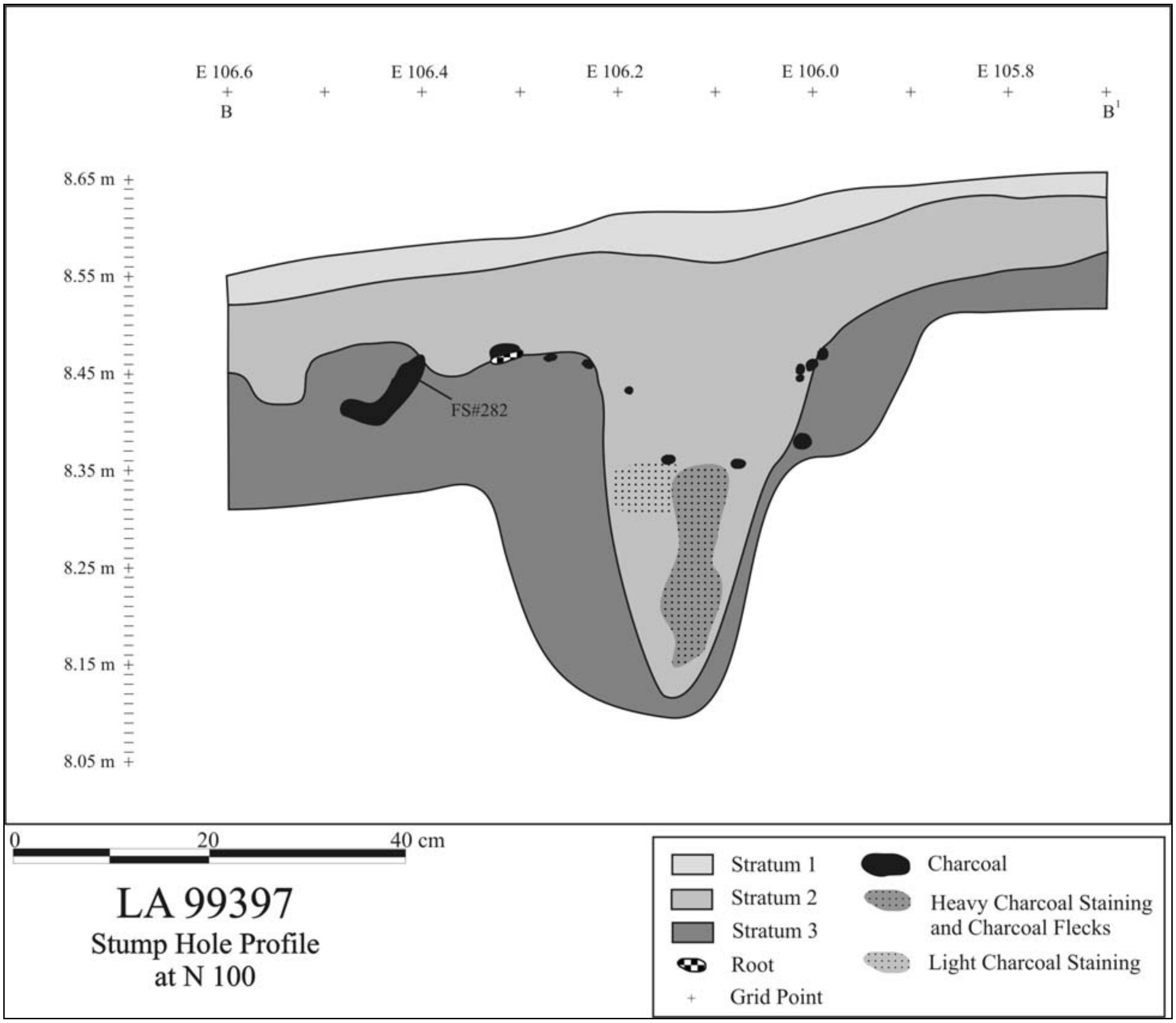

Figure 48.3. Profile of the stump hole at 100N.

One piece of wood charcoal from the burned stump (Field Specimen [FS] 282) and two pieces of wood charcoal (FS 211 and FS 214) from Stratum 3 were submitted for radiocarbon analysis. FS 211 was taken from unit 100N/95E and FS 214 was taken from unit 91N/100E; both samples were taken at an elevation between 9.60 and 9.50 m. FS 282 appears to be a sample of root wood. It returned an age of 880±40 BP (Beta-202213) and a date of cal AD 1180 with a two-sigma age of cal AD 1030–1250. This date supports the geomorphological interpretation that Strata 1 and 2 were formed within the last 1000 years. FS 211 returned an age of 2110±60 BP (Beta-199383) and a date of cal 160 BC with a two-sigma date range of cal 360–280 BC and cal 240 BC–AD 20. FS 214 returned an age of 2280±40 BP (Beta-199384) and a date of cal 380 BC with a two-sigma date range of 400–350 BC and 310–210 BC. Both of these dates are younger than the inferred late-Pleistocene/early-Holocene date of Stratum 3. The presence of this later material is probably the result of bioturbation and/or infiltration.

East of 120E, there is a subtle change in the stratigraphy. Strata 1 and 2 are present as sandy loams. Stratum 2 is generally thicker (mean thickness of 17 cm) and slightly harder than in the west. Stratum 1 consists of about 5 percent gravel and Stratum 2 is approximately 30 percent gravel. Strata 3, 4, 10, and 11 underlie Strata 1 and 2 (Figure 48.4).

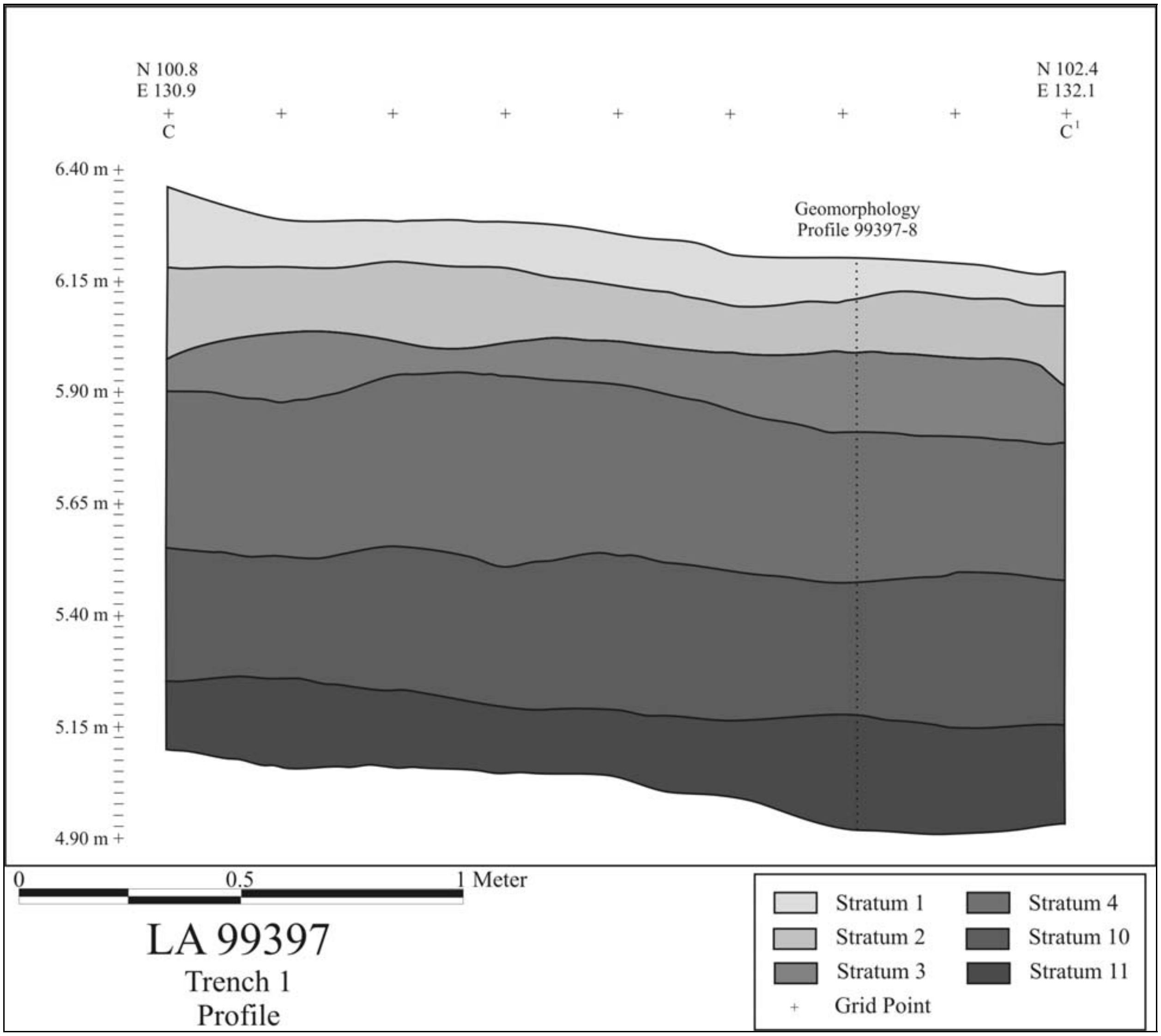

Figure 48.4. Profile of Trench 1.

Excavation in unit 98N/129E revealed swale fill deposits (Strata 8 and 9) underlying Strata 1 and 2. The presence of these deposits indicates the development of shallow drainages in the area and their subsequent filling by episodic deposition in the middle to late Holocene.

A piece of wood charcoal (FS 292) from Stratum 2 in unit 98N/129E was submitted for radiocarbon analysis. The sample returned an age of 530±40 BP (Beta-199385) and a date of cal AD 1420 with a two-sigma date range of AD 1320–1350 and AD 1390–1440.

The stratigraphy from the two units on the ridge top and near LA 85411 (85N/63E and 89N/66E) is similar to that from within the LA 99397 boundaries, although the Bw horizon (Stratum 2) is absent. Unit 117.1N/67.3E, however, represents a different stratigraphic pattern (Figure 48.5). This unit is capped by a 4-cm-thick AC horizon (Stratum 5) of fine pumice gravel. This is underlain by a 10-cm-thick A horizon (Stratum 1). The underlying Bw horizon (Stratum 7) is composed of soft to loose sand. Cerro Toledo (Qct) gravel bedrock (Stratum 6) was encountered approximately 25 cm below the surface.

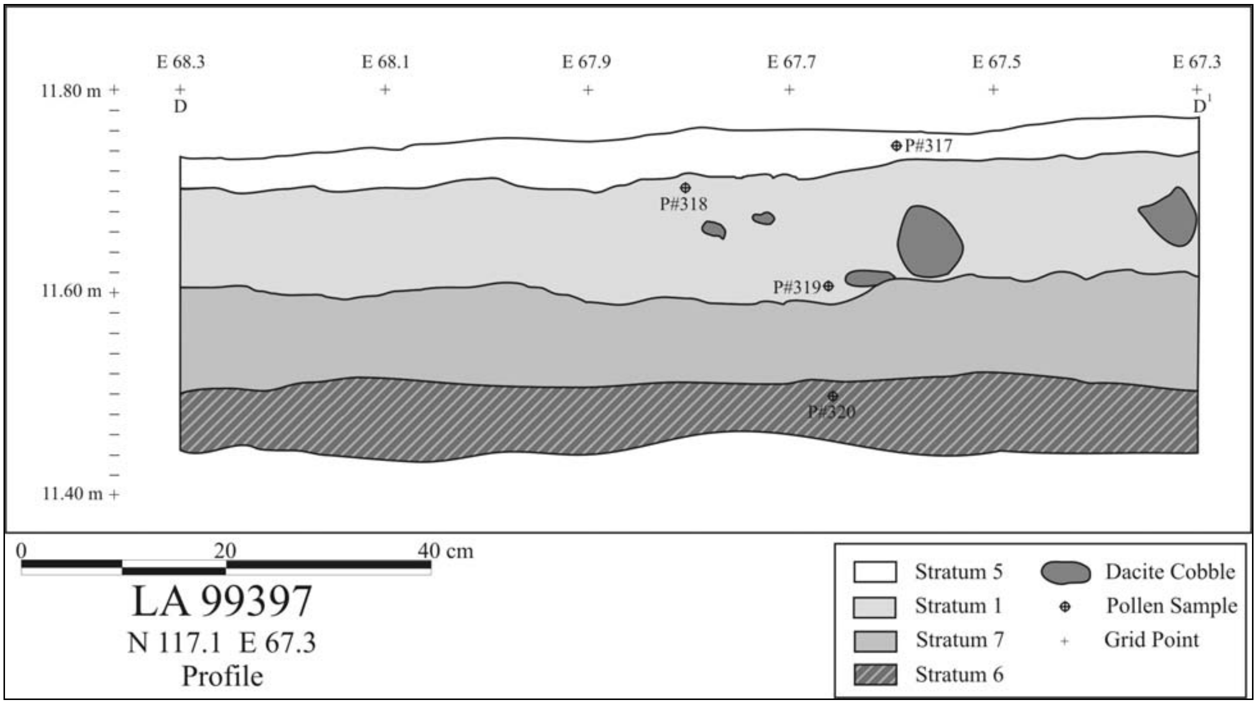

Figure 48.5. Profile of 117.1N/67.3E.

In summation, Stratum 3 and the underlying strata were deposited during the late Pleistocene or early Holocene. The parent material of these strata may be bioturbated Qct deposits and eolian fines. During the early to middle Holocene, the upper portion of Stratum 3 was removed by erosion. Sometime in the middle to late Holocene, shallow drainages developed in the site area and were subsequently episodically filled (Strata 8 and 9). Strata 1 and 2 were deposited during the late Holocene, probably within the last 1000 years.

SURFACE COLLECTION

The surface collection covered 453 1- by 1-m units in the center of the site. Outside of this area pine duff cover was too thick to undertake a meaningful collection. The distribution of the ground stone and lithic debitage collected from the surface is shown in Figure 48.6.

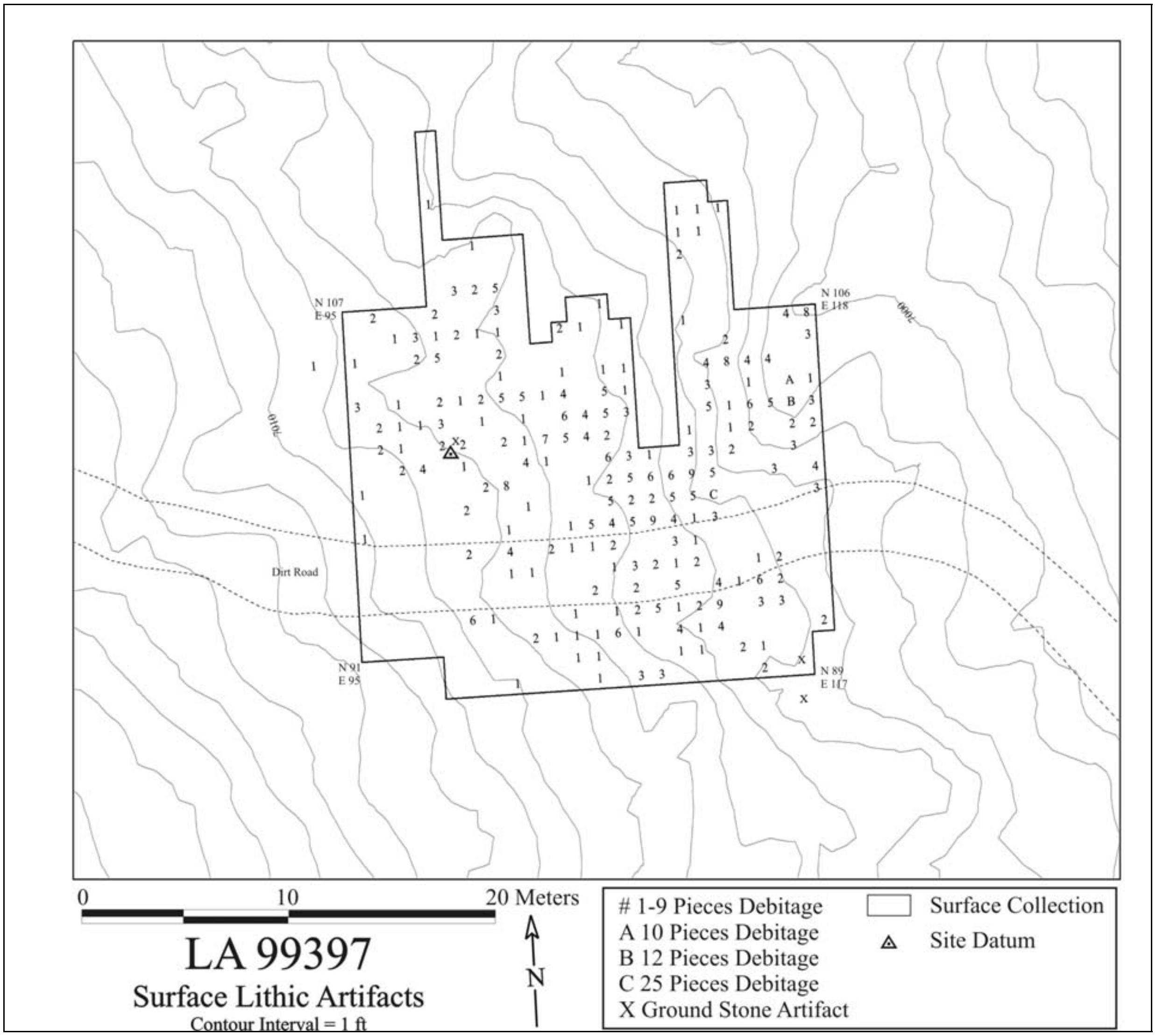

Figure 48.6. Surface artifact distribution.

Figure 48.6 shows that the densest concentration of artifacts is located just north of the road near the center of the surface collection area. Part of this concentration lies within a shallow rill and at the head of a larger erosional channel. Two smaller concentrations are also present; both are located in and near erosional channels. One is centered at 102N/115E, the other at 92N/112E. Note the area along the 103N line where there are few artifacts. A small erosional channel runs through this area, emptying into the northern "drainage concentration." In general, the distribution of the surface artifacts appears to have been shaped by erosional activity.

SITE EXCAVATION

One dozen excavation units were placed in the central artifact concentration (i.e., between 95 to 104N and 101E to 110E). Not surprisingly, subsurface artifact density was higher here than on the rest of the site (Table 48.3). Subsurface artifact density was moderately high in the five excavation units between 118E and 135E. Everywhere else artifact densities were very low. No artifacts were found in the three units west of 85E and east of 135E, and only four artifacts (including one ceramic sherd) were found in the two units south of 85N.

Table 48.3. Artifact density: chipped stone/m^3 by area.

	Central Concentration			East Area			Periphery[1]		
Stratum	Volume	Debitage	Density	Volume	Debitage	Density	Volume	Debitage	Density
1[2]	0.5225	158	302.4	0.3050	55	180.3	1.0675	65	61.0
2[3]	0.4650	122	262.4	0.6450	58	89.9	0.6275	22	35.1
3[4]	1.3575	50	36.8	0.2000	1	5.0	1.9100	6	3.1

[1]Excluding units outside of the site boundary; [2]Including Stratum 1/2 in Periphery units; [3]Including Stratum 2/8 in the East Area; [4]Stratum 3 and 3A combined in Central Concentration and Everywhere Else

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 1093 artifacts were analyzed from the excavations conducted at LA 99397. In addition, flotation and pollen samples were selected for analysis from Strata 1 to 4 and 9 (flotation) and Strata 1 to 7 and 9 (pollen) (Table 48.4). Charcoal was submitted for radiocarbon dating from Strata 2 and 3, and 10 pieces of obsidian were submitted for hydration dating from Stratum 0. The results of the artifact and sample analyses are presented in the following sections.

Table 48.4. Samples selected for analysis from LA 99397.

	Sample Type			
Stratum	**Flotation**	**Pollen**	**Radiocarbon**	**Hydration**
0				5, 12, 32, 43, 50, 60, 66, 67, 76, 77
1	301, 313	299, 309, 318		
2	302, 314	300, 310	292	
3	315	311	211, 214, 282	
4	316	294, 312		
5		317		
6		320		
7		319		
8				
9	331	332, 333		
10				
11				

Chronology

Radiocarbon Dating

Four charcoal samples were submitted for radiocarbon analysis (Table 48.5). Two of these are piñon pine wood (FS 211 and FS 214) and two are ponderosa pine wood. Although none of the samples can be associated with cultural activities they help refine the stratigraphic chronology.

Table 48.5. Radiocarbon dates from LA 99397.

FS	Context of Sample	Laboratory (Beta)#	Conventional radiocarbon age	Intercept of radiocarbon age	Two-sigma calibrated result
211	100N/95E, Stratum 3	199383	2110±60 BP	160 BC	360–280 BC 240 BC–AD 20
214	91N/100E, Stratum 3	199384	2280±40 BP	380 BC	400–350 BC 310–210 BC
282	100.00N/106.42E, burned tree stump (root)	202213	880±40 BP	AD 1180	AD 1030–1250
292	98N/129E, Stratum 2	199385	530±40 BP	AD 1420	AD 1320–1350 AD 1390–1440

Obsidian Hydration Dating

Ten obsidian artifacts from LA 99397 were submitted to the Diffusion Laboratory for age determination using the obsidian hydration dating method. All of these artifacts came from Stratum 0. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rim, was measured. Second, the high-temperature hydration-rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site were estimated so that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 48.6).

Table 48.6. Obsidian hydration dates for LA 99397.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
5	2006-31	Valle Grande	3.15	-1914	249
12	2006-32	Valle Grande	2.71	-1029	224
32	2006-33	Valle Grande	3.46	-2715	274
43	2006-34	Valle Grande	2.98	1527	29
50	2006-35	Valle Grande	3.54	-1402	192
60	2006-36	Valle Grande	2.80	1492	33
66	2006-37	Valle Grande	3.43	-2778	280
67	2006-38	Valle Grande	2.69	-903	216

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
76	2006-39	Valle Grande	3.02	-1656	243
77	2006-40	Valle Grande	3.59	-3156	288

The obsidian hydration dates range from 3156 BC to AD 1527; however, they tend to cluster into two groups: 3156 to 903 BC (Middle to Late Archaic) and AD 1492 to 1527 (Middle to Late Classic).

Ceramic Artifacts (Dean Wilson)

Only three ceramic artifacts were recovered from LA 99397. All of these artifacts were identified as smeared-indented corrugated jar sherds; two came for Stratum 0 (FS 105 and FS 111) and one came from Stratum 1 (FS 230).

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 1090 lithic artifacts were analyzed from LA 99397, consisting of one core, 1068 pieces of debitage, 18 retouched tools, and three ground stone artifacts. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 48.7 presents the data on lithic artifact type by material type. The majority of the debitage and retouched tools are made of obsidian, with some chalcedony and other materials. The presence of cortex on 8.1 percent of the debitage indicates that most of these materials were collected from primary nodular sources (74.7%), with some from secondary waterworn sources. The obsidian is present at nearby sources in the Jemez Mountains. In contrast, the chalcedony and Pedernal chert are available from local Rio Grande Valley gravel sources.

Table 48.7. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Sandstone	Total
Cores	Core	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Debitage	Angular debris	0	0	0	0	0	0	38	31	0	10	0	0	0	79
	Core flake	1	0	0	0	0	0	209	76	0	28	0	0	0	314
	Blade	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Biface flake	0	0	0	0	0	0	303	17	0	9	0	0	0	329
	Microdeb.	0	0	0	0	0	0	205	21	0	2	0	0	0	228

Artifact Type		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Sandstone	Total
		Material Type													
	Und. flake	0	0	0	0	0	0	89	21	1	6	0	0	0	117
	Subtotal	0	0	0	0	0	0	845	166	1	55	0	0	0	1068
Retouched Tools	Retouched piece	0	0	0	0	0	0	4	1	1	1	0	0	0	7
	Biface	0	0	0	0	0	0	5	3	0	0	0	0	0	8
	Projectile point	0	0	0	0	0	0	3	0	0	0	0	0	0	3
	Subtotal	0	0	0	0	0	0	12	4	1	1	0	0	0	18
Ground Stone	Millingstone	0	0	0	0	3	0	0	0	0	0	0	0	0	3
	Subtotal	0	0	0	0	3	0	0	0	0	0	0	0	0	3
Total		**0**	**0**	**0**	**0**	**3**	**0**	**857**	**170**	**2**	**57**	**0**	**0**	**0**	**1090**

Ten pieces of debitage were submitted for X-ray fluorescence analysis. All of these artifacts were identified as being obtained from the Valle Grande source (Table 48.8). The Valle Grande (Cerro del Medio) source area is located about 17 km (11 mi) as the "crow flies" to the west of the site.

Table 48.8. Obsidian source samples.

FS #	Artifact	Color	Source
5	Debitage	Translucent	Valle Grande rhyolite
12	Debitage	Translucent	Valle Grande rhyolite
32	Debitage	Translucent	Valle Grande rhyolite
43	Debitage	Translucent	Valle Grande rhyolite
50	Debitage	Translucent	Valle Grande rhyolite
60	Debitage	Translucent	Valle Grande rhyolite
66	Debitage	Translucent	Valle Grande rhyolite
67	Debitage	Translucent	Valle Grande rhyolite
76	Debitage	Translucent	Valle Grande rhyolite
77	Debitage	Translucent	Valle Grande rhyolite

Lithic Reduction

The core consists of a bidirectional, bifacial core made on a chalcedony cobble. It exhibits waterworn cortex indicating that it was obtained from secondary gravel sources. The core was classified as exhausted when discarded. Table 48.9 presents the metric information on this core.

Table 48.9. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Bi-directional	51	36	18	29.5

The debitage mainly consists of biface flakes, core flakes, and microdebitage, with some undetermined flake fragments and angular debris. Table 48.10 summarizes the various stages of reduction represented by the whole core and biface (tertiary) flakes. The debitage assemblage is primarily composed of tertiary flakes, with less secondary non-cortical and cortical flakes. No primary flakes were identified. The overall cortical:non-cortical ratio of 0.41 reflects an emphasis on the later stages of core reduction and tool production.

Table 48.10. Debitage reduction stages.

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Obsidian	0	9	8	13	0.42
Chalcedony	0	1	2	1	0.33
Total	**0**	**10**	**10**	**14**	**0.41**
Percentage	0	29.4	29.4	61.1	---

The majority of the flakes exhibit crushed platforms (*n* = 90), with cortical (*n* = 9), single-faceted (*n* = 38), dihedral (*n* = 4), multi-faceted (*n* = 26), and collapsed (*n* = 38) platforms. Fifty-six (27.3%) of the flake platforms exhibit evidence of preparation, with most of these being abraded/crushed and a few ground, abraded/ground, retouched, and retouched/abraded.

The majority of the core flakes consist of distal fragments (*n* = 145; 46.2%), with fewer whole (*n* = 21), proximal (*n* = 45), midsection (*n* = 86), lateral (*n* = 3), and undetermined (*n* = 14) fragments. Most of the biface flakes are also proximal fragments (*n* = 127; 38.6%), with fewer whole (*n* = 14), midsection (*n* = 99), distal (*n* = 85), lateral (*n* = 2), and undetermined (*n* = 2) fragments. The whole core flakes have a mean length of 20.4 mm (*std* = 8.2), whereas the whole biface flakes exhibit a mean length of 16.0 mm (*std* = 6.9). Lastly, angular debris have a mean weight of 1.4 g (*std* = 1.8).

The retouched tools consist of a mix of expedient flakes tools (i.e., retouched pieces) while the formal tools consist primarily of bifaces and projectile points (Figure 48.7). All the retouched pieces exhibit a single modified edge. The edges are unidirectional ventral (*n* = 1), unidirectional dorsal (*n* = 3), and bidirectional (*n* = 1) retouched, with straight (*n* = 5), concave/convex (*n* = 1), and undetermined outlines (*n* = 1). The edge angles range from 40 to 70 degrees, with a mean of 52.1 degrees (*std* = 11.1).

All eight bifaces are broken, consisting of three proximal, one lateral, and four undetermined fragments. Edge angles range from 35 to 65 degrees, with a mean of 52.5 degrees (*std* = 8.4). Most of these appear to have been broken during manufacture, with the range of edge angles indicating middle- to late-stage reduction. A review of Figure 48.8 indicates a modal distribution for biface platform angles, with peaks at 55 to 65 degrees, but an overall range from 40 to 80 degrees. This indicates that early-, middle-, and late-stage bifaces, and possibly bifacial cores, were being reduced at the site.

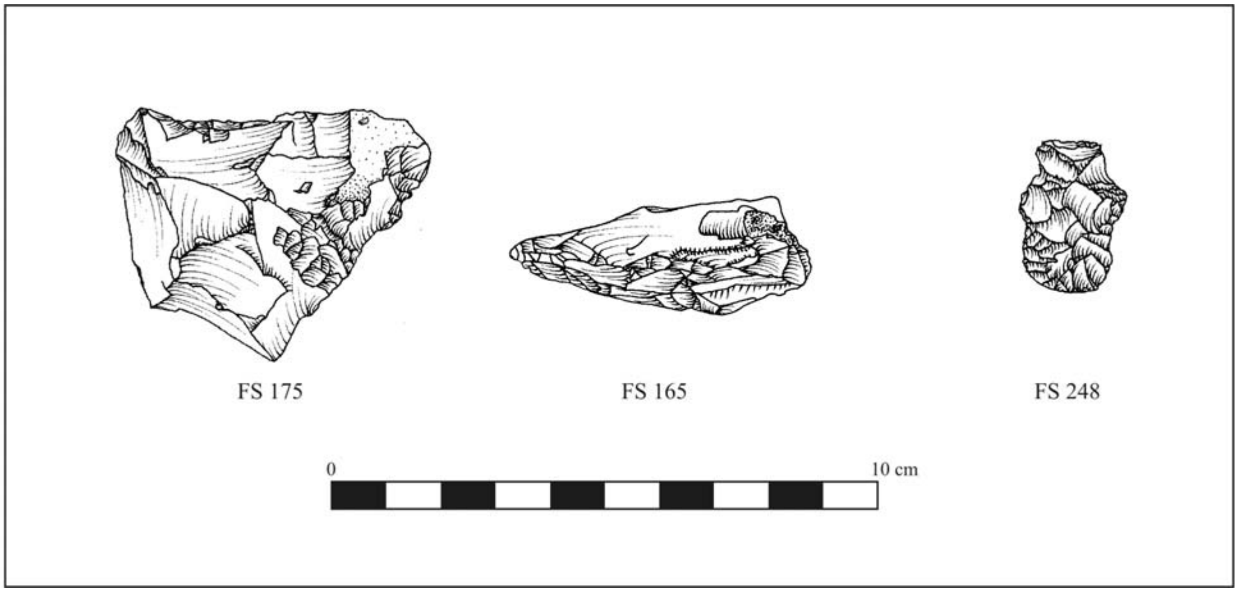

Figure 48.7. Retouched flake, biface fragment, and projectile point.

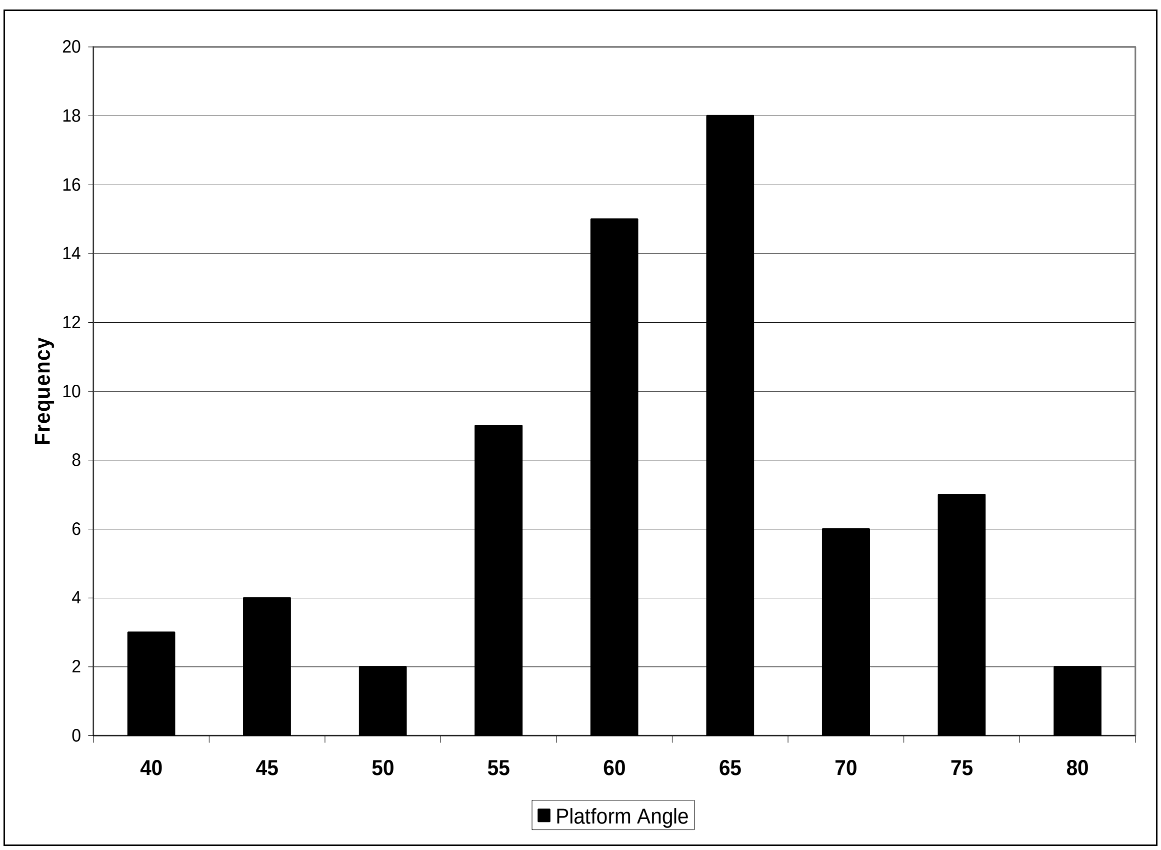

Figure 48.8. Biface platform angles.

The three projectile points consist of proximal, midsection, and distal fragments. The base fragment is a possible Late Archaic dart point with a snap break at the tip (see Figure 48.7). It exhibits marked tangs and was manufactured on a flake blank with a marked ventral curvature. Metric and descriptive information on the projectile points is presented in Table 48.11.

Table 48.11. Projectile point metric (mm) and descriptive data.

FS #	Material	Condition	Overall Length	Blade Length	Neck Width	Stem Length	Stem Width	Thickness	Weight (g)	Haft Type	Blade Shape	Base Shape
248	Obsidian	Proximal	--	--	11	7	--	4.9	2.7	Stemmed	Und.	Con-cave

Tool Use

None of the debitage exhibit evidence of damage that could be attributed to use-wear. In contrast, two marginally retouched flakes do exhibit evidence of edge damage consisting of rounding and scarring. One of these is a biface flake that is 25 mm long and the other is a large core flake that is 57 mm long (see Figure 48.7). In addition, two of the projectile points appear to have impact breaks.

Three millingstones were identified during the analysis. All three items are broken dacite fragments that have oval-shaped grinding surfaces that are concave in cross-section.

Archaeobotanical Remains (Pamela McBride)

Very little wood charcoal or other charred macrobotanical remains were found at LA 99397 and none of the remains could be linked to cultural activities. Seven flotation samples and six macrobotanical samples were submitted for analysis. Table 48.12 reflects the paucity of charred macorbotanical items at the site.

Table 48.12. Charred macrobotanical remains from LA 99397.

FS	Provenience	Charred Material
Flotation Samples		
301	98N 129E, Stratum 1	None
302	98N 129 E, Stratum 2	<0.1 g *Pinus edulis* wood *Pinus ponderosa* needle
313	100N 101E, Stratum 1	None
314	100N 101E, Stratum 2	None

FS	Provenience	Charred Material
315	100N 101E, Stratum 3	None
316	100N 101E, Stratum 4	None
331	98N 129E, Stratum 9	*Pinus ponderosa* needle
Macrobotanical Samples (from screen)		
211	100N 95E, Stratum 3	0.1 g *Pinus edulis* wood
214	91N 100E, Stratum 3	4.0 g *Pinus edulis* wood, 0.4 g unknown conifer wood
282	100N 106E, burned tree sump	1.7 g cf. *Ponderosa pine* wood
283	100N 106E, burned tree stump	3.8 g cf. *Pinus ponderosa* wood
291	98N 129E, Stratum 2	0.1 g unknown conifer wood
292	98N 129E, Stratum 2	0.7 g cf. *Pinus ponderosa* wood

Pollen Remains (Susan Smith)

Thirteen pollen samples were analyzed from LA 99397. Table 48.13 lists the frequency of identified pollen types. Maize was the only cultigen identified in the botanical assemblage. Prickly pear, beeweed, and sunflower type were the only other economic resources that were identified in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 48.13), and these are discussed in detail in Smith's chapter in Volume 3.

Table 48.13. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 99397 (*n* = 13)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	1
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	1
	cf. *Helianthus*	Sunflower type	1
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 99397 (*n* = 13)**
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	7
		Grass Aggregates	1
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	1
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs, and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	9
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	11
		Sunflower Family Aggregates	1
	Ambrosia	Ragweed, Bursage	2
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 99397 (*n* = 13)
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	3
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	6
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	4
	Pinus	Pine	12
		Pine Aggregates	1
	Pinus edulis type	Piñon	11
	Juniperus	Juniper	9
		Juniper Aggregates	0
	Quercus	Oak	4
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	1
	Ephedra	Mormon Tea	3
	Artemisia	Sagebrush	9
		Sagebrush Aggregates	1
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	1
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SITE SUMMARY

Obsidian hydration dates suggest Middle to Late Archaic period occupation of LA 99397. A Late Archaic projectile point fragment (FS 248) lends additional support to a Late Archaic period occupation. Two charcoal samples returned Late Archaic dates (FS 211 and FS 214); however these dates are several hundred years younger than the youngest obsidian hydration date and there is no evidence that these samples are the result of cultural activity. Nearly all of the artifacts recovered from LA 99397 come from Strata 0, 1, and 2. These strata do not appear to be older than AD 1000; consequently it seems likely that the LA 99397 Archaic assemblage is in a reworked context and that no culturally derived site structure patterns remain. Analysis of the lithic artifacts indicates that a wide range of core reduction and tool production/maintenance activities were performed at the site. LA 99397 may therefore represent a habitation site. All of the sourced obsidian is from the Valle Grande source, implying that the site inhabitants had geared up with obsidian from the caldera and then moved into the Rendija Canyon area.

Two obsidian hydration samples and a single radiocarbon sample returned Classic period dates. These dates may represent a Puebloan use of the site; specifically, this use may be associated with the nearby fieldhouse, LA 85411.

CHAPTER 49
RENDIJA TRACT (A-14): LA 127627

Michael J. Dilley and Bradley J. Vierra

INTRODUCTION

LA127627 is a small one-room Classic period fieldhouse situated on a northwest-facing slope of a terrace about 110 m south of the ephemeral creek in Rendija Canyon. The area is covered by a ponderosa pine forest at an elevation of 2117 m (6940 ft). The fieldhouse is located to the immediate north of the Los Alamos Sportsmen's Club, but did not appear to have been impacted by these activities.

The original survey identified alignments of unshaped dacite blocks, one to two courses in height, within a 3- by 3-m area that incorporated naturally occurring bedrock boulders. The alignments were situated in a section of the forest that was heavily burned by the Cerro Grande fire, including burned pine duff and ponderosa pine trees. No surface artifacts were observed.

FIELD METHODS

Fieldwork began with the cutting and removal of several burned ponderosa pine trees that were partially covering the site. A reconnaissance was subsequently conducted of the area around the fieldhouse to define the nature and extent of the surface remains. No artifacts or any other features were identified. The site datum was set at the southwestern corner of the site and designated as 100N/100E and 10.00 m elevation. A 1- by 1-m grid system was laid in around the surface architecture with grid corners at 101N/101E, 105N/101E, 105N/107E, and 101N/107E. Subdata were shot in along the north, east, and south sides of the excavation (A-C). The site was photographed and excavations begun (Figure 49.1).

An east-west-oriented trench was excavated across the site through grids 103N/101-106E. It was excavated to define the walls within the structure and identify the stratigraphic sequence. Upon completion, it was determined that the alignments represented a one-room structure. Excavations proceeded to expose the remaining walls of the structure and removal of the interior fill by stratigraphic layers and 1- by 1-m grids. A block excavation including grids 101-106N/103-106E was excavated around the room.

Pollen and flotation samples were taken from each stratigraphic unit and various locations on the floor of the structure. All excavated soil was sieved through 1/8-in. mesh to aid in the recovery of cultural remains. The immediate area bounding the structure was exposed to locate external features or outside activity areas. After excavations were complete, the site was mapped and photographed (Figure 49.2).

The excavation of the site was supervised by Michael Dilley. Crew members included Sandi Copeland, Maggie Dew, Alan Madsen, and Aaron Lenihan. Timothy Martinez, Aaron Gonzales, and Michael Chavarria served as site monitors representing both San Ildefonso and Santa Clara pueblos.

Figure 49.1. LA 127627 before excavation.

STRATIGRAPHY

Four stratigraphic units were defined during the excavations. These are illustrated in the profile provided in Figure 49.2 and are listed in Table 49.1. Stratum 1 is the loose topsoil that covered the site and represents the A soil horizon. Some of the surface duff had been burned by the Cerro Grande fire. Stratum 2 consists of a sandy loam that characterizes the post-occupational fill. This stratum is situated within and outside the structure and represents the Bw soil horizon. Stratum 3 is an unprepared occupational surface that is situated inside the structure.

A geomorphic test pit was excavated outside and adjacent to the structure in grid 103N/106E (see Chapter 57, Volume 3). It was excavated to a depth of about 1 m and four separate soil horizons were identified (Table 49.2). From top to bottom these horizons consisted of A, Bw, Bt1b1, and Bt2b1. The site is buried in a weakly developed soil in a colluvial deposit, but the Bw horizon has a hard consistency. The occupation surface at the site is situated at the top of the Bt1b1 horizon. Table 49.3 provides the artifact count information by stratigraphic unit at the site. A total of 173 artifacts were recovered.

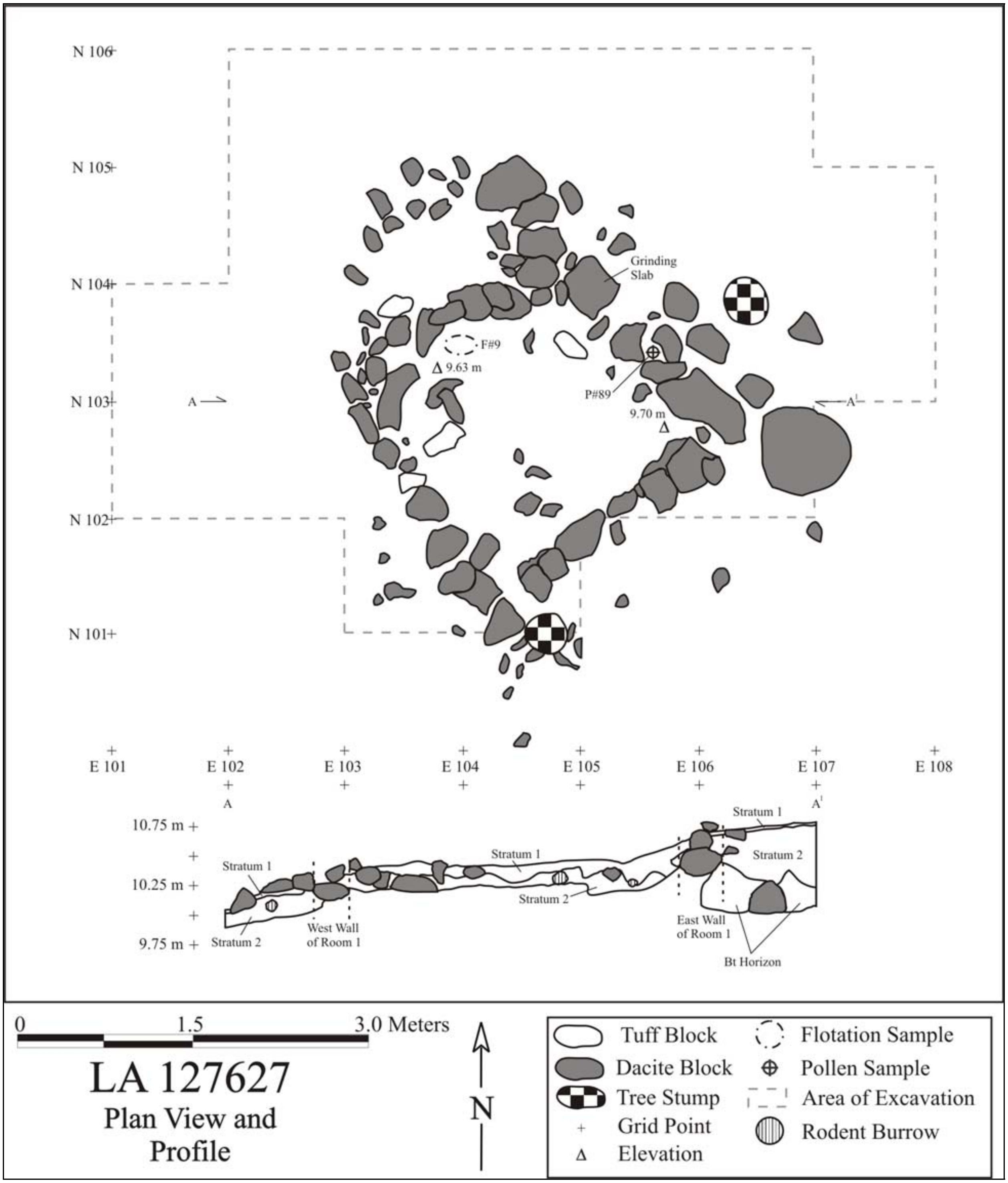

Figure 49.2. LA 127627 plan view and profile.

Table 49.1. LA 127627 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 3/3	Sandy loam	1–6	Surface sediment
2	10YR 4.5/3	Sandy loam	5–30	Post-occupational fill
3	10YR 4.5/3	Sandy clay loam	0	Floor/living surface

Table 49.2. LA 127627 soil horizon descriptions from the south profile of the geological test pit.

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 3/3	Sandy loam	0–5	Topsoil
Bw	10YR 4.5/3	Sandy loam	5–21	Late-Holocene soil
Bt1b1	7.5YR 4/4	Sandy clay loam	21–48	Late-Pleistocene soil
Bt2b1	7.5YR 4/5	Sandy clay loam	48–72+	Late-Pleistocene soil

Table 49.3. LA 127627 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	0	1	0	0	**1**
1	9	10	0	1	**20**
2	75	63	12	1	**151**
3	1	0	0	0	**1**
Total	**85**	**74**	**12**	**2**	**173**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a single room in a small fieldhouse (Figure 49.3). The room is oriented along a northwest-southeast line, with the northern side situated downslope. The room measures 1.87 m north-south by 1.66 m east-west, with about 3.1 m^2 of interior space. The excavation of the room began with the east-west trench that extended across the rubble area along the 103N grid line. This excavation defined the east and west walls of the structure, the internal stratigraphy, and a possible unprepared floor surface. After the trench was completed, the remainder of the room fill was removed down to the level of the possible floor. The geomorphic test pit was subsequently excavated adjacent to the southeastern walls of the structure to define the stratigraphic context of the walls and occupational surface.

Floor. Approximately 5 to 30 cm of post-occupational fill was removed before exposing a possible unprepared living surface within the structure. It was difficult to discern as it was heavily disturbed by rodent activity and slope wash. Nonetheless, patches were preserved in the northeastern and southern sections of the room. These were defined by a buff color and the presence of ashy adobe melt that was situated on top of the Bt1b1 soil horizon. The portion of the floor in the northeastern corner of the room also contained some adobe plaster that extended onto the floor from the adjacent wall. Since the fieldhouse was constructed on a northwest-facing slope, the floor appears to have been leveled by cutting into the slope above and filling on the downslope side; however, the floor still sloped about 10 cm down. No features or artifacts were associated with the floor. A single pollen sample (Field Specimen [FS] 89) was taken from the better-preserved northeastern area of the room. Taxa identified in this sample included cheno-ams, sunflower family, ragweed/bursage, spruce, unidentified pine, piñon pine, juniper, oak, Mormon tea, sagebrush, and greasewood. A flotation sample (FS 9) was also taken from directly on top of the floor in the northwestern corner of the room. Charred taxa identified in this sample included unidentified pine, piñon pine, ponderosa pine, cheno-ams, maize, and unknown conifer.

Figure 49.3. LA 127627, Room 1.

Wall Construction. The walls in Room 1 were primarily composed of dacite cobbles, with a few tuff blocks. In addition, some *in situ* dacite boulders were also integrated into the construction of the fieldhouse, as was a dacite grinding slab. The dacite is available from the nearby ephemeral drainage and the tuff from outcrops in the canyon. The walls are resting on top of the floor and Bt1b1 soil horizon. There is no evidence of a foundation, and adobe plaster was only observed on a few cobbles located in the eastern section of the room. Otherwise, the building's stones appear to be dry-laid walls, with one to two courses remaining. A possible doorway is situated at the northeastern corner of the room, where a grinding slab is located. Wall measurement information is provided in Table 49.4. Most of the standing walls had collapsed and the original walls were estimated at approximately 1 m high.

Table 49.4. LA 127627 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
West	1.87	0.07–0.33	0.17–0.31	1 to 2
East	1.87	0.21–0.43	0.15–0.29	1 to 2
North	1.56	0.12–0.42	0.24–0.49	1 to 2
South	1.75	0.12–0.46	0.17–0.34	1 to 2

Artifact Distribution

Table 49.5 illustrates the distribution of artifacts that were recovered during the site excavations. These totals do not include one artifact that was recovered outside of the excavated area during the surface collection. The bold numbers indicate grid units that were located completely or partially within Room 1, which indicates that most of the artifacts were recovered from within the structure or directly north of the room. However, since the room and hill slope is oriented to the northwest, the higher levels of artifacts located in grids 105N/104-105E may reflect an outside activity area that was located in front of the fieldhouse.

Table 49.5. Artifact distribution by grid unit.

	101E	102E	103E	104E	105E	106E	107E
105N		0	3	11	16	0	
104N		8	**17**	**25**	**7**	8	0
103N	0	5	**7**	**20**	**8**	4	2
102N	2	2	5	**8**	8	4	
101N			1	1			

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 173 artifacts were analyzed from the excavations of LA 127627. In addition, flotation and pollen samples were selected for analysis from the post-occupational fill (Stratum 2) and the living surface (Stratum 3). Maize recovered from the flotation samples was submitted for radiocarbon dating (Table 49.6).

Table 49.6. Samples selected for analysis from LA 127627.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2	31, 52	8, 66, 67, 69, 71	9, 52	
3	9	89		

*thermoluminescence

Chronology

Radiocarbon Dating

Maize that was recovered from two separate contexts at LA 127627 were submitted for radiocarbon dating. The first sample was recovered from the floor of the structure (FS 9). It provided a date of 380±40 BP (Beta-215554), with a calibrated intercept of AD 1480 and a two-sigma range of AD 1440–1640. The second sample was recovered from under a rock in the northeast corner of the room (FS 52). This sample provided a date of 400±40 BP (Beta-215555), with a calibrated intercept of AD 1460 and a two-sigma range of AD 1430–1530. Both dates indicate a 15th century occupation at the site.

Ceramic Artifacts (Dean Wilson)

A total of 82 ceramics were analyzed from LA 127627. The majority of the pottery represents local Rio Grande utilityware ceramics, with a few decorated wares (Table 49.7), including Biscuit B and Sapawe Micaceous. The whitewares are primarily tempered with local fine tuff or ash, whereas the utilitywares are tempered with non-local granite and mica and tuff with phenocrysts (i.e., smeared-indented sand) (Table 49.8). The differences in utilityware temper reflect the non-local production of Sapawe Micaceous (and plain gray) versus the local production of smeared-indented corrugated ceramic vessels. All of the utilitywares are represented by jar vessel forms, whereas the whitewares are mostly bowls with a single jar sherd (Table 49.9). The glazeware sherds appear to be from the same jar. Based on these assemblage characteristics (i.e., Biscuit B and Sapawe Micaceous), it is likely that LA 127627 dates to the Middle Classic period. This corroborates the potential 15th century occupation represented by the radiocarbon dates.

Table 49.7. Ceramic types from LA 127627.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Santa Fe Black-on-white	1	1.2
Biscuit B rim	1	1.2
Biscuit B-C body	1	1.2
Biscuit unpainted, slipped one side	4	4.9
Northern Rio Grande Utilityware		
Plain gray rim	1	1.2
Plain gray body	26	31.7
Smeared-indented corrugated	19	23.2
Sapawe Micaceous	16	19.5
Middle Rio Grande Glazeware		
Glaze red body	3	3.7
Total	82	100.0

Table 49.8. Temper by ware for ceramics from LA 127627.

Temper	Ware			
	Gray	White	Glaze	Total
Granite with mica	21	2	0	23
Fine tuff or ash	1	13	0	14
Fine tuff and sand	0	1	0	1
Latite Keres area	2	0	0	2
Smeared-indented sand	32	1	0	33
Basalt	0	0	3	3
Sapawe Micaceous temper	6	0	0	6
Total	**62**	**17**	**3**	**82**

Table 49.9. Vessel form by ware for ceramics from LA 127627.

Vessel Form	Ware			
	Gray	White	Glaze	Total
Indeterminate	4	10	0	14
Bowl rim	0	1	0	1
Bowl body	0	5	0	5
Jar neck	1	0	0	1
Jar body	57	1	3	61
Total	**62**	**17**	**3**	**82**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 74 artifacts were analyzed from LA 127627, consisting of three cores, 68 pieces of debitage, two retouched tools, and four ground stone artifacts. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 49.10 presents the data on lithic artifact type by material type. The debitage is primarily made of Pedernal chert and chalcedony with other materials. The presence of cortex on 8.8 percent of the debitage indicates that these materials were collected from waterworn (n = 6) sources. The Pedernal chert and chalcedony are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

One piece of obsidian and a piece of basalt debitage were submitted for X-ray fluorescence analysis. The obsidian artifact is derived from the El Rechuelos (Polvadera Peak) source area located about 27 km (17 mi) northwest of the site (Table 49.11). The basalt artifact was determined to be basalt and not dacite.

Table 49.10. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Schist	Total
Cores	Core	0	0	0	0	0	0	0	0	0	3	0	0	0	3
	Subtotal	0	0	0	0	0	0	0	0	0	3	0	0	0	3
Debitage	Angular debris	0	0	0	0	0	0	0	1	0	2	0	0	0	3
	Core flake	1	0	4	2	0	0	1	24	0	26	0	0	0	59
	Biface flake	0	0	0	0	0	0	0	0	0	2	0	0	0	2
	Microdebi-tage	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Und. flake	0	0	0	0	0	0	1	1	0	1	0	0	0	3
	Subtotal	1	0	4	2	0	0	2	26	0	32	0	0	0	68
Retouched Tools	Retouched piece	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Biface	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Projectile point	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Subtotal	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Ground Stone	Two-hand mano	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Und. mano	0	0	0	0	0	1	0	0	0	0	0	1	0	2
	Und. ground stone	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	0	1	1	0	0	0	0	0	1	1	4
Total		**1**	**0**	**4**	**2**	**1**	**1**	**2**	**26**	**0**	**37**	**0**	**1**	**1**	**74**

Table 49.11. Obsidian source samples.

FS #	Artifact	Color	Source
93	Debitage	Black Dusty	El Rechuelos

Lithic Reduction

Two of the cores are a platform and flake core that were reduced using a single-directional, multi-face technique. The other artifact is a core fragment. All were still useable and broken on a material flaw when discarded. Table 49.12 presents the metric information on the cores.

The debitage mostly consists of core flakes, with a few other debitage types. The overall cortical:non-cortical ratio of 16.0 reflects an emphasis on the later stages of core reduction and tool production/maintenance. The flakes mostly have single-faceted platforms (*n* = 31), with fewer cortical (n = 1), collapsed (*n* = 4), and crushed (*n* = 5) platforms. None of the platforms exhibit evidence of preparation. The majority of the core flakes are whole (*n* = 28), with fewer proximal (*n* = 10), midsection (*n* = 6), distal (*n* = 13), and undetermined flake (*n* = 1) fragments. In contrast, the biface flakes consist of a whole and proximal fragment. The whole core flakes have a mean length of 31.7 mm (*std* = 11.1), the single whole biface a length of 23.0 mm, and the angular debris a mean weight of 6.7 g (*std* = 5.8).

Table 49.12. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Single-directional	39	43	43	96.9
Single-directional	24	47	39	58.2

The retouched tools consist of a retouched piece and a biface. The retouched piece is a large chalcedony flake fragment with unidirectional dorsal retouch along an edge with an angle of 80 degrees. The biface is a proximal fragment with an edge angle of 80 degrees, indicating that it was broken during the early stage of manufacturing.

Tool Use

One piece of debitage exhibits evidence of edge damage that could be attributed to use. It is a core flake with a concave/convex-shaped damaged lateral edge with an angle of 55 degrees. The retouched flake also exhibits rounding/polish along the edge. This tool could have been broken during the resharpening process.

The ground stone artifacts include manos. One of the manos is a two-hand variety made on an oblong-shaped schist cobble with a single heavily ground flat surface (Figure 49.4). The other two manos are cobble fragments with one and two ground surfaces that are flat and convex-shaped. Lastly, the undetermined piece of ground stone is a piece of dacite with the high points ground on a single side. This artifact could be a mano fragment or a small grinding slab.

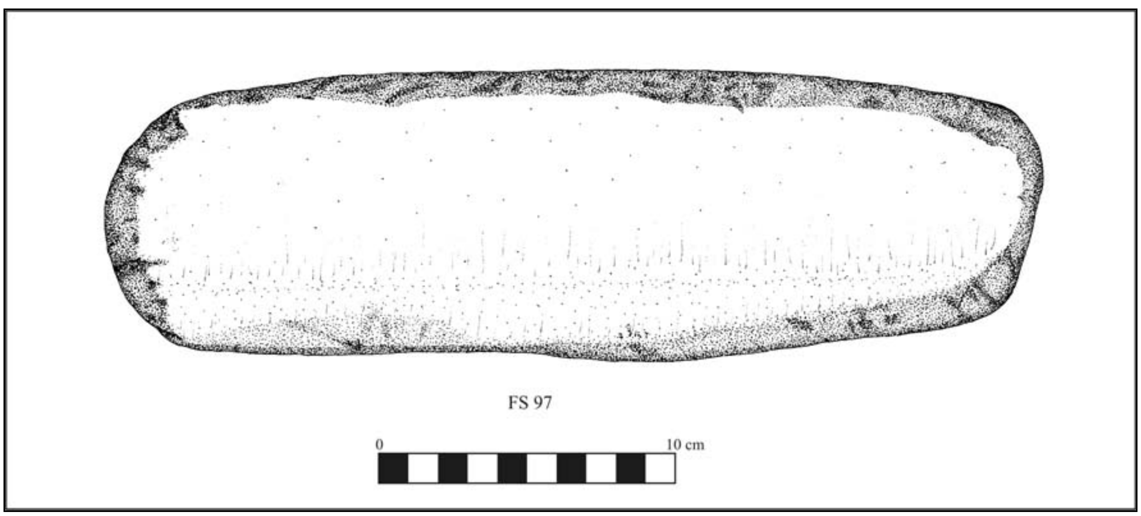

Figure 49.4. Two-hand mano.

Faunal Remains (Kari Schmidt)

Two pieces of unidentified bone were recovered from LA 127627. The bones were both recovered from the same unit (103N/107E), both were burned, and both were very small. Both pieces of bone were recovered from the fill of the fieldhouse, and both contained old breaks.

Archaeobotanical Remains (Pamela McBride)

Cultural plant material consisted of conifer duff, unknown seeds and plant parts, corn cupules, and a goosefoot seed fragment (Table 49.13). More conifer duff was recovered unburned, along with annual seeds and grass parts.

Table 49.13. Flotation plant remains, count, and abundance per liter from LA 127627.

FS No.	**9**	**31**	**52**
Feature	Living surface	Occupational fill	Under stone in NW corner
Cultural			
Annuals			
Cheno-Am	1(0)		
Cultivars			
Maize	2(1) c	2(1) c, 1(1) cs	1(0) c
Other			
Unidentifiable	1(0), 5(0) pp	1(0), 2(0) pp	3(2) pp
Unknown #1			1(1)
Perennials			
Juniper			+ twig
Pine	+ umbo		cf. 1(1), + barkscale, + umbo
Piñon	+ needle		+ needle
Ponderosa pine	+ needle	+ needle	+ fascicle, + needle
Non-Cultural			
Annuals			
Amaranth	+		
Goosefoot			+
Purslane			+
Other			
Spurge			+
cf. Wild lettuce			+
Grasses			
Grass family			+ floret, + stem
Ricegrass			+
Perennials			
cf. Douglas fir			+ needle
Juniper			+ twig

FS No.	9	31	52
Pine			+ umbo
Piñon			+, + needle
Ponderosa pine		+ needle	+ needle

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter, c cupule, cf. compares favorably, cs cupule segment, pp plant part.

Coniferous woods dominated the wood assemblage; two fragments of oak identified in occupational fill were the only representatives of non-conifer wood (Table 49.14). Ponderosa and pine were the most abundant wood taxa, but may not be cultural in origin as the site area was heavily burned in the Cerro Grande fire. A single fragment of juniper was recovered from under the stone in the northwest corner of the structure. Corncobs and possibly local woods were used for fuel and site occupants may have consumed goosefoot (but considering only a fragment was recovered and the condition of the site, this is equivocal at best).

Table 49.14. Flotation sample wood charcoal by count and weight in grams.

FS No.	9	31	52
Feature	Living surface	Occupational fill	Under stone in NW corner
Conifers			
Juniper			1/<0.1 g
Pine	2/<0.1 g	3/0.1 g	1/0.4 g
Ponderosa pine	3/<0.1 g	3/0.2 g	2/0.1 g
Unknown conifer	5/0.1 g	2/<0.1 g	1/<0.1 g
Non-Conifers			
Oak		2/<0.1 g	
Totals	**10/0.1 g**	**10/0.3 g**	**5/0.5 g**

Pollen Remains (Susan Smith)

Six pollen samples were analyzed from LA 127627. Table 49.15 lists the frequency of identified pollen types. No cultigens or other economic resources were identified in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 49.15), and these are discussed in detail in Smith's chapter in Volume 3.

Table 49.15. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 127627 (*n* = 6)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	0
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 127627 (*n* = 6)
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	1
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	4
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	1
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs	Cheno-Am	Cheno-Am	6
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 127627 (*n* = 6)
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	4
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	1
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	2
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	3
	Abies	Fir	1
	Pinus	Pine	5
		Pine Aggregates	1
	Pinus edulis type	Piñon	4
	Juniperus	Juniper	5
		Juniper Aggregates	0
	Quercus	Oak	4
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	1

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 127627 (*n* = 6)
	Artemisia	Sagebrush	3
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	2
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY OF SITE EXCAVATIONS

LA 127627 consists of a one-room fieldhouse. The site was situated on the terrace overlooking the adjacent drainage in Rendija Canyon, with the room constructed to offset the northwest-facing slope. The walls were built from local dacite cobbles and tuff blocks, with several boulders integrated into the architecture. Excavations revealed a single unprepared living surface with no interior features. This surface was situated at the top of the Bt1b1 horizon, with the post-occupational fill being composed of the Bw soil. The majority of the artifacts were recovered from the fill of the structure, with a concentration located to the immediate northeast that could represent an outside activity area. Although no cultigens were recovered, the site presumably was occupied during the growing season with maize being cultivated. The radiocarbon dates and ceramic evidence indicate a Middle Classic period occupation during the 15^{th} century.

CHAPTER 50
RENDIJA TRACT (A-14): LA 127633

Michael J. Dilley and Bradley J. Vierra

INTRODUCTION

LA 127633 is the remains of a rock feature consisting of four upright slabs, with several other blocks eroding downslope. The site is located on a north-south-trending ridge near the bottom of Rendija Canyon. The northern and western (upslope) portion of the site remains intact while the southern and eastern sides of the site have eroded downslope. Vegetation on the site consists of ponderosa pine and various tall grasses, with a heavy pine duff ground cover. The site is situated at an elevation of 2109 m (6900 ft).

The site was first recorded on April 1, 1999, by Hoagland and Campbell during a survey for the Conveyance and Transfer Project and given the temporary site number of Q-195. The site was initially recorded as a rock feature, possibly representing the remains of a structure foundation. No surface artifacts were recorded. The site was partially eroded and some questions were raised about the presence of intact subsurface deposits.

FIELD METHODS

Before excavation proceeded, the slab feature and surrounding area was cleared of fallen trees and underbrush to ensure safe working conditions and to expose the extent of the feature. The feature was visible as four unshaped upright dacite slabs with several other dacite and tuff blocks eroding downslope (Figure 50.1). The slab feature was 1.3 m in length (east-west) and 1 m in width (north-south). An arbitrary site datum was established (designated 100N/100E) and the site was then covered with a 1- by 1-m grid that extended 2 m north and 4 m east of the site datum. Two subdatums (A-B) were established for taking elevations and pre-excavation photographs were taken (see Figure 50.1). A surface survey of the site was conducted, and no artifacts were recovered. A 1- by 3-m east-west trench (101N/101-103E) was then excavated across the feature. The purpose of this trench was to expose the stratigraphy of the site and to determine the extent of the feature. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. No living surface was determined, and the excavations were terminated at the base of the upright slabs. Upon completion of the trench excavation, the rest of the feature area was then excavated by grid unit and strata, with thicker units excavated in arbitrary 10-cm levels. Since excavated units outside the feature produced no subsurface deposits, excavations focused on the interior of the structure. A total of seven units were excavated for this feature (Area 1). Grid unit 101N/101E served as a geomorphic test pit and was excavated below the base of the upright slabs into the Btjb1 horizon.

Figure 50.1. Pre-excavation photograph of the feature at LA 127633.

Approximately 10 m downslope to the southwest of the slab feature, a rough alignment of tuff blocks was partially exposed on the surface of the ridge slope (Area 2). The grid was extended to include the possible alignment. A second trench was excavated to investigate this area for possible cultural deposits. The trench was oriented north-south to accommodate the slope and included grids 89-91N/98E. A subdatum (C) was established to take elevations. No cultural deposits were determined for this area, but the trench was utilized for further geomorphological investigations. A total of three units were excavated in Area 2.

Soil and pollen samples were taken from selected locations in both Areas 1 and 2, and all other soil was screened through a 1/8-in. screen to recover any artifacts. Subsequent to excavation, both areas were mapped (Figure 50.2) and photographed (Figure 50.3).

The excavation of the site was supervised by Michael Dilley. The field crew included Sandi Copeland, Hannah Lockard, Rhonda Robinson, and Bradley Vierra. Timothy Martinez represented San Ildefonso Pueblo as site monitor.

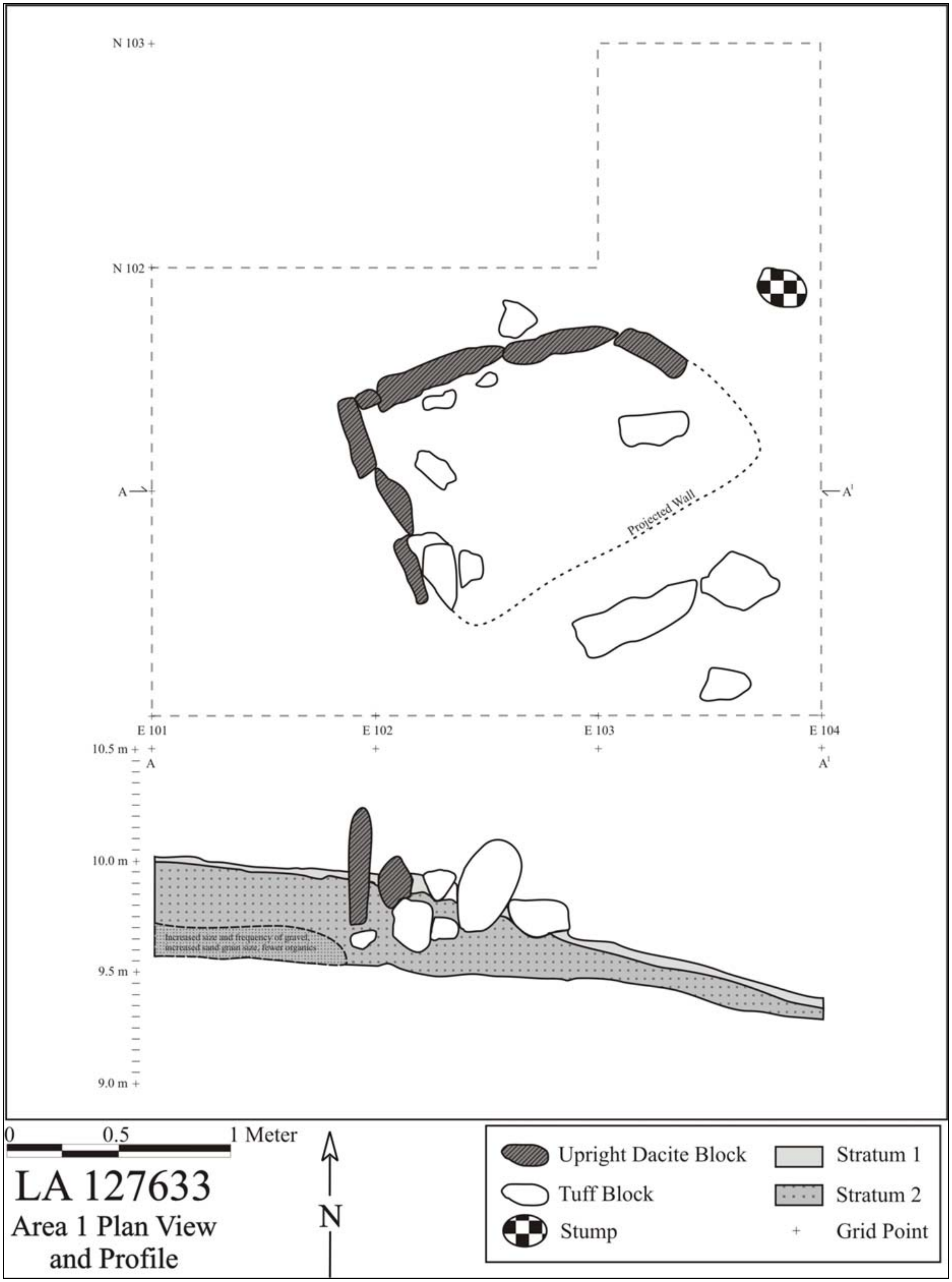

Figure 50.2. Plan view and profile of the excavations in Area 1.

Figure 50.3. Post-excavation photograph of Feature 1.

STRATIGRAPHY

Stratum 1 is the loose surface sediment, consisting of loamy sand and pine duff (Table 50.1). The stratum is 3 to 9 cm thick across Area 1 and 1 to 6 cm thick in Area 2. Stratum 2 is post-occupational fill and semi-consolidated soils consisting of loamy sand with gravel inclusions, ranging from 9 to 56 cm in thickness in Area 1. In Area 2, Stratum 2 was not considered post-occupational fill, but included the semi-consolidated soils, ranging from 6 to 57 cm in thickness (Table 50.2). Excavation below Stratum 2 was limited to geomorphological investigations and included sterile soils.

Table 50.1. Area 1 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 6/3	Loamy sand/ pine duff	3–9	Surface sediment
2	8.75 YR 4/3	Loamy sand w/gravel inclusions	9–56	Semi-consolidated fill
3	10YR 4/3	Sandy soil w/gravels/pumice	56+	Sterile

Table 50.2. Area 2 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 5/3	Loamy sand/pine duff	1–6	Surface sediment
2	10YR 6/3	Loamy sand w/gravel inclusions	6–57	Semi-consolidated fill
3	7.5YR 5/4	Sandy soil w/gravels/pumice	57+	Sterile

SITE EXCAVATION

Area 1, Feature 1

Sequence of Excavation. Area 1 included the slab feature (Feature 1), which consisted of four upright dacite slabs (see Figure 50.3). Feature 1 is considered to be a possible storage bin. The feature measures 1.3 m east-west by 1.0 m north-south. Feature 1 is situated on an eroding south-facing slope and the four upright slabs were all that remained intact. Excavation began with an east-west trench across the feature (101N/101-103E). The trench was excavated in an attempt to define the feature and to determine the extent and condition of the feature. Upon completion of the trench excavation, the remainder of the feature area was excavated by grid down to the base of the upright slabs. Grids surrounding the feature were also excavated, but were determined to contain no additional cultural information and were abandoned in favor of concentrating on excavation of the feature's interior. During the excavation of the interior of Feature 1, several tuff and dacite blocks were recovered as well as several small fragments, these rocks were recorded as possible construction materials. No floor, defined living surface, or additional feature elements were encountered. After the feature excavation was completed, samples were taken and the feature was mapped and photographed.

Fill. The interior of the feature was filled with 1 to 10 cm of loose surface sediment overlying 10 to 56 cm of a semi-consolidated post-occupational fill. The soil below the loose surface sediment was a loamy sand (BC horizon) that contained numerous small gravel inclusions that increased in size and frequency with depth, indicating episodic erosion. Flotation (Field Specimen [FS] 2) and pollen samples (FS 3) were taken from the Feature 1 fill. The flotation sample was not analyzed, but taxa identified in the pollen sample included grass family, cheno-ams, sunflower family, fir, unidentified pine, piñon pine, juniper, and oak.

Floor. No floor or living surface was determined for Feature 1. Due to the feature's location on an eroding slope, a good portion was eroded away, and any interior surface was also eroded away. There also was root and rodent disturbance noted within the interior of the feature. As best as could be determined, the base of the upright slabs was used as an indicator of the living surface. No artifacts were recovered from the interior. Flotation (FS 14 and FS 15) and pollen

(FS 11, FS 12, and FS 13) samples were taken from the interior of the feature. FS 14 was analyzed and the only charred taxon identified was ponderosa pine. Taxa identified in the pollen samples included rose family, buckwheat, mustard family, grass family, cheno-ams, sunflower family, spurge family, fir, unidentified pine, piñon pine, juniper, oak, ash, Mormon tea, and sagebrush.

Wall Construction. Feature 1 was constructed of upright dacite slabs, only four of which remained in place. These slabs made up the north and west walls of the feature. The slabs, as far as could be determined due to the eroded nature of the area, were set into the BC soil horizon. The slabs were apparently held in place, or supported by, smaller rocks that were situated at and against the base of the slabs. Several of these smaller rocks were still noted in place and several more were encountered in the fill during excavation. There was also some evidence of possible mortar still in place. Some hardened clay/adobe was exposed at the base of the large slab in grid 101N/102E. There also were some larger tuff rocks included in the fill of the feature's interior that may represent additional construction material, or were weights used to hold down a cover of the feature. Units excavated outside of Feature 1, immediately to the south, produced additional tuff and dacite rubble (additional dacite slab fragments were also noted on the surface downslope), indicating the possibility that the south and east side of the feature had eroded downslope.

Area 2

Sequence of Excavation. Area 2 consisted of a suspected rock alignment that was located approximately 10 m downslope to the southwest of Feature 1. The alignment included several partially buried tuff blocks transversing a narrow eroding ridge. A test trench was excavated north-south through the suspected tuff block alignment (89-91N/98E).

Fill. Fill from the trench excavation consisted of a loose surface sediment including pine duff (Stratum 1) that was 1 to 6 cm in thickness, a semi-consolidated loamy sand with dacite and pumice inclusions (Stratum 2) that was 6 to 21 cm thick, and a more consolidated, darker fine-grained loamy sand (Stratum 3) that was 21 to 57 cm thick (Figure 50.4). Pollen (FS 8) and flotation (FS 9) samples were taken from the fill, but were not analyzed.

Excavation of the trench produced no subsurface cultural deposits. No actual alignments were exposed and no artifacts were recovered. The area was then abandoned, but the trench was subsequently utilized in a geomorphological profile.

Geomorphic Analysis

A single grid unit was excavated below the BC horizon (Stratum 2) to serve as a geomorphic test pit in Area 1. The profile of this unit was analyzed by geomorphologists Paul Drakos and Steven Reneau. A soil sequence was determined consisting of an A horizon young colluvium topsoil (middle-late Holocene), a BC/IIC young colluvium post-occupation (middle-late Holocene), and a IIIBwb1 horizon (middle-late Holocene).

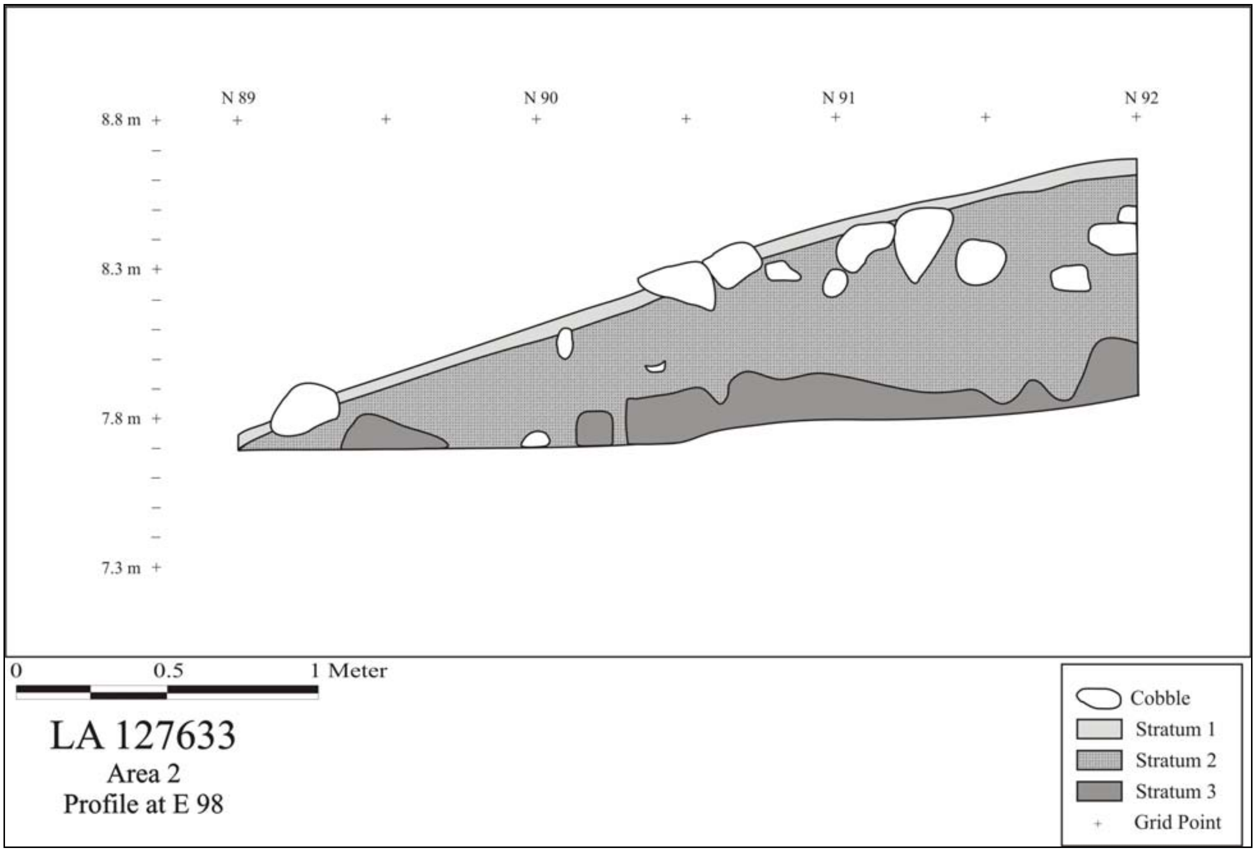

Figure 50.4. Profile of the 98E line in Area 2.

In Area 2, a test trench was excavated (89-91N/98E) into the slope of the ridge 10 m below Area 1. The profile of this trench was also analyzed by Paul Drakos and Steven Reneau. A soil sequence was determined consisting of an A horizon late-Holocene topsoil, a BC horizon late Holocene, and a Btjb1 horizon middle-late Holocene.

The likely occupation surface at LA 127633 is within the upper part or at the top of the BC soil horizon. The weak soil development both above and below the structure indicates a likely Classic period age.

SITE CHRONOLOGY AND ASSEMBLAGE

Only two artifacts were analyzed from the excavations conducted at LA 127633. Flotation and pollen samples were selected for analysis from the post-occupational fill (Stratum 2) (Table 50.3). The results of the artifact and sample analyses are presented in the following sections.

Table 50.3. Samples selected for analysis from LA 127633.

Stratum	Flotation	Pollen	Radiocarbon	TL*
1				
2	2,4,14	3,5,11,13		
3				

*thermoluminescence

Ceramic Artifacts (Dean Wilson)

A single plain gray body sherd was the only ceramic artifact that was recovered from the site. It is a jar body sherd that was tempered with smeared-indented sand.

Lithic Artifacts (Bradley Vierra and Michael Dilley)

A single Pedernal chert core was the only lithic artifact recovered from LA 127633. It was reduced using a bidirectional, 90-degree technique and was classified as being discarded due to extensive hinging/stepping. Table 50.4 presents the metric information on the core.

Table 50.4. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Bidirectional	75	62	33	164.3

Archaeobotanical Remains (Pamela McBride)

Contexts associated with a rectangular feature that could be all that remains of a storage bin or cist, produced carbonized goosefoot seeds, ponderosa pine needles, and unidentifiable plant parts (Table 50.5). The site was extremely compromised, the southern and eastern sides of the site having eroded downslope. Wood taxa were limited to ponderosa pine and unknown conifer (Table 50.6). Considering the poor condition of the site, the charred plant remains are most likely non-cultural.

Table 50.5. Flotation plant remains, count and abundance per liter from LA 127633.

FS No.	4	6	10	14
Feature	West end next to No. slab	East end next to No. slab	Post-occupational fill	NE ¼ of Feature against upright
Cultural				
Annuals				
Goosefoot		1(1)		
Other				
Unidentifiable		4(0) pp		1(0) pp

FS No.	4	6	10	14
Perennials				
Ponderosa pine		+ needle, + needle pc	+ needle	
Non-Cultural				
Annuals				
Goosefoot	+			
Perennials				
Ponderosa pine	+ needle			+ needle

+ 1-10/liter, pc partially charred, pp plant part.

Table 50.6. Flotation sample wood charcoal by count and weight in grams.

FS No.	4	6	10	14
Feature	West end next to No. slab	East end next to No. slab	Post-occupational fill	NE ¼ of Feature against upright
Conifers				
Ponderosa pine	1/<0.1 g	4/0.1 g	1/<0.1 g	2/0.1 g
Unknown conifer			1/<0.1 g	
Totals	**1/<0.1 g**	**4/0.1 g**	**2/<0.1 g**	**2/0.1 g**

Pollen Remains (Susan Smith)

Five pollen samples were analyzed from LA 127633. Table 50.7 lists the frequency of identified pollen types. No cultigens were identified in the botanical assemblage. Lily family was the only other economic resource that was identified in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 50.7), and these are discussed in detail in Smith's chapter in Volume 3.

Table 50.7. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 127633 (*n* = 5)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	0
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 127633 (*n* = 5)
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	1
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	1
	Brassicaceae	Mustard Family	1
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	5
		Grass Aggregates	1
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs	Cheno-Am	Cheno-Am	5
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 127633 (*n* = 5)**
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	5
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	1
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	1
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	5
	Pinus	Pine	5
		Pine Aggregates	2
	Pinus edulis type	Piñon	5
	Juniperus	Juniper	5
		Juniper Aggregates	0
	Quercus	Oak	3
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	2

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 127633 (*n* = 5)**
	Artemisia	Sagebrush	4
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	1
Exotic	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY OF SITE EXCAVATIONS

LA 127633 consists of a rectangular feature with upright slabs that could be the remains of a storage bin or cist. The presence of a single plain gray jar sherd could indicate a Classic period occupation. No evidence of cultigens was recovered.

CHAPTER 51
RENDIJA TRACT (A-14): LA 127634

Gregory D. Lockard

INTRODUCTION

LA 127634 is a small one-room Classic period fieldhouse situated on a ridge finger overlooking Rendija Canyon. The site is located 340 m north of the Rendija Canyon bottom and just east of site LA 127635, which is another small one-room fieldhouse (see Chapter 52, this volume). The site is on a slope of approximately four degrees. The surrounding area is covered with ponderosa pine trees, most of which were severely burned in the Cerro Grande fire, and a scattering of juniper trees. The understory is dominated by several grass and wildflower species. The site is situated at an elevation of 2115 m (6940 ft).

The site was first surveyed on April 1, 1999, by Hoagland and Campbell and given a temporary site number of Q196. In the Laboratory of Anthropology Site Record, they interpret the site as a two-room fieldhouse. Nineteen artifacts were discovered in a surface survey of the site and analyzed in the field. Fourteen lithics were encountered. Eleven were Pedernal chert, two were black translucent obsidian, and one was rhyolite. Five biscuitware sherds were encountered, three of which were identified as Biscuit B. The structure was therefore presumed to date to the Classic period (AD 1325–1600).

FIELD METHODS

Before excavation, the site and surrounding area were cleared of trees and large undergrowth. An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the southwest corner of the site. The site was then covered with a 1- by 1-m grid system that extended 7 m north and 8 m east of the site datum, and four subdatums (A-D) were set up for taking elevations (Figure 51.1). The site was then photographed and surface collected. A ceramic sherd and a lithic were the only artifacts encountered in the surface collection.

A 6- by 1-m east-west trench was initially excavated across the middle of the rock alignments and wallfall visible on the surface of the site (103N/100-105E). The purpose of this trench was to define and present a profile of the stratigraphy both within and outside of the structure, as well as to determine the location of the east and west walls of the structure. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. During the excavation of grid 103N/103E, a small patch of burned floor was encountered. Excavation within the structure thereafter proceeded down to the level of this patch of floor. In the areas of the trench to the east and west of the structure, excavation proceeded down to the top of the sterile Btkb1 horizon. The westernmost unit in the trench (103N/100E) was chosen to serve as a test pit for geological analysis. Excavation in this unit therefore continued through the Btkb1 horizon down to the underlying Bandelier Tuff bedrock. The north profile of the trench was then drawn and photographed.

Figure 51.1. Pre-excavation photograph of LA 127634.

The rest of the site was subsequently excavated, again by strata and arbitrary levels for thicker strata. In all, 29 units were excavated. Within the structure, excavation proceeded down to the floor surface where present. In areas where no clearly discernible floor surface was encountered, excavation proceeded down to a compact surface often found at or just below the level of nearby patches of well-preserved floor. This compact sediment is most likely the floor matrix that was once just beneath the floor's smooth surface. Outside of the structure, excavation proceeded down to the top of the sterile Btkb1 horizon. Excavation included the removal of rocks that could be clearly identified as wallfall to define the structure's walls and locate any internal or external features.

Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifactual remains. The excavation area was extended approximately 1 m outside of the structure in all directions to locate external features and identify outside activity areas. The excavations were extended 2 m to the east of the structure as this area contained the highest concentration of artifacts at the site and may therefore have been an outdoor activity area. The site was then mapped (Figure 51.2) and photographed (Figure 51.3).

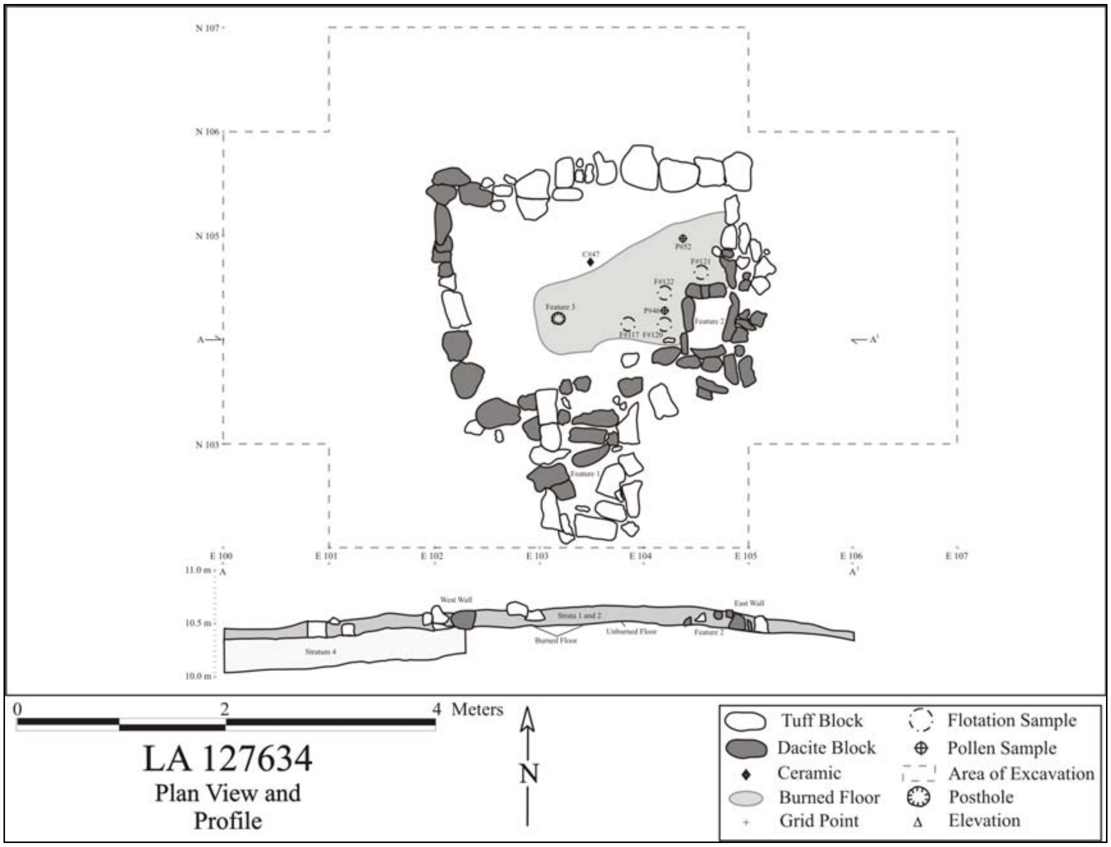

Figure 51.2. Plan view and profile drawing of the fieldhouse at LA 127634.

Figure 51.3. Post-excavation photograph of LA 127634.

The excavation of the site was supervised by Greg Lockard. Crewmembers included Joseph Aguilar, Brandon Gabler, and Jeanine Wood. Aaron Gonzalez and Michael Chavarria served as site monitors, representing San Ildefonso and Santa Clara pueblos, respectively.

STRATIGRAPHY

Stratum 1 is composed of loose surface sediment. It is uniformly 2 to 10 cm thick across the site and is roughly equivalent to the top half of the A horizon (topsoil). Stratum 2, which ranges from 7 to 25 cm thick in the area excavated, is post-occupational fill. This fill was thickest in and around the structure, especially in the area just south (downhill) of its north wall. Stratum 2 includes the lower half of the A horizon. A thin Bw horizon may have also existed in some areas of the site, although it was not present in the profile analyzed by geologists Paul Drakos and Steven Reneau. Stratum 3 is a prepared floor within the structure and Stratum 4 is the sterile Btkb1 horizon. The Btkb1 horizon, upon which the structure was built, contains discontinuous $CaCO_3$ coatings and is most likely a Pleistocene colluvium. Stratum 5 is the ashy fill from a slab-lined hearth (Feature 2) and Stratum 6 is the fill from a small posthole (Feature 3), both of which are inside the structure. Tables 51.1 through 51.3 summarize and describe the strata excavated at LA 127634.

Table 51.1. LA 127634 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 5/3	Loamy sand	2–10	Surface sediment
2	10YR 5/3	Loamy sand	7–25	Post-occupational fill
3	10YR 5/2	Clay	-	Room 1 floor
4	7.5YR 4/6	Sandy clay loam	25	Late-Pleistocene soil
5	10YR 6/2	Loamy sand	10	Feature 2 (hearth) fill
6	10YR 5/3	Loamy sand	7	Feature 3 (posthole) fill

Table 51.2. LA 127634 soil horizon descriptions from the north profile of the geological test pit (103N/100E).

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 5/3	Loamy sand	0–6	Topsoil
Btkb1	7.5YR 4/6	Sandy clay loam	6–23	Late-Pleistocene soil
IICBk	-	-	23–36+	Bedrock

Table 51.3. LA 127634 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	6	2	0	0	**8**
1	50	33	1	0	**84**
2	96	69	2	0	**167**

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
3	1	0	0	0	**1**
4	0	0	0	0	**0**
5	0	0	0	0	**0**
6	0	0	0	0	**0**
Total	**153**	**104**	**3**	**0**	**260**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is the only room in a small fieldhouse. The room measures 1.80 m north-south by 2.50 m east-west, with approximately 4.50 m^2 of interior space. Excavation of the room began with the east-west trench that extended across the site (103N/100-105E). The excavation of this trench served to define the stratigraphy and locate the east and west walls and floor of the room. After the excavation of the trench, the rest of the room was excavated down to the floor level and then photographed. A small test pit was subsequently excavated below the floor level in unit 104N/103E. The purpose of this test pit was to determine whether there were any additional living surfaces below. No additional living surface was encountered. In addition, the geological test pit (103N/100E) was extended eastward to the west wall of the room to ascertain how deep the foundation of the west wall extends in that location. The wall foundation was found to extend only a couple of centimeters into the Btkb1 horizon, indicating that the structure was basically built directly on top of this surface.

Fill. The room was filled with 2 to 10 cm of surface sediment and 10 to 20 cm of post-occupational fill. The fill was thickest just south (downhill) of the room's north wall. Two flotation samples were taken of Room 1 fill (Field Specimen [FS] 39 and FS 84), one of which came from directly on top of floor (FS 84). Charred taxa in these samples included piñon pine, ponderosa pine, sagebrush, unidentified pine, maize, mountain mahogany, unknown conifer, cottonwood/willow, and oak. Two pollen samples (FS 40 and FS 72) were also taken of Room 1 fill. One of these (FS 72) is from directly beneath a ground stone metate fragment that was at or near floor level (the floor was badly disturbed in this area). Taxa identified in these samples included maize, cholla, buckwheat, grass family, cheno-ams, sunflower family, ragweed/bursage, spurge family, spruce, fir, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

Floor. The first step in the construction of the living surface of Room 1 was to clear the area of loose surface sediment and expose the top of the more compact Btkb1 horizon. The living surface has about the same slope as the surrounding hillside (sloping upward to the northwest), and therefore does not appear to have been leveled. The surface was not plastered. It was, however, covered with a thin layer of clay-rich sediment (i.e., adobe). This layer of adobe was either added to the top of or formed by wetting and packing down the surface of the Btkb1 horizon. This floor is very poorly preserved except where it was burned. This burning is most extensive near Feature 2, which is a slab-lined hearth located in the southeast corner of the room. The floor is best preserved just to the north and especially west of the hearth. In the western third of the structure, the floor is very poorly preserved and in places indiscernible.

Burned, hardened adobe was also encountered on top of the rock slab that defines the northern border of the Feature 2. This adobe is most likely the remains of a collar that covered the stone slab that defines the northern boundary of the hearth. The two slabs that form the western boundary of the hearth were probably also covered by the adobe collar. The slabs to south and east, on the other hand, probably were not covered with adobe as they extend significantly higher above the floor level and directly abut the perimeter wall of the structure. In addition to the hearth (Feature 2), the floor is also associated with a posthole (Feature 3). This posthole, which is located just to the southwest of the center of the room, is 9 cm in diameter and 7 cm deep.

Two pollen samples (FS 46 and FS 52) were taken from directly on top of the living surface. Taxa identified in these samples included maize, prickly pear, beeweed, rose family, buckwheat, grass family, cheno-ams, sunflower family, ragweed/bursage, spurge family, evening primrose, fir, unidentified pine, piñon pine, oak, and sagebrush. Four flotation samples (FS 117 and FS 120-122) were taken of burned floor matrix. Three of these are from areas directly to the west (FS 120 and FS 122) and north (FS 121) of the slab-lined hearth (Feature 2). Charred taxa identified in the samples taken from west of the hearth included piñon pine, ponderosa pine, unidentified pine, maize, oak, squash/coyote gourd, mountain mahogany, and unknown conifer. Charred taxa identified in FS 121 included juniper, piñon pine, ponderosa pine, unidentified pine, maize, beeweed, bugseed, and unknown conifer, while charred taxa identified in FS 117 included ponderosa pine, oak, goosefoot, unknown conifer, sagebrush, piñon pine, and unidentified pine. Two charcoal samples were also taken from these areas (FS 118 and FS 119) to serve as radiocarbon samples if no better botanical samples are recovered from flotation samples, but these samples were not analyzed.

Wall Construction. The rocks that form the perimeter walls of the fieldhouse are mostly long shaped tuff blocks (Table 51.4). Dacite cobbles were also used, especially as foundation rocks. As mentioned above, the geological test pit was extended eastward to the west wall of Room 1 in order to determine how deep the wall foundation is in this location. The wall foundation was found to extend only a few centimeters into the Btkb1 horizon, upon which the Room 1 floor was built. The Room 1 perimeter walls did not therefore have a very deep foundation. The upright slabs that form the perimeter of Feature 2 (slab-lined hearth), on the other hand, were embedded much deeper into the Btkb1 horizon (they extend below the base of the hearth, which is about 15 cm below floor level). The remains of the north and west walls of Room 1 are still two courses high. The east and especially south walls are more poorly preserved. They are only a single course high and contain some small gaps were no *in situ* rocks were encountered. One of the gaps in the south wall, however, may be an entryway (see Feature 1 description below).

Table 51.4. LA 127634 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	2.60	0.13–0.35	0.17–0.34	1 to 2
South	2.30	0.05–0.15	0.10–0.30	1
East	1.75	0.05–0.11	0.10–0.30	1
West	1.85	0.08–0.25	0.10–0.22	1 to 2

The high quantity of wallfall encountered during the excavation of Room 1 indicates that the masonry portion of the walls were originally considerable higher than they are today. In order to estimate how much higher, all of the rocks removed as wallfall during the excavation were placed into two stacks for measurement. One of these stacks measured 2.95 by 0.58 by 0.25 m, for a total of 0.428 m^3. The second stack measured 3.40 by 0.80 by 0.35 m, for a total of 0.952 m^3. Based on the combined volume of these stacks of wallfall (1.38 m^3) and the overall length, average thickness, and average height of the extant portions of the walls, the masonry portion of the Room 1 wall was originally only about 94 cm in height. The upper part of the walls and ceiling were most likely composed of vegetal material and adobe. These materials are rarely preserved at archaeological sites on the Pajarito Plateau. In fact, four small pieces of burned adobe (FS 10, FS 60, FS 65, and FS 86) were the only evidence found of such a superstructure.

Feature 1 (Staircase/Entryway)

Feature 1 appears to be a staircase leading to the Room 1 entryway (Figures 51.4). It is an external feature located directly south of the central portion of the south wall of Room 1. The feature is composed of dacite cobbles and several shaped tuff blocks. The feature's south, east, and west perimeter walls are mostly composed of the shaped tuff blocks. The south and west perimeter walls are fairly well preserved, while the east perimeter wall appears to have been partially disturbed. The northern boundary of the feature is defined only by a couple of small dacite cobbles that appear to form the threshold (i.e., doorsill) of the entryway into Room 1. The feature measures approximately 1.5 m north-south by 1.0 m east-west.

Figure 51.4. Post-excavation photograph of Feature 2, an entryway/staircase.

Three long, flat dacite rocks are located within the feature. These rocks are oriented east to west and appear to have functioned as steps leading up to the entryway. If this interpretation is correct, the shaped tuff block that forms the south perimeter wall of the feature also functioned as the first step in the staircase. There is a gap of approximately 40 cm between this first step and the southernmost interior step. Originally, this gap was probably filled by another step that is now missing or displaced. If Feature 1 functioned as a staircase, it probably originally had five steps.

Feature 2 (Hearth)

Feature 2 is a rectangular, slab-lined hearth located in the far southeast corner of Room 1 (Figure 51.5).

Figure 51.5. Feature 2, a slab-lined hearth at LA 127634.

All of the slabs that form the perimeter of the hearth are dacite. Two upright slabs form the western border of the hearth and the other three borders are each formed by a single upright slab. The top of the slab that forms the northern border of the hearth has broken off. This area of the slab is covered with burned adobe, however, indicating that it was broken either before or during the occupation of the fieldhouse. The presence of adobe on top of this slab also suggests that an adobe collar once covered the northern border of the hearth. If this is the case, the adobe collar probably also covered the slabs that formed the western border of the hearth. The adobe collar probably did not cover the slabs that formed the southern and eastern borders of the hearth, on the other hand, as they extend significantly higher above the floor level and directly abut the perimeter wall of the structure. The interior of the hearth measures 47 cm north-south by 27 cm east-west and is 15 cm deep. The hearth was filled with very ashy sediment that contained some small pieces of charcoal. Burned, hardened adobe was encountered in the bottom corners of the hearth, especially the northwest corner. This adobe does not appear to be the remains of a hearth lining. Instead, the adobe appears to have been used only to fill in the places in between the slabs that form the hearth's perimeter.

A pollen sample (FS 104) was taken from beneath a rock lying directly on top of the ashy sediment that filled the hearth, at about floor level, but no taxa were identified. The rest of the ashy fill (Stratum 5) removed from the hearth was kept as eight flotation samples (FS 105 through FS 112). Charred taxa identified in these samples included maize, beans, tobacco, oak, banana yucca, goosefoot, sagebrush, ponderosa pine, beeweed, mountain mahogany, and piñon pine.

Feature 3 (Posthole)

Feature 3 is a posthole located just to the southwest of the center of Room 1 (Figure 51.6). The center of the posthole is located at 104.23N/103.16E on the excavation grid.

Figure 51.6. Post-hole (Feature 3).

The posthole is 9 cm in diameter and 7 cm deep. All of sediment excavated from within the posthole (Stratum 6) was kept as a pollen sample (FS 116). Taxa identified in this sample included maize, rose family, mustard family, grass family, cheno-ams, ragweed/bursage, sunflower family, unidentified pine, piñon pine, and sagebrush.

Geological Test Pit

A single unit (103N/100E) was excavated below the top surface of the Btkb1 horizon as a geological test pit. The north profile of this unit, which was analyzed by geologists Paul Drakos and Steven Reneau, contained a soil sequence consisting of A and Btkb1 horizons (see Table 51.2). The Btkb1 horizon rests directly on top of Bandelier Tuff bedrock. After the site was completely excavated and photographed, the northern half of the test pit was extended eastward to the west wall of Room 1 to determine the depth of the wall's foundation. This excavation revealed that the foundation of the west wall of Room 1 extends only a couple of centimeters into the Btkb1 horizon in that location.

Artifact Distribution

The usual pattern for prehistoric architecture on the Pajarito Plateau is for entryways to be placed in the east wall of residential rooms, presumably to take advantage of the light from the rising sun. Artifact density is usually high in the areas directly outside of the entryways, to the east of the rooms. One explanation for the high artifact density to the east of the rooms is that this locale functioned as an activity area. An alternative, or possibly complementary, explanation is that the artifacts were swept into the area from inside the rooms through their doorways. As Table 51.5 demonstrates, the majority of artifacts encountered from LA 127634 are from the area just east of Room 1. The entryway to Room 1, however, appears to be to the south (see Feature 1 description above). The increased artifact density to the east of the room therefore cannot be the result of sweeping artifacts through the doorway, and instead most likely reflects its use as an activity area. Surprisingly, the southern, downhill half of the area excavated did not contain significantly more artifacts than the northern, uphill half. This suggests that erosion was not a significant natural formation process affecting the distribution of artifacts at the site.

Table 51.5. LA 127634 artifact counts by grid unit.

	E100	E101	E102	E103	E104	E105	E106
N106		1	2	9	8		
N105	0	0	**3**	**5**	**7**	25	29
N104	0	1	**2**	**17**	**12**	21	14
N103	1	10	**6**	**7**	**13**	23	13
N102		6	5	2	12		

Note: Does not include six artifacts found outside of the excavated area during surface collection; bold numbers indicate grid units that are located completely or partially within Room 1.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 247 artifacts were analyzed from excavations at LA 127634. Analyses of the ceramics, lithics (chipped and ground stone), pollen, and archaeobotanical materials were conducted (Table 51.6). In addition, samples were submitted for radiocarbon, thermoluminescence (TL), and obsidian hydration dating. The results of these analyses, as well as associated tables, are presented in the following pages.

Table 51.6. Samples selected for analysis from LA 127634.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL
1				
2	39, 84	40, 72		43, 95
3	117, 120, 121, 122	46, 52		
4				
5	105, 106, 107, 108, 109, 110, 111, 112	104	105, 108	
6		116		

Chronology

Radiocarbon Dating

Two maize samples recovered from Feature 5 (hearth) were submitted for accelerator mass spectroscopy dating. The first sample provided a date of 350±40 BP (Beta-215556), with calibrated intercepts of AD 1510, AD 1600, and AD 1620, and a two-sigma range of AD 1470–1630. The second sample yielded a similar date of 340±40 BP (Beta-215557), with calibrated intercepts of AD 1520, AD 1590, and AD 1620, and a two-sigma range of AD 1480–1640.

Thermoluminescence Dating

Two Biscuit B sherds were submitted for Optically Stimulated Luminescence (OSL) dating from LA 127634 (Table 51.7). All derived ages are given in years BP, which refers to years before 2003, and both are consistent with a Middle Classic period date.

Table 51.7. Thermoluminescence dates from ceramics at LA 127634.

FS#	Lab #	Context	Burial depth (cm)	Years BP	% error	Years AD
43	UW1417	East wall Room 1	8	542	6.1	1464±33
95	UW1418	East of Room 1	17	512	5.5	1494±28

Obsidian Hydration Dating

Three obsidian artifacts from LA 127634 were submitted to the Diffusion Laboratory for age determination using the obsidian hydration dating method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rim, was measured. Second, the high-temperature hydration-rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site were estimated so that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 51.8).

Table 51.8. Obsidian hydration dates for LA 127634.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
8	2003-74	Cerro Toledo	4.49	1565	17
19	2003-75	Valle Grande	3.13	-2166	267
99	2003-76	Valle Grande	4.26	-5023	331

Relative to other dating methods conducted at the site, the obsidian hydration dates seem to be the least accurate. Radiocarbon and OSL dates indicate a Middle to Late Classic period date (16^{th} or 17^{th} century), with only one of the three obsidian samples providing a 16^{th} century date. The other two obsidian artifacts might have been scavenged from nearby Early and Middle Archaic sites.

Ceramic Artifacts (Dean Wilson)

One-hundred-forty-nine sherds were recovered from the fieldhouse at LA 127634. These primarily consist of Biscuit B/C (Biscuit B?) and Sapawe Micaceous sherds, which indicate a Middle Classic period date (16^{th} century). This corresponds with the presence of Sankawi Black-on-cream and glazeware ceramics, which also support a Classic period occupation. Tables 51.9 through 51.12 show the summary ceramic data for the site, including general type, types by tradition, temper material by ware type, and ware by vessel form. Most of the graywares and all of the whitewares contain local tempering material like smeared-indented sand to tuff; however, the glazewares and five graywares contain basalt temper and the Sapawe Micaceous sherds a granitic temper with mica. The graywares, micaceous wares, and most of the glazewares represent jar vessel forms. In contrast, the whitewares exhibit mostly bowls, with some jars.

Table 51.9. Distribution of ceramics types from LA 127634.

Ceramic Types	Frequency	Percent
Northern Rio Grande Whiteware		
Biscuitware unpainted slipped both sides	4	2.7
Biscuitware unpainted slipped one side	6	4.0
Biscuitware paint and slip absent	9	6.0

Ceramic Types	Frequency	Percent
Biscuit A	5	3.4
Biscuit B	6	4.0
Biscuit B/C	52	34.9
Sankawi Black-on-cream	2	1.3
Northern Rio Grande Utilityware		
Plain gray body	3	2.0
Sapawe Micaceous	50	33.6
Middle Rio Grande Utilityware and Glazeware		
"utility ware"	5	3.4
Glaze red body unpainted	3	2.0
Glaze yellow body unpainted	1	0.7
Glaze yellow body undifferentiated	1	0.7
Glaze unslipped body	1	0.7
Total	**149**	**100.0**

Table 51.10. Tradition by ware for LA 127634 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	3	100.0	85	100.0	0	0.0	0	100.0	88	59.0
Rio Grande (Tewa Micaceous)	0	0.0	0	0.0	0	0.0	50	100.0	50	33.5
Middle Rio Grande	5	0.0	0	0.0	6	100.0	0	100.0	11	7.3
Total	**8**	**100.0**	**85**	**100.0**	**6**	**0.0**	**50**	**0.0**	**149**	**100.0**

Table 51.11. Temper by ware for LA 127634 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Sand	0	0.0	1	1.1	0	0.0	0	0.0	1	0.6
Granite with mica	0	0.0	1	1.1	0	0.0	1	2.0	2	1.3
Highly micaceous paste	0	0.0	0	0.0	0	0.0	5	10.0	5	3.3
Fine tuff or ash	1	12.5	67	78.8	0	0.0	0	0.0	68	45.6
Fine tuff and sand	0	0.0	15	17.6	0	0.0	0	0.0	15	10.0
Fine sandstone	1	12.5	0	0.0	0	0.0	0	0.0	1	0.6
Anthill sand	1	12.5	0	0.0	0	0.0	0	0.0	2	1.3
Basalt	5	62.5	0	0.0	6	100.0	0	0.0	11	7.3
Sapawe Micaceous temper	0	0.0	1	1.1	0	0.0	44	88.0	44	29.5
Total	**8**	**100.0**	**85**	**100.0**	**6**	**0.0**	**50**	**100.0**	**149**	**100.0**

Table 51.12. Vessel Form by ware for LA 127634 ceramics.

Vessel Form	Ware				Total
	Gray	White	Glaze	Micaceous	

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	0	0.0	8	9.4	1	20.0	0	0.0	9	6.0
Bowl rim	0	0.0	8	9.4	0	0.0	0	0.0	8	5.3
Bowl body	0	0.0	58	68.2	0	0.0	0	0.0	58	38.9
Jar neck	1	12.5	0	0.0	0	0.0	2	4.0	3	2.0
Jar rim	1	12.5	1	0.0	0	0.0	2	4.0	4	2.6
Jar body	6	75.0	9	0.0	5	80.0	46	92.0	66	44.2
Jar rim with strap handle	0	0.0	1	0.0	0	0.0	0	0.0	1	0.6
Total	**8**	**100.0**	**85**	**100.0**	**6**	**0.0**	**50**	**100.0**	**149**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 98 artifacts were analyzed from LA 127634, consisting of 94 pieces of debitage, a retouched tool, and three ground stone artifacts. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 51.13 presents the data on lithic artifact type by material type. The debitage is primarily made of chalcedony and Pedernal chert, with some other materials. The presence of cortex on 17.0 percent of the debitage indicates that these materials were collected from waterworn (*n* = 15) and nodule (*n* = 1) sources. The chalcedony and Pedernal chert are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. The igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 51.13. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Sandstone	Total
Debitage	Angular debris	0	0	5	0	0	0	0	10	0	5	0	0	0	20
	Core flake	2	0	4	1	3	0	3	26	0	21	0	0	0	60
	Biface flake	0	0	0	0	0	0	1	3	0	0	0	0	0	4
	Bipolar flake	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Core trimming flake	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Microdeb.	0	0	0	0	0	0	0	4	0	0	0	0	0	4
	Und. flake	0	0	1	0	0	0	0	2	0	1	0	0	0	4

Artifact Type		Material Type													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Sandstone	Total
	Subtotal	2	0	10	1	3	0	5	46	0	27	0	0	0	94
Retouched Tools	Retouched piece	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Ground Stone	Und. mano	0	0	0	1	0	0	0	0	0	0	0	0	0	1
	Und. metate	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Misc.ground stone	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	1	1	1	0	0	0	0	0	0	0	3
Total		**2**	**0**	**10**	**2**	**4**	**1**	**5**	**47**	**0**	**27**	**0**	**0**	**0**	**98**

Three pieces of obsidian and two pieces of basalt debitage were submitted for X-ray fluorescence analysis. The obsidian artifacts are Valle Grande, Cerro Toledo, and El Rechuelos obsidian (Table 51.14). The Valle Grande (Cerro del Medio) and Cerro Toledo (Obsidian Ridge/Rabbit Mountain) source areas are situated about 17 km (11 mi) and 19 km (12 mi) to the west and southwest. Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present on the nearby mesa as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval. The El Rechuelos (Polvadera Peak) source area is located approximately 27 km (17 mi) northwest of the site. A single basalt flake is actually made of dacite that was derived from local sources, however, the other flake appears to be basalt.

Table 51.14. Obsidian source samples.

FS #	Artifact	Color	Source
8	Debitage	Translucent	Cerro Toledo rhyolite
19	Debitage	Black dusty	El Rechuelos
99	Debitage	Translucent	Valle Grande rhyolite

Lithic Reduction

The debitage mostly consists of core flakes and angular debris, with a few biface flakes and microdebitage. The presence of a single obsidian bipolar flake may reflect the reduction of small nodules that are locally available on the nearby mesa top. The overall cortical:non-cortical ratio of 27.2 reflects an emphasis on the later stages of core reduction and tool production/maintenance. The flakes mostly have single-faceted platforms (n = 20), with fewer cortical (n = 3), dihedral (n = 1), collapsed (n = 3), and crushed (n = 9) platforms. Only one of the platforms exhibit evidence of preparation by abrasion/crushing. The majority of the core flakes are distal fragments (n = 24), with fewer whole (n = 12), proximal (n = 19), and midsection (*n* = 5) fragments. In contrast, the biface flakes consist of two whole, one proximal, and a distal fragment. The whole core flakes have a mean length of 30.8 mm (*std* = 14.8), biface flakes a mean length of 13.0 mm (*std* = 2.8), and the angular debris a mean weight of 5.6 g (*std* = 12.6).

A single retouched flake was identified during the analysis. It exhibits unidirectional ventral retouch that creates a convex-shaped lateral edge with an angle of 70 degrees.

Tool Use

Three pieces of debitage exhibit evidence of edge damage that could be attributed to use. Two of the flakes have rounding/polish along a lateral edge with a straight outline and the third a concave outline. Each exhibits an edge angle of 55, 60, and 70 degrees, respectively.

The ground stone artifacts include a mano and metate. The mano is a fire-cracked cobble fragment with small ground areas on two opposing surfaces. The metate is also fire-cracked, consisting of a dacite fragment with a single ground surface. Lastly, the undetermined ground stone artifact is a black piece of tuff that has been shaped on two sides by abrasion and grinding to create two smooth flat surfaces.

Archaeobotanical Remains (Pamela McBride)

Aside from charred conifer duff, beeweed and corn were the most common taxa identified in flotation samples (Table 51.15). Banana yucca, beans, and tobacco seeds were found in samples from the hearth, while bugseed and possible squash rind were present in floor contexts near the hearth. This is quite a remarkable floral assemblage from a one-room fieldhouse. Carbonized tobacco indicates ritual activities may have taken place here that may have included using beeweed pigment to paint pottery or ritual items (Adams et al. 2002). Beeweed was of course also used extensively as a pot herb and the seeds were ground into a meal for flour or gruel (see Jones 1931 or Lange 1968a) and its presence may have more to do with food preparation rather than pigment manufacture.

Table 51.15. Flotation plant remains, count, and abundance per liter from LA 127634.

FS No.	**39**	**84**	**105**	**106**	**107**	**108**
Feature	Room 1, post-occupational fill, Stratum 2	Floor surface	Hearth fill 104N/104E			
Cultural						
Annuals						
cf. Beeweed				1(1)	7(6)	2(2)
Tobacco						1(1)
Cultivars						
Bean				cf. 5(0) cot	5(0) cot	

FS No.	**39**	**84**	**105**	**106**	**107**	**108**
Maize	6(2) c	1(0) cf. c	1(0) c, 1(1) e	3(0) c		2(0) c, 1(0) e pc
Other						
Unident.				2(0) pp	2(0) pp	
Perennials						
Piñon	+ needle					
Ponderosa pine	+ needle	+ needle		+ needle		
Non-Cultural						
Annuals						
Goosefoot	+	+		+		
Perennials						
Juniper					+ twig	
Piñon	+ needle			+ needle	+ needle	
Ponderosa pine	+ needle		+ needle	+ needle	+ needle	+ needle

Table 51.15 (continued). Flotation plant remains, count, and abundance per liter from LA 127634.

FS No.	**109**	**110**	**111**	**112**
Feature	Hearth fill 104N/104E			Hearth fill 103N/104E
Cultural				
Annuals				
cf. Beeweed	7(7), 1(0) pc	3(0)	1(1)	1(1)
Cultivars				
Maize	1(0) c, 2(0) cf. e pc			
Perennials				
Piñon				+ needle
Ponderosa pine	+ needle	+ needle	+ needle	+ needle
Banana yucca				1(1)

Table 51.15 (continued). Flotation plant remains, count, and abundance per liter from LA 127634.

FS No.	**117**	**120**	**121**	**122**
Feature	Floor matrix, level 4	Floor matrix W of hearth	Floor matrix N of hearth	Floor matrix NW of hearth
Cultural				
Annuals				
cf. Beeweed			1(1) pc	
Bugseed			1(1)	

FS No.	117	120	121	122
Cultivars				
Maize		2(0) c, 1(0) k	1(0) c	1(1) c
Other				
poss. Coyote gourd/Squash				+ rind
Perennials				
Juniper			+ twig	
Pine		+ barkscale	+ barkscale	+ barkscale
Piñon		+ needle	+ needle	+ needle
Ponderosa pine	+ needle	+ needle	+ needle	+ needle
Non-Cultural				
Annuals				
Goosefoot	+		+	
Perennials				
Piñon	+ needle		+ needle	+ needle
Ponderosa pine			+ needle	

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter, c cupule, cf. compares favorably, cot cotyledon, e embryo, k kernel, pc partially charred, pp plant part.

The wood assemblage at LA 127634 was composed of piñon, cottonwood/willow, ponderosa pine, mountain mahogany, oak, and sagebrush (Table 51.16). Site occupants probably used corncobs for fuel and the presence of kernels and embryos points to processing of maize. Compared to other fieldhouses in the Rendija Tract, LA 127634 and LA 127635 (see Chapter 52, this volume) yielded the greatest number of wild and domesticated taxa, including ritual plants, indicating that perhaps these sites were in use over a longer period of time.

Table 51.16. Flotation sample wood charcoal by count and weight in grams from LA 127634.

FS No.	39	84	105	106	107	108	109
Feature	Room 1, post-occupational fill, Stratum 2	Top of floor	Hearth fill 104N/104E				
Conifers							
Pine	2/0.2 g	3/<0.1 g	4/0.1 g	1/<0.1 g		1/<0.1 g	6/0.1 g
Ponderosa pine	13/0.6 g	11/0.7 g		1/<0.1 g		15/0.7 g	
Unknown conifer		1/<0.1 g	7/0.2 g	5/0.1 g	9/0.3 g	3/<0.1 g	5/0.1 g
Non-Conifers							
Cottonwood/ Willow		1/<0.1 g					

Mountain mahogany		1/<0.1 g				1/<0.1 g	
Oak	3/<0.1 g		4/<0.1 g				
Sagebrush	2/0.1 g						
Unknown Non-conifer					2/<0.1 g		
Totals	**20/0.9 g**	**17/0.7 g**	**15/0.3 g**	**7/0.1 g**	**11/0.3 g**	**20/0.7 g**	**11/0.2 g**

Table 51.16 (continued). Flotation sample wood charcoal by count and weight in grams from LA 127634.

FS No.	**110**	**111**	**112**	**117**	**120**	**121**	**122**
Feature	Hearth fill 104N/104E				Floor matrix W of hearth	Floor matrix N of hearth	Floor matrix NW of hearth
				Conifers			
Pine	1/<0.1 g	3/0.2 g		6/0.6 g		5/0.2 g	
Piñon				3/0.5 g	2/0.9 g		
Ponderosa pine	5/0.4 g	3/<0.1 g	2/<0.1 g	5/0.2 g	16/1.4 g	8/0.1 g	
Unknown conifer	2/<0.1 g		2/<0.1 g	2/<0.1 g		7/0.1 g	3/<0.1 g
				Non-Conifers			
Mountain mahogany			2/<0.1 g				2/0.1 g
Oak				1/<0.1 g	2/<0.1 g		
Sagebrush				3/0.1 g			
Totals	**8/0.4 g**	**6/0.2 g**	**6/<0.1 g**	**20/1.4 g**	**20/2.3 g**	**20/0.4 g**	**5/0.1 g**

Pollen Remains (Susan Smith)

Six pollen samples were analyzed from LA 127634. Table 51.17 lists the frequency of identified pollen types. Maize and cholla were the only cultigens identified in the botanical assemblage. Prickly pear and beeweed were the only other economic resources that were identified in the assemblage. A number of potential economic resources were also identified in the assemblage (Table 51.17), and these are discussed in detail in Smith's chapter in Volume 3.

Table 51.17. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 127634 (*n* = 6)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	4
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	1
Economic Resources	*Opuntia* (Platy)	Prickly Pear	1
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	1
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	2
	Eriogonum	Buckwheat	2
	Brassicaceae	Mustard Family	1
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	4
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	2
Riparian Types	*Populus*	Cottonwood, Aspen	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 127634 (*n* = 6)**
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs	Cheno-Am	Cheno-Am	5
		Cheno-Am Aggregates	2
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	5
		Sunflower Family Aggregates	1
	Ambrosia	Ragweed, Bursage	4
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	2
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	1
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees & Shrubs	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	3
	Pinus	Pine	5
		Pine Aggregates	1

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 127634 (*n* = 6)
	Pinus edulis type	Piñon	5
	Juniperus	Juniper	3
		Juniper Aggregates	0
	Quercus	Oak	0
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	1
	Ephedra	Mormon Tea	1
	Artemisia	Sagebrush	4
		Sagebrush Aggregates	1
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY OF SITE EXCAVATIONS

LA 127634 consists of a one-room fieldhouse, a staircase/entryway, a slab-lined hearth, and a posthole. All four walls were intact and appeared to contain an opening to the east. A formal floor was not identified, but the fieldhouse did contain a compact living surface. The slab-lined hearth contained both maize and beans. The ceramic, radiocarbon, and TL evidence indicate that the fieldhouse was probably occupied during the Middle Classic period.

CHAPTER 52
RENDIJA TRACT (A-14): LA 127635

Michael J. Dilley and Bradley J. Vierra

INTRODUCTION

LA 127635 consists of the remains of a one-room early Classic period fieldhouse. The site is located near the southern end of a low north-south trending ridge overlooking Rendija Canyon. Vegetation in the site area is primarily ponderosa pine with scattered junipers and various grasses, with a surface covering of pine duff. The site is situated at an elevation of 2120 m (6950 ft).

The site was first recorded on April 1, 1999, by Hoagland and Campbell during a survey for the Conveyance and Transfer Project and given the temporary site number of Q-197. The site was initially recorded as a one-room fieldhouse with very little remaining rubble but having an intact foundation with potential for subsurface deposits. Surface artifacts consisted of three ceramic sherds identified as a single Biscuit A and two non-micaceous plainware sherds. Based on the surface-identified artifacts, the site was tentatively dated to the Classic period.

FIELD METHODS

Before excavation proceeded, the site and surrounding area was cleared of felled trees and underbrush to ensure safe working conditions and to expose the extent of the structure. The structure was visible as a roughly rectangular outline of shaped and unshaped tuff blocks, roughly 3 m north-south by 2 m east-west in size. An arbitrary site datum was established (designated 100N/100E) and the site was then covered with a 1- by 1-m grid that extended 6 m north of the datum and 3 m east and 3 m west of the datum. Two subdatums (A and B) were set up for taking elevations. Pre-excavation photographs were then taken and the site was surveyed for surface artifacts. A 6- by 1-m trench was initially excavated across the site (grids 103N/97-103E) to determine stratigraphy and to locate the east and west walls of the structure. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. The west wall of the structure was encountered in unit 103N/98E, and the east wall was encountered in unit 103N/100E. The alignment of the walls was not oriented exactly north to south. Wall orientation was more along a northeast to southwest axis. Units excavated for the trench were taken down to a compact surface that was ashy with charcoal flecking imbedded. This surface was determined to be the floor (living surface).

Upon completion of the excavation of the trench, the remainder of the site was then excavated by grid unit and strata, with thicker units excavated in 10-cm arbitrary levels. A total of 21 units were excavated. Within the structure, units were excavated to the floor/living surface determined during the excavation of the trench. Outside the structure, units were excavated to the top of a sterile Bwb1 horizon. The focus of excavation was on defining the walls of the structure, removing wallfall, exposing the floor/living surface, and locating any internal or external features. Soil and pollen samples were taken from selected locations, and all other soil removed was screened through a 1/8-in. screen to recover any artifacts. Excavation was extended at least 1 m around the perimeter of the structure to locate any external features or activity areas. Subsequent to excavation the structure was mapped (Figure 52.1) and photographed (Figure 52.2). Grid unit 104N/101E was excavated below the Bw horizon to serve as a geomorphological test pit.

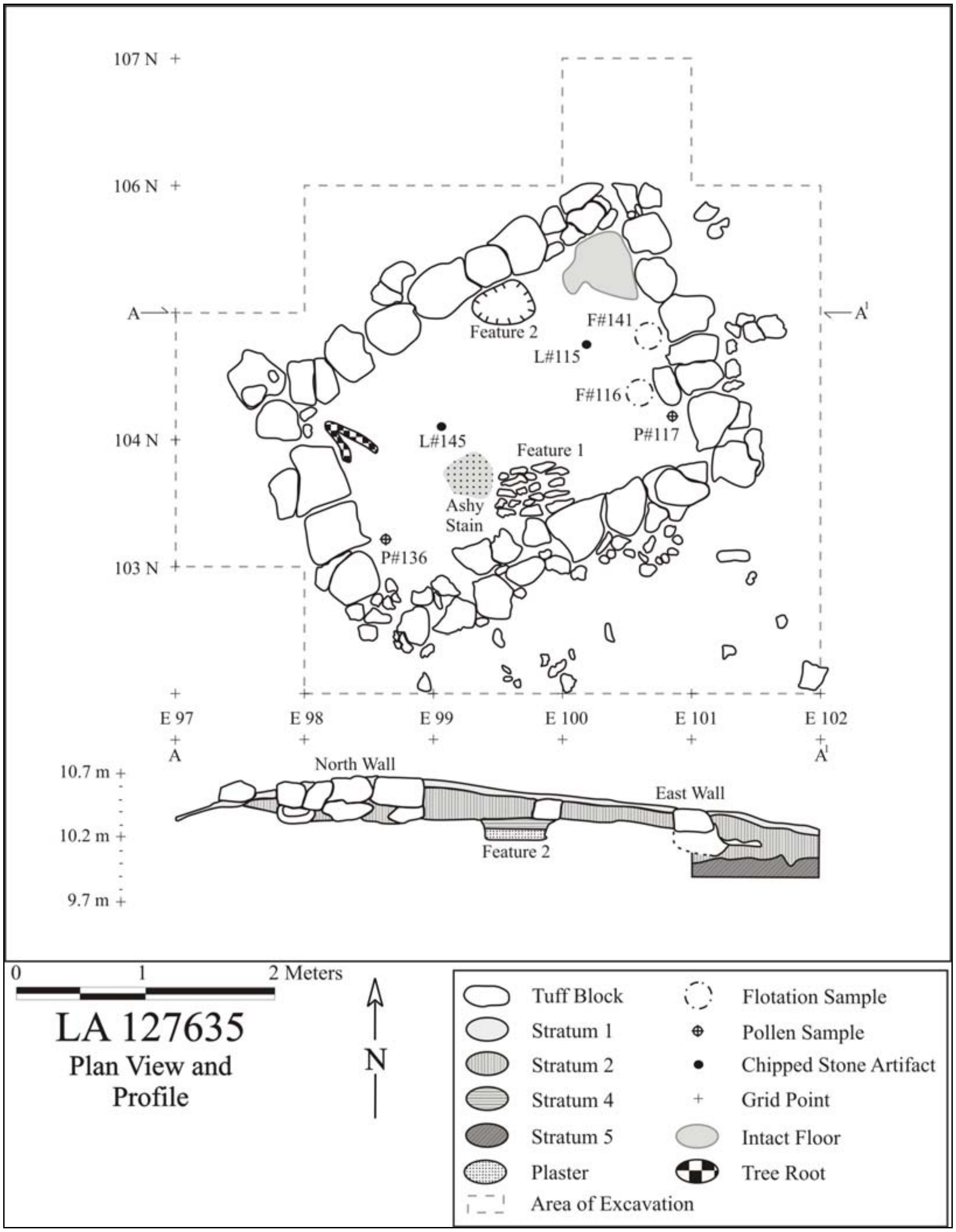

Figure 52.1. Plan view and profile drawing of LA 127635.

Figure 52.2. Post-excavation photograph of LA 127635.

The excavation of the site was supervised by Michael Dilley. The field crew included Sandi Copeland, Hannah Lockard, Aaron Lenihan, and Alan Madsen. Timothy Martinez and Mike Chavarria served as monitors and screeners representing San Ildefonso and Santa Clara pueblos, respectively.

STRATIGRAPHY

Stratum 1 is loose surface sediment and is composed of a loamy sand that is 1 to 7 cm thick across the site (A horizon). Stratum 2 is post-occupational fill ranging from 7 to 19 cm in thickness and is composed of a sandy loam (Bw horizon). Stratum 3 is the living surface and is the top of a soil horizon composed of a sandy clay loam (Bwb1 horizon). Stratum 4 is feature fill from Feature 2 and is composed of an ashy sandy loam. Stratum 5 is soil excavated outside of the structure and is composed of the sandy clay loam below the living surface (Bwb1 horizon). Excavation into this stratum went to depths ranging from 19 to 33 cm. Stratum 6 is composed of the sandy clay loam soil excavated from a subfloor test pit in 103N/98E, which was inside the structure (Bwb1 horizon). Stratum 7 is soil excavated from a bioturbated area outside the south wall of the structure and is composed of loamy sand with charcoal flecking (Bw horizon). Tables 52.1 through 52.3 summarize and describe the strata excavated at LA 127635.

Table 52.1. LA 127635 strata descriptions.

Stratum	Color	Texture	Thick (cm)	Description
0	-	-	-	Surface
1	10yr 5/3	Loamy sand	1–7	Surface sediment
2	10yr 5/3	Sandy loam	7–19	Post-occupational fill
3	8.75yr 5/4	Sandy clay loam	19–33	Living surface and below
4*	10yr 5/2	Ashy sandy loam	17	Feature fill (Feature 2)
5*	10yr 5/3	Sandy loam	7–19	Outside of structure
6*	10yr 5/3	Sandy loam	7–19	Sub floor pit
7*	10yr 5/3	Sandy loam	7–19	Bioturbated area

*Note: Strata are not listed as a strict soil horizon sequence, but rather as an excavation sequence.

Table 52.2. LA 127635 soil horizon descriptions from geomorphic test pit profile.

Horizon	Color	Texture	Depth (cm)	Description
A	10yr 5/3	Loamy sand	0–7	Young colluvium (late Holocene)
Bw	10yr 5/3	Sandy loam	7–19	Young colluvium (late Holocene)
Bwb1	8.75yr 5/4	Sandy clay loam	19–33	Middle to late Holocene
Bkb1	8.75yr 5/4	Sandy clay loam/carbonate	33–43+	Middle to late Holocene

Table 52.3. LA 127635 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	5	0	0	0	5
1	92	9	0	0	101
2	257	60	1	0	318
3	0	2	0	0	2
4	3	0	0	0	3
5	15	4	0	0	19
6	0	0	0	0	0
7	9	8	0	0	17
Total	**381**	**83**	**1**	**0**	**465**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a relatively small one-room rectangular structure that probably functioned as a fieldhouse. The room measures 2.75 m north-south by 1.9 m east-west with approximately 5.23 m^2 of interior space. Construction of the room consisted of two courses of shaped and unshaped tuff block. Excavation of the room began with an east-west trench that extended across the structure (units 93N/97-103E). The excavation of this trench served to define the stratigraphy within the room, to locate the east and west walls of the room, and to determine the floor/living surface within the room. After the trench was excavated, the rest of the room was excavated, by grid, down to the presumed living surface (top of the Bwb1 soil horizon). During the excavation of the room, two features were exposed. Feature 1 (103N/99E) consisted of a patterned concentration of tuff rocks and Feature 2 (104-105N/99E) consisted of a formal plastered hearth. The features were excavated, samples were taken, and the features were mapped. Following the completion of the room and feature excavations, photographs of the features, walls, and living surface were taken. A subfloor pit was excavated in the southwest corner of the room (103N/98E) to determine if any living surfaces were below the initial surface and to determine the depth of the wall foundation.

Fill. The interior of the room was filled with 1 to 7 cm of loose surface sediment overlying 7 to 19 cm of a more consolidated post-occupational fill. Flotation (Field Specimen [FS] 45 and FS 53) and pollen (FS 42) samples were taken from the room fill. Charred taxa identified in the flotation samples included unidentified pine, piñon pine, ponderosa pine, unknown conifer, squash/coyote gourd, maize, and mountain mahogany. Taxa identified in the pollen sample included rose family, cheno-ams, grass family, sunflower family, spurge family, evening primrose, unidentified pine, piñon pine, and sagebrush.

Floor. Although no formal plastered floor was encountered, patches of a prepared surface were exposed during excavation of Room 1 in 104-105N/100E. This surface consisted of a compact clay-rich mud that was 1 to 2 cm thick, ashy gray in color, and contained imbedded charcoal pieces and flecking. Within these grid units some evidence of coping was also encountered, where the mud was smoothed and curved upwards to the base of the wall. There was also some evidence for an episode of remodeling, or an earlier occupation. The top layer of the smoothed surface (1 to 2 cm) popped off when it was scraped with a trowel, revealing another surface. This lower surface (an additional 2 to 3 cm thick) was a very compact ashy/burned surface, exhibiting oxidation and discoloration. Other areas across the living surface within Room 1 exhibited ashy staining and charcoal flecking, but no other patches of the smoothed mud were encountered. It is likely that the top of the compact Bwb1 horizon served as a foundation for the floor. The living surface was disturbed by roots and insect and rodent activity.

Feature 2, a formal hearth, was exposed in unit 104-105N/99E and was situated at floor level adjacent to the north wall of the room (see feature description). Two chipped stone artifacts (FS 115 and FS 145) were recovered from floor context. Flotation (FS 116) and pollen (FS 117) samples were taken from the floor context. Charred taxa identified in the flotation sample included piñon pine, mountain mahogany, unidentified pine, and unknown conifer. Taxa identified in the pollen sample included cheno-ams and unidentified pine.

Additional samples were taken from wall and floor contexts along the west wall (FS 136, pollen) and east wall (FS 141, flotation). Taxa identified in the pollen sample included maize, cheno-ams, grass family, sunflower family, ragweed/bursage, spruce, fir, unidentified pine, piñon pine, oak, Mormon tea, and sagebrush. Charred taxa identified in the flotation sample included maize and ponderosa pine. A pollen (FS 134) and flotation sample (FS 135) were taken from underneath soil that a tuff rock concentration (Feature1) was resting on, which was located 10 cm above the floor (see feature description). Taxa identified in the pollen sample included maize, rose family, grass family, cheno-ams, sunflower family, unidentified pine, piñon pine, juniper, and sagebrush. No charred specimens were identified in the flotation sample.

An area of ashy staining was also observed in unit 103N/99E just to the west of Feature 1. This ashy stain contained charcoal flecking and small pieces of charcoal. A flotation sample (FS 53) was taken from this stain and identified charred taxa included ponderosa pine, squash/coyote gourd, maize, mountain mahogany, and unknown conifer. Several small chipped stone flakes were also recovered from this area. Although the south wall of the structure appeared to be complete, it is possible that this area may have served as an entryway. The ashy staining, chipped stone flakes, and the presence of the rock concentration (Feature 1) may indicate this area was an entryway. Additionally, the wall block encountered in grids 102-103N/99E appear to be smaller and more jumbled than the rest of the wall.

Wall Construction. All that remained of the walls of Room 1 are two courses, in a single row, of shaped and unshaped tuff blocks that formed the foundation of the structure. Very little wallfall was observed during the excavation of Room 1 and it is possible that wall block from this site was scavenged and utilized elsewhere either during prehistoric times or more recently. What remained of the walls formed a well-preserved rectangular foundation. There were areas within the wall block where there was some remnant mortar, consisting of chunks of clay adhering to the block. Chinking stones were also present, some still in place between larger wall blocks, and these smaller rocks were also the most common rubble in the post-occupational fill.

It is possible that the walls of the structure were not very high to begin with and the foundation blocks may have had a stick and adobe superstructure (Table 52.4). Several pieces of burned adobe were recovered from the room fill. Very compact clay (wall slump?) was noted in areas along the base of the walls inside the room. As described briefly above, wall/foundation blocks along the west end of the south wall were of a somewhat different nature than the rest of the wall. Rocks were smaller and appeared to be in a double row. This could have been intentional or could represent either wallfall or a purposeful closing off of this section of wall. Just inside the room, an area of ashy staining and a light concentration of small chipped stone flakes, which could possibly represent a limited work, were noted on the floor. Excavation to the base of the wall blocks showed that, for the most part, the foundation of the structure was set into the Bwb1 horizon by means of a shallow, narrow trench, not more than 8 to 10 cm in depth.

Table 52.4. LA 127635 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	2.75	0.35	0.35	2
South	2.65	0.36	0.38	2
East	1.82	0.20	0.36	2
West	1.90	0.29	0.35	2

Feature 1

Feature 1 is a concentration of 18 small tuff rocks located next to the south wall of Room 1 in units103N/99-100E. The rocks appear to be in rows, in a rough alignment. These rocks were not resting on the living surface. Two ceramic sherds and two chipped stone artifacts were recovered from the fill underneath the rocks and it was determined that this fill was part of the post-occupational fill. It is possible these rocks were originally part of the wall construction and fell into the structure subsequent to abandonment. Though there is no direct supportive evidence for it, these rocks could possibly represent the walling up of the entry way to the structure, the concentration was located adjacent to an area of the south wall where the foundation rocks differed from the rest of the wall. Wall blocks in this section were smaller and appeared to be in a double row, whereas in the rest of the wall and the structure, wall block was only a single row in width. Additionally, just inside the room, there was an area of ashy staining on the living surface that contained several small chipped stone artifacts, suggesting a possible activity area that may have been situated by the entryway. This area of ashy staining was located immediately to the west of the rock concentration. A flotation sample (FS 135) and pollen sample (FS 134) were taken from the fill below the rock concentration. No charred taxa were identified in the flotation sample, and taxa identified in the pollen sample included maize, rose family, grass family, cheno-ams, sunflower family, unidentified pine, piñon pine, juniper, and sagebrush.

Feature 2

Feature 2 consists of a prepared plaster hearth located against the north wall and inside of Room 1 (Figures 52.3 and 52.4). The top of the feature was roughly level with the living surface. Feature 2 is roughly ovoid in shape with plastered sides and bottom.

Figure 52.3. Post-excavation photograph of Feature 2 (hearth).

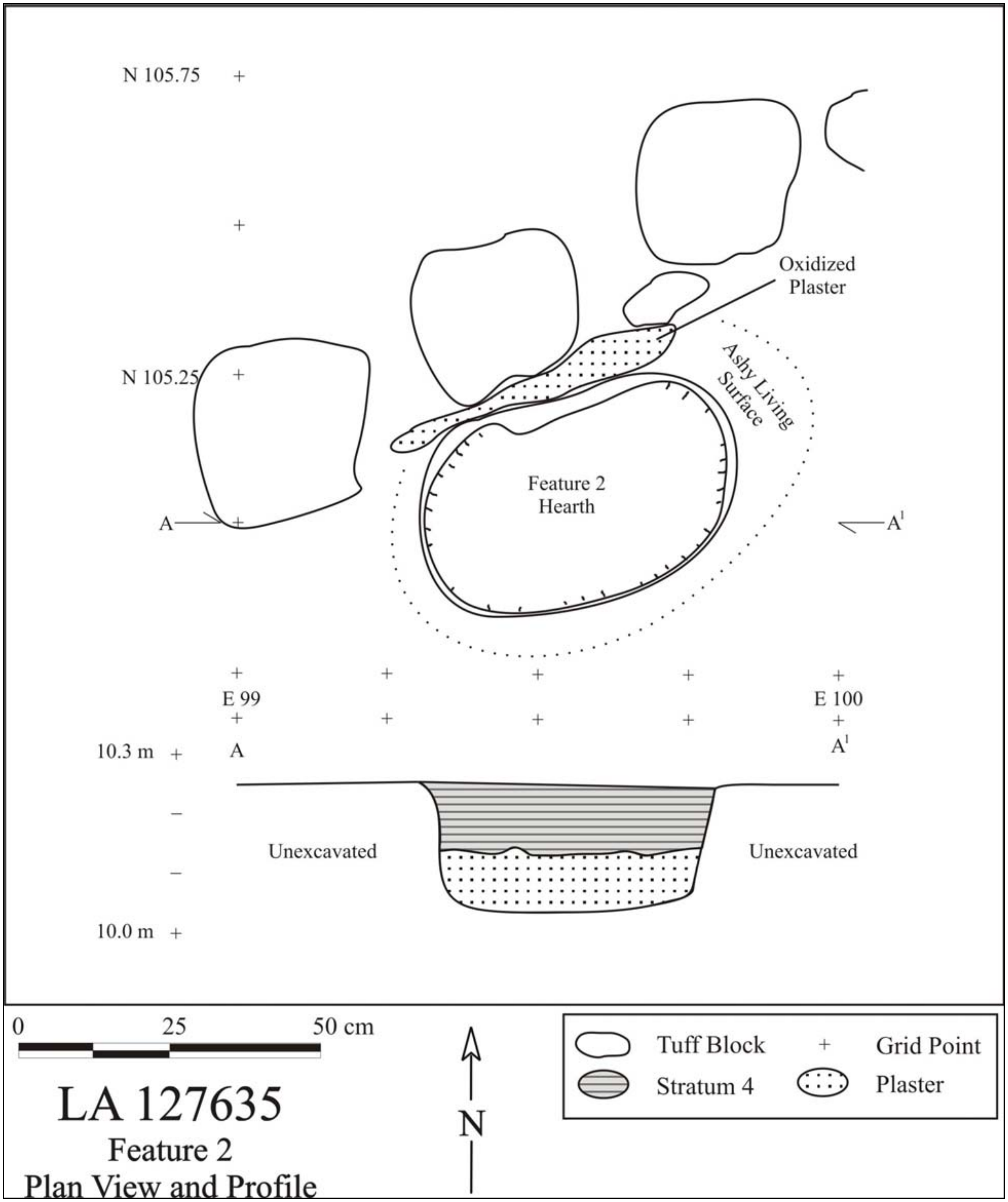

Figure 52.4. Plan view and profile drawing of the hearth (Feature 2) at LA 127635.

Feature 2 is heavily oxidized on the plaster surfaces, and the wall behind the feature also exhibited oxidation, indicating some fairly heavy use. Feature fill consisted of solid ash with some charcoal flecking. Although rootlets were observed growing in the bottom of the hearth, it was basically intact. The plaster on the upper sides of the hearth was somewhat damaged and crumbling, but the sides were also intact. There was no prepared collar noted but there was evidence of a small lip around the perimeter at the top of the hearth. The space between the feature and the north wall of the room was filled in with reddish dirt that also may be oxidized. The dirt fill appeared to be intentional as it was of a different color and texture and was looser than the surrounding compacted dirt of the living surface. Pollen (FS 109 and FS 127), flotation (FS 105, FS 123, FS 124, FS 125, and FS 126), charcoal (FS 107), and macrobotanical/corn (FS 108) samples were all collected from the hearth. No identifiable taxa were recovered from the pollen sample (FS 109). Charred taxa identified in the flotation samples included unknown conifer, unidentified pine, mountain mahogany, maize, tobacco, sagebrush, cheno-ams, ponderosa pine, oak, juniper, bugseed, cottonwood/willow, hedgehog cactus, and beeweed. The charcoal sample was not analyzed, but the maize sample was submitted for radiocarbon dating (see Chronology section below).

Geomorphic Analysis

A single grid unit (104N/101E) was excavated below the Bwb1 horizon to serve as a geomorphic test pit. The profile of this unit was analyzed by geomorphologists Paul Drakos and Steven Reneau. A soil sequence was determined consisting of an A horizon topsoil young colluvium (late Holocene), a Bw post-occupation colluvium with wallfall (late Holocene), a Bwb1 level, the top of which was the likely living surface (middle to late Holocene), and a Bkb1 sterile soil with carbonate development (middle to late Holocene).

Artifact Distribution

A total of 465 artifacts were recovered from the excavation of LA 127635, including 83 pieces of chipped stone, 381 ceramics, and one piece of ground stone. A total of 37 chipped stone artifacts were recovered from inside Room 1. The majority of these artifacts were recovered from units 103-104N/99E, located between Feature 2 and Feature 1 (including the ashy stain next to the feature) (Table 52.5). Both of these units were in direct line with the possible entry way (grid 102N/99E). Three chipped stone artifacts were recovered from the fill beneath Feature 1. Two chipped stone artifacts were recovered from the Feature 2 fill. As stated previously, several small chipped stone flakes (n = 17) were recovered from the ashy area next to Feature 1, suggesting the possibility of a limited activity area. These artifacts constituted almost half of the chipped stone recovered from inside the room.

Most of the chipped stone artifacts were recovered from Stratum 2, Level 2 (post-occupational fill), with fewer artifacts recovered from the ash stain area (Level 4) and the feature fill. The remaining 46 chipped stone artifacts were recovered from outside of Room 1. Located just outside of the south wall of Room 1 (102N/99E) there was a heavily bioturbated area from which 12 chipped stone artifacts were recovered. This unit was in line with the grids inside the room with the highest artifact concentration, suggesting the possibility of an activity area associated with the entryway of the structure. However, a large burrow continued from the unit outside the structure up under the wall and just inside the structure, which could have resulted in the loss of integrity of *in situ* artifacts due to rodent activity. If not for the rodent disturbance it could be suggested that artifacts recovered from the grid line 102-104N/99E represented a possible limited activity area, or was the result of sweeping out the structure. The remainder of the chipped stone artifacts was fairly evenly distributed across the site with no apparent concentrations.

Of the 381 ceramic sherds recovered from the excavation, 154 were recovered from inside Room 1. The majority were recovered from the post-occupational fill, with only three sherds recovered from the living surface (Stratum 3). Additionally, two sherds were recovered from the fill beneath Feature 1 and six sherds were recovered from the Feature 2 fill. As with the chipped stone artifacts, the highest concentration of ceramics was recovered from grids 103-104N/99E. A total of 227 ceramic sherds were recovered from units excavated outside of Room 1. The highest concentrations were recovered from units just to the east of the structure (104-105N/101E) and from the bioturbated area just outside the structure to the south (102N/99E). A total of 57 ceramic sherds were recovered from 104-105N/101E, all of which were from Stratum 2, Level 2. Thirty-one sherds were recovered from the bioturbated area in grid 102N/99E.

A single ground stone artifact, a two-hand mano, was recovered in an area located less than 1 m from the southeast corner of the structure. The mano was not associated with any activity area or features.

Table 52.5. LA 127635 artifact counts by grid unit.

	97E	**98E**	**99E**	**100E**	**101E**
102N	0	6	39	32	23
103N	12	25	43	17	10
104N	6	29	65	22	50
105N	0	14	16	7	41

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 448 artifacts were analyzed from the excavations conducted at LA 127635. In addition, flotation and pollen samples were selected for analysis from the post-occupational fill (Stratum 2), the floor (Stratum 3), the hearth fill (Stratum 4), and outside the structure (Stratum 5) (Table 52.6). Two maize samples were submitted for radiocarbon dating, a micaceous sherd for thermoluminescence (TL) dating, and three pieces of obsidian for hydration dating. The results of the artifact and sample analyzes are presented in the following sections.

Table 52.6. Samples selected for analysis from LA 127635 by FS#.

Stratum	Flotation	Pollen	Radiocarbon	TL
1				
2	135	134,136		
3	116,141	117		106
4	105, 123–126	109,127	105, 125	

Stratum	Flotation	Pollen	Radiocarbon	TL
5	100	99		

Chronology

Radiocarbon Dating

Two maize samples were submitted for accelerator mass spectroscopy dating. Both of the maize specimens were derived from flotation samples taken from the Feature 2 hearth fill. The first sample provided a date of 800±40 BP (Beta-215558), with a calibrated intercept of AD 1250 and a two-sigma range of AD 1180–1280. The second sample yielded a similar date of 760±40 BP (Beta-215559), with a calibrated intercept of AD 1270 and a two-sigma range of AD 1210–1290. Both dates indicate a Coalition period occupation dating to the 13th century.

Thermoluminescence Dating

A single Sapawe Micaceous sherd was submitted for TL dating from LA 127635 (Table 52.7). All derived ages are given in years BP, which refers to years before 2003. The TL date corresponds with the two radiocarbon dates, indicating a 13th century occupation.

Table 52.7. Thermoluminescence date from ceramics at LA 127635.

FS#	Lab #	Context	Burial depth (cm)	Years BP	% error	Years AD
106	UW1419	Stratum 3	40	753	14.3	1253±108

Obsidian Hydration Dating

Three obsidian artifacts from LA 127635 were submitted to the Diffusion Laboratory for age determination using the obsidian hydration dating method. In order to calculate the absolute date for an obsidian artifact, three analytical procedures were completed. First, the amount of surface hydration, or the thickness of the hydration rim, was measured. Second, the high-temperature hydration-rate constants for each artifact were determined from the composition of the glass. Lastly, the soil temperature and relative humidity at the archaeological site were estimated so that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. Using these methods, a hydration rate for the obsidian artifacts was calculated (Table 52.8).

Table 52.8. Obsidian hydration dates for LA 127635.

FS No.	Lab No.	Source	Rim (um)	AD/-BC	1 S.D.
6	2003-77	Valle Grande	1.37	1732	33
43	2003-78	Cerro Toledo	n/a		
103	2003-79	Valle Grande	4.11	-4556	321

Relative to other dating methods conducted at the site, the obsidian hydration dates seem to be the least accurate. Radiocarbon and TL dates indicate a Late Coalition period date (13th century), with neither of the two obsidian samples providing results.

Ceramic Artifacts (Dean Wilson)

A total of 371 ceramics were analyzed from LA 127635. The majority of the pottery consists of smeared-indented corrugated and Biscuit A sherds. In addition, the presence of Santa Fe Black-on-white, Wiyo Black-on-white, Galisteo Black-on-white, and Sapawe Micaceous would seem to reflect an Early Classic period occupation (Table 52.9). This would, however, represent a 14th century and not an earlier 13th century occupation as indicated by the radiocarbon dates. On the other hand, it would fit the two-sigma range of the TL date. Therefore, this site may have been occupied early in the 14th century or circa AD 1300. Information on ceramic tradition by ware, temper by ware, and vessel form by ware is provided in Tables 52.10 through 52.12. The graywares and whitewares appear to have been locally made from smeared-indented sand or tuff, in contrast to Sapawe Micaceous, mica utility, seven smeared-indented, and one plain gray sherd, which contained a non-local micaceous temper. Most of the grayware and all of the micaceous ceramics consist of jar vessel forms, while several grayware sherds were derived from a bowl(s). In contrast, the whiteware sherds include mostly bowls, with some jars.

Table 52.9. Ceramic types from LA 127635.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	18	4.9
Indeterminate organic	1	0.3
Santa Fe Black-on-white	11	3.0
Wiyo Black-on-white	7	1.9
Galisteo Black-on-white	1	0.3
Unpainted Galisteo paste	1	0.3
Biscuit unpainted both sides slipped	2	0.5
Biscuit A	15	4.0
Biscuit B/C body	3	0.8
Northern Rio Grande Utilityware		
Plain gray rim	1	0.3
Plain gray body	20	5.4
Indented corrugated	1	0.3
Smeared-indented corrugated	262	70.6
Mica utility undifferentiated	4	1.1
Sapawe Micaceous	24	6.5
Total	**371**	**100.0**

Table 52.10. Tradition by ware for LA 127635 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	277	100.0	59	100.0	0	0.0	0	0.0	336	90.5
Rio Grande (Tewa Micaceous)	0	0.0	0	0.0	0	0.0	35	100.0	35	9.5
Middle Rio Grande	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	**277**	**100.0**	**59**	**100.0**	**0**	**0.0**	**35**	**0.0**	**371**	**100.0**

Table 52.11. Temper by ware for LA 127635 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	3	1.0	0	0.0	0	0.0	0	0.0	3	0.8
Sherd	0	0.0	2	3.3	0	0.0	0	0.0	2	0.5
Fine tuff or ash	8	2.8	37	62.7	0	0.0	0	0.0	45	12.1
Fine tuff and sand	0	0.0	11	18.6	0	0.0	0	0.0	11	2.9
Anthill sand	266	96.0	5	8.4	0	0.0	0	0.0	271	73.0
Oblate shale and tuff	0	0.0	4	6.7	0	0.0	0	0.0	4	1.0
Granite with mica	0	0.0	0	0.0	0	0.0	12	0.0	12	3.2
Sapawe Micaceous temper	0	0.0	0	0.0	0	0.0	23	0.0	23	6.1
Total	**277**	**100.0**	**59**	**100.0**	**0**	**0.0**	**35**	**100.0**	**371**	**100.0**

Table 52.12. Vessel form by ware for LA 127635 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	0	0.0	3	5.0	0	0.0	0	0.0	3	0.8
Bowl rim	5	1.8	9	15.2	0	0.0	0	0.0	14	3.7
Bowl body	5	1.8	41	69.4	0	0.0	0	0.0	46	12.3
Jar neck	31	13.8	0	0.0	0	0.0	0	0.0	31	8.3
Jar rim	7	2.5	0	0.0	0	0.0	2	5.8	9	2.4
Jar body	224	80.8	6	10.1	0	0.0	33	94.2	263	70.8
Jar body with strap	5	1.8	0	0.0	0	0.0	0	0.0	5	1.3
Total	**277**	**100.0**	**59**	**100.0**	**0**	**0.0**	**35**	**100.0**	**371**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 77 artifacts were analyzed from LA 127635, consisting of two cores, 71 pieces of debitage, three retouched tools, and one ground stone artifact. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 52.13 presents the data on lithic artifact type by material type. The debitage is primarily made of chalcedony and Pedernal chert, with other materials. The presence of cortex on 12.6 percent of the debitage indicates that these materials were collected from waterworn (*n* = 9) sources. The chalcedony and Pedernal chert are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 52.13. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	**Vesic. Basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Sil. Wood**	**Quartzite**	**Sandstone**	**Total**
Cores	Core	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Cobble uniface	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	2	0	0	0	0	0	2
Debitage	Angular debris	0	0	0	0	0	0	0	3	0	3	0	0	0	6
	Core flake	0	0	0	3	0	0	2	18	0	18	0	0	0	41
	Biface flake	0	0	0	0	0	0	0	2	0	0	0	0	0	2
	Microdeb.	0	0	0	0	0	0	0	6	0	5	0	0	0	11
	Und. flake	0	0	0	0	0	0	1	8	0	2	0	0	0	11
	Subtotal	0	0	0	3	0	0	3	37	0	28	0	0	0	71
Retouched Tools	Retouched piece	1	0	0	0	0	0	1	0	0	0	0	0	0	2
	Notch	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	1	0	0	0	0	0	1	1	0	0	0	0	0	3
Ground Stone	Two-hand mano	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Subtotal	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Total		**1**	**0**	**0**	**3**	**1**	**0**	**4**	**40**	**0**	**28**	**0**	**0**	**0**	**77**

Three pieces of obsidian and a piece of basalt debitage were submitted for X-ray fluorescence analysis. The obsidian artifacts are Valle Grande and Cerro Toledo obsidian (Table 52.14). The Valle Grande (Cerro del Medio) and Cerro Toledo (Obsidian Ridge/Rabbit Mountain) source areas are situated about 17 km (11 mi) and 19 km (12 mi) to the west and southwest. Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present on the nearby mesa as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval. A single basalt flake is actually made of dacite that was derived from a local source.

Table 52.14. Obsidian source samples.

FS #	Artifact	Color	Source
6	Debitage	Translucent	Valle Grande rhyolite
43	Debitage	Translucent	Cerro Toledo rhyolite
103	Debitage	Translucent	Valle Grande rhyolite

Lithic Reduction

The platform core was reduced using a bidirectional, 90 degree technique, whereas the cobble uniface represents the removal of flakes from an unprepared cortical platform. The core was classified as exhausted and the cobble uniface as still useable when discarded. Table 52.15 presents the metric information on the core and cobble uniface.

Table 52.15. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Bidirectional	27	44	30	39.3
Cobble Uniface	42	94	103	526.0

The debitage mostly consists of core flakes, with a few other items. The overall cortical:non-cortical ratio of 33.3 reflects an emphasis on the later stages of core reduction and tool production/maintenance. The flakes mostly have single-faceted platforms (n = 11), with fewer cortical (n = 1), dihedral (n = 1), collapsed (n = 4), and crushed (n = 3) platforms. Only one of the platforms exhibited evidence of preparation by abrasion/crushing. The majority of the core flakes are distal fragments (n = 20), with fewer whole (n = 11), proximal (n = 8), and midsection (n = 2) fragments. In contrast, the biface flakes consist of a whole and distal fragment. The whole core flakes have a mean length of 25.0 mm (*std* = 10.5), the single whole biface flake a length of 16.0 mm, and the angular debris a mean weight of 2.3 g (*std* = 3.1).

Two retouched pieces and a notch were identified during the analysis. One of the retouched pieces is an obsidian flake with alternate retouch that creates a rounded end that could have been used as perforator or drill. The other item is a flake with bidirectional retouch along a lateral edge with an angle of 55 degrees. The notched tool is actually a double notch with an edge angle of 40 degrees.

Tool Use

None of the debitage and two of the retouched tools exhibit evidence of edge damage that could be attributed to use. The obsidian retouched tool has rounding along the end, which indicates possible use as a perforator or drill. The retouched flake also exhibits rounding and scarring along the lateral retouched edge.

The ground stone artifacts solely consist of a two-hand mano. The mano is a well-worn loaf-shaped piece of tuff with flat and convex-shaped grinding surfaces (Figure 52.5).

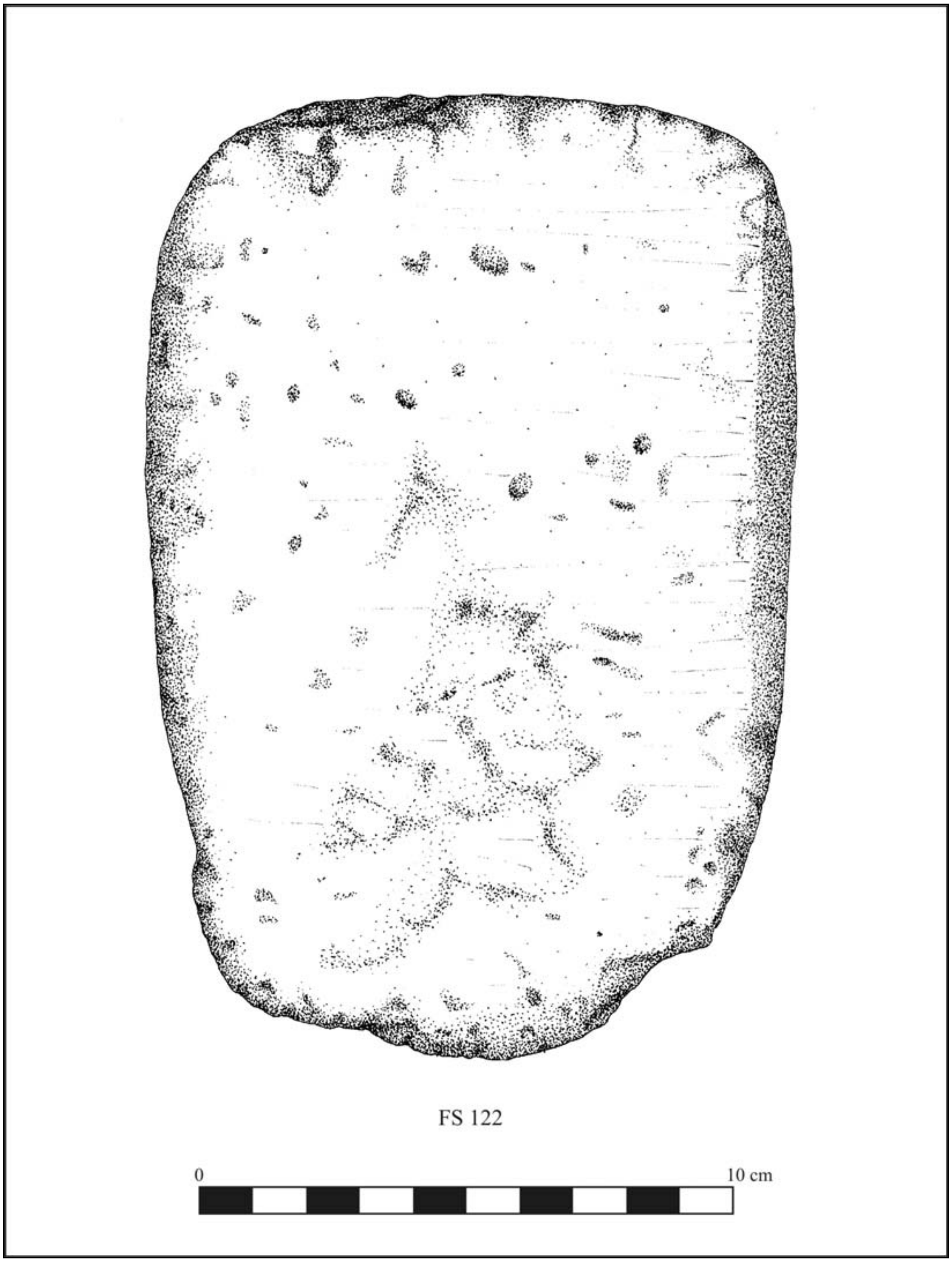

Figure 52.5. Two-hand mano from LA 127635.

Archaeobotanical Remains (Pamela McBride)

Floral remains from this Classic period fieldhouse resemble those from the neighboring fieldhouse, LA 127634, to the east. Beeweed and maize were the most common taxa from both fieldhouses. While tobacco was found in hearths at both sites, only one sample out of 14 at LA

127634 yielded tobacco, whereas tobacco was present in 56 percent of samples from LA 127635. Beans were present at LA 127634 and not at LA 127635. Aside from conifer needles and bark, evidence for perennial plant use was represented by a hedgehog cactus seed fragment from the upper fill of the hearth, while at LA 127634, a banana yucca seed in the hearth was the only non-conifer perennial plant part recovered. Possible squash rind was identified from both structures.

LA 127635 floor scrape and floor samples (FS 116 and FS 141) yielded very similar taxa to those encountered in post-occupational fill samples (FS 45 and FS 53), including corn cupules and charred conifer duff (Table 52.16). The exception was possible squash rind identified in the general fill sample. Only unburned material was recovered from under the patterned rock concentration (Feature 1). Lower and upper fill of the hearth (Feature 2) yielded cheno-ams, tobacco, beeweed, maize, and conifer duff; bugseed and hedgehog cactus seeds were restricted to the upper fill. One sample from the upper fill of the hearth consisted almost entirely of kernel fragments. In general, much higher concentrations of maize kernels were present at LA 127635 than at LA 127634. The sample taken from under the concentration of tuff rocks adjacent to the south wall of the structure (Feature 1) contained only unburned plant material. It was suggested earlier in this chapter that this rock concentration may represent the deliberate walling up of the entrance to the structure. Two ceramic sherds and two chipped stone artifacts were found in the fill under Feature 1 and it was determined that this was post-occupational fill. However, if this were the case, the sample would be more likely to contain similar remains to those found in FS 45 that included conifer needles, bark, and charcoal.

Table 52.16. Flotation plant remains, count and abundance per liter from LA 127635.

FS No.	**45**	**53**	**105**	**116**	**123**
Feature	N ½ unit inside room above living surface	Ash stain west of F. 1	Hearth, lower ½	Floor	Hearth, upper fill
			Cultural		
Annuals					
cf. Beeweed			3(1)		3(2)
cf. Bugseed					1(0)
Cheno-Am			2(2)		
Tobacco			1(1)		5(5)
Cultivars					
Maize		1(0) c, 1(0) poss. c	1(0) cf. c, 2(2) e, 3(2) e pc, 26(0) cf. k		16(11) e, 50(1) k
Other					
cf. Coyote gourd/Squash		+ rind			
Unidentifiable				1(0) pp	
Perennials					
Pine	+ barkscale		+ barkscale		
Piñon	+ needle			+	

FS No.	45	53	105	116	123
				needle	
Ponderosa pine	+ fascicle, + needle	+ needle			+ needle
Non-Cultural					
Annuals					
Goosefoot	+	+		+	+
Perennials					
Piñon	+ needle				
Ponderosa pine	+ fascicle, + needle			+ needle	+ needle

Table 52.16 (continued). Flotation plant remains, count and abundance per liter from LA 127635.

FS No.	124	125	126	135	141
Feature	Hearth, upper fill			Under F. 1 and above floor	Floor scrape
Cultural					
Annuals					
Beeweed	4(3), 1(0) pc	4(3)	1(1), cf. 1(0)		
Cheno-Am		1(1)			
Tobacco	6(6)	3(3)	5(5)		
Cultivars					
Maize	5(3) e, 16(0) k	5(3) e, 37(0) k	1(0) c, 5(4) e, 17(0)k		2(0) c
Other					
Unidentifiable					1(0) pp
Perennials					
Hedgehog cactus		1(0)			
Pine		+ barkscale			
Ponderosa pine	+ needle pc	+ needle			+ needle
Non-Cultural					
Annuals					
Goosefoot	+			+	+
Perennials					
Piñon	+ needle				
Ponderosa pine	+ needle	+ needle	+ needle	+ needle	+ needle

+ 1-10/liter, c cupule, cf. compares favorably, e embryo, k kernel, pc partially charred, pp plant part.

Wood charcoal from the floor scrape was very different from the floor sample; ponderosa pine was the only wood type identified in the floor scrape sample, while pine, piñon, and mountain mahogany were identified in the floor sample (Table 52.17). Charcoal from the two general fill samples was also very different. Fill above the living surface produced only coniferous woods, while the majority of charcoal from the general fill sample was mountain mahogany with a small amount of unknown conifer. The Feature 2 wood assemblage was much more diverse than other contexts, yielding coniferous (including juniper), cottonwood/willow, mountain mahogany, oak, and sagebrush.

Table 52.17. Flotation sample wood charcoal by count and weight in grams from LA 127635.

FS No.	**45**	**53**	**105**	**116**	**123**	**124**	**125**
Feature	N ½ unit inside room above living surface	Ash stain west of F. 1	Hearth, lower ½	Floor	Hearth, upper fill		
Conifers							
cf. Juniper						5/0.1 g	
Pine	3/0.1 g			3/0.2 g			
Piñon			4/0.2 g	8/0.4 g			
Ponderosa pine	4/0.1 g		3/0.1 g			6/0.1 g	3/0.1 g
Unknown conifer	1/<0.1 g	2/0.1 g	3/<0.1 g	7/0.3 g	1/<0.1 g	2/<0.1 g	4/<0.1 g
Non-Conifers							
cf. Cottonwood/ Willow							1/<0.1 g
Mountain mahogany		18/0.6 g	1/<0.1 g	2/<0.1 g		7/<0.1 g	
Oak			4/<0.1 g				
cf. Sagebrush			2<0.1 g				
Totals	**8/0.2 g**	**20/0.7 g**	**17/0.2 g**	**20/0.9 g**	**1/<0.1 g**	**20/0.2 g**	**8/0.1 g**

Table 52.17 (continued). Flotation sample wood charcoal by count and weight in grams from LA 127635.

FS No.	**126**	**141**
Feature	Hearth, upper fill	Floor scrape
Conifers		
cf. Juniper	1/<0.1 g	
Pine	1/<0.1 g	
Ponderosa pine	2/<0.1 g	20/0.3 g
Unknown conifer	2/<0.1 g	
Non-Conifers		
Oak	2/<0.1 g	
Totals	**8/<0.1 g**	**20/0.3 g**

Feature 2 was the best-preserved hearth that was excavated in Rendija Canyon (Lockard, personal communication), and the preservation of plant material certainly confirms this observation. Plant remains indicate that the occupants of LA 127635 were utilizing several annual species (including ritual use of tobacco), hedgehog cactus, maize and possibly squash, and wood species from the riparian, mountain foothills, and ponderosa pine forest zones.

Pollen Remains (Susan Smith)

Five pollen samples were analyzed from LA 127635. Table 52.18 lists the frequency of identified pollen types. Maize was the only cultigen identified in the assemblage. No other economic resources were identified. A number of potential economic resources were also identified in the assemblage, and these are discussed in Smith's chapter in Volume 3.

Table 52.18. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 127635 (*n* = 5)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	2
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	2
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 127635 (*n* = 5)
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	3
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs and Other Possible Subsistence Resources	Cheno-Am	Cheno-Am	4
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	3
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	1
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	1
	Scrophulariaceae	Penstemon Family	0

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 127635 (*n* = 5)
	Onagraceae	Evening Primrose	1
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	1
	Abies	Fir	1
	Pinus	Pine	4
		Pine Aggregates	0
	Pinus edulis type	Piñon	3
	Juniperus	Juniper	1
		Juniper Aggregates	0
	Quercus	Oak	1
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	1
	Artemisia	Sagebrush	3
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	0
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY OF SITE EXCAVATIONS

LA 127635 consists of a one-room fieldhouse with plaster-lined heath. All four walls were intact, with evidence for two possible floors. This evidence, in conjunction with the ceramic, radiocarbon, and TL data, indicates that the fieldhouse was probably occupied during the Late Coalition and Early Classic period. Maize pollen was recovered during the site excavations indicating that the fieldhouse may have been seasonally occupied during the growing season.

CHAPTER 53
RENDIJA TRACT (A-14): LA 135291

Michael J. Dilley and Bradley J. Vierra

INTRODUCTION

LA 135291 is a small one-room Classic period fieldhouse situated on a north-facing slope of the terrace about 115 m south of the ephemeral creek in Rendija Canyon. The area is covered by a ponderosa pine forest at an elevation of 2108 m (6915 ft). The fieldhouse is located to the east and outside the Los Alamos Sportsmen's Club and to the immediate north of the Rendija Canyon road. Neither of these appear to have impacted the site.

The site was originally identified by Brian Harmon during the Cerro Grande post-fire assessment project and given a temporary number of BCH-1. It was described as a possible fieldhouse consisting of a large cluster of cobbles that covered a 10- by 10-m area; however, most of the rocks were centered in a roughly rectangular-shaped 3- by 4-m area. This locale was severely burned during the Cerro Grande fire, as is evidenced by the remains of two burned junipers on the site. The architectural feature was surrounded by a light scatter of artifacts that included a Wiyo Black-on-white sherd, two Biscuit A sherds, two plainware sherds, a Pedernal flake, and a quartzite cobble fragment. The site was said to date to the Classic period.

FIELD METHODS

Fieldwork began with a reconnaissance of the area around the fieldhouse to define the nature and extent of the surface remains. The site datum was set at the southwestern corner of the site and designated 100N/100E and 10.00 m elevation. A 1- by 1-m grid system was laid in around the surface architectural remains. Subdatums were subsequently shot in along the west and south sides of the excavation block (A and B). The site was photographed and excavations begun (Figure 53.1).

An east-west trench was excavated along the 104N grid line from 100 to 106E to expose and define the walls of the structure and the site stratigraphy. The east and west walls were identified, as was a possible unprepared living surface about 20 cm below the present surface. The block excavation was, therefore, expanded to include the area bounded by 103N/100E, 106N/100E, 106N/106E, and 103N/106E. A total of 26 grids were excavated in and around the one-room fieldhouse.

Excavations within the structure involved removing the post-occupational fill down to the level of the possible unprepared living surface. This surface was situated at the top of the Btb1 soil horizon and was covered by fill consisting of Bw soil. Obvious wallfall was removed so that the structure's walls and any internal features could be identified. It appeared that the south wall had collapsed within the structure, whereas, the north, east, and west walls had collapsed towards the outside of the structure.

Figure 53.1. Pre-excavation photograph of LA 135291.

Pollen and flotation samples were taken from each stratigraphic unit and various locations on the possible floor surface. All excavated soil was sieved through a 1/8-in. mesh to aid in the recovery of cultural remains. The excavation was extended approximately 1 m around the structure to locate external features and identify outside activity areas. Both internal and external features were found during the excavations. After the excavations were complete, the site was mapped (Figure 53.2) and photographed (Figure 53.3).

The excavation of the site was supervised by Michael Dilley. Crewmembers included Sandi Copeland, Hannah Lockard, Greg Lockard, Alan Madsen, and Bradley Vierra. Timothy Martinez and Mike Chavarria served as monitors and screeners representing San Ildefonso and Santa Clara pueblos, respectively.

STRATIGRAPHY

Four stratigraphic units were defined during the excavations. These are illustrated in the profile provided in Figure 53.2 and are listed in Table 53.1. Stratum 1 is the loose topsoil that covered the site and represents most of the A soil horizon. Some of the surface organic material and two juniper trees burned during the Cerro Grande fire. Stratum 2 consists of the sandy loam that characterizes the post-occupational fill. This stratum is situated within and outside of the structure, consisting of the Bw soil horizon. Stratum 3 is an unprepared occupational surface. Stratum 4 is the ashy clay soil that filled Feature 2, an ashpit.

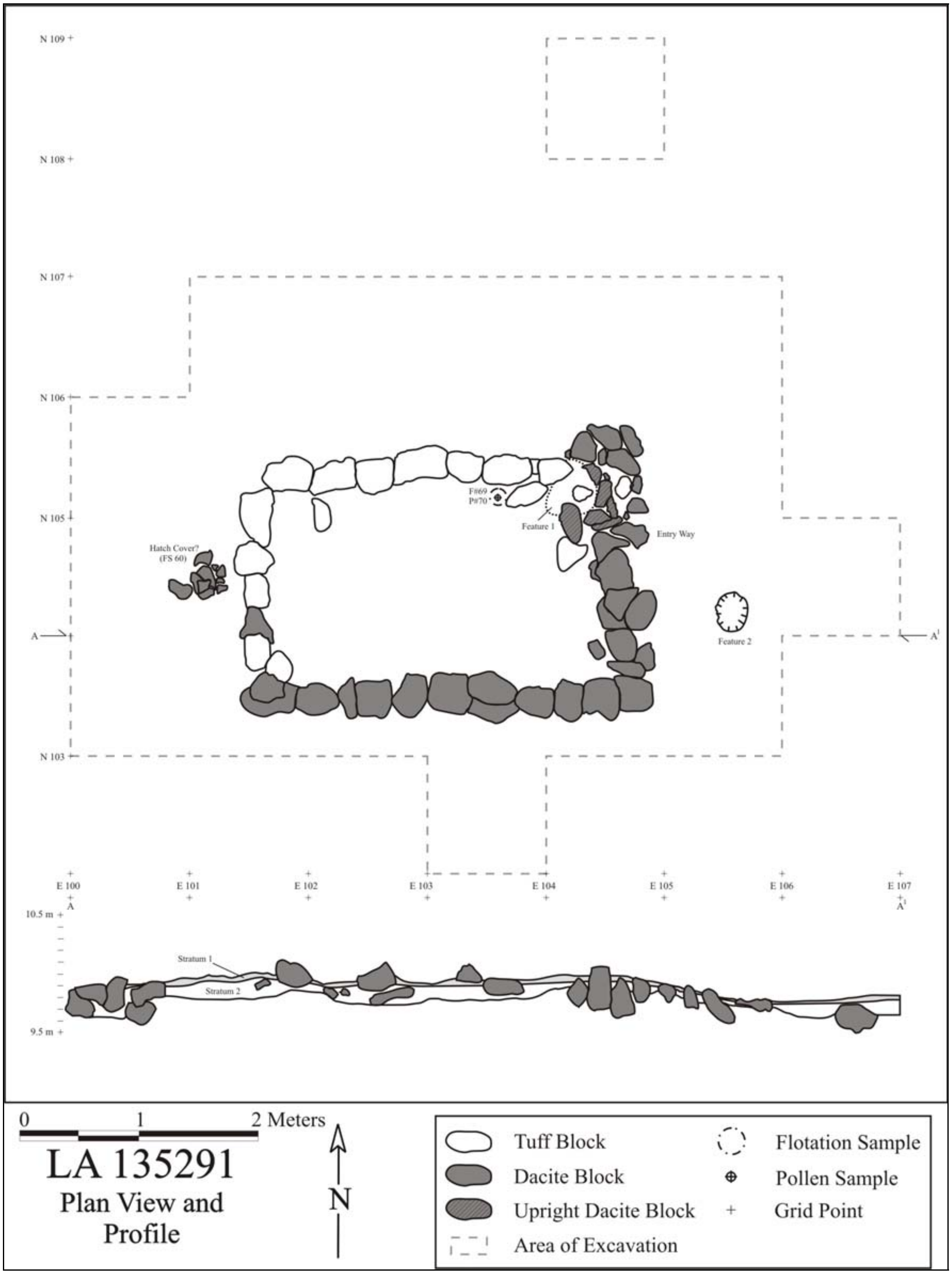

Figure 53.2. Plan view and profile drawing of LA 135291.

Figure 53.3. Post-excavation photograph of the fieldhouse at LA 135291.

Table 53.1. LA 135291 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 3/3	Sandy loam	1–5	Surface sediment
2	10YR 3/4	Sandy loam	10–30	Post-occupational fill
3	7.5YR 3/3	Sandy clay	-	Living surface
4	10YR 7/2	Sandy loam	18	Feature 2 (ash pit) fill

A geomorphic test pit was excavated adjacent and outside the east wall of the structure in grid 103N/105E (see Chapter 57, Volume 3). It was excavated to a depth of about 1 m, and three soil horizons were identified (Table 53.2). From top to bottom these consist of A, Bw, and Btb1. As previously noted, the A and Bw soil horizons relate to Strata 1 and 2; whereas, the site occupation was associated with the top of the Btb1 soil horizon and Stratum 3. Table 53.3 provides the artifact count information by stratigraphic unit at the site, with a total of 113 artifacts recovered.

Table 53.2. LA 135291 soil horizon descriptions from the east profile of unit 103N/105E.

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 3/3	Sandy loam	0–4	Topsoil
Bw	10YR 3/4	Sandy loam	4–11	Late-Holocene soil
Btb1	7.5YR 3/3	Sandy clay	11–30+	Pleistocene soil

Table 53.3. LA 135291 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	6	2	0	0	**8**
1	8	1	0	0	**9**
2	66	16	14	0	**96**
3	0	0	0	0	**0**
4	0	0	0	0	**0**
Total	**80**	**19**	**14**	**0**	**113**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a one-room fieldhouse (see Figure 53.3). The room measures about 1.70 m north-south by 2.85 m east-west, with about 4.8 m^2 of interior space. Excavation of the room began with an east-west trench that extended across the rubble area along the 104N grid line. This excavation defined the east and west walls of the structure, the internal stratigraphy, and a possible unprepared floor surface. After the trench was completed, the remainder of the room fill was removed to the level of the possible floor. The geomorphic test pit was subsequently excavated to the immediate east of the structure to define the stratigraphic context of the walls and occupational surfaces.

Floor. Approximately 20 to 30 cm of post-occupational fill was removed before exposing a possible unprepared living surface within the structure. The floor was poorly defined with no obvious preparation, but was primarily identified by the break in the soil profile and the top of the Btb1 horizon. The surface was not level, but sloped down towards the north. No artifacts were recovered from the floor, but a flotation (Field Specimen [FS] 69) and pollen (FS 70) sample were taken from the southeastern corner of the room. Charred taxa identified in the flotation sample included unknown conifer, mountain mahogany, juniper, unidentified pine, and ponderosa pine. The pollen sample was not analyzed.

Features

Feature 1. Feature 1 consists of a circular set of upright dacite cobbles that bound a 43- by 57-cm area (Figure 53.4). At least one cobble is set in the bottom of the feature, but none exhibit any obvious evidence of burning, nor was any ash or charcoal present as fill. Therefore, it seems unlikely that it represents a hearth, but could be a pot rest. A pollen (FS 57) and two flotation samples (FS 58 and FS 59) were taken from the fill. Taxa identified in the pollen sample included cheno-ams, grass family, sunflower family, ragweed/bursage, globemallow, spurge family, fir, unidentified pine, piñon pine, juniper, oak, Mormon tea, and sagebrush. Charred taxa identified in the flotation samples included juniper, piñon pine, ponderosa pine, and unknown conifer.

Figure 53.4. Post-excavation photograph of Feature 1.

Feature 2. Feature 2 consists of a small ash concentration that is located outside and to the immediate east of the structure (see Figures 53.2 and 53.3). The concentration is ovoid in plan view and is 25 by 30 cm in size and 6 cm in depth (Figure 53.5). The feature could represent a discard pile, since it was not well-preserved, exhibited no evidence of *in situ* burning, and contained no charcoal or artifacts. The feature was situated directly on top of the Btb1 soil horizon. A flotation (FS 61) and pollen (FS 62) sample were taken from the fill of the feature (Stratum 4). Charred taxa identified in the flotation sample included mountain mahogany, unidentified pine, ponderosa pine, Douglas fir, oak, and maize. Taxa identified in the pollen sample included buckwheat, grass family, cheno-ams, sunflower family, ragweed/bursage, unidentified pine, piñon pine, juniper, Mormon tea, and sagebrush.

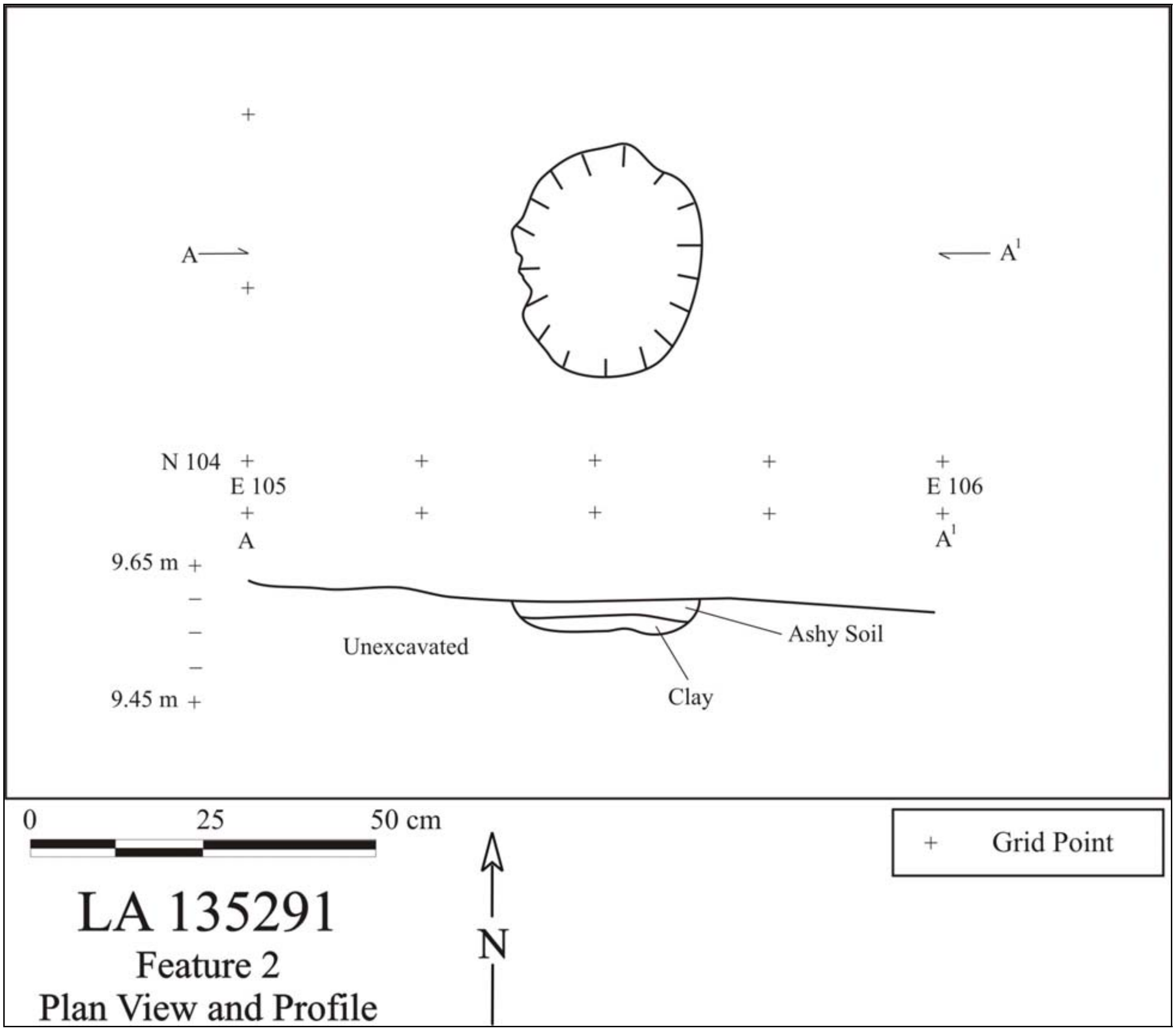

Figure 53.5. Plan view and profile drawing of Feature 2.

Wall Construction. The walls in Room 1 were composed of dacite cobbles with a few tuff blocks. The dacite is available from gravels in the nearby drainage and the tuff from outcrops in the canyon. The existing walls are one to two courses high, with dacite cobbles composing the upper course and more uniform tabular dacite cobbles the lower course. This basal course has been placed a few centimeters below the surface in a foundation trench. There was no evidence of mortar or plaster, indicating that the walls were probably dry laid. A broken dacite slab was embedded in the east wall and could represent a possible doorway into the room. The distribution of wallfall indicates that the north, east, and west walls collapsed towards the outside of the room and the south wall towards the inside of the room. A total of 2.5 m^3 of masonry rubble was removed from the fill of the room, indicating that the original walls may have stood less than 1 m high. Fragments of a broken dacite slab were identified outside the west wall that could be the remains of a hatch cover. Wall measurement information is provided in Table 53.4.

Table 53.4. LA 135291 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	2.80	0.05–0.25	0.18–0.30	1
South	2.90	0.10–0.25	0.20–0.30	2
East	1.85	0.12–0.24	0.17–0.30	1 to 2
West	1.60	0.05–0.21	0.17–0.34	1 to 2

Artifact Distribution

Table 53.5 illustrates the distribution of artifacts recovered during the site excavation (i.e., ceramics, chipped stone, ground stone, and faunal remains). The bold numbers indicate grid units that are located completely or partially within Room 1, which indicates that the majority of the artifacts were recovered from within the structure; however, there are three grids with numerous artifacts that are located to the north of the fieldhouse.

Table 53.5. LA 135291 artifact distribution by grid unit.

	E100	E101	E102	E103	E104	E105	E106
N108					8		
N107							
N106		11	0	2	9	3	
N105	4	**3**	**7**	**9**	**3**	0	
N104	3	**13**	**5**	**6**	**0**	0	1
N103	2	**3**	**2**	**9**	**4**	1	
N102				5			

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 113 artifacts were analyzed from the excavations conducted at LA 135291. In addition, flotation and pollen samples were selected for analysis from the post-occupation fill (Stratum 2), Feature 1 (Stratum 3), and Feature 2 (Stratum 4) (Table 53.6).

Table 53.6. Samples selected for analysis from LA 135291.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2	30, 32	11, 31		
2 (Feature 1)	58, 59	57		
3	69	70		
4	61	62	61	

*thermoluminescence

Chronology

Radiocarbon Dating

A single maize sample was submitted for accelerator mass spectroscopy dating from LA 135291. The sample provided a date of 410±40 BP (Beta-229536), with a calibrated intercept of AD 1450 and a two-sigma range of AD 1430 to 1520.

Ceramic Artifacts (Dean Wilson)

A total of 82 ceramics were analyzed from LA 135291. The majority of the pottery represents local Rio Grande decorated ceramics, with a few utilityware types (Table 53.7). These include Biscuit A, smeared-indented corrugated, and micaceous plain gray sherds. The whitewares are primarily tempered with fine ash tuff, the corrugated wares with smeared-indented sand, and the plain gray sherds with granite and mica (Table 53.8). Most of the whitewares are represented by bowl forms and the utilitywares by jar forms; however, two whiteware sherds are from jars and one of the plain gray sherds is from a bowl (Table 53.9). The site probably dates to the early Classic period (14th century) given the presence of Biscuit A.

Table 53.7. Ceramic types from LA 135291.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Biscuit A	12	14.6
Unpainted Biscuit one side slipped	3	3.7
Biscuit paint and slip absent	14	17.1
Northern Rio Grande Utilityware		
Plain gray rim	3	3.7
Plain gray body	13	15.9
Smeared-indented corrugated	37	45.1
Total	82	100.0

Table 53.8. Temper by ware for ceramics from LA 135291.

Temper	Ware		
	Gray	**White**	**Total**
Granite with mica	13	0	13
Fine tuff or ash	0	26	26
Anthill sand	40	3	43
Total	53	29	82

Table 53.9. Vessel form by ware for ceramics from LA 135291.

Vessel Form	Ware		
	Gray	**White**	**Total**
Indeterminate	0	3	3
Bowl rim	0	11	11
Bowl body	1	13	14
Jar neck	6	0	6
Jar body	46	2	48
Total	53	29	82

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 32 artifacts were analyzed from LA 135291, consisting of two cores, 14 pieces of debitage, two retouched tools, and 14 ground stone artifacts. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 53.10 presents the data on lithic artifact type by material type. The debitage is primarily made of Pedernal chert and chalcedony, with a single obsidian artifact. The presence of cortex on 14.2 percent of the debitage indicates that these materials were collected from waterworn (*n* = 2) sources. The Pedernal chert and chalcedony are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains. Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 53.10. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	**Vesic. Basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Sil. Wood**	**Quartzite**	**Sandstone**	**Total**
Cores	Core	0	0	0	0	0	0	0	0	0	2	0	0	0	2
	Subtotal	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Debitage	Angular debris	0	0	0	0	0	0	0	0	1	3	0	0	0	4
	Core flake	0	0	0	0	0	0	0	4	0	4	0	0	0	8
	Biface flake	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	Bipolar flake	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	1	5	1	7	0	0	0	14
Retouched Tools	Retouched piece	0	0	0	0	0	0	1	0	0	1	0	0	0	2

Artifact Type		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal	Sil. Wood	Quartzite	Sandstone	Total
		Material Type													
	Subtotal	0	0	0	0	0	0	1	0	0	1	0	0	0	2
Ground Stone	One-hand mano	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Two-hand mano	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Und. mano	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Und. metate	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Shaped slab	0	0	0	0	10	0	0	0	0	0	0	0	0	10
	Subtotal	0	0	0	0	13	0	0	0	0	0	0	1	0	14
Total		**0**	**0**	**0**	**0**	**13**	**0**	**2**	**5**	**1**	**10**	**0**	**1**	**0**	**32**

Lithic Reduction

The platform core was reduced using a bidirectional, opposed-same-face technique; whereas, the flake core was reduced using a single-face technique. The platform core was classified as exhausted and the flake core as broken due to a culturally induced fracture when discarded. Table 53.11 presents the metric information on the cores.

Table 53.11. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Single-directional	22	40	31	28.2
Bidirectional	24	40	42	41.7

The debitage consists mostly of core flakes and angular debris, with a few other items. The flakes mostly have collapsed platforms (n = 3), with fewer cortical (n = 1), single-faceted (n = 2), and multi-faceted (n = 2) platforms. Only one of the platforms exhibits evidence of preparation by abrasion/crushing. The majority of the core flakes are whole (n = 8), with fewer proximal (n = 3), midsection (n = 1), and distal (n = 2) fragments. In contrast, the biface flakes consist of a whole and distal fragment. The whole core flakes have a mean length of 36.5 mm (*std* = 6.3), the single whole biface flake a length of 12.0 mm, and the angular debris a mean weight of 2.8 g (*std* = 2.3).

Two retouched pieces were identified during the analysis. One of the retouched pieces is an obsidian flake fragment with bidirectional retouch along a lateral edge with an edge angle of 55 degrees. The other is a Pedernal chert flake fragment that exhibits unidirectional dorsal retouch along a lateral edge with an angle of 65 degrees.

Tool Use

None of the debitage or the retouched tools exhibit evidence of edge damage that could be attributed to use.

The ground stone artifacts include manos and metates. The one-hand mano consists of a piece of dacite with a single ground surface. The two-hand mano consists of a loaf-shaped piece of dacite with flat and convex-shaped grinding surfaces. The undetermined mano fragment is a fire-cracked quartzite cobble with some evidence of grinding on two opposing surfaces. The undetermined metate is a fire-cracked piece of dacite with a single heavily ground flat surface. Lastly, the undetermined ground stone items compose part of a shaped dacite slab.

Archaeobotanical Remains (Pamela McBride)

Maize cupules from the ash concentration found outside the structure just to the east were the only plant remains hinting at the agricultural activities that took place near the fieldhouse (Table 53.12). Juniper twigs and ponderosa pine and piñon needles could be related to fuelwood use or represent residue from the Cerro Grande fire. Unburned juniper twigs, ponderosa pine needles, hedgehog cactus seeds, and weedy annual seeds most likely represent modern intrusives transported into the site by wind or rodents.

Table 53.12. Flotation plant remains, count and abundance per liter from LA 135291.

FS No.	**30**	**32**	**58**	**59**	**61**	**69**
Feature	Under rock inside structure next to wall	Post-occupational fill	F. 1 (possible pot rest) fill		F. 2 Exterior ash concentration fill	Floor
Cultural						
Cultivars						
Maize					2(2) cupule	
Other						
Unidentifiable					3(0) plant part	
Perennials						
Juniper	+ twig		+ twig	+ twig		+ twig
Piñon			+ needle			
Ponderosa pine	+ fascicle, + needle	+ needle	+ needle	+ needle	+ needle	+ needle
Non-Cultural						
Annuals						
Amaranth	+		+	+		

FS No.	30	32	58	59	61	69
Goosefoot	+	+	+	+	+	+
Purslane	+	+	+		+	+
Spurge			+			
Sunflower		+				
Other						
Bean family		+				
Composite family	+	+	+		+	
Knotweed family			+			
Perennials						
Hedgehog cactus	+					
Juniper	+ twig	+ twig	+ twig	+ twig	+ twig	+ twig
Ponderosa pine	+ needle	+ needle	+ needle	+ needle	+ needle	

+ 1-10/liter.

Wood charcoal from inside the structure consisted of pine, ponderosa pine, and unknown conifer (Table 53.13). The wood may also be the result of the Cerro Grande fire. The site is located in a pine forest that was severely burned during the fire and two burned juniper trees were found inside the feature. In contrast, the wood assemblage from the possible discard pile outside the structure was quite different in composition, including possible Douglas fir, mountain mahogany, and oak. The presence of maize in this feature along with this unique wood assemblage suggests a discrete dumping episode that may be the only intact evidence at the site of fuel use.

Table 53.13. Flotation sample wood charcoal by count and weight from LA 135291.

FS No.	30	32	58	59	61	69
Feature	Under rock inside structure next to wall	Post-occupational fill	F. 1 (possible pot rest) fill		F. 2 Exterior ash concentration fill	Floor
Conifers						
cf. Douglas fir					1/<0.1 g	
Pine	1/<0.1 g				6/0.2 g	1/<0.1 g
Ponderosa pine	7/<0.1 g	2/<0.1 g	1/<0.1 g			cf. 5/0.1 g
Unknown conifer	5/0.1 g	2/<0.1 g	1/<0.1 g	3/<0.1 g		13/0.7 g
Non-Conifers						

cf. Mountain mahogany					9/0.3 g	1/<0.1 g
cf. Oak					4/0.2 g	
Totals	**13/0.1 g**	**4/<0.1 g**	**2/<0.1 g**	**3/<0.1 g**	**20/0.7 g**	

cf. compares favorably.

Pollen Remains (Susan Smith)

Four pollen samples were analyzed from LA 135291. Table 53.14 lists the frequency of identified pollen types. Maize was the only cultigen identified in the assemblage. No other economic resources were identified. A number of potential economic resources were also identified in the assemblage, and these are discussed in Smith's chapter in Volume 3.

Table 53.14. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 135291 (*n* = 4)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	0
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	0
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	1
	Eriogonum	Buckwheat	2
	Brassicaceae	Mustard Family	1

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 135291 (*n* = 4)**
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	4
		Grass Aggregates	1
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs	Cheno-Am	Cheno-Am	4
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	4
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	3
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	1

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 135291 (*n* = 4)
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	2
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	0
	Abies	Fir	2
	Pinus	Pine	4
		Pine Aggregates	0
	Pinus edulis type	Piñon	4
	Juniperus	Juniper	4
		Juniper Aggregates	0
	Quercus	Oak	2
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	4
	Artemisia	Sagebrush	4
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	1
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY OF SITE EXCAVATIONS

LA 135291 consists of a one-room fieldhouse. Excavations revealed the presence of an unprepared floor that corresponded with the top of the Btb1 soil horizon. No artifacts were exposed on the floor; however, a single feature was identified. The feature consisted of several upright dacite cobbles that enclosed the northeast corner of the room. The cobbles do not appear to be the remains of a hearth given the absence of burning, but may be a pot rest. An ash discard pile was identified outside and to the east of the fieldhouse. The presence of maize and the prevalence of storage jars reflect the agricultural function of the site, with limited core reduction and grinding activities also being represented. The occupation of the site dates to the 14th century (Early Classic) based on the presence of Biscuit A ceramics.

CHAPTER 54
RENDIJA TRACT (A-14): LA 135292

Gregory D. Lockard

INTRODUCTION

LA 135292 is the remains of a one-room Classic period fieldhouse located on a terrace to the south of the Rendija Canyon channel. The site is located a few tens of m north of the Rendija Canyon Road. It is covered with grass, but otherwise contains only a few small bushes that were burned during the Cerro Grande fire. The site is situated at an elevation of 2080 m (6915 ft).

LA 135292 was first recorded on October 19, 2000, by Nisengard, Harmon, and Schmidt as part of the Cerro Grande post-fire assessment project. The site was identified as a possible fieldhouse. Artifacts visible on the surface included an obsidian core flake, a Pedernal chert core flake, a Wiyo black-on-white sherd, a Biscuit B sherd, two indeterminate whiteware sherds, two smeared-indented sherds, and three plainware sherds. Based on these ceramics, the site was likely occupied during the Classic period (AD 1325–1600).

FIELD METHODS

Before excavation, the site and surrounding area were cleared of trees and large undergrowth. The site was then visible as a small rubble mound approximately 2 by 2 m in area (Figure 54.1). An arbitrary site datum (designated 100N/100E, 10.00 m elevation) was set up in the southwest corner of the site. The site was then covered with a 1- by 1-m grid that extended 5 m north and 6 m east of the site datum. Two subdatums (A and B) were set up for taking elevations. The site was then photographed. Artifacts visible on the surface were collected by grid unit, and the location of artifacts outside of the grid was determined with tape measures. A 6- by 1-m east-west trench (102N/100-105E) was initially excavated across the rubble mound. The purpose of this trench was to expose a profile of the site stratigraphy, as well as to determine the location of the structure's east and west walls. Units were excavated by strata, and thicker strata were excavated in arbitrary 10-cm levels. The southwest corner of the structure was encountered in unit 102N/102E. The south wall extends eastward through unit 102N/103E and into the western half of unit 102N/104E.

No discernible living surface was encountered in any of the grid units in the trench. Excavation of the trench units proceeded down to the base of the walls. Unit 102N/101E, located just west of the southwest corner of the room, was selected to serve as a test pit for geological analysis. Excavation in this unit therefore proceeded an additional 50 cm below the surrounding units. After the excavation of the trench units, the north profile of the trench was drawn and photographed. The rest of the area was subsequently excavated, again by strata and arbitrary levels for thicker strata. In all, 18 units were excavated. Excavation revealed that only the structure's southwest corner was preserved. The other corners, along with most if not all of the room's north and east walls, were destroyed, probably by modern machinery. As a result, there was no clear boundary between the inside and outside of the room, except in the southwest corner.

Figure 54.1. Pre-excavation photograph of LA 135292.

Excavation throughout the site therefore terminated at the same level—the base of the extant portions of the room's walls. Excavation focused on defining the room's walls, removing wallfall, and locating features. Soil samples were taken from select locations, and all other soil was passed through screens with 1/8-in. mesh to aid in the recovery of artifacts. The excavation area extended at least 1 m beyond the structure in all directions to locate external features and/or outdoor activity areas. The structure was then mapped (Figure 54.2) and photographed (Figure 54.3).

The excavation of the site was supervised by Greg Lockard. The field crew included Joseph (Woody) Aguilar, Bettina Kuru'es, Brandon Gabler, Margaret Dew, Jeanine Wood, and Aaron Lenihan. Timothy Martinez and Aaron Gonzalez served as site monitors from San Ildefonso Pueblo and as screeners. Michael Chavarria was the site monitor representing Santa Clara Pueblo, as well as an additional screener.

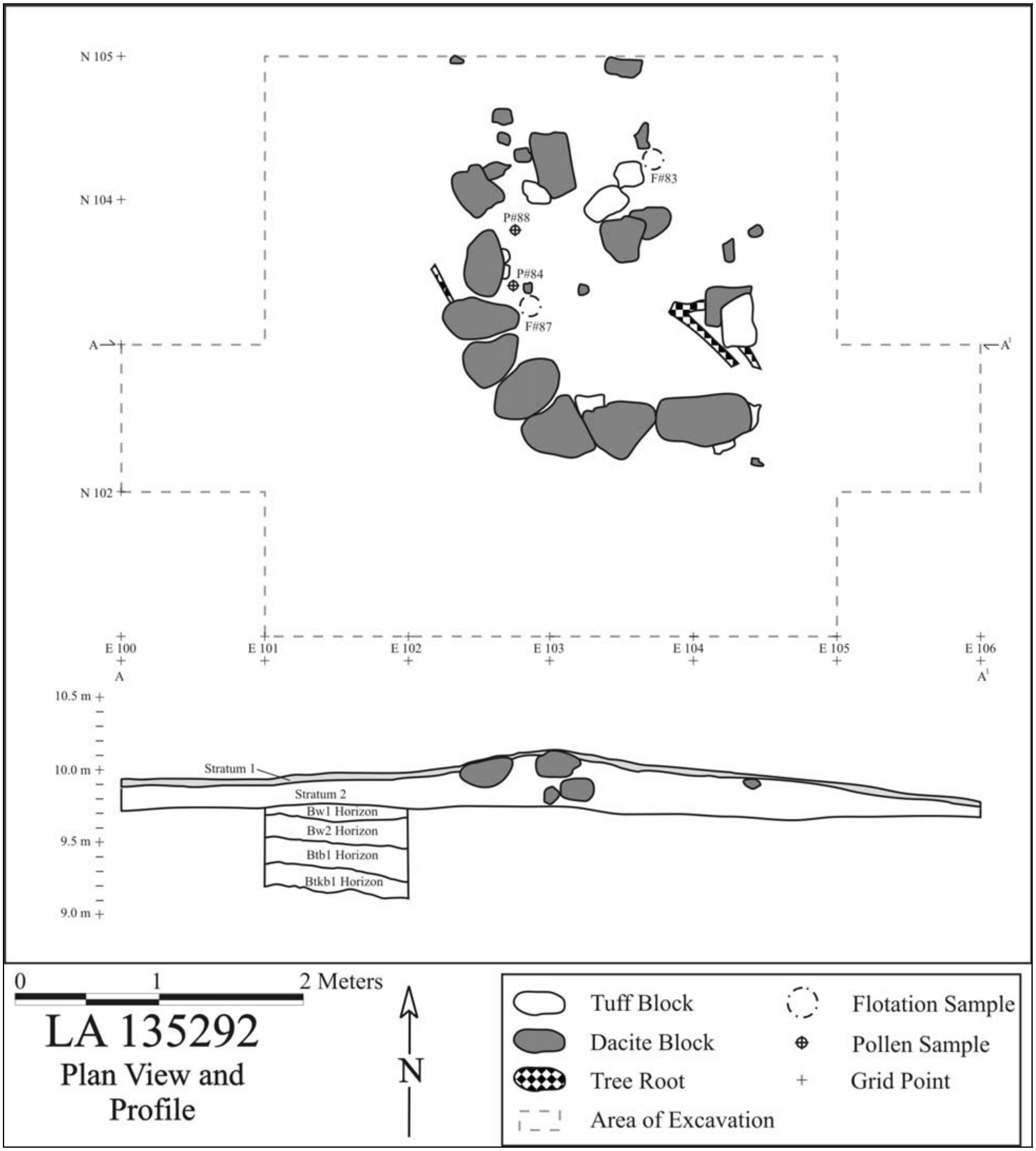

Figure 54.2. Plan view and profile drawing of LA 135292.

STRATIGRAPHY

Stratum 1 is composed of loose surface sediment. It is uniformly 2 to 6 cm thick across the site and is equivalent to the upper portion of the A horizon (topsoil). Stratum 2 is post-occupational fill and ranges from 20 to 35 cm in thickness. The post-occupational fill was thickest in the southwest (i.e., preserved) corner of the room. Stratum 2 includes the lower portion of the A horizon and the upper portion of the Bw1 horizon. Stratum 3 is the sterile sediment excavated in the geological test pit and includes the lower portion of the Bw1 horizon and the Bw2, Btb1, and Btkb1 horizons. Tables 54.1 to 54.4 describe the strata.

Table 54.1. LA 135292 strata descriptions.

Stratum	Color	Texture	Thickness (cm)	Description
0	-	-	-	Surface
1	10YR 4/3	Silty loam	2–6	Surface sediment
2	10YR 4/4	Silty loam	20–35	Post-occupational fill
3	8.75YR 4/4	Silt	45	Pleistocene soil

Figure 54.3. Post-excavation photograph of the fieldhouse at LA 135292.

Table 54.2. LA 135292 soil horizon descriptions from the north profile of the geological test pit (102N/101E).

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 4/3	Silty loam	0–14	Topsoil
Bw1	10YR 4/4	Silty loam	14–30	Late-Holocene soil

Horizon	Color	Texture	Depth (cm)	Description
Bw2	10YR 3.5/4	Silt	30–44	Late-Holocene soil
Btb1	8.75YR 4/4	Silt	44–61	Pleistocene soil
Btkb1	7.5YR 3/3	Silty clay	61–70+	Pleistocene soil

Table 54.3. LA 135292 soil horizon descriptions from the north profile of unit 102N/103E.

Horizon	Color	Texture	Depth (cm)	Description
A	10YR 4.5/3	Silt	0–28	Topsoil
Bw1	10YR 4/4	Silt	28–36+	Late-Holocene soil

Table 54.4. LA 135292 artifact counts by strata.

Stratum	Ceramics	Chipped Stone	Ground Stone	Faunal Remains	Total
0	3	7	0	0	**10**
1	25	13	0	1	**39**
2	64	63	3	0	**130**
3	0	0	0	0	**0**
Total	**92**	**83**	**3**	**1**	**179**

SITE EXCAVATION

Room 1

Sequence of Excavation. Room 1 is a small structure of unknown shape and dimensions that probably functioned as a fieldhouse. Excavation of the room began with an east-west trench that extended across the site (102N/100-105E). The excavation of this trench served to define the room's stratigraphy, as well as to locate the room's south and west walls. No living surface was encountered in any of the grid units in the trench. The excavations therefore terminated at the base of the room's walls. After the excavation of the trench, the area to the northeast of the south and west walls was excavated down to the level of the base of the room's walls. A small patch of burned earth was encountered in 104N/103E. This patch of burned earth may have been part of the room's living surface.

Fill. Due to the destruction of all but the southwest corner of the room, the room's fill could not be differentiated from the post-occupational fill outside of the room. Nevertheless, three flotation samples (Field Specimen [FS] 75, FS 77, and FS 87) and three pollen samples (FS 76, FS 78, and FS 88) were taken of post-occupational fill in the area to the northeast of the south and west walls. All of these samples are from locations that were most likely within Room 1. The samples may therefore represent room fill. The machinery that disturbed the room's walls, however, most likely also disturbed the post-occupational fill in all but the room's southwest corner. As a result, the samples probably represent mixed deposits rather than pure room fill. Charred taxa identified in the flotation samples included ponderosa pine, unidentified pine, maize, cheno-ams, juniper, unknown conifer, and mountain mahogany. Taxa identified in the pollen samples included maize, beeweed, lily family, rose family, grass family, cheno-ams, sunflower family, ragweed/bursage, spurge family, unidentified pine, piñon pine, juniper, oak, and sagebrush.

Floor. No floor or prepared living surface was encountered during the excavation of LA 135292. A small patch of burned earth was encountered in the southeast quadrant of 104N/103E (Figure 54.4). This patch of burned earth could be part of the room's living surface. It is equally likely, however, that the earth was burned during a forest fire. A small pit was encountered nearby in 103-104N/103E. This pit was most likely the remains of an animal burrow. The pit contained four large rocks. These rocks may have been placed within the pit during the site's occupation. If this is the case, the animal burrow probably post-dates the room's construction, as it is unlikely that a fieldhouse would have been built around such a large hole. The site was thereafter reoccupied, at which time the rocks were placed in the animal burrow to repair the room's living surface. There is no firm evidence, however, that the rocks were placed within the pit prehistorically. In other words, the animal burrow may post-date the site's occupation. If this is the case, the rocks are wallfall that fell into the burrow, or were pushed into the burrow by the modern machinery that destroyed the walls in this area of the site.

Figure 54.4. Burned patch of earth in Room 1 at LA 135292.

A pollen sample (FS 84) was taken from just inside the room at the base of the west wall. Taxa identified in this sample included beeweed, grass family, cheno-ams, ragweed/bursage, sunflower family, spurge family, unidentified pine, oak, and sagebrush. A flotation sample (FS 87) and a pollen sample (FS 88) were also taken from just inside the room's west wall, a few centimeters above the base of the walls (see above for results). At least one of these three samples is from a level that is at least near the Room 1 living surface. A flotation sample (FS 83) was taken of the burned earth in the southeast quadrant of 104N/103E. Charred taxa identified in this sample included juniper, Douglas fir, oak, mountain mahogany, unknown conifer, and ponderosa pine. A great deal of charcoal was encountered during the excavation of the site. Most if not all of the charcoal, however, was produced during the Cerro Grande fire. This modern charcoal could not be distinguished from any possible prehistoric charcoal. As a result, no charcoal was kept from the site as a radiocarbon sample.

Wall Construction. The only walls in Room 1 that were preserved at the time of excavation were the south and west walls. These walls join to form the southwest corner of the room, which is well-rounded. The walls do straighten out, however, away from the corner. The room therefore does not appear to have been elliptical in shape. Instead, it was most likely rectangular with rounded corners. The easternmost two rocks of the south wall are elongated and oriented lengthwise. The cobbles that form the southwest corner and west wall, on the other hand, tend to be rounder and more irregular in shape. Small tuff rocks were utilized as foundations for, and placed in, the spaces between the large dacite cobbles. Because the northwest and southeast corners of the structure were destroyed, the prehistoric lengths of the walls are unknown (Table 54.5). Two stones, one on top of the other, were encountered to the north of the east end of the south wall. The lower rock is not like the cobbles that form the south and east walls and is considerably deeper. It therefore does not appear to have been part of the room's walls. The upper rock, on the other hand, is a shaped tuff block, and therefore probably was part of the room's walls. It is unknown, however, whether the rock is *in situ*. Its north-south orientation suggests that it is *in situ* and was part of the east wall. If this is the case, however, the room was very narrow (about 1.5 m). A large dacite cobble was encountered to the north of the west wall. This rock was most likely part of the west wall and is only slightly displaced. Two tuff blocks were encountered to the northeast of the west wall. These rocks were probably part of the north wall. Their orientation, however, indicates that they are not *in situ*.

Table 54.5. LA 135292 Room 1 wall measurements.

Orientation	Length (m)	Height (m)	Thickness (m)	Number of Courses
North	0	N/A	N/A	0
South	1.42	0.10–0.27	0.18–0.36	1
East	0.36	0.16–0.29	0.18	1 to 2
West	1.21	0.13–0.23	0.10–0.40	1

Note: The lengths are of the extant portions of the walls.

Judging from the amount of wallfall removed during the excavation of the area in and around Room 1, the room's masonry was originally considerably higher than it was when the site was excavated. Due to the fact that the lengths of the room's walls could not be determined, the original height of the masonry could not be determined. All of the rocks removed as wallfall during the site's excavation, however, were placed in a large stack for measurement. The stack measured 4.35 by 0.30 by 0.45 m, for a total of approximately 0.59 m^3 of wallfall. This number is significantly less than the average volume of wallfall removed during the excavation of other fieldhouses in the Rendija Canyon Tract during the Conveyance and Transfer Project. The rest of the rocks that formed the room's walls were probably pushed off of the excavated portion of the site by the modern machinery that destroyed the room's north and east walls. This interpretation is supported by the fact that most of the wallfall removed from the site was from the southwest (i.e., preserved) corner of the room. The uppermost portions of the room's walls, as well as the roof, were most likely composed of wattle and daub. These materials are rarely preserved at archaeological sites on the Pajarito Plateau. In fact, only seven pieces of burned adobe (FS 45, FS 51, FS 55, FS 60, FS 67, FS 82, and FS 86) were recovered from the site.

Geological Analysis

Geologists Paul Drakos and Steven Reneau utilized two profiles to reconstruct the natural soil horizons at the site. The first is the north profile of the geological test pit (102N/101E). The profile contained a soil sequence consisting of an A horizon (topsoil), Bw1 and Bw2 horizons (late-Holocene soils), and Btb1 and Btkb1 horizons (Pleistocene soils) (see Table 54.2; Figure 54.5). The second profile, the north profile of 102N/103E, was examined just after the excavation of the east-west trench across the site. This profile contained a soil sequence consisting of an A horizon (topsoil) and a Bw1 horizon (a late-Holocene soil) (see Table 54.3). An examination of the relationship between the stratigraphy and the extant portions of the Room 1 walls reveals that the foundations were constructed directly on top of the Bw1 horizon.

Artifact Distribution

There are no obvious patterns in the distribution of artifacts at LA 135292 (Table 54.6). Much of the site has been severely disturbed, probably by modern machinery. Even if patterns were evident in the artifact distribution, they would have probably been the result of modern rather than prehistoric site formation processes anyway.

Table 54.6. LA 135292 artifact counts (ceramics, chipped stone, ground stone, and faunal remains) by grid unit.

	E100	E101	E102	E103	E104	E105
N104		13	5	14	6	
N103		0	6	12	17	
N102	0	14	5	17	5	3
N101		11	15	18	9	

Note: Does not include nine artifacts found outside of the excavated area during surface collection.

Figure 54.5. Profile of the north wall in the geologic test pit.

SITE CHRONOLOGY AND ASSEMBLAGE

A total of 178 artifacts were analyzed from the excavations conducted at LA 135292. In addition, flotation and pollen samples were selected for analysis from the post-occupation fill

(Stratum 2) (Table 54.7). The results of the artifact and sample analyzes are presented in the following sections.

Table 54.7. Samples selected for analysis from LA 135292.

Stratum	Sample Type			
	Flotation	Pollen	Radiocarbon	TL*
1				
2	77, 83, 87	78, 84, 88		
3				

*thermoluminescence

Ceramic Artifacts (Dean Wilson)

A total of 89 ceramics were analyzed from LA 135292. The majority of the pottery consists of smeared-indented corrugated and Biscuit A sherds. In addition, the presence of Santa Fe Black-on-white, Wiyo Black-on-white, Galisteo Black-on-white, and Sapawe Micaceous would seem to reflect an Early Classic period occupation (Table 54.8). Information on ceramic tradition by ware, temper by ware, and vessel form by ware are provided in Tables 54.9 to 54.11. The graywares and whitewares appear to have been locally made from smeared-indented sand or tuff, although a single whiteware sherd does exhibit non-local micaceous temper. Most of the grayware ceramics consist of jar vessel forms, however, one sherd was derived from a bowl. In contrast, the whiteware sherds include mostly bowls, with some jars.

Table 54.8. Ceramic types from LA 135292.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	1	2.2
Santa Fe Black-on-white	2	2.2
Biscuit paint and slip absent	4	4.5
Biscuit painted unspecified	2	2.2
Biscuit unpainted one side slipped	2	2.2
Biscuit unpainted both sides slipped	4	4.5
Biscuit A	3	3.4
Biscuit B/C body	14	15.7
Sankawi Black-on-cream	2	2.2
Northern Rio Grande Utilityware		
Unknown gray rim	1	1.1
Plain gray body	3	3.4
Smeared-indented corrugated	50	56.4
Total	**89**	**100.0**

Table 54.9. Tradition by ware for LA 135292 ceramics.

Tradition	Ware								Total	
	Gray		White		Glaze		Micaceous			
Rio Grande (Prehistoric)	54	100.0	34	97.1	0	0.0	0	0.0	88	98.8
Rio Grande (Tewa Micaceous)	0	0.0	1	2.9	0	0.0	0	0.0	1	1.2
Middle Rio Grande	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	**54**	**100.0**	**35**	**100.0**	**0**	**0.0**	**0**	**0.0**	**89**	**100.0**

Table 54.10. Temper by ware for LA 135292 ceramics.

Temper	Ware								Total	
	Gray		White		Glaze		Micaceous			
Fine tuff or ash	0	0.0	29	82.8	0	0.0	0	0.0	29	32.5
Fine tuff and sand	0	0.0	1	2.8	0	0.0	0	0.0	1	1.1
Smeared-indented sand	54	100.0	3	8.5	0	0.0	0	0.0	57	64.0
Oblate shale and tuff	0	0.0	1	2.8	0	0.0	0	0.0	1	1.1
Granite with mica	0	0.0	1	2.8	0	0.0	0	0.0	1	1.1
Total	**54**	**100.0**	**35**	**100.0**	**0**	**0.0**	**0**	**100.0**	**89**	**100.0**

Table 54.11. Vessel form by ware for LA 135292 ceramics.

Vessel Form	Ware								Total	
	Gray		White		Glaze		Micaceous			
Indeterminate	4	7.4	4	11.4	0	0.0	0	0.0	8	8.9
Bowl rim	1	1.8	0	0.0	0	0.0	0	0.0	1	1.1
Bowl body	0	0.0	25	71.4	0	0.0	0	0.0	25	28.0
Jar neck	2	3.7	1	2.8	0	0.0	0	0.0	3	3.3
Jar body	47	87.0	5	14.2	0	0.0	0	0.0	52	58.4
Total	**54**	**100.0**	**35**	**100.0**	**0**	**0.0**	**0**	**100.0**	**89**	**100.0**

Lithic Artifacts (Bradley Vierra and Michael Dilley)

Material Selection

A total of 89 artifacts were analyzed from LA 135292, consisting of a core, 78 pieces of debitage, six retouched tools, and four ground stone artifacts. This represents a 100 percent sample of the total lithic artifacts recovered during the site excavations. Table 54.12 presents the data on lithic artifact type by material type. The debitage is primarily made of chalcedony, Pedernal chert, and obsidian, with a few other materials. The presence of cortex on 12.8 percent of the debitage indicates that these materials were collected from waterworn (n = 7) and nodule (n = 3) sources. The chalcedony, Pedernal chert, and silicified wood are available from local Rio Grande Valley gravels and the obsidian from nearby sources in the Jemez Mountains.

Otherwise, the igneous materials are available both as bedrock outcrops and in stream gravels that cross-cut the plateau.

Table 54.12. Lithic artifact type by material type.

Artifact Type		Material Type													
		Basalt	**Vesic. Basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal**	**Sil. Wood**	**Quartzite**	**Greenstone**	**Total**
Cores	Core	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Subtotal	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Debitage	Angular debris	0	0	0	0	0	0	4	2	0	3	0	0	0	9
	Core flake	1	0	4	0	1	0	2	2	0	1	1	0	1	45
	Biface flake	0	0	0	0	0	0	7	2	0	1	1	0	0	11
	Microdeb.	0	0	0	0	0	0	1	1	0	0	0	0	0	4
	Und. flake	0	0	0	0	0	0	1	8	0	0	0	0	0	9
	Subtotal	1	0	4	0	1	0	15	35	0	19	2	0	1	78
Retouched Tools	Retouched piece	0	0	0	0	0	0	0	0	0	2	0	0	0	2
	Biface	0	0	0	0	0	0	2	0	0	0	0	0	0	2
	Projectile point	0	0	0	0	0	0	2	0	0	0	0	0	0	2
	Subtotal	0	0	0	0	0	0	4	0	0	2	0	0	0	6
Ground Stone	One-hand mano	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	Und. mano	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Polishing stone	0	0	0	1	0	0	0	0	0	0	0	0	0	1
	Hoe	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	Subtotal	1	1	0	1	0	0	0	0	0	0	0	1	0	4
Total		**2**	**1**	**4**	**1**	**1**	**0**	**19**	**36**	**0**	**21**	**2**	**1**	**1**	**89**

Four pieces of obsidian debitage, a single piece of basalt debitage, and four obsidian retouched tools were submitted for X-ray fluorescence analysis. The obsidian artifacts are Valle Grande, Cerro Toledo, and El Rechuelos obsidian (Table 54.13). The Valle Grande (Cerro del Medio) and Cerro Toledo (Obsidian Ridge/Rabbit Mountain) source areas are situated about 17 km (11 mi) and 19 km (12 mi) to the west and southwest. Although obsidian is present at these nearby sources in the Jemez Mountains, it is also present on the nearby mesa as small pebbles. These pebbles compose part of the secondary deposits associated with the Cerro Toledo interval. The El Rechuelos (Polvadera Peak) source area is located approximately 27 km (17 mi) northwest of the site. A single basalt flake is actually made of dacite that was derived from a local source.

Table 54.13. Obsidian source samples.

FS #	Artifact	Color	Source
20	Debitage	Translucent	Cerro Toledo rhyolite
30	Biface	Translucent	Cerro Toledo rhyolite
33	Debitage	Translucent	Valle Grande rhyolite
39	Biface	Black dusty	El Rechuelos
63	Debitage	Translucent	Valle Grande rhyolite
73	Debitage	Translucent	Cerro Toledo rhyolite
89	Point	Black Dusty	El Rechuelos

Lithic Reduction

The single core is a flake core that was reduced using opposed-same-face technique. It was classified as still useable when discarded. Table 54.14 presents the metric information on the core.

Table 54.14. Core type dimensions (mm) and weight (g).

Core Type	Length	Width	Thickness	Weight
Flake core	45	44	15	32.0

The debitage mostly consists of core flakes, with fewer biface flakes, angular debris, and other items. The flakes mostly have single-faceted platforms (*n* = 20), with fewer multi-faceted (*n* = 1), collapsed (*n* = 9), and crushed (*n* = 10) platforms. Only two of the platforms exhibit evidence of preparation by abrasion/crushing. The majority of the core flakes are whole (*n* = 16), with fewer proximal (*n* = 15), distal (*n* = 13), and undetermined (*n* = 1) fragments. In contrast, the biface flakes consist of a whole (*n* = 2), proximal (*n* = 7), and midsection (*n* = 2) fragments. The whole core flakes have a mean length of 24.1 mm (*std* = 11.4), the whole biface flakes a mean length of 24.5 mm (*std* = 7.7), and the angular debris a mean weight of 1.5 g (*std* = 1.4).

The retouched tools consist of retouched pieces, bifaces, and projectile points. The retouched pieces are large flakes with laterally retouched edges. One has been retouched along the dorsal surface and the other exhibits alternating retouch (dorsal and ventral), with edge angles of 75 and 70 degrees. The bifaces consist of a distal fragment from a large biface and a whole late-stage biface. The latter may be a reworked point or an unfinished preform (Figure 54.6). The projectile points consist of two base fragments. One appears to be a corner-notched point with a broken blade and tangs. The other is a stemmed point with a concave base. It exhibits an impact fracture that burinated the tip and lateral side of the point. Both of these items could represent Archaic dart points.

Tool Use

Only one piece of debitage and none of the retouched tools exhibit evidence of edge damage that could be attributed to use. The single utilized flake has rounding use along a lateral straight edge with an angle of 45 degrees.

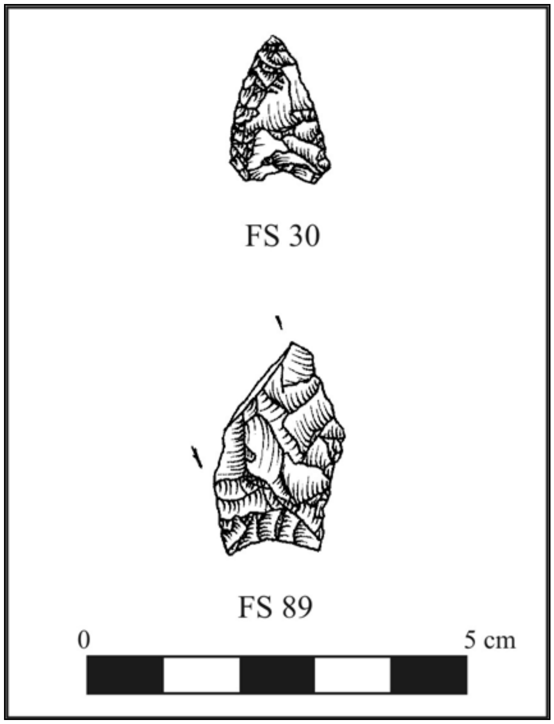

Figure 54.6. Biface and projectile point.

The ground stone artifacts include manos, a polishing stone, and an axe. The two-hand mano is a fragment that appears to have been reworked and continued to be used as a one-hand mano (Figure 54.7). It has two opposing heavily ground surfaces and a wedge-shaped cross-section. The other mano is a fire-cracked quartzite cobble fragment with a single ground surface. The polishing stone consists of a flat andesite pebble with a single ground/polished surface. Lastly, the axe is a butt fragment with a full groove (Figure 54.7). The faces are polished, indicating that the item might have been ground during resharpening, rather that chipped; however, this might also be the by-product of use.

Faunal Remains (Kari Schmidt)

One piece of unidentified bone was recovered from LA 135292. The bone was recovered from unit 102N/103E, was heavily burned, and was a very small fragment of cancellous bone. The bone was recovered from the upper fill of the fieldhouse and contained an old break.

Archaeobotanical Remains (Pamela McBride)

LA 135292 was severely affected by the Cerro Grande fire and all but the southwest corner of the room was destroyed by modern machinery. The sample from room fill contained a charred cheno-am seed, ponderosa pine needles, and a possible cupule fragment (Table 54.15). Unidentifiable plant parts were recovered from the area of burned earth that may represent what remains of the living surface. Modern uncharred grass, annual, and groundcherry seeds were all that was recovered from the sample just inside the room's west wall.

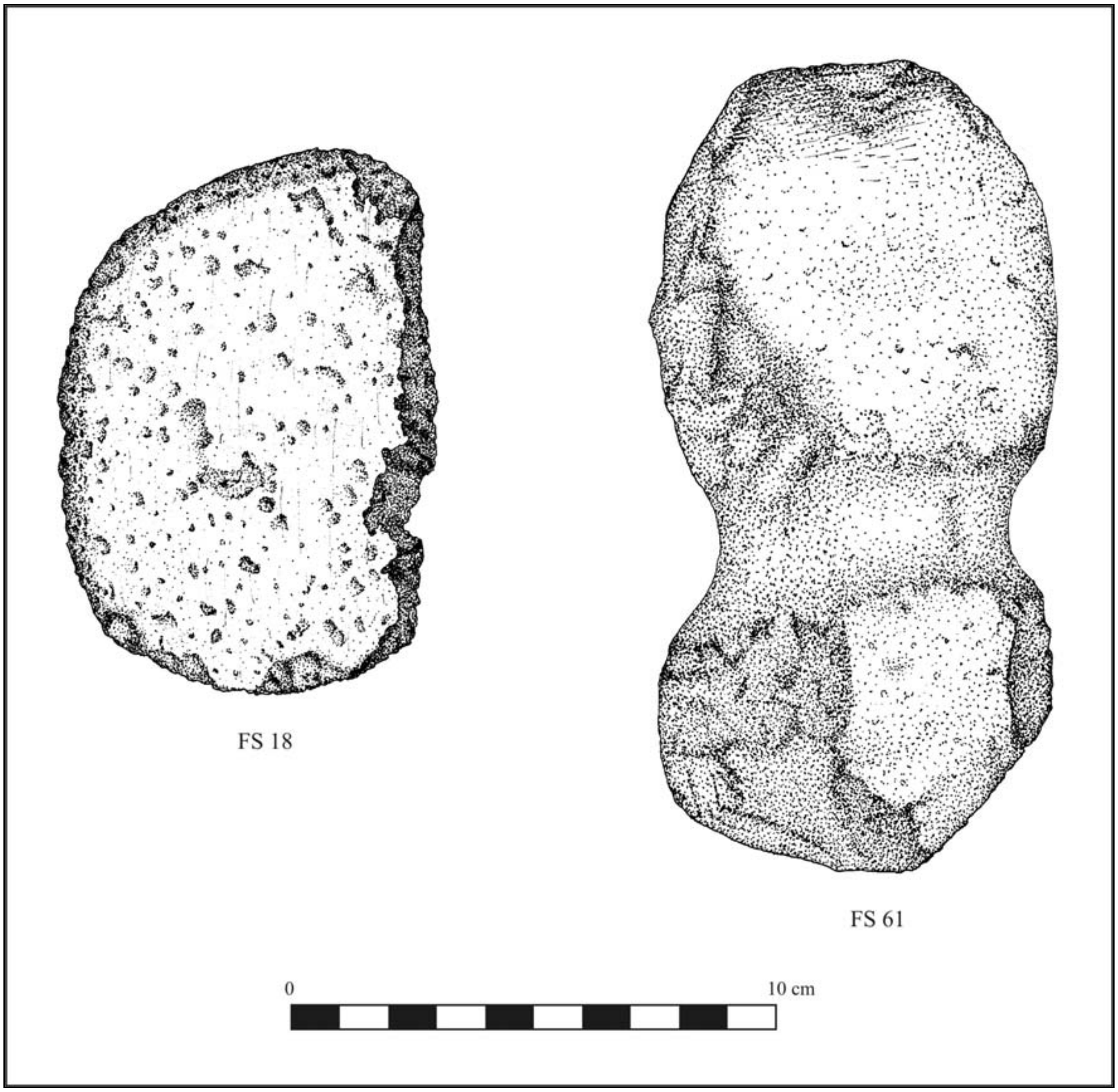

Figure 54.7. Mano and axe from LA 135292.

Table 54.15. Flotation plant remains, count, and abundance per liter from LA 135292.

FS No.	**77**	**83**	**87**
Feature	Post-occupational fill, Strat. 2, level 3	Burned earth	Strat. 2, level 4, just E of W wall of Rm. 1
Cultural			
Annuals			
Cheno-Am	1(1)		
Cultivars			
Maize	1(0) cf. c		

FS No.	77	83	87
Other			
Unidentifiable		1(0), 1(1) pc	
Perennials			
Ponderosa pine	+ needle		
Non-Cultural			
Annuals			
Amaranth	+	+	+
Goosefoot	+	+	+
Purslane	+		+
Sunflower		+	
Grasses			
Dropseed grass		+	
Grass family	+	+	+
Other			
Evening primrose		+	
Groundcherry	+	+	+

+ 1-10/liter, c cupule, cf. compares favorably, pc partially charred.

The wood assemblage was much more diverse than that present at LA 135291 and included juniper, ponderosa pine, and mountain mahogany (Table 54.16). Possible Douglas fir and oak were identified in the sample from the burned earth, wood taxa that were absent from general fill samples. Excavators noted that burned wood resulting from the Cerro Grande fire could not be distinguished from possible prehistoric charcoal. Therefore, the cultural origin of wood from flotation samples is doubtful.

Table 54.16. Flotation sample wood charcoal by count and weight in grams from LA 135292.

FS No.	77	83	87
Feature	Post-occupational fill, Strat. 2, level 3	Burned earth	Strat. 2, level 4, just E of W wall of Rm. 1
Conifers			
cf. Douglas fir		1/<0.1 g	
Juniper	2/0.1 g	1/<0.1 g	
Pine	1/<0.1 g		
Ponderosa pine		5/0.1 g	8/0.4 g
Unknown conifer	2/<0.1 g	2/<0.1 g	1/<0.1 g
Non-Conifers			
Mountain mahogany	3/<0.1 g	10/0.2 g	1/<0.1 g
Oak		1/<0.1 g	
Totals	**8/0.1 g**	**20/0.3 g**	**10/0.4 g**

Pollen Remains (Susan Smith)

Three pollen samples were analyzed from LA 135292. Table 54.17 lists the frequency of identified pollen types. Maize was the only cultigen identified in the assemblage. Beeweed and lily family were also identified as economic resources. A number of potential economic resources were also identified in the assemblage, and these are discussed in Smith's chapter in Volume 3.

Table 54.17. Pollen types identified by taxa and common names with sample frequency.

Ecological and Ethnobotanical Category	Taxa Name	Common Name	LA 135292 (*n* = 3)
Cultigens	*Gossypium*	Cotton	0
	Cucurbita	Squash	0
	Zea mays	Maize	1
	Zea Aggregates	Maize Aggregates	0
	Opuntia (Cylindro)	Cholla	0
Economic Resources	*Opuntia* (Platy)	Prickly Pear	0
		Prickly Pear Aggregates	0
	Cactaceae	Cactus Family	0
	Cactus Family Aggregates	Cactus Family Aggregates	0
	Cleome	Beeweed	3
	cf. *Helianthus*	Sunflower type	0
	Liliaceae	Lily Family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	1
	Solanaceae	Nightshade Family	0
	Apiaceae	Parsley Family	0
	Typha	Cattail	0
	Cyperaceae	Sedge	0
	Lamiaceae	Mint Family	0
	Portulaca	Purslane	0
Other Potential Economic Resources	Rosaceae	Rose Family	2
	Eriogonum	Buckwheat	0
	Brassicaceae	Mustard Family	0
		Mustard Aggregates	0
	cf. *Astragalus*	Locoweed	0
		cf. Locoweed Aggregates	0
	Polygonaceae	Knotweed Family	0
	Polygonum (frilly grain, cf. *Paronychia)* type	Knotweed cf. *Paronychia* type	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 135292 (*n* = 3)**
	Plantago	Plantain	0
	Polygala type	Milkwort	0
	Poaceae	Grass Family	3
		Grass Aggregates	0
	Large Poaceae	Large Grass includes Indian ricegrass (Achnatherum, cereal grasses (oats, Avena, wheat, Triticum, etc.), and others	0
Riparian Types	*Populus*	Cottonwood, Aspen	0
	Juglans	Walnut	0
	Betula	Birch	0
	Alnus	Alder	0
	Salix	Willow	0
Native Weeds, Herbs, and Shrubs	Cheno-Am	Cheno-Am	3
		Cheno-Am Aggregates	0
	Fabaceae	Pea Family	0
	Asteraceae	Sunflower Family includes rabbitbrush (Chrysothamnus), snakeweed (Gutierrezia), aster (Aster), groundsel (Senecio), and others	3
		Sunflower Family Aggregates	0
	Ambrosia	Ragweed, Bursage	2
		Ragweed/Bursage Aggregates	0
	Unknown Asteraceae type only at LA 86637	Unknown Sunflower Family type only at LA 86637	0
	Asteraceae Broad Spine type	Sunflower Family broad spine type	0
	Unknown Asteraceae Low-Spine type	Unknown Low-Spine Sunflower Family, possible Marshelder	0
	Liguliflorae	Chicory Tribe includes prickly lettuce (Lactuca), microseris (Microseris), hawkweed (Hieracium), and others	0
	Sphaeralcea	Globemallow	0
		Globemallow Aggregates	0
	Euphorbiaceae	Spurge Family	2
	Scrophulariaceae	Penstemon Family	0
	Onagraceae	Evening Primrose	0
	Unknown cf. Brassicaceae (prolate, semi-tectate)	Unknown Mustard type	0

Ecological and Ethnobotanical Category	**Taxa Name**	**Common Name**	**LA 135292 (*n* = 3)**
	Nyctaginaceae	Four O'Clock Family	0
	Unknown cf. Nyctaginaceae	Unknown cf. Four O'Clock Family (periporate, ca. 80 µm)	0
	Convolvulaceae	Morning Glory Family	0
Regional to Extralocal Native Trees and Shrubs and Subsistence Resources	*Pseudotsuga*	Douglas Fir	0
	Picea	Spruce	0
	Abies	Fir	0
	Pinus	Pine	3
		Pine Aggregates	0
	Pinus edulis type	Piñon	2
	Juniperus	Juniper	2
		Juniper Aggregates	0
	Quercus	Oak	2
	Rhus type	Squawbush type	0
	Rhamnaceae	Buckthorn Family	0
	Ephedra	Mormon Tea	0
	Artemisia	Sagebrush	3
		Sagebrush Aggregates	0
	Unknown Small *Artemisia*	Unknown Small Sagebrush	1
		Small Sagebrush Aggregates	0
	Sarcobatus	Greasewood	0
	Fraxinus	Ash	0
Exotics	*Ulmus*	Elm (exotic)	0
	Elaeagnus	cf. Russian Olive type (exotic)	0
	Erodium	Crane's Bill (exotic)	0
	Carya	Pecan (exotic)	0

SUMMARY OF SITE EXCAVATIONS

LA 135292 consists of a probable one-room fieldhouse that did not contain a formal floor or a living surface. Ceramic evidence suggests the site was occupied during the Early Classic period. The presence of maize and the prevalence of storage jars reflect the agricultural function of the site, with limited core reduction and grinding activities also being represented. The occupation of the site dates to the 14th century (Early Classic) based on the presence of Biscuit A ceramics.

CHAPTER 55
TESTING FOR SITE ELIGIBILITY IN THE TA-74 AND WHITE ROCK Y TRACTS

Steven R. Hoagland

INTRODUCTION

Portions of two Land Conveyance and Transfer Tracts, that were scheduled to be conveyed to the County of Los Alamos (County), New Mexico, or its designee, contained archaeological sites that were assessed to have an undetermined Register eligibility. Under 36 CFR 800.5(vii), the conveyance of lands to the County is considered an adverse effect to historic properties, if adequate and legally enforceable restrictions or conditions to ensure the long-tern preservation of these properties' historic significance are not established. The original cultural resources evaluation for this project assessed 10 archaeological sites in the TA-74 Tract and two sites in the White Rock Y Tract as having an undetermined potential under Criterion D to yield information important to New Mexico's history and prehistory. As a result, 11 of these 12 sites were tested to determine whether they qualify as historic properties (Register eligible). The sites tested in the TA-74 Tract include LA 21596, LA 86528, LA 86531, LA 110121, LA 110126, LA 110130, LA 110132, LA 110133, and LA 117883, and White Rock Y Tract tested sites include LA 61034 and LA 61035. Prior to testing, an eligibility evaluation was conducted for TA-74 Tract site LA 86532. Upon review, a determination was made to concur with a New Mexico State Historic Preservation Officer (SHPO) assessment that LA 86532 was not eligible to the Register as the information potential had been exhausted through survey recording. As LA 86532 was no longer assessed to have an undetermined eligibility, it was not tested.

TA-74 TRACT

The TA-74 Tract is located east of the Los Alamos town site and below the mesa upon which the town site is built. This tract is comprised of several canyons and mesas. The northern half of the tract is dominated by lower Bayo Canyon and Barrancas Canyon, whereas the southern half includes Pueblo Canyon. The tract that is situated at an elevation between 2013 m and 2333 m (6040 to 7000 ft) is forested by a piñon-juniper woodland with stands of ponderosa pine present along the south side of some canyons. The TA-74 County parcel is located in a relatively broad part of lower Pueblo Canyon. Surficial geologic units within the parcel include the active stream channel and adjacent floodplains of Pueblo Canyon with areas of colluvium and alluvial fans on the side slopes and along tributary drainages. All of the sites with an undetermined Register eligibility are located south of the Pueblo Canyon drainage. The sites and testing are described below by Laboratory of Anthropology (LA) site number order.

LA 21596

LA 21596 is a set of three distinct series of garden plots (A-C) that is associated with Otowi Pueblo (LA 169), a very large multi-room Classic period habitation site located upslope to the east-northeast. LA 21596 is located along the north side of the Pueblo Canyon drainage. The surficial geologic units within the site vicinity include the active stream channel and adjacent floodplains of Pueblo Canyon, higher stream terraces of Holocene and Pleistocene age, and areas of colluvium and alluvial fans on the side slopes and along tributary drainages (Drakos and Reneau 2003). The grid gardens are located at the base of a colluvial slope adjoining floodplains or fluvial terraces in the bottom of Pueblo Canyon. The area is vegetated by a piñon-juniper woodland and ponderosa pine forest. Heavy vegetation obscures the center portion of the site. The site is at an elevation of 1989 m (6460 ft) above sea level.

The Pajarito Archaeological Research Project (PARP) originally recorded LA 21596 in 1978. The site was described as four sets of grid gardens and terraces although it was noted that erosion and rock fall may have erased links between some of them. Running from west to east the gardens were labeled D, A, B, and C. The site area measured 204.5 by 24.5 m with Plot A situated 12 m east of Plot D, Plot B located 52 m east of Plot A, and Plot C situated 26 m east of Plot B. According to the site form, garden plot D measured 24.5 by 19 m, Plot A measured 10 by 23.5 m, Plot B measured 15.5 by 5.0 m, and Plot C measured 56.5 by 4 m. Garden plots A and D were 100 percent collected. No collections were taken at Plots B and C. PARP noted that ceramics on the site most likely washed down from Otowi Pueblo or were deposited during agricultural-related activities.

The current project survey documented three sets of terraced garden plots with associated artifacts. Additional erosion and rock fall apparently has obscured the fourth set documented by PARP. Also, subsequent alluvial and colluvial processes and the schematic nature of the original PARP site sketch make it impossible to correlate the 1978 recorded plots with the 1994 plots. The recent project documentation labeled the garden plots from east to west as Components A, B, and C (Figure 55.1).

Site Setting

Otowi Pueblo is located on the second bench upslope from LA 21596. There is a continuous scatter of artifacts extending down from Otowi, with hundreds of artifacts situated on the first bench. The associated artifact boundaries for Components A through C are relatively arbitrary and restricted to the immediate garden plot vicinity. Within these areas either all of the observed artifacts or a sample of the artifacts were documented.

Site Description

LA 21596A consists of a series of 10 to 12 garden plots outlined by tuff, basalt, and rhyolite rocks. The series of plots cover an area measuring approximately 11 by 16 m in size. Several good linear alignments are visible.

Two-hundred-seventy-three artifacts were recorded near LA 21596A. Most of these were ceramics (*n* = 259) with fewer lithics. Most of the identified ceramics consist of Biscuit A and Biscuit B, with a few Santa Fe Black-on-white, Espinosa Glaze-on-Polychrome, Potsu'ii Incised, and micaceous and non-micaceous plainwares. The chipped stone artifacts consist of Pedernal chert and obsidian chipped stone debitage and a retouched flake.

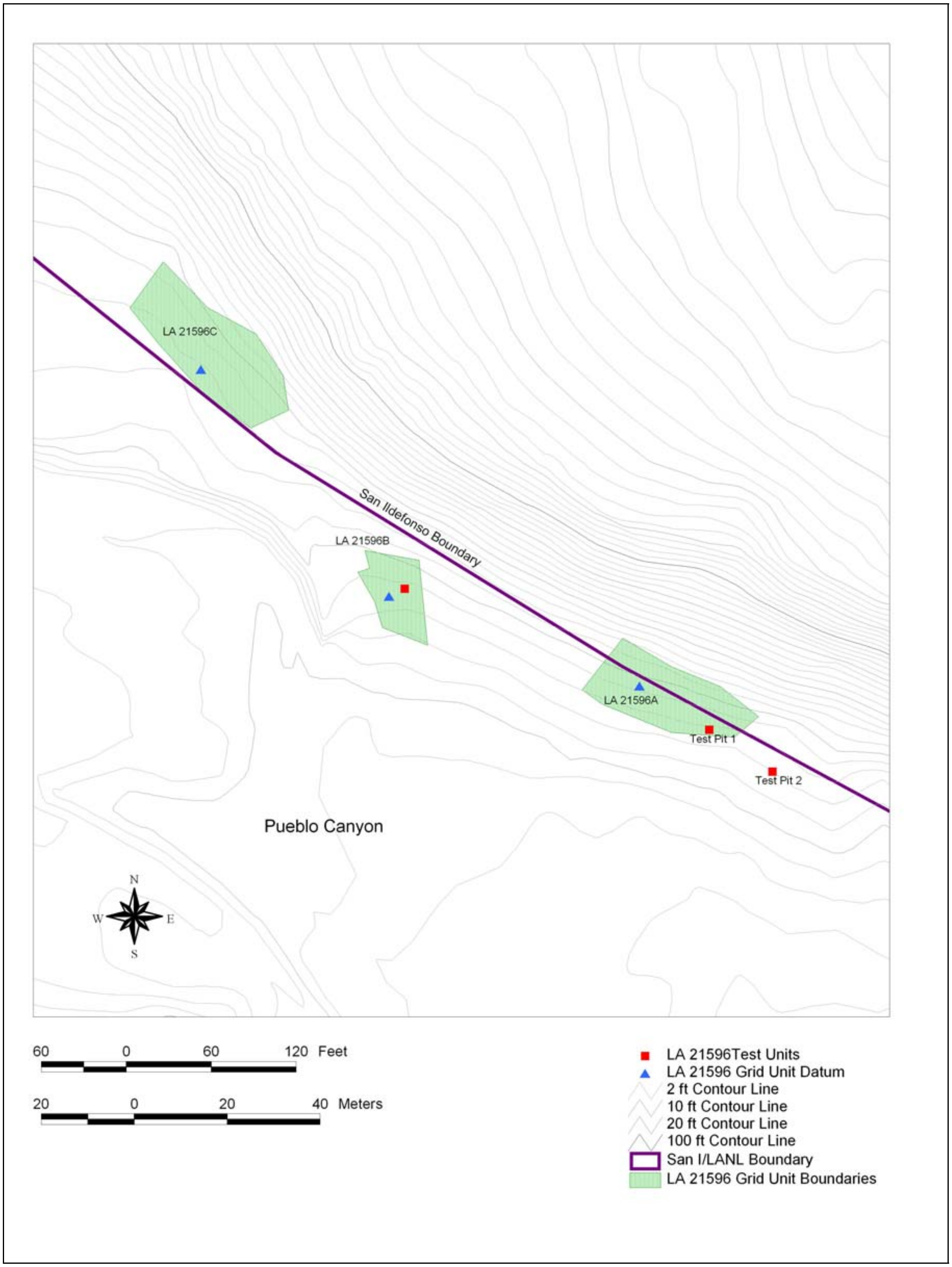

Figure 55.1. LA 21596 geographic positioning system (GPS) differential map.

LA 21596B consists of a series of five to six small garden plots constructed of tuff, basalt, and rhyolite blocks. The rocks range in size from 10 by 6 by 6 cm to 50 by 36 by 25 cm, averaging 35 by 30 by 20 cm. The features cover an area approximately 12 by 15 m in size.

Forty-four artifacts were recorded in this area, with most being ceramics (n = 46). The majority of the ceramics consist of Biscuit A and Biscuit B, with less Santa Fe Black-on-white, Sankawi Black-on-cream, and non-micaceous and micaceous plainwares. The lithic artifacts primarily consist of Pedernal chert and obsidian debitage with two metate fragments.

LA 21596C consists of a series of three small garden plots constructed of tuff, basalt, and rhyolite blocks. The rocks forming the garden plots range in size from 12 by 10 by 8 cm to 60 by 40 by 30 cm, the average being 40 by 35 by 20 cm. The plots are in two rectangular shapes, covering an area of approximately 17 by 15 m. The plots are oriented roughly northwest to southeast.

There is a continuous scatter of artifacts down from Otowi including approximately 200 to 300 items on the first bench near the site. The artifact boundary for LA 21596C is arbitrary and is restricted to a 30- by 40-m area. Within this area, all the lithic artifacts and only a 30 percent sample of the ceramic artifacts were flagged, examined, described, and quantified. Numerous other artifacts were observed and there is good potential for many more to be located under high concentrations of pine duff. Artifacts were also abundant on the slope between the first and second benches.

Ninety-one artifacts were recorded in the garden plot boundary. Most of these are ceramics (n = 76) with fewer lithics. The majority of the ceramics consists of Biscuit A and Biscuit B, with less Santa Fe Black-on-white, Sankawi Black-on-cream, Potsu'ii Incised, smeared-indented, and obliterated corrugated sherds. The lithics consist of Pedernal chert and obsidian debitage with a single obsidian uniface.

Site Excavation

LA 21596 is located in Los Alamos National Laboratory, Technical Area (TA) 74. The boundary between Los Alamos County and San Ildefonso properties runs through the approximate center of LA 21596. Garden plot C and the approximate northern half of Plot A are on land that will be transferred to the Department of the Interior and the southern half of Plot A and Plot B are on land that will be conveyed to Los Alamos County. Garden Plot B and the southern half of Garden Plot A were tested in October and November of 2002 because of their potential to be adversely affected.

One 2- by 1-m test unit was excavated within both Garden Plot A and the southern half of Garden Blot B (Figures 55.2 and 55.3). The two test units were situated where they straddled what appeared to be the lowest (southern) enclosing garden plot wall in hopes of recovering comparative data from within and outside of the features. Also, a 1- by 1-m test unit was placed to the east of Garden Plot A, outside of any garden plot, to use for a comparison. The test units were excavated in arbitrary 10-cm levels with shovel and trowel. With the exception of pollen, soil, and macrobotanical samples, all hand-excavated materials were screened through 1/8-in. mesh.

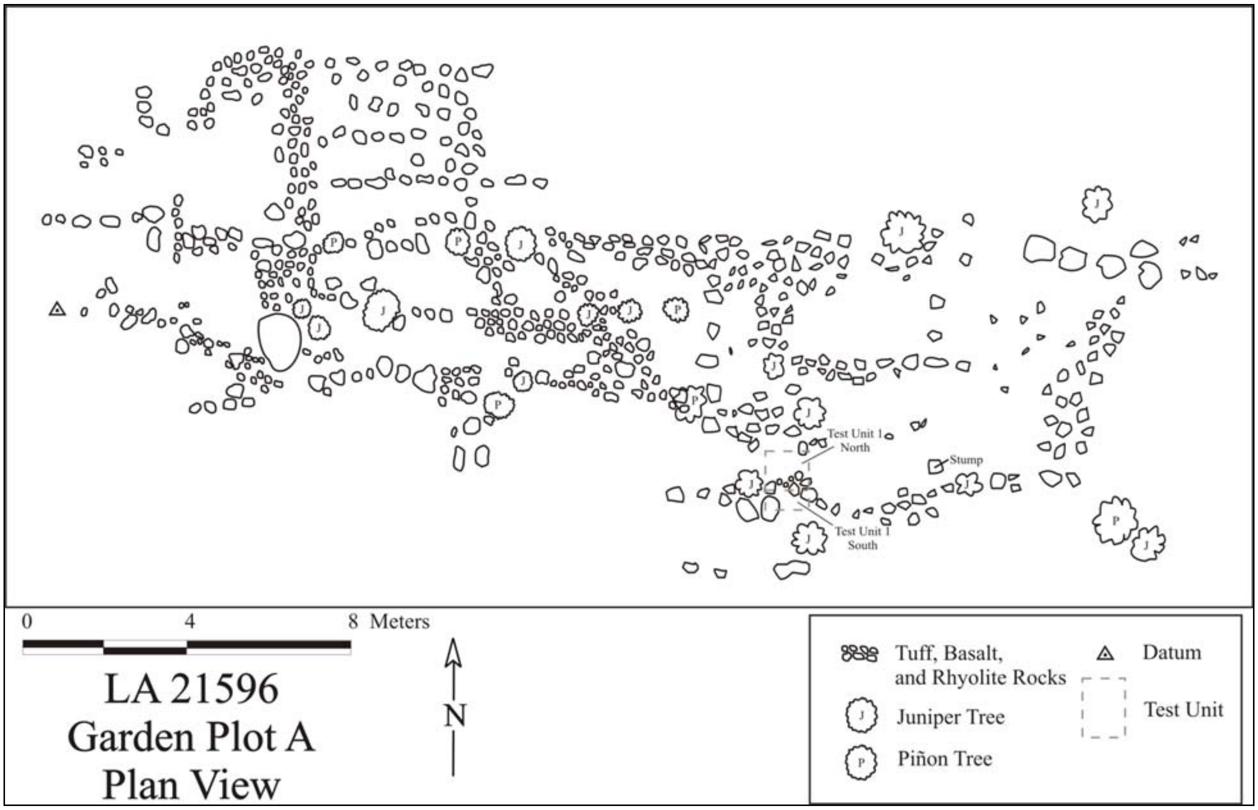

Figure 55.2. Plan view of Garden Plot A at LA 21596.

The 2- by 1-m test unit in Plot A (Test Pit 1) was excavated to a depth of 30 cm below surface. The northern half was assumed to be within the garden plot and the slightly downslope southern half to be outside the garden plot. The fill within the two 1- by 1-m test units was essentially the same. They contained three stratigraphic deposits with the upper 4 cm being an A horizon soil consisting of a soft/loose loamy sand with abundant decomposed organic material. Stratum 2 (4 to 15 cm), a Bw1 horizon soil, consisted of a soft sandy loam with about 30 percent to 40 percent gravel and several tuff and basalt rocks that were generally 10 cm in diameter or less. Stratum 3 (15 to 30 cm), a Bw2 horizon soil, was a soft loamy sand with about 30 percent to 40 percent gravel and several tuff and basalt rocks that tended to become larger with depth (5 cm diameter and larger).

The northern half of the 2- by 1-m test unit placed in Plot B was excavated to a depth of 50 cm below surface (Test Pit 1), while the southern half (Test Pit 2) that was assumed to be outside of the garden plot was excavated to a depth of 30 cm. Fill within Test Pit 1 consisted of three stratigraphic deposits with the upper 5 cm (A horizon) consisting of loamy sand with abundant decomposed organic material. Stratum 2 (5 to 22 cm), a Bw1 horizon soil, consisted of a soft sandy loam containing 20 percent to 30 percent gravel and several fist-sized and smaller tuff, basalt, and rhyolite rocks. Stratum 3 (22 to 50 cm), a Bw2 horizon soil, was a soft sandy loam with about 20 percent to 30 percent gravel.

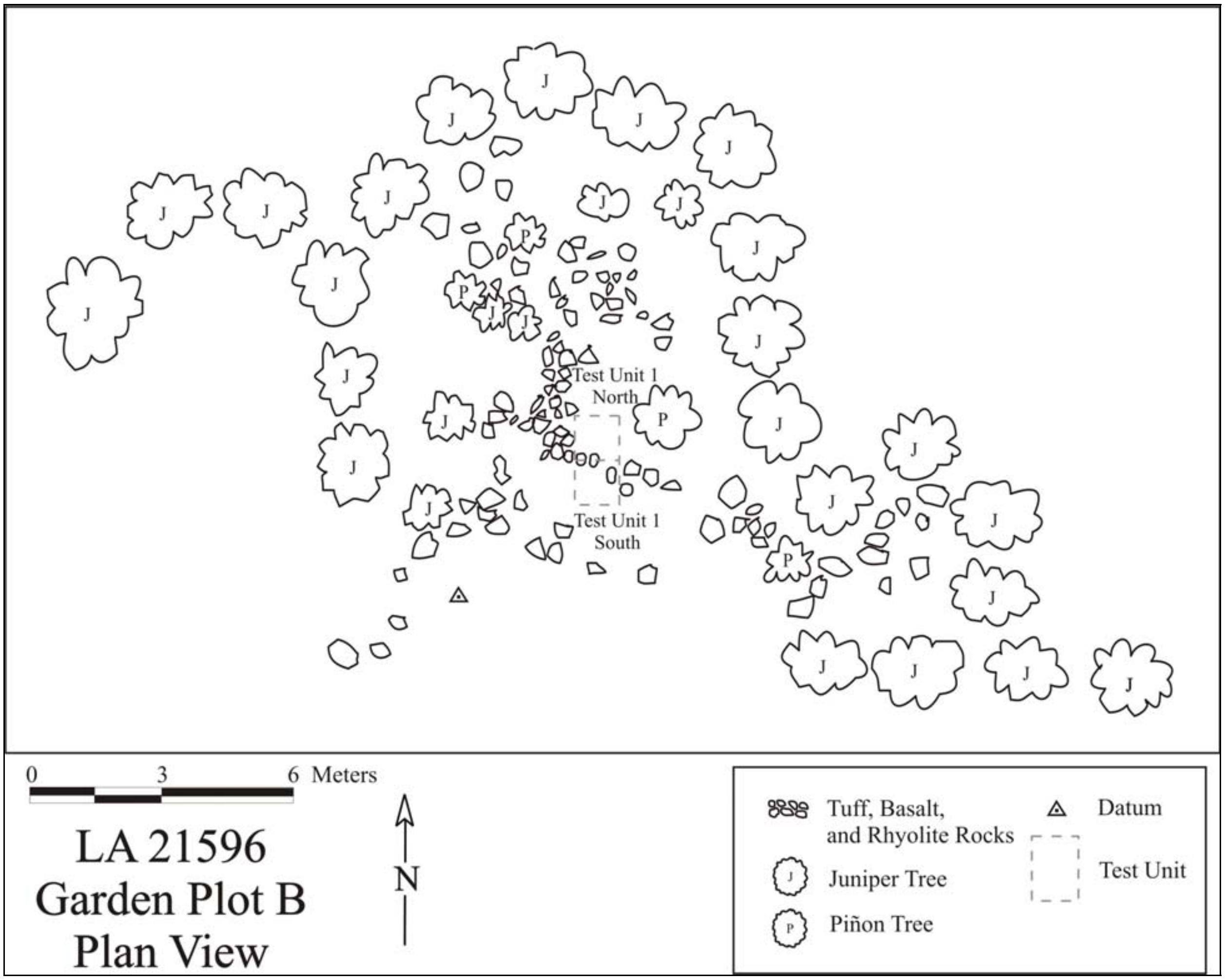

Figure 55.3. Plan view of Garden Plot B at LA 21596.

The southern half of the test unit (Test Pit 2) contained only two soil strata. Stratum 1 (0 to 6 cm) was soft loamy sand with 10 percent to 20 percent gravel (A horizon) and Stratum 2 (6 to 30 cm) was a soft/loose sand with 10 percent to 20 percent gravel (Bw1 horizon). Both strata contained fist-sized and smaller tuff and basalt rocks scattered throughout, although they did become less abundant with depth.

Although excavated at a similar elevation, the 1- by 1-m test unit was placed to the east of the LA 21596A garden plots for comparison (Test pit 2) and was excavated into a relatively open area on the colluvial slope. As such, it did not have the rich organic material that was observed within the garden plot test units. It contained only two soil strata. Stratum 1 (0 to 12 cm), an AC horizon soil, was a loose sandy loam with about 40 percent gravel. Stratum 2 (12 to 30 cm), a C horizon soil, was a loose loamy sand with 40 percent to 50 percent gravel. It contained tuff and basalt rocks ranging from 5 to 10 cm in diameter. Lenses of dry sand were noted throughout the lower portion of Stratum 2. These lenses appeared to be somewhat graded lenses deposited through erosional runoff.

Site Chronology and Assemblage

The test unit in LA 21596A combined with the control test unit located just east of Garden Plot A contained 371 ceramics and 19 chipped stone artifacts, while the LA 21596B test unit contained 264 sherds and four pieces of chipped stone. The ceramics recovered from the testing exhibited combinations of Santa Fe Black-on-white and biscuitware types that may indicate mixed or transitional site utilization between the Ancestral Pueblo Coalition and Classic periods. An even mixture of Biscuit A and Biscuit B ceramics was noted at both LA 21596A and LA 21596B. The presence of Sapawi and Potsuwi may indicate that some of this site dates fairly late in the Classic Period.

The excavations indicated that artifacts are abundant from 0 to 30 cm and present but less abundant from 30 to 50 cm. The excavation also indicates that relatively little sediment has been deposited since construction of the grid gardens. Rocks forming the grid gardens are set on the Bw1 horizon and are buried by only 4 to 6 cm of sediment. Unlike the recovered ceramics, these observations suggest that the gardens were created during a relatively late stage of occupation at Otowi Pueblo and that a significant amount of colluvial deposition occurred at this location concurrent with the Ancestral Puebloan occupation. The control test unit placed to the east of LA 21596A showed that the thickness of young colluvium is greater than 30 cm. It is possible that human traffic or other disturbances on the steep slope between Otowi Pueblo and the grid gardens accelerated the rate of colluvial transport and deposition at this location (Drakos and Reneau 2003). Thus, it is also possible that the Late Coalition and Early Classic ceramics were deposited at LA 21596 before establishment of the grid gardens.

Macrobotanical (flotation samples) and pollen samples were collected and processed from all three LA 21596 test units. These samples were collected from the soil horizons exposed within both the north and south sides of the LA 21596A Test Unit and from the horizons exposed within the control test unit excavated to the east of LA 21596A. Macrobotanical and pollen samples were also collected from each 10-cm arbitrary level (Levels 1-3) excavated within the LA 21596B Test Unit.

The macrobotanical analysis produced charred corn cupules from the test units in both LA 21596A and LA 21596B. One cupule was recovered from Stratum 3 (Bw2 horizon) collected from the north side of LA 21596A, and five cupules were recovered from Level 3 (Bw1 horizon) collected from the south side of LA 21596B. The presence of these charred cupules suggest one of two scenarios: 1) the occupants were cooking nearby and a few cob remains that were used as fuel ended up in the garden plots or 2) the occupants of Otowi Pueblo were throwing garbage over the escarpment and some landed approximately 40 ft below within the grid gardens (Chapter 62, Volume 3).

The charred corn cupules were submitted to Beta Analytical, Inc., for accelerator mass spectrometer radiocarbon dating. The calibration of radiocarbon age to calendar years for the LA 21596 North sample (Beta Number 183768) resulted in a conventional age of 600±40 BP and a two-sigma calibration date range of AD 1290 to 1420 with intercepts of AD 1320, AD 1340, and AD 1390. The calibration of the LA 21596 South sample (Beta Number 183769) resulted in a conventional age of 70±30 BP with two-sigma calibration date ranges of AD 1690 to 1730, AD 1810 to 1920, and AD 1950 to 1960, and an intercept of AD 1950.

The pollen analysis also produced evidence of cultigens as well as some evidence as to the occupational surface. Both the north- and south-side samples recovered from LA 21596A exhibited a trend for decreasing pollen abundance with depth matched by decreasing values of tree pollen and a higher representation of cheno-am (*Chenopdoium/Amaranthus*), sunflower family (Asteraceae), and grass (Poaceae). This observed signature could reflect an agricultural weed signal that would mark Stratum 3 (Bw2 horizon) as the cultural surface. Maize pollen was identified from Strata 2 (Bw1 horizon) and 3 from the north side of the test unit and from Stratum 3 from the south side. There were no observed trends in pollen spectra with increasing depth from either the north- or south-side samples collected from LA 21596B. Two of the three north side samples were sterile (too little pollen for a significant count), although maize was identified in one of the sterile samples. Evidence for cultigens was also documented from the south half of the test unit with maize (*Zea mays*) and squash (*Cucurbita*) pollen recovered from Level 2 and maize pollen recovered from Level 3 (both are from the Bw1 horizon). One of the two samples recovered from the control test unit excavated outside of LA 21596A was sterile. Neither of the test unit stratigraphic samples produced any agricultural pollen evidence (Chapter 63, Volume 3).

Summary

The preservation of corn cupules along with maize and squash pollen from within stratigraphic deposits suggests that the unexcavated portions of the site likely contain potential for additional significant cultural remains. Floral and pollen materials could aid in establishing additional subsistence crops and other crops that may have been utilized by Classic period inhabitants of the area. There is also potential for establishing a chronological sequence that could aid in establishing agricultural changes that may have occurred during the Ancestral Pueblo Classic period and potentially through reuse of the site in later Historical periods. As the research potential at LA 21596 is still assessed to be excellent, it is considered eligible to the Register under Criterion D, likely to yield information important in prehistory or history.

LA 86528

Site LA 86528 (Q-28) is a partially enclosed rock overhang that likely served as a temporary shelter. It is located at the base of the steep talus slope that forms the upper north side of Pueblo Canyon. The local vegetation is transitional between piñon-juniper woodland and ponderosa pine forest. The site is situated at an elevation of 2024 m (6640 ft). This site consists of a large tuff boulder overhang associated with 8 to 10 large rocks representing an enclosed area (Figure 55.4). The overhang, which is 2.55 m wide, 2.25 m deep, and 0.9 m high at the mouth, opens to the south. A small water channel running from southeast to northwest has cut through the overhang and below the large tuff boulder (Figure 55.5).

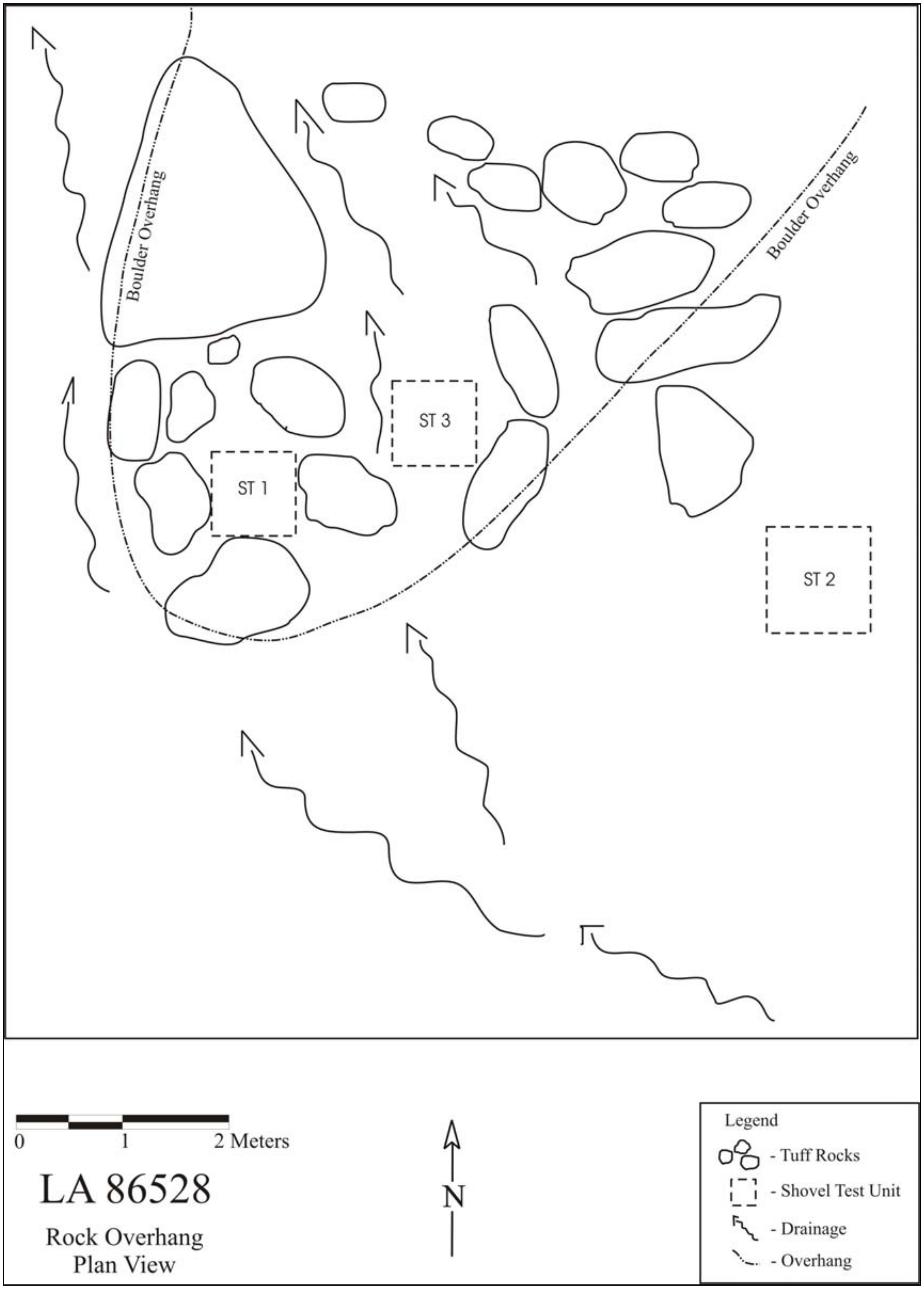

Figure 55.4. Plan view of overhang at LA 86528.

Figure 55.5. Post-testing photo of LA 86528 looking northwest.

During the original site recording, a few small chunks of charcoal were observed just downslope from the overhang. It was assumed that the charcoal could have washed out from the overhang via the small drainage that has cut through the feature. Approximately nine Glaze E sherds (same vessel) were associated with the structure. These sherds were situated within a small drainage running across the front and down along the west side of this shelter. A rhyolite core flake was observed about 8 to 10 m below the overhang. Three grooves measuring 40 by 4 cm, 35 by 2 cm, and 1 by 5 cm were potentially cut into the rock above the overhang. Based on the presence of the Glaze E ceramics, the site likely dates to the Classic period.

Testing

Two test units (referred to as shovel tests) were initially excavated to assess whether there was any potential for intact cultural remains to be present within or adjacent to the overhang. Test Unit 1 was a 40- by 40-cm unit placed between fallen enclosure rocks beneath the overhang. It was situated in the outer southwestern portion of the overhang in the area that displayed the least amount of water erosion. Test Unit 2 was located just over a meter southeast (upslope) of the overhang in an area that displayed less colluvial erosion than that observed within the general area. Test Unit 3 was placed within the overhang, to the east-northeast and beyond the enclosure rocks that surrounded Test Unit 1. This test unit was excavated to further explore a charcoal stain that was encountered within Test Unit 1. All three test units were excavated in arbitrary 10-cm levels. No artifacts were recovered from any of the test units.

Test Unit 1 that exhibited three soil horizons was excavated to a depth of 40 cm below surface. The upper 5 cm of the unit contained an AC horizon sandy loam (Stratum 1). A few charcoal flecks were observed within the upper half of the stratum and a 2- to 3-cm-thick lens with charcoal staining was present at the base of the stratum. Situated from 5 to 21 cm in depth was a late-Holocene Bwb1 horizon sandy loam (Stratum 2) that overlaid a Btb2 horizon sandy clay loam (Stratum 3) that likely dates to the Pleistocene. The boundary between the A/C horizon and the Bwb1 horizon was abrupt and smooth suggesting that an erosional cycle occurred between depositions of the two horizons. The boundary between the Bwb1 and Btb2 horizons was abrupt and irregular, which also may indicate erosional impacts.

Test Unit 2 was excavated to a depth of 30 cm below surface. It contained two soil horizons, a relatively recent (AC horizon) sandy loam from surface to 10 cm and a Pleistocene, Btb1 horizon, sandy, clay loam from 10 to 30 cm. A small chunk of charcoal was recovered from a depth of 4 cm below surface.

Test Unit 3 was excavated within the overhang to clarify the nature of charcoal encountered within Test Unit 1. The unit, which contained four soil horizons, was excavated to a depth of 30 cm. The upper 3 cm was a C horizon with loose sandy loam that overlaid a late-Holocene Ab1 sandy loam (3 to 10 cm). A Bwb1 horizon sandy clay loam (10 to 20 cm), which overlaid a Pleistocene era Btb2 sandy clay loam (20 to 30 cm), was located below. A few chunks and flecks of charcoal were observed throughout the test unit, which indicates that there has been some degree of mixing between strata.

One flotation (Stratum 2), one macrobotancial (charcoal), and two pollen samples (Strata 1 and 2) were collected from Test Unit 1. A macrobotanical charcoal sample from Test Unit 2 and two macrobotanical charcoal samples from Test Unit 3 were also collected. The flotation and macrobotanical samples represented charred and uncharred wood materials that were dominated by oak and unknown conifer. Oak and conifer trees are abundant on the canyon slope in the vicinity of LA 86528. The Stratum 1 pollen sample was dominated by tree pollen and the Stratum 2 sample contained too little pollen for a significant count. Prickly pear pollen was documented from Stratum 1 and maize was identified from Stratum 2.

The test units situated within the overhang exhibit late-Holocene (possibly Puebloan-age) Bwb1 horizons overlying Pleistocene colluvial soils. Test Unit 2, situated on the colluvial slope outside the overhang, exhibits only young colluvium (<500 years) overlying Pleistocene soil. These soil profiles are indicative of a stripped, Pleistocene colluvial hillslope overlain by thin (10 to 20 cm thick) late-Holocene to historic age colluvium (Drakos and Reneau 2003).

Drakos and Reneau (2003) noted that the abrupt, irregular boundary between the Bwb1 and underlying Btb2 Pleistocene soil can be interpreted as resulting from either cultural or non-cultural processes. One explanation is that a pit or similar excavation was dug into the Pleistocene soil during cultural use of the overhang. An alternative explanation is that the irregular boundary between the Bwb1 and the Btb2 horizons was caused by erosion on the fairly steep slope that moved materials down through the overhang with an opening at the downslope end. In this scenario, subsequent partial plugging of the erosional escape hole facilitated colluvial deposition, which was followed by a non-cultural fire. Overall, the geomorphic evidence is ambiguous with respect to whether or not the overhang contained intact cultural deposits. The charcoal stain at the base of the AC horizon in Test Unit 1 may be of relatively recent origin, post-dating the Puebloan occupation (Drakos and Reneau 2003).

The formation of tuff stones situated around the overhanging boulder indicates cultural modification and likely utilization. This assessment is supported by the maize pollen recovered from Stratum 2 in Test Unit 1. However, the lack of artifacts from within the shelter suggests that deposited remains subsequently eroded downslope and out of the shelter or that the original occupation was of such a short duration that few to no cultural remains were discarded or lost.

Summary

The two test units placed within the overhang did not expose any traces of a previous excavation such as a pit dug into the floor of the shelter. There was no patterned concentration of charcoal or charcoal-stained fill that would suggest that it had originated from a hearth. As a result, it is assumed that the second scenario is more likely, that post occupation charred and uncharred wood materials and possibly the maize and prickly pear pollen eroded down into and were subsequently trapped within the overhang as the escape hole was temporally plugged. Erosion again appears to be moving materials downslope through the overhang. The integrity of the fill beneath the overhang has been subjected to bioturbation and likely replacement as colluvial materials have eroded, and are continuing to erode, down through the feature. As a result, the research potential of LA 86528 was likely exhausted during the testing activities and is no longer considered eligible to the Register.

LA 86531

LA 86531 (Q-33) is an artifact scatter located in a 582-m² area on the top and upper northern slope of a narrow ridge situated along the south side of Pueblo Canyon (Figure 55.6). The ridge is a fluvial fill terrace located approximately 30 m above the canyon floor. The deposit underlying the terrace comprises multiple fluvial sequences, with a coarsening upward deposit capped by imbricated boulders at the top (Drakos and Reneau 2003). The site, which is located at an elevation of 2009 m (6590 ft), is in an area that is transitional between a piñon-juniper woodland and ponderosa pine forest. When originally recorded the observed artifacts included approximately 20 ceramic sherds representing five to seven vessels and three pieces of chipped stone debitage.

Identified ceramics represent one or two Wiyo Black-on-white vessels, a Biscuit B vessel, a Sankawi Black-on-cream vessel, and one or two smeared-indented utilityware vessels. Also noted was a bowl sherd that appeared to have remnants of a reddish or orange slip on the interior and an incised line on the exterior. The lithics included a basalt, an obsidian, and a quartzite core flake. Based on the ceramic assemblage, the site likely dates to the Late Coalition/Early Classic period.

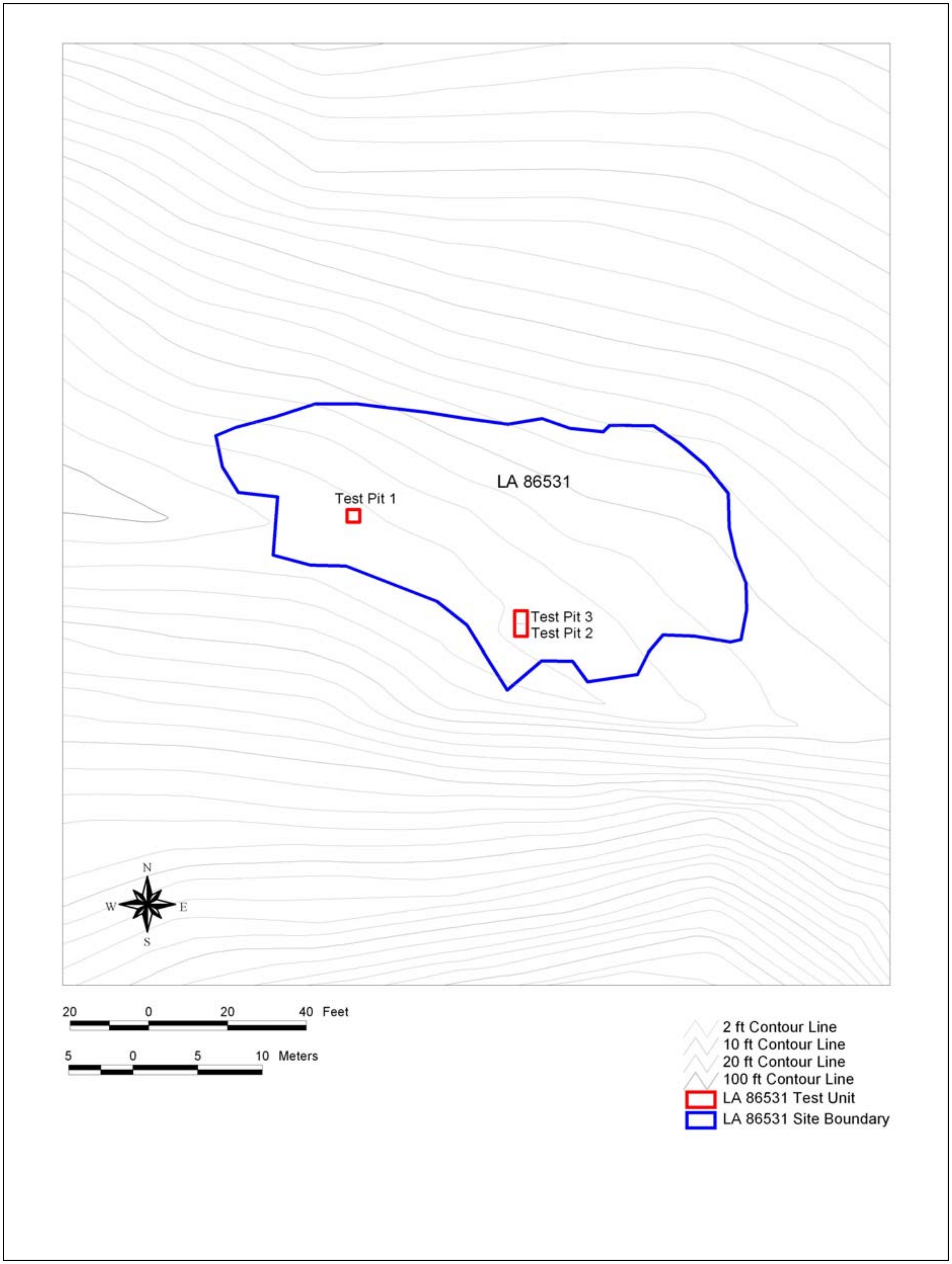

Figure 55.6. LA 86531 GPS differential map.

Testing

In January of 2003, three 1- by 1-m test units were excavated by trowel at LA 86531 in arbitrary 10-cm levels (Figure 55.7). With the exception of pollen, soil, and macrobotanical samples, all hand-excavated materials were screened through 1/8-in. mesh. Test Unit 1 was excavated into the west central portion of the site. It was excavated to a depth of 10 to 20 cm below surface where it was terminated after encountering boulders forming the top of the fluvial terrace. The test unit contained three stratigraphic layers. The upper 3 cm consisted of a C horizon soil that contained a loose sandy clay loam with gravel that formed 20 percent to 30 percent of the deposit (7.5YR4/3 damp). Stratum 2 (3 to 10 cm), an Ab1 horizon soil, was also a sandy clay loam with 20 percent to 30 percent gravel (7.5YR3/3 damp). Stratum 3 (10 to 20 cm) was a Btb2 horizon sandy clay (5YR4/3 damp) containing 20 percent to 30 percent gravel (middle to late Pleistocene). A few charcoal flecks were observed within the Ab1 horizon. Other than the charcoal flecks, which may or may not be cultural, no cultural materials were recovered.

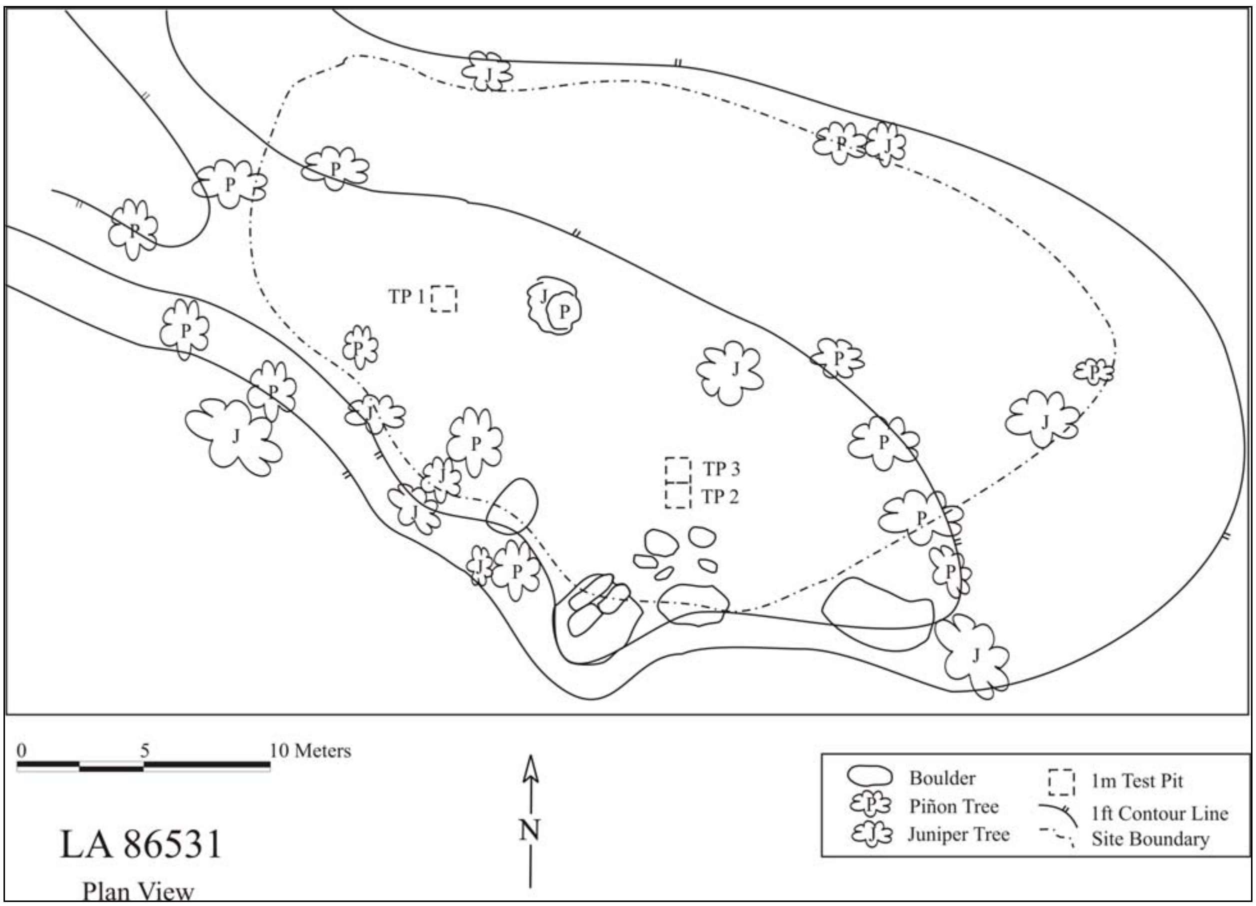

Figure 55.7. Plan view of artifact scatter at LA 86531.

Test Unit 2 was excavated into the east-central portion of the ridge top. It was excavated to a depth of 3 to 17 cm where the underlying boulders were encountered. Two soil strata were encountered within the excavation (Figure 55.8). The upper 3 cm was a C horizon soil consisting of loose silty loam with 20 percent to 30 percent gravel (10YR3/3 damp). This stratum was assessed to be recent slopewash. The underlying stratum was an Ab1 horizon soil consisting of a sandy clay loam with 20 percent gravel (10YR3/2 damp). A small amount of burned soil and charcoal was located within the northwest corner of the unit. As a result, the adjacent 1- by 1-m unit to the north (Test Unit 3) was excavated. It also was terminated at the underlying boulder zone that was encountered at depths ranging from 8 to 23 cm below surface. The stratigraphy was the same as that encountered in Test Unit 2 except that a third potential Bk horizon soil was encountered at depths ranging from 12 to 23 cm (7.5YR6/4 to 10YR6/4). This soil that was a compact silty loam with virtually no gravel was assessed to be a Pleistocene deposit. Charcoal and charcoal-stained fill were situated throughout the southern third of the unit in Strata 2 and 3 (8 to 23 cm). As the charcoal was inset into the Pleistocene soil, the stain was interpreted to be a root burn rather than a cultural feature. One indented corrugated utilityware sherd was recovered from Stratum 2 within Test Unit 3.

Figure 55.8. Photo of LA 86531, Test Units 2 and 3 looking north.

Based on the soils exposed through excavation, the top of the terrace appears to be a stripped surface that is capped by a thin (less than 20 cm thick) young soil overlying a stripped Pleistocene soil or bedrock. Stratum 1 appears to be a 0- to 3-cm-thick (less than 100 years?) slopewash that overlies Stratum 2, a thin 7- to 11-cm-thick late-Holocene/post-Puebloan(?) deposit. Based on the relatively well-developed stripped Bt horizon encountered within Test Unit 1 and the height of the terrace above the canyon floor, the terrace is inferred to be middle Pleistocene in age (Drakos and Reneau 2003).

The likely cultural horizon (Ab1) observed at LA 86531 is thin. The presence of the surficial artifact scatter on an eroded ridge top with thin soils indicates that LA 86531 represents an eroded site situated on the Pleistocene terrace. The observed artifacts may represent a lag and may have only been transported a short distance (Drakos and Reneau 2003).

Macrobotanical (flotation and charcoal) and pollen samples were collected and processed from Test Unit 3, Level 1 (Stratum 2) and Level 2 (Stratum 2/3.). The flotation sample from Level 1 produced two charred corn cupules and five possible charred corn kernel fragments. No cultigens were identified from Level 2. The pollen sample assemblages were characterized by tree pollen although maize pollen was recovered from the Stratum 2/3 sample. The charred corn cupules and kernel fragments were submitted to Beta Analytical, Inc., for accelerator mass spectrometer radiocarbon dating. The results of the two-sigma calibration produced a date range of AD 1180 to 1280 (Cal BP 780 to 670).

Summary

The testing conducted at LA 86531 indicates that most of the surface soils have been stripped from the ridge and that the remaining deposits are quite thin. The upper two soil horizons are assessed to post-date the Ancestral Puebloan area utilization as indicated by the site associated ceramics, and the underlying soil horizon is assessed to date to the middle Pleistocene. The site cultural materials that are situated within the upper 20 cm of soil deposition remaining on the ridge are the result of slopewash colluvium or are surface lag (Drakos and Reneau 2003). Based on this assessment, the cultural materials associated with LA 86531 are not in their original context and there is no potential for intact cultural remains to be situated on the site. As a result, LA 86531 is no longer eligible to the Register.

LA 86532

LA 86532 (Q-34) is the remains of a homestead cabin that was subsequently utilized as Camp Hamilton Boy Scout Camp. It is located within the Pueblo Canyon floodplain directly north of the existing channel. Situated at an elevation of 1987 m (6520 ft), the site area is transitional between a piñon-juniper woodland and ponderosa pine forest.

The site contains the foundation and some wall and roof remains of an approximately 7- by 7-m log cabin mortared with concrete. The foundation consists of stacked rock slabs. Although deteriorated, portions of standing walls form a 3- by 3-m two-room area. Two window openings remain within the structure: one in the south wall of the southernmost room and one in the west wall of the northernmost room. Roof beams are located on the ground within and near the northeast corner of the structure. A 12-m-long stacked masonry wall built against a dirt bank is located about 2 to 3 m north (upslope) of the cabin. Outhouse material remains are located several meters northwest of the structure.

Historic trash is scattered throughout a 12- by 112-m area surrounding the cabin. Some observed items include a car seat, brick, mortar, milled lumber, a silver knife blade, assorted broken bottle glass, and a 1944 New Mexico license plate from a truck.

The cabin was originally constructed by a Santa Fe resident named Coomer. Coomer, who leased the land from the Forest Service, conducted guided tours ("Tent Cities of the Rockies") in Pueblo Canyon during the early 1920s. In 1923, S. C. Hamilton bought the lease and improved the cabin. Hamilton was the father of Ranch School student Samuel Hamilton. Upon renovation, the cabin was used as a base for schoolboy outings. These outings, which were frequently conducted during the winter months, continued for two decades. When the cabin reached a state of disrepair, some of the original timbers were used to construct the National Historic Registry Landmark shelter on Trinity Drive just south of Ashley Pond in Los Alamos, NM (Hoard 1981:47). Based on documented history, this Homestead Era site was occupied from the early 1920s to 1943.

Upon completion of a review conducted for the Land Conveyance and Transfer Project site eligibility testing program, LA 86532 was re-evaluated and deemed ineligible to the Register. The re-evaluation was based upon the SHPO opinion that the information potential of LA 86532 had been exhausted through survey recording. As the decision was made to concur with the SHPO eligibility evaluation, and as LA 86532 is not eligible under other criteria, it was reassessed as not eligible to the Register. As LA 86532 is no longer assessed to be a potentially eligibility property, it was not tested for site eligibility.

LA 110121

LA 110121 (V-117) is located on the eroding slope of an eastern-trending ridge in the bottom of Pueblo Canyon. The site is situated between two east-west-running drainages (Figure 55.9). The area is dominated by a piñon-juniper woodland. The site slopes five degrees to the east and is at an elevation of 1967 m (6450 ft).

The site consists of a light artifact scatter situated within a 25- by 43-m area. Observed surface artifacts included 56 ceramic sherds and 12 pieces of lithic debitage. Decorated ceramics included 11 Santa Fe Black-on-white, two Santa Fe/Wiyo Black-on-white, three Wiyo Black-on-white, and nine unidentified black-on-white sherds. Utilityware ceramics included 11 indented corrugated, 10 smeared-indented-corrugated, eight obliterated, and two non-micaceous plainware sherds. Lithic debitage consisted of 10 Pedernal chert core flakes, one piece of Pedernal chert angular debris, and one obsidian core flake.

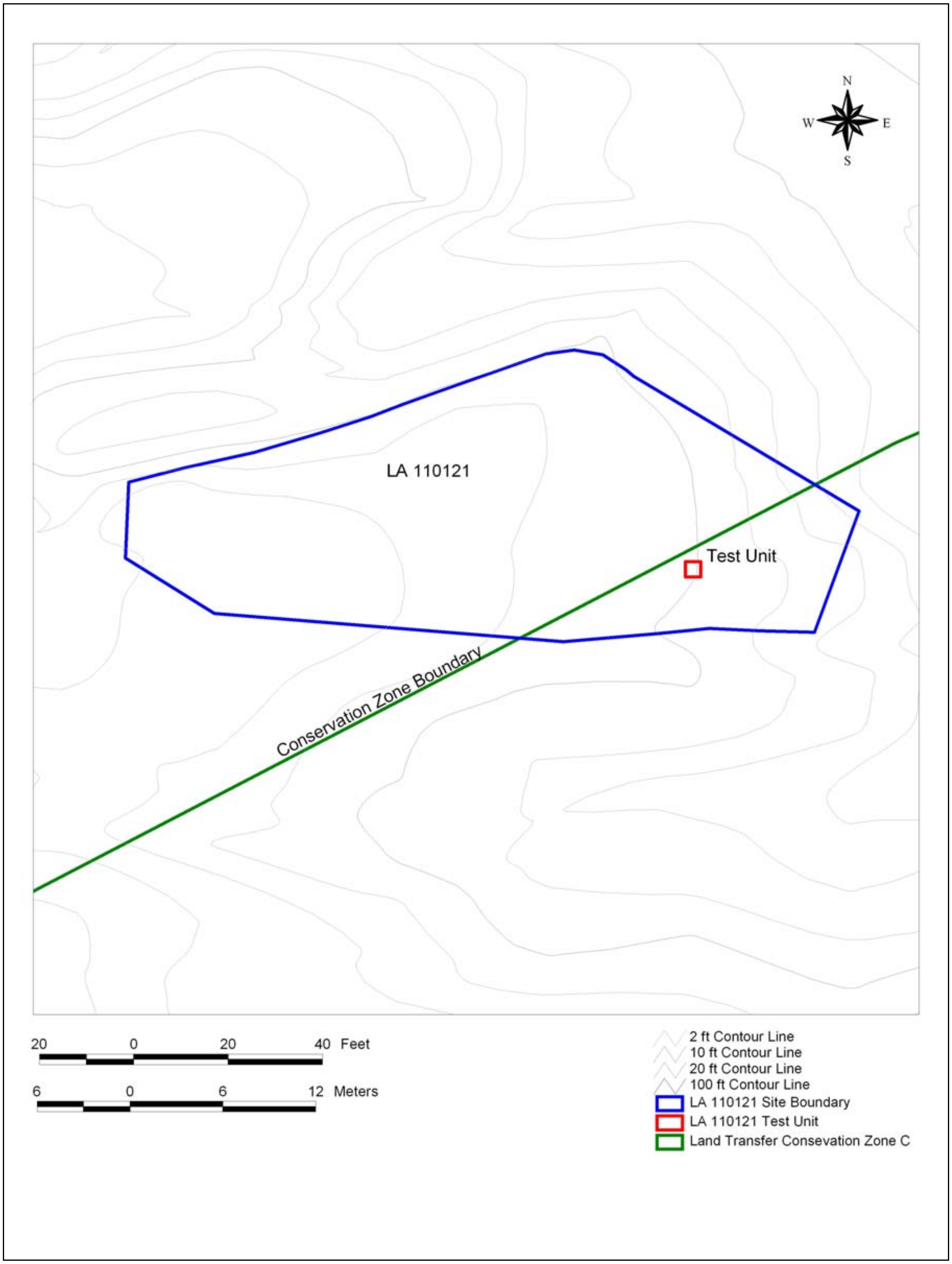

Figure 55.9. LA 110121 GPS differential map.

Testing

The eastern quarter of LA 110121 was tested to establish whether there were any intact cultural remains that could be adversely affected by the land conveyance. As the eastern end of LA 110121 appeared to have been impacted by erosion, a 1- by 1-m test unit was established outside the conservation zone boundary in the area that appeared to have the most potential for retaining surface soils and cultural remains (Figure 55.10). The test unit was excavated in arbitrary 10-cm levels by trowel. With the exception of pollen, soil, and macrobotanical samples, all excavated materials were screened through 1/8-in. mesh.

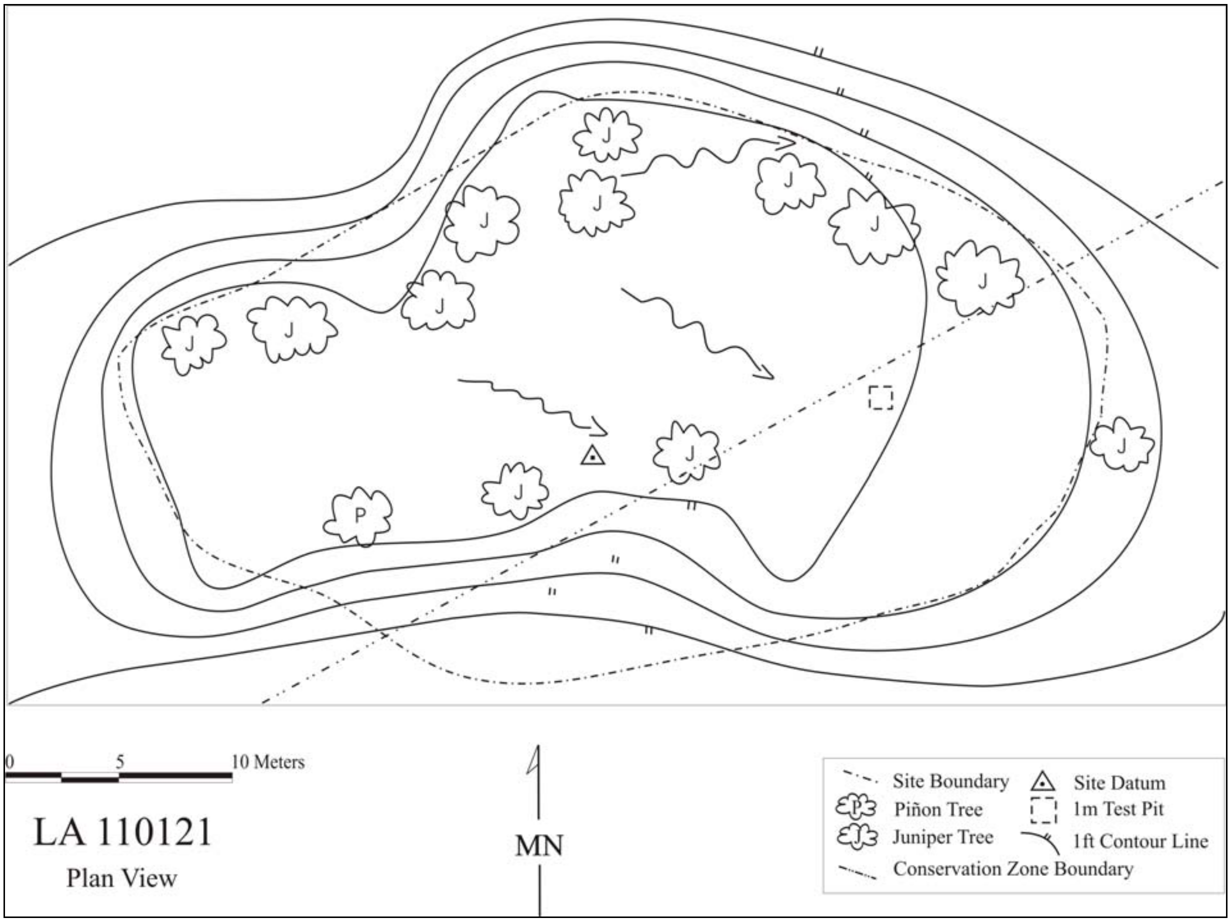

Figure 55.10. Plan view of artifact scatter at LA 110121.

Test Unit 1 was excavated to a depth of 20 cm below surface. The upper 11 cm contained an A horizon sandy clay loam with a pumice gravel content that increased with depth (10YR5/4). The upper 2 to 3 cm of the deposit contained about 5 percent pumice gravels, which increased to about 60 percent by the base of the stratum. Underlying the A horizon soil was a Bw horizon sand and pumice deposit. Pumice clasts formed approximately 90 percent of this deposit. At a depth of 19 cm below surface, a Guaje pumice bed deposit (C horizon) was encountered (Drakos and Reneau 2003). No cultural materials were encountered during the excavation.

As the post-Guaje sediment was only 11 cm thick at the test unit location, the artifact scatter that is apparently part of the thin overlaying colluvium is not in cultural context (Drakos and Reneau 2003). The testing indicated that the western quarter of LA 110121 contains no intact cultural deposits and as such should be removed from the site. As testing was not conducted in the western 3/4 of the site, although unlikely, there is some potential that intact cultural deposits could still be present. A few piñon and juniper trees have facilitated the retention of soil along the west side ridge edges. Until such time as these ridge edge locations can be tested, LA 110121 is still assessed to have an undetermined Register eligibility.

LA 110126

LA 110126 (V-123) consists of a highly eroded one-room structure situated on a north facing ridge finger that formed between two small drainages on the south side of Pueblo Canyon (Figure 55.11). The site was recorded in October of 1994 by Los Alamos National Laboratory Cultural Resources Team archaeologists during fieldwork conducted for the Environmental Restoration Canyon Bottom Project. This area is dominated by piñon-juniper and ponderosa pine. The site area slopes 10 degrees to the north and is at an elevation of 1960 m (6430 ft).

The structure was constructed of shaped and unshaped tuff blocks. An average tuff block measured 15 by 10 by 8 cm. The limited number of blocks located in the vicinity suggests that they originally formed the foundation of a one-room structure. In the least disturbed northern area of the site, an alignment of four tuff rocks is still present (Figure 55.12). Most of the remaining blocks are located downslope to the north and east from this alignment. A juniper tree is located directly south of the four rock alignment and a piñon and a juniper tree are located just northeast of the northern end of the alignment. These trees have partially stabilized the tip of the ridge finger containing the structural remnants. Defining the original size and shape of the structure was impossible due to the high degree of erosion (Figure 55.13).

The surface artifact assemblage, which was located in a 270-m² area situated within and downslope from the structural remains, consists of both chipped stone debris and ceramics. Decorated ceramics include three Biscuit A sherds (one is worked), nine Biscuit B sherds, one Santa Fe Black-on-white sherd, and two indeterminate black-on-white sherds. Utilityware ceramics included seven obliterated, one smeared-indented sherd, and one Sapawe Micaceous sherd. Chipped stone debitage included one obsidian biface flake, four chalcedony core flakes, one chalcedony core, and one piece of chalcedony angular debris. These surface artifacts indicated an Ancestral Pueblo Classic period affiliation for the site.

Testing

Site testing that resulted in the excavation of four 0.5- by 0.5-m test units, was conducted from October 18 through the 22, 2002. Although the test units were termed shovel tests to denote that they were smaller than a 1- by 1-m test unit, they were excavated by trowel in arbitrary 10-cm levels. Shovel Test 1 was placed 2 m east of the juniper located south of the four-rock alignment along the eastern edge of the tree-supported knoll. Shovel Test 2 was positioned at the northern edge of the knoll just above the slope where many of the structural tuff rocks have been redeposited by erosion. Shovel Test 3 was sited approximately 1 m east of the rock alignment within what appeared to be a stabilized portion of the structure interior. Shovel Test 4 was located just south of the juniper located south of the rock alignment in an area that did not appear to be impacted by erosion.

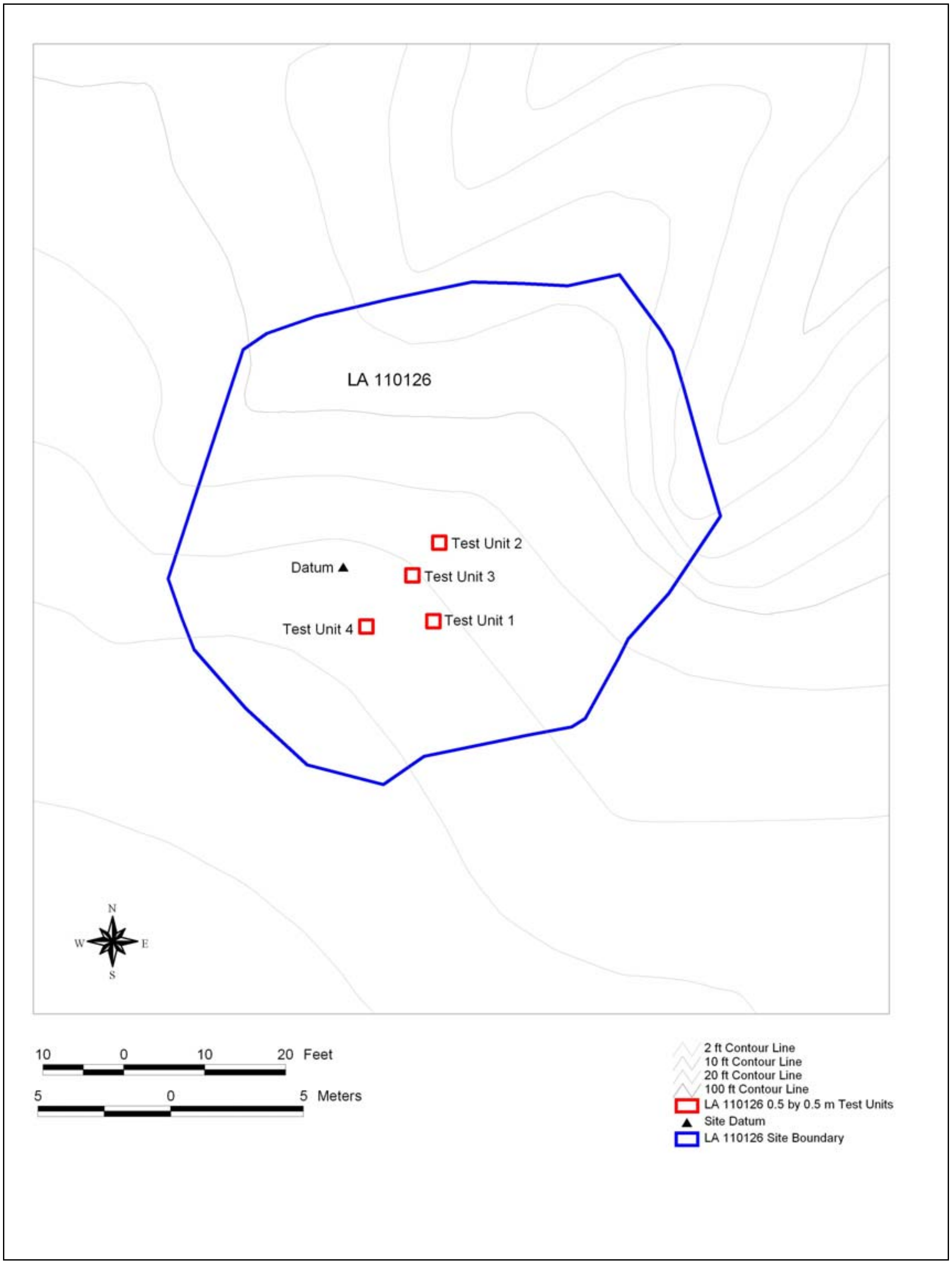

Figure 55.11. LA 110126 GPS differential map.

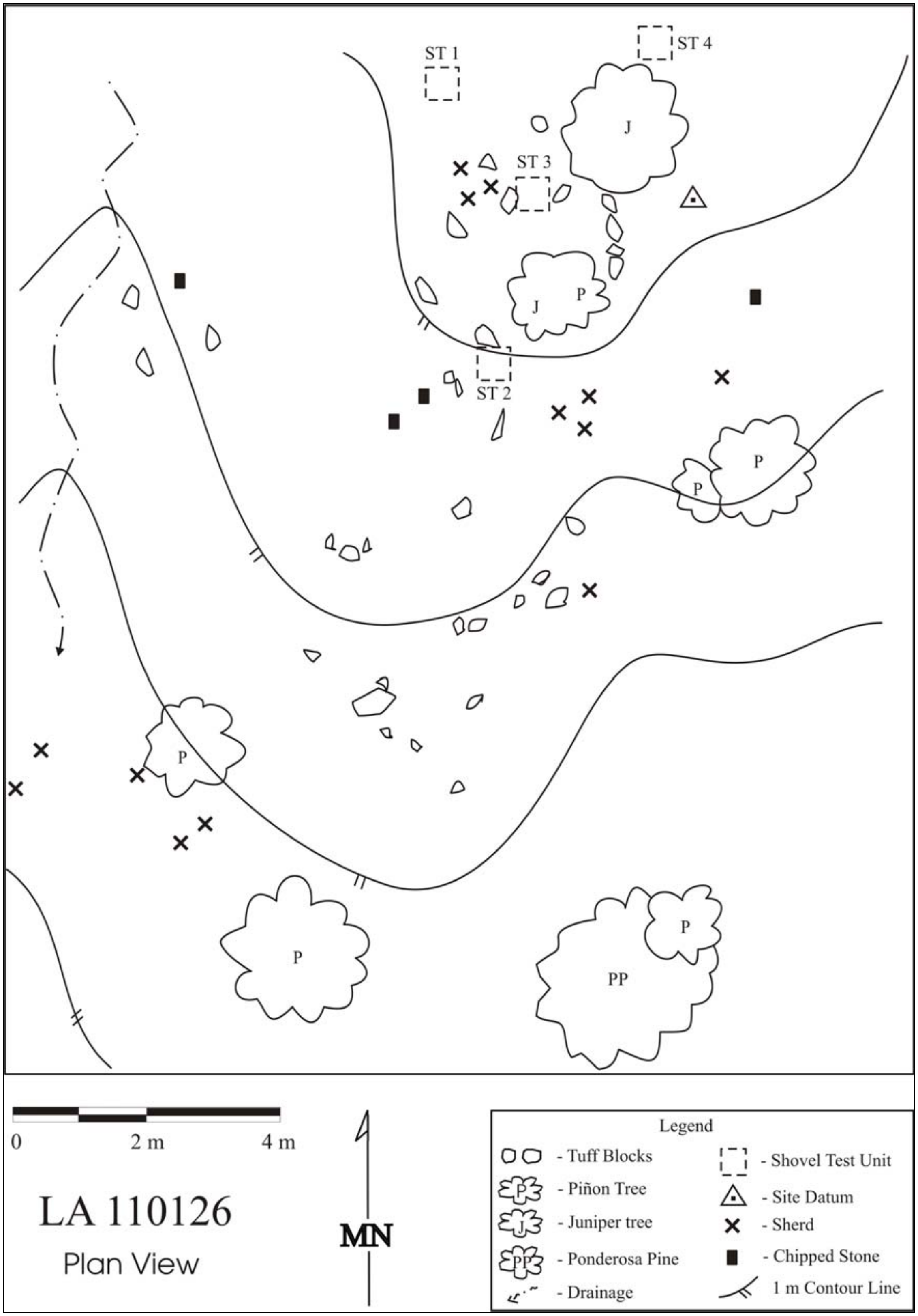

Figure 55.12. Plan view of the one-room structure at LA 110126.

Figure 55.13. Photo of LA 110126 looking southeast.

The stratigraphy was similar across the site with only the depth of deposits varying. Stratum 1 was a silty sandy loam ranging from 8 to 13 cm in depth. The upper 1 to 3 in. was loose with light to abundant duff. The soil below was lightly compacted. The Munsell color of the loam ranged form 7.5 to 10Y4/3. Stratum 1 was distinguished from Stratum 2 primarily on the level of compactness, color mottling, and the presence of decomposed tuff blocks and gravels (5% to 10%). The soil was a semi-compact silty sandy loam with 5 percent to 10 percent gravel. Also present were a few decomposing tuff blocks within ST 1 through 3. Although the soil was assessed to be Munsell color 7.5 to 10YR4/3, it visually ranged from a light brown to a grayish or reddish brown. Charcoal-stained fill was noted within the northwest quadrant of Shovel Test 1 and a few chunks and flecks of charcoal were observed within Shovel Tests 2 and 3. The charcoal chunks noted in Shovel Test 3 were assessed to be associated with a burned root, and it is likely that the other charcoal remains were associated with a tree fire. Stratum 3 consisted of compact clay with some well developed peds (7.5 to 10 YR 5/4).

Shovel Test 4 was apparently positioned beyond the original site activity area as no cultural materials were encountered or any materials that were present subsequently eroded downslope into the structural remains. Eleven ceramics and four pieces of chipped stone debris were recovered from Strata 1 and 2 within Shovel Tests 1 through 3. The ceramics recovered from the test unit excavations included seven Biscuit B sherds, two unpainted biscuitwares that were slipped on one side, and two Sapawe Micaceous sherds. The chipped stone included a chalcedony core flake recovered from Level 1 in Shovel Test 2 and core flake, a piece of microdebitage and a piece of Pedernal chert angular debris recovered from Level 3 in Shovel Test 3.

Macrobotanical and pollen samples were taken from Stratum 2 and 3 from Shovel Test 2. No culturally significant remains were recovered from either sample.

No evidence of an occupational surface or intact cultural deposit was encountered. Both Strata 1 and 2 are assessed to be post-occupational deposits with Stratum 3 being a late-Pleistocene culturally sterile soil. Many of the cultural remains associated with the structure have eroded downslope, primarily to the north and east. The remaining subsurface cultural materials have been mixed into Strata 1 and 2. The localized erosion has destroyed the original site context with only the four-tuff-rock alignment still assumed to be intact due to its location between trees that have reduced the amount of soil movement. As erosional processes have destroyed the site integrity, LA 110126 is no longer considered eligible to the Register.

LA 110130

LA 110130 (V-127) consists of a one-room structure located on the north edge of an eroded, gently east-sloping fluvial terrace (Figure 55.14). The terrace is situated above the Pueblo Canyon floodplain. It is situated within the transition zone from piñon-juniper woodland to ponderosa pine forest, at an elevation of 1954 m (6410 ft).

The structure is represented by partial alignments of tuff blocks with additional blocks deposited downslope to the north and east (wallfall?) (Figure 55.15). Based on the partial alignments, the masonry structure roughly measured 4 by 3 m with an associated earthen mound measuring approximately 0.2 m in height. The masonry blocks are relatively small, averaging about 15 by 10 by 6 cm in size. The overall extent of the site, including artifacts and eroded building material, is approximately 15 by 35 m.

About 10 m to the west of the one-room structure is another rough alignment of tuff rocks. It is unclear what the function of this feature might have been. The 1.1-m-long eight-stone alignment is oriented in an east to west direction.

Testing

Two 1- by 1-m test units and two 0.5- by 0.5-m units termed shovel tests were excavated into the masonry block concentration in November of 2002 (Figure 55.16). All four test excavations were excavated in arbitrary 10-cm levels using a trowel. With the exception of pollen, soil, and macrobotanical samples, all excavated materials were screened through 1/8-in. mesh.

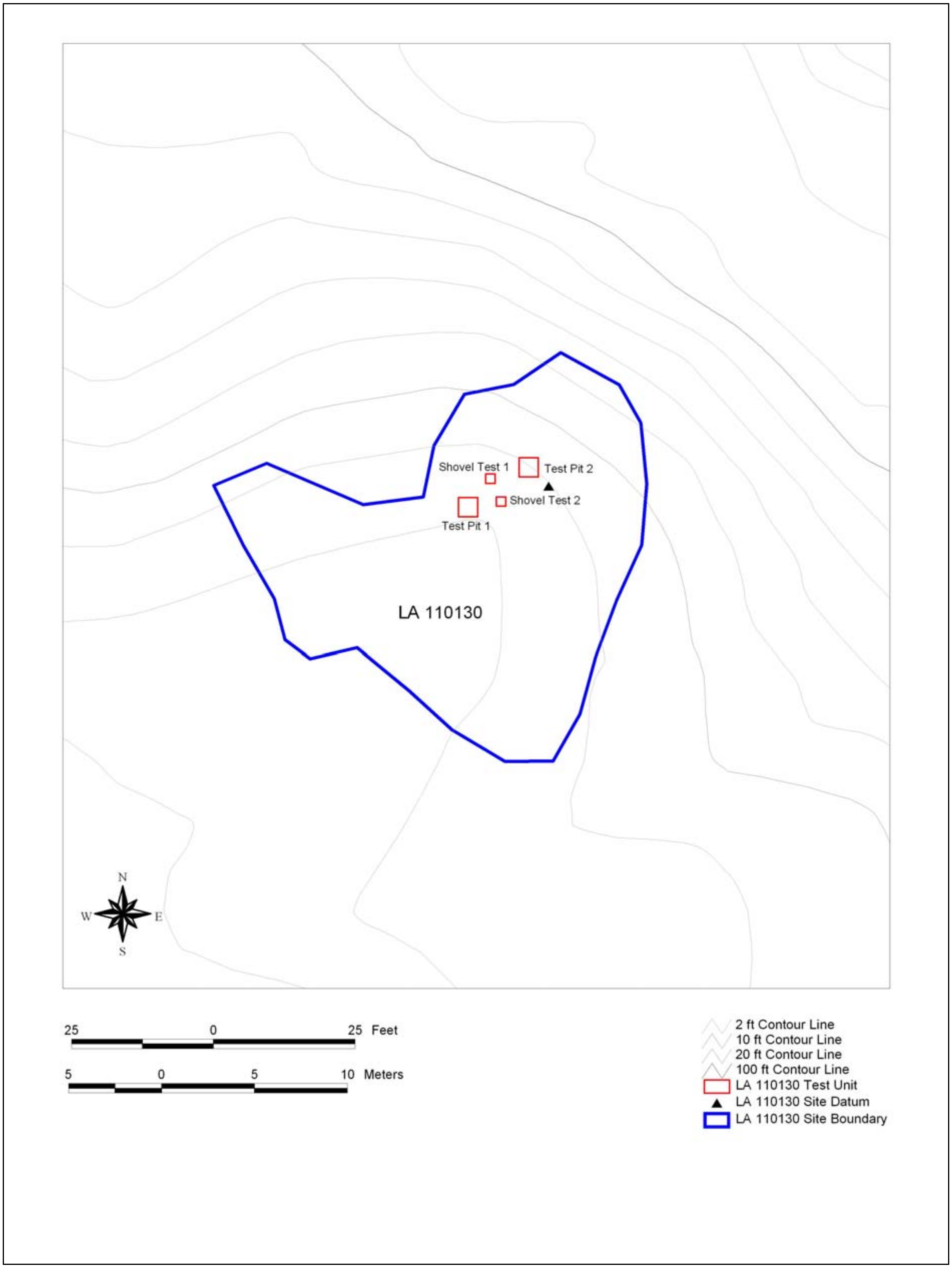

Figure 55.14. LA 110130 GPS differential map.

Figure 55.15. Plan view of structure at LA 110130.

Test Unit 1 was situated to straddle the apparent southwest corner of the masonry structure, while Test Unit 2 was placed within the rubble concentration located in the southeastern portion of the structure. Both test units were terminated at a depth of 20 cm after approximately 3 to 4 cm of culturally sterile soil was encountered. There was essentially no difference in the encountered stratigraphy between Test Unit 1 and Test Unit 2 except that there was a pocket of lightly charcoal-stained soil located within the southwest quadrant of Unit 2. The charcoal-stained soil that was encountered at a depth of 12 to 15 cm below the surface was 20 cm in diameter. There was also virtually no stratigraphic variability between the assumed interior and exterior of the structure as defined by the rock alignment in Test Unit 1. As a result, the two shovel tests were placed between Test Unit 1 and Test Unit 2 into what was assumed to be the interior of the structure to ascertain whether an activity surface was present. Shovel Test 1 was located about 1 m to the north-northeast, and Shovel Test 2 was located about 0.75 m to the east-northeast of Test Unit 1. Shovel Test 1 was excavated to a depth of 20 cm while Shovel Test 2 was excavated to a depth of 30 cm. No activity surface was encountered within either shovel test. The stratigraphy in both shovel tests was virtually the same as that encountered in the two test units, although an additional 10 cm of culturally sterile soil was removed from Shovel Test 2 (20 to 30 cm). Twenty Sapawe Micaceous and two smeared-indented utilityware sherds were recovered from Levels 1 and 2 and a quartzite core flake from Level 1 in Shovel Test 2. Other recovered artifacts included one Wiyo Black-on-white sherd from the surface and a plain non-micaceous utilityware sherd from Level 1 in Test Unit 1; two rhyolite core flakes, two Pedernal chert core flakes, and one piece of Pedernal chert angular debris from Level 1; one plain non-micaceous utilityware sherd from Level 2 in Test Unit 2; one Sapawe Micaceous sherd from Level 1; and one rhyolite core flake from Level 2 in Shovel Test 1.

Figure 55.16. Post-testing photo of LA 110130 looking east.

As the soil stratigraphy within all four test excavations was very similar, only the Test Unit 1 profile is described. The upper 5 cm was an A horizon soil consisting of loose sandy loam with about 5 percent gravel content. Stratum 2, a Bw soil, ranged from about 5 to 17 cm below surface. It consisted of soft to slightly hard sandy clay loam with about 10 percent gravel content. Stratum 3 (17 to 20+ cm) is a Btb1 horizon soil consisting of soft/loose sandy clay loam with a 40 percent to 50 percent gravel content.

The test excavations revealed approximately 17 cm of sediment overlying a buried Bt horizon interpreted to likely represent a stripped or eroded late-Pleistocene soil. The tuff blocks associated with the partial structural alignments are set slightly into or on top of the Btb1 horizon. The tuff block alignments are not clearly walls, but may represent the foundation of a structure. The additional tuff blocks to the north and east likely represent the fall and downslope erosion of upper course wall blocks. An alternative assessment is that the partial tuff block alignments may represent the remnants of a rock-lined grid garden.

The A and Bw horizons likely represent slopewash colluvium that includes reworked older soil in the Bw horizon that has partially buried the rock alignments. The artifacts observed within the A and Bw horizons are likely part of the slopewash colluvium although their presence does suggest an association with the alignments and a Classic period affiliation for the structure. The artifacts may also represent locally bioturbated material that is in reasonably good archaeological context (Drakos and Reneau 2003).

Strata 2 and 3 macrobotanical (flotation) and pollen samples were collected and processed from both the assumed interior and exterior of the structure as defined in Test Unit 1. A flotation sample collected from the charcoal stain observed in Test Unit 2 was also collected. The flotation sample from Test Unit 1, Stratum 2 produced one charred *Amaranthus* seed while the charcoal stain in Test Unit 2 produced a corn cupule and a corn cupule fragment. The corn cupule was submitted to Beta Analytical, Inc., for accelerator mass spectrometer radiocarbon dating (Beta Number 183767). The calibration of radiocarbon age to calendar years resulted in a conventional age of 360±30 BP, a two-sigma calibration date range of AD 1450 to 1640, and an intercept date of AD 1500.

Pollen samples from the assumed exterior of the structure were more productive, exhibiting a gradient from the shallow to the deeper samples of decreased tree pollen and increased cheno-am. No cultigen pollen was recovered from any of the samples.

Summary

Although likely bioturbated, the artifacts and corn cupule remains suggest that the cultural material is in reasonably good archaeological context. As a result, there is still potential that LA 110130 contains cultural materials that could aid in establishing the nature of the structural remains (i.e., is the site the remains of a fieldhouse or grid garden). With the establishment of the site type, there is additional potential to address regional and site-specific research questions concerning the Classic period adaptation on the Pajarito Plateau such as establishing land and resource utilization patterns. As LA 110130 is assessed to retain research potential that could better establish the Ancestral Pueblo Classic period cultural adaptation on the Pajarito Plateau, it is considered eligible to the Register under Criterion D, likely to yield information important in prehistory or history.

LA 110132

LA 110132 (V-129) contains two adjoining partial rock alignments that, based on the apparent association of artifacts, were assessed to be potential masonry structure foundation or garden plot enclosure alignments (Figures 55.17 and 55.18). The site is located on a ridge situated along the south side of Pueblo Canyon. It is situated at an elevation of 1955 m (6415 ft), within an area that is transitional between piñon-juniper woodland and ponderosa pine forest.

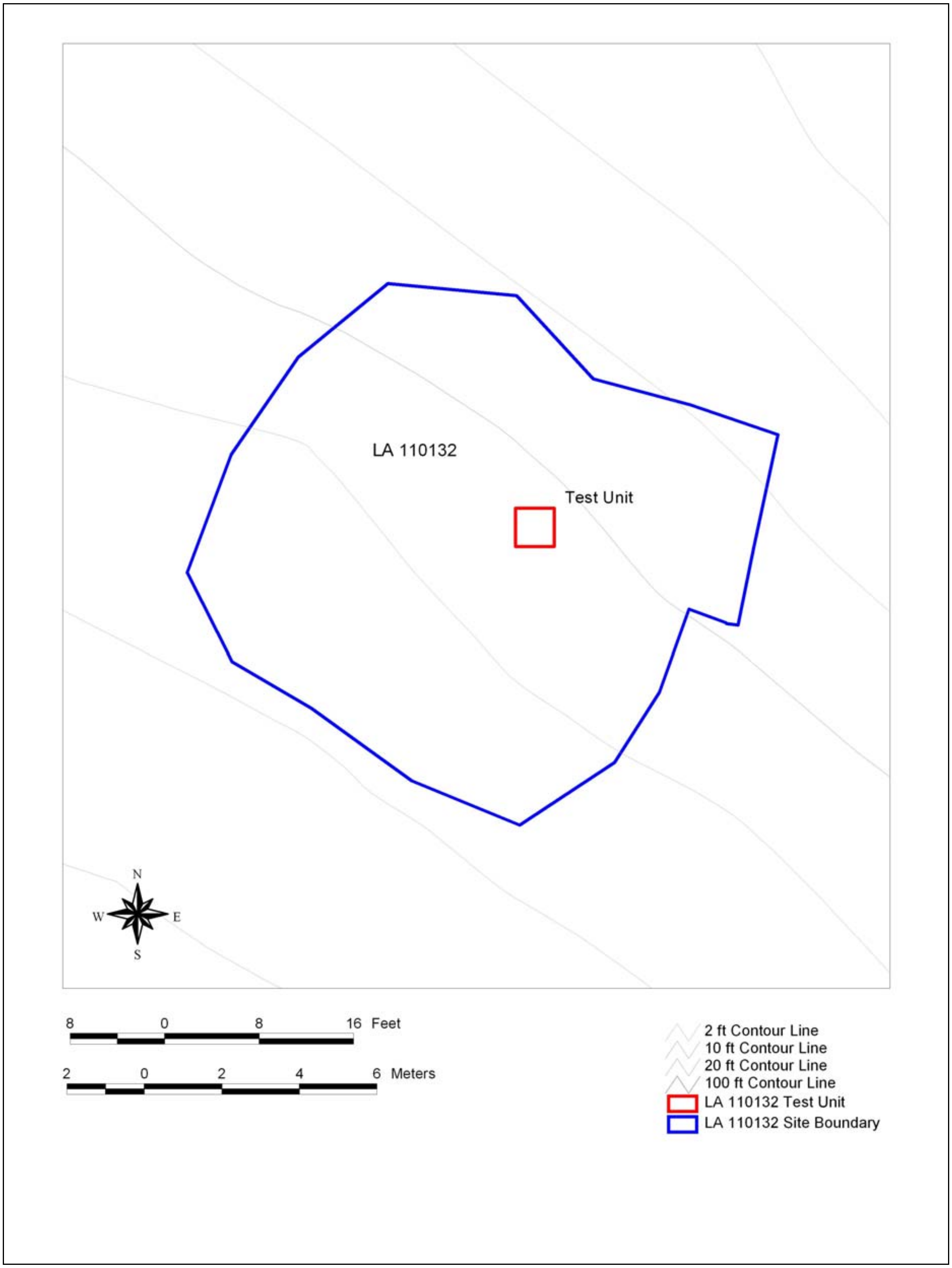

Figure 55.17. LA 110132 GPS differential map.

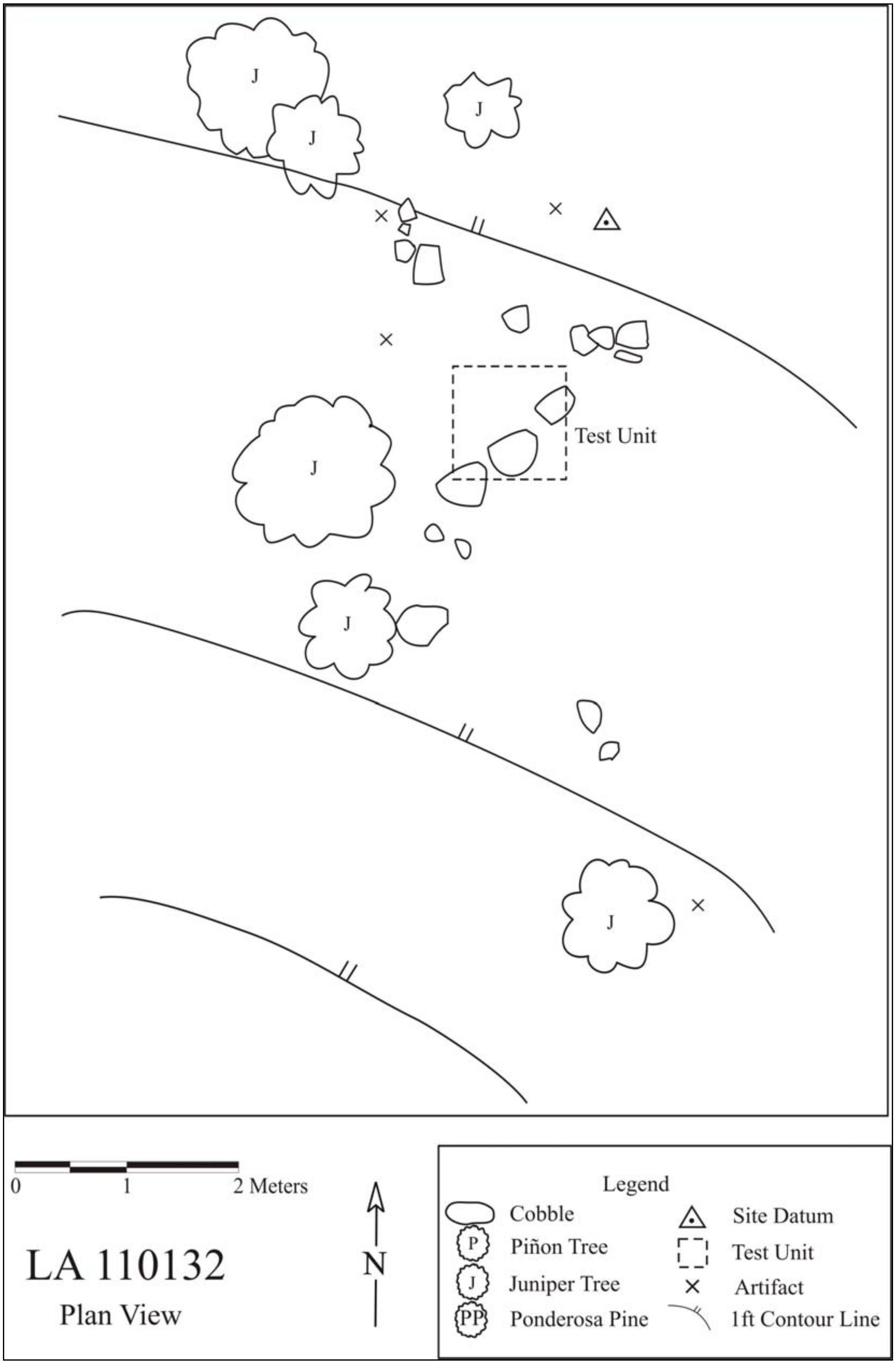

Figure 55.18. Plan view of potential structure at LA 110132.

The partial alignments are one course wide, with the north-south alignment measuring 2.4 m and the east-west alignment measuring 2.1 m in length. These intersecting alignments appear to form the northeast corner of a feature. The overall site area, including associated artifacts, is about 36 m^2. The rocks forming the potential cultural alignments average about 25 by 15 by 10 cm.

Four artifacts were observed within the site perimeter. The two ceramics consisted of a Santa Fe Black-on-white bowl sherd and a Biscuit A bowl sherd. The two lithics include an obsidian biface fragment, possibly a knife tip, and a broken quartzite cobble, possibly a mano fragment.

Testing

One test unit (A) was positioned over the east-side alignment to assess any stratigraphic differences from the inside to the outside of the structure. The test unit was excavated to a maximum depth of 10 cm with a trowel. All excavated materials were screened through 1/8-in. mesh.

The surface of a terrace boulder(s) was encountered between 2 cm (southwest corner) and 10 cm (southeast corner) below surface in the test unit. The fill above the terrace boulder was a sandy loam colluvium, which included reworked terrace gravels. There was no discernable difference in the colluvium from one side of the cobble alignment to the other. Based on the test unit, the potential structural alignments were assessed to be naturally occurring terrace cobbles and not of cultural origin. Other than the four surface artifacts, no cultural materials were associated with LA 110132. As no intact cultural materials were present, LA 110132 is no longer assessed to be eligible to the Register.

LA 110133

LA 110133 (Q-199) consists of a sparse ceramic and lithic artifact scatter. It is located on a north-facing colluvial slope situated below the mesa cliff face, along the southern edge of Pueblo Canyon (Figure 55.19). The site abuts the north side of the Pueblo Canyon dirt road. It is situated at an elevation of 1995 m (6540 ft) within a piñon-juniper woodland.

The artifact scatter is situated within an area that measures 2803 m^2. The 27 observed surface artifacts were dominated by ceramics. The decorated ceramics included four Santa Fe Black-on-white, one Wiyo Black-on-white, one Wingate Black-on-white, two unidentified redwares, two Biscuit A, one Biscuit B, and one Potsuwi'i Incised sherd. Utilityware ceramics included one indented corrugated, eight smeared-indented corrugated, one obliterated, and three unidentified sherds. The lithics consist of a chert biface flake and a ground quartzite cobble fragment.

Testing

Two 1- by 1-m test units were excavated into light artifact concentrations, one just below a two-track dirt road in the lower southern quarter of the site (Test Unit 1) and the other in the upper southeast corner of the site (Test Unit 2). Both test units were excavated in arbitrary 10-cm levels with shovel and trowel. With the exception of pollen, soil, and macrobotanical samples, all hand-excavated materials were screened through 1/8-in. mesh.

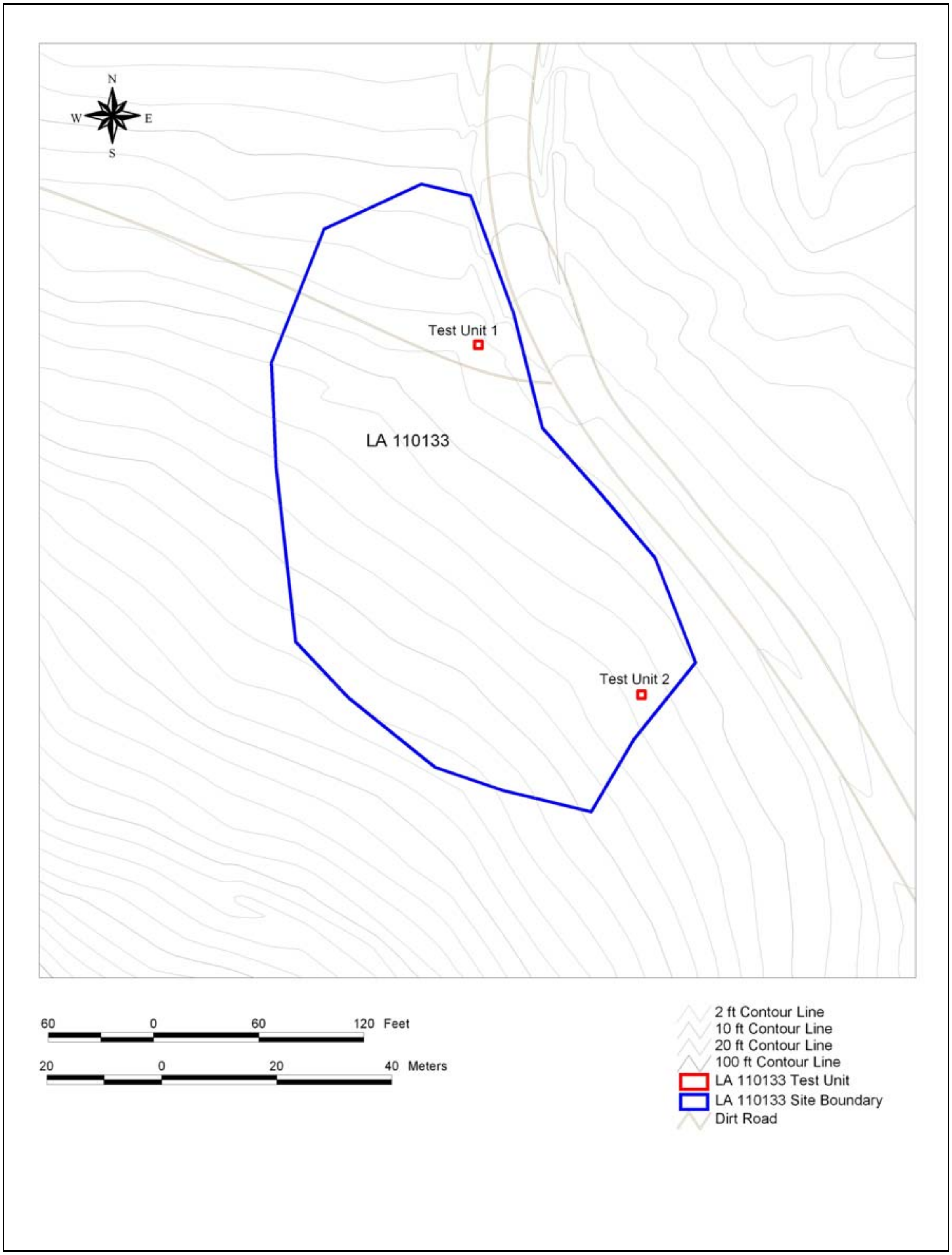

Figure 55.19. LA 110133 GPS differential map.

Test Unit 1 was excavated to a depth of 1 m and Test Unit 2 was excavated to a depth of 0.7 m below surface. Both test units were extremely similar in that they contained young colluvium throughout. The upper 16 to 19 cm contained a loose sand to loamy sand (10YR5/4) AC horizon soil that was assessed to be less than 100 years in age. The underlying fill was a loose to soft sandy loam (7.5YR5/4) BC or CB horizon soil exhibiting very weak soil development that was assessed to be less than 500 years in age (Drakos and Reneau 2003). Test Unit 1 was terminated within the colluvium, whereas Test Unit 2 was terminated at a change in the soil stratigraphy. At a depth of about 65 cm below surface, the colluvium in Test Unit 2 became extremely compact although pockets of loose sandy loam were still present. The hardening of the soil may have been produced by silica cement.

One ceramic was recovered from the upper 10 cm within both test units, and two ceramics were recovered from depths of 40 to 70 cm below surface in Test Unit 1. A plain gray utilityware sherd was recovered from the upper 10 cm (level 1), while smeared-indented utilityware sherds were recovered from Levels 5 (40 to 50 cm) and 7 (60 to 70 cm) in Test Unit 1. An unpainted, undifferentiated sherd was recovered from Level 1 in Test Unit 2. Other than theses four ceramics, no cultural materials were observed from within the two test units.

The test unit profiles indicated that LA 110133 is located on a very active colluvial slope with 70 cm or greater of post-Ancestral Pueblo colluvial deposition. The artifacts observed at LA 110133 appear to be part of the colluvium and are not in archaeological context (Drakos and Reneau 2003). As there appears to be no intact cultural deposits associated with LA 110133, it is no longer assessed to be eligible to the Register.

LA 117883

LA 117883 (Q-39) consists of a sparse lithic scatter situated within an area measuring 1410 m². The site is located on a north-side colluvial slope that forms a bench situated 3 m above the current drainage channel within Pueblo Canyon (Figure 55.20). The south and west sides of the site have been exposed to recent channel cutting. The area is vegetated by a piñon-juniper woodland and a ponderosa pine forest. The site is situated at an elevation of 1969 m (6460 ft).

During the initial recording, 62 lithic artifacts and four ceramics that were thought to be intrusive were documented during infield analysis. The chipped stone tools include the proximal end of an obsidian dart point with a concave base, an obsidian uniface, and a chert biface fragment. The debitage consisted of 39 pieces of obsidian, 14 pieces of Pedernal chert, and two pieces of basalt. The obsidian included 24 core flakes, 14 biface flakes, and one piece of angular debris. The Pedernal chert consisted of 10 core flakes and three biface flakes. The basalt included one core flake and one biface flake. The ceramics were identified as one unidentified biscuitware and three smeared-indented corrugated utilityware sherds.

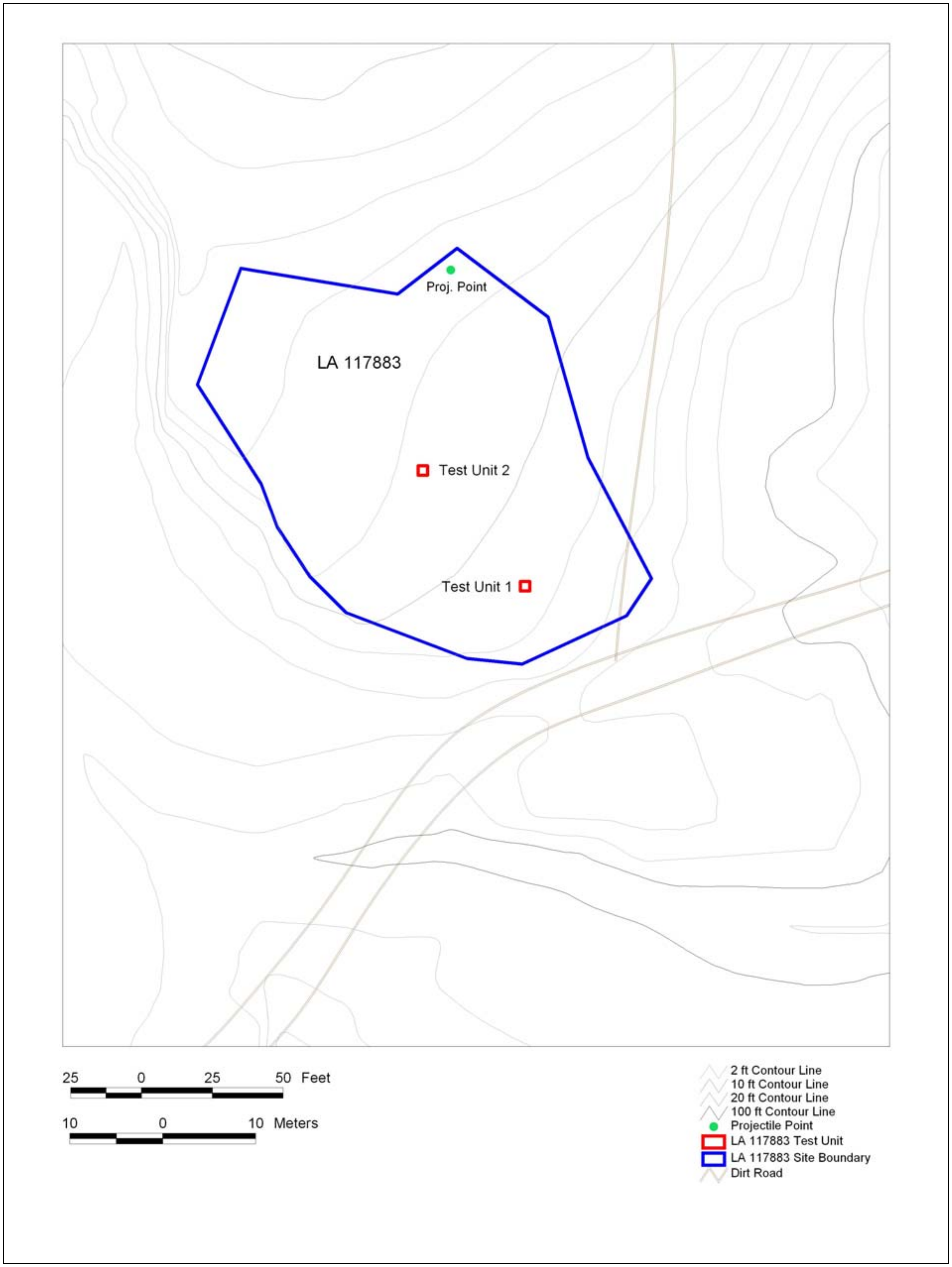

Figure 55.20. LA 117883 GPS differential map.

One ground stone artifact that was identified as a possible spade-shaped, tabular, polishing stone was also documented. It showed evidence of polishing along one rounded and one angled edge. It measured 12 by 7.5 by 5 cm and appeared to be made from a slate-like material.

Testing

Before the initiation of test unit excavations, an infield analysis was conducted on all observed surface artifacts located on LA 117833 (Table 55.1). The infield analysis resulted in the documentation of 75 lithics, including a projectile point, a biface fragment, a core, and 71 pieces of chipped stone debitage. Obsidian artifacts formed 81 percent of the surface lithics and Pedernal chert formed 13.5 percent. Biface flakes formed 51 percent of the lithic debitage while core flakes and flake fragments formed 28 percent and 10 percent, respectively. Also noted during the infield analysis were a Biscuit A ceramic and a Biscuit B ceramic sherd.

Table 55.1. Lithic artifact type by material type from LA 117833.

Artifact Type		**Obsidian**	**Pedernal**	**Basalt**	**Chert**	**Chalce-dony**	**Total**
Debi-tage	Angular debris	1	2	0	0	0	3
	Core flake	15	4	0	1	0	20
	Biface flake	30	4	1	0	1	36
	Microdebitage	3	0	0	0	0	3
	Und. flake	7	0	0	0	0	7
	Retouched flake	1	0	0	0	0	1
Tool	Core	1	0	1	0	0	2
	Biface fragment	1	0	0	0	0	1
	Projectile point	1	0	0	0	0	1
Total		**60**	**10**	**2**	**1**	**1**	**74**

Two 1- by 1-m test units were excavated into light artifact concentrations. Test Unit 1 was located on a terrace situated 20 m north of the Pueblo Canyon channel and Test Unit 2 was situated upslope approximately 32 m north of the Pueblo Canyon channel. Both test units were excavated in arbitrary 10-cm levels with shovel and trowel. With the exception of pollen, soil, and macrobotanical samples, all hand-excavated materials were screened through 1/8-in. mesh.

Test Unit 1 was excavated to a depth of 0.67 m and Test Unit 2 was excavated to a depth of 1 m below surface. Both test units were similar in that they contained colluvium overlying buried terrace gravels. The upper 9 to 15 cm contained a loose sand (10YR4/3 to 10YR4/2) AC horizon soil that was assessed to be less than 500 years in age. Underlying the AC soil horizon was a 25- to 28-cm-thick C horizon soil deposit of loose sand (10YR5/3 to 10YR4/3) that was also assessed to be less than 500 years in age. Situated between the C horizon and the gravel terrace was an 18- to 23-cm-thick Bwb1 horizon soft sand deposit (10YR5/3) that was assessed to be less than 1000 to 2000 years in age. In Test Unit 2, a 60-cm-thick BCb1 horizon deposit of soft sand (10YR5/3) was situated between the C horizon soil and the terrace gravels. The test unit deposits suggest that there were two depositional events, with older colluvium, less than 1000 to 2000 years, overlain by young colluvium, less than 500 years (Drakos and Reneau 2003).

The buried soil in with the gravels in Test Unit 2 includes a Stage I carbonate suggesting a late-Pleistocene to early-Holocene age for the terrace. In contrast, the buried terrace gravels in Test Unit 1 lack carbonate, soil structure, or other indicators of soil development, suggesting that this terrace is late Holocene in age. These differences suggest that two terraces of different age are buried beneath the colluvium, with the terrace below Test Unit 1 inset into the terrace situated beneath Test Unit 2 (Drakos and Reneau 2003).

Lithic debitage was recovered from every level of both test units (Table 55.2) with 42 collected from Test Unit 1 and 105 from Test Unit 2. Also recovered was an undetermined biscuitware sherd from Level 3 (20 to 30 cm below surface) in Test Unit 1. Chunks of charcoal were also recovered from Level 6 in Test Unit 1 and Level 8 from Test Unit 2. The presence of lithics throughout the colluvium in the test units suggests that the artifacts have been transported from upslope and are not in place (Drakos and Reneau 2003).

Table 55.2. Excavation recovered artifacts from LA 117883.

Test Unit	Depth of Test Unit (cm)	Level (depth in cm)	No. of Lithics	No. of Sherds	Ground Stone	Faunal Bone	Charcoal	Total Arti-facts
TP 1	0 to 67	1 (0 to 10)	3					43
		2 (10 to 20)	6					
		3 (20 to 30)	2	1				
		4 (30 to 40)	13					
		5 (40 to 50)	9					
		6 (50 to 60)	5				Fragment	
		7 (60 to 67)	4					
TP 2	0 to 100	1 (0 to 10)	6					105
		2 (10 to 20)	6					
		3 (20 to 30)	5					
		4 (30 to 40)	3					
		5 (40 to 50)	9					
		6 (50 to 60)	11			1		
		7 (60 to 70)	11			1		
		8 (70 to 80)	20			1	Fragment	
		9 (80 to 90)	18			1		
		10 (0 to 100)	12					
Totals			**143**	**1**		**4**		**148**

Summary

The testing at LA 117883 indicated that there are no intact cultural deposits associated with the site. Although several artifacts and a few chunks of charcoal were recovered, they were all mixed in with colluvium, and as such, lack cultural context. As there appears to be no intact cultural deposits associated with LA 117883, it is no longer eligible to the Register.

WHITE ROCK TRACT

As originally defined, the White Rock Y Tract was located south of State Road (SR) 502 and west of SR 4 and included the interchange between the two. Sandia Canyon ran through the southern portion and Los Alamos Canyon, including its confluence with Pueblo Canyon, ran through the northern portion of the tract. Elsewhere, the tract was dominated by several small mesas that are dissected by narrow valleys. The tract, which is lightly forested with a piñon-juniper woodland and ponderosa pine forest, ranged in elevation from 2107 m to 2267 m (6320 to 6800 ft).

The U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) made a decision after the cultural resource survey phase to remove most of the White Rock Y Tract from the proposed conveyance. The remaining areas proposed for conveyance include the highway right-of-way surrounding the interchange and the SR 4 and 502 corridors. The SR 4 and 502 interchange is located just west of the confluence of Los Alamos and Pueblo canyons. The two sites with an undetermined Register eligibility are located directly south of Los Alamos Canyon, which is situated a short distance south of SR 502. Within the cultural site vicinities, Los Alamos Canyon is incised into basalt bedrock and contains an adjacent stream terrace that is overlain by colluvium derived from a higher terrace.

LA 61034

LA 61034 is an artifact scatter situated on a colluvial bench slope located directly south of the Los Alamos Canyon drainage (Figure 55.21). The site is at an elevation of 1922 m (6305 ft) in an area that is dominated by piñon-juniper woodland. The several hundred artifacts are situated in an area measuring 2190 m². When originally recorded, no formal artifact analysis was conducted. Observed ceramics included Potsuwi'i Incised, Sankawi Black-on-cream, red-slipped ware, Jemez Black-on-white, and smeared-indented corrugated sherds. The lithic assemblage was not detailed. The presence of Sankawi Black-on-cream and Potsuwi'i Incised ceramics dated this site to the Classic period.

Testing

Before initiating the excavation of test units, infield analysis was conducted on 100 percent of the observed surface artifacts. The infield analysis resulted in the documentation of 32 ceramics (Table 55.3) and 147 pieces of lithic debitage (Table 55.4). The four decorated ceramics are associated with the Classic period. The three micaceous plainware sherds and the Potsuw'ii Incised sherd support the Classic period assessment.

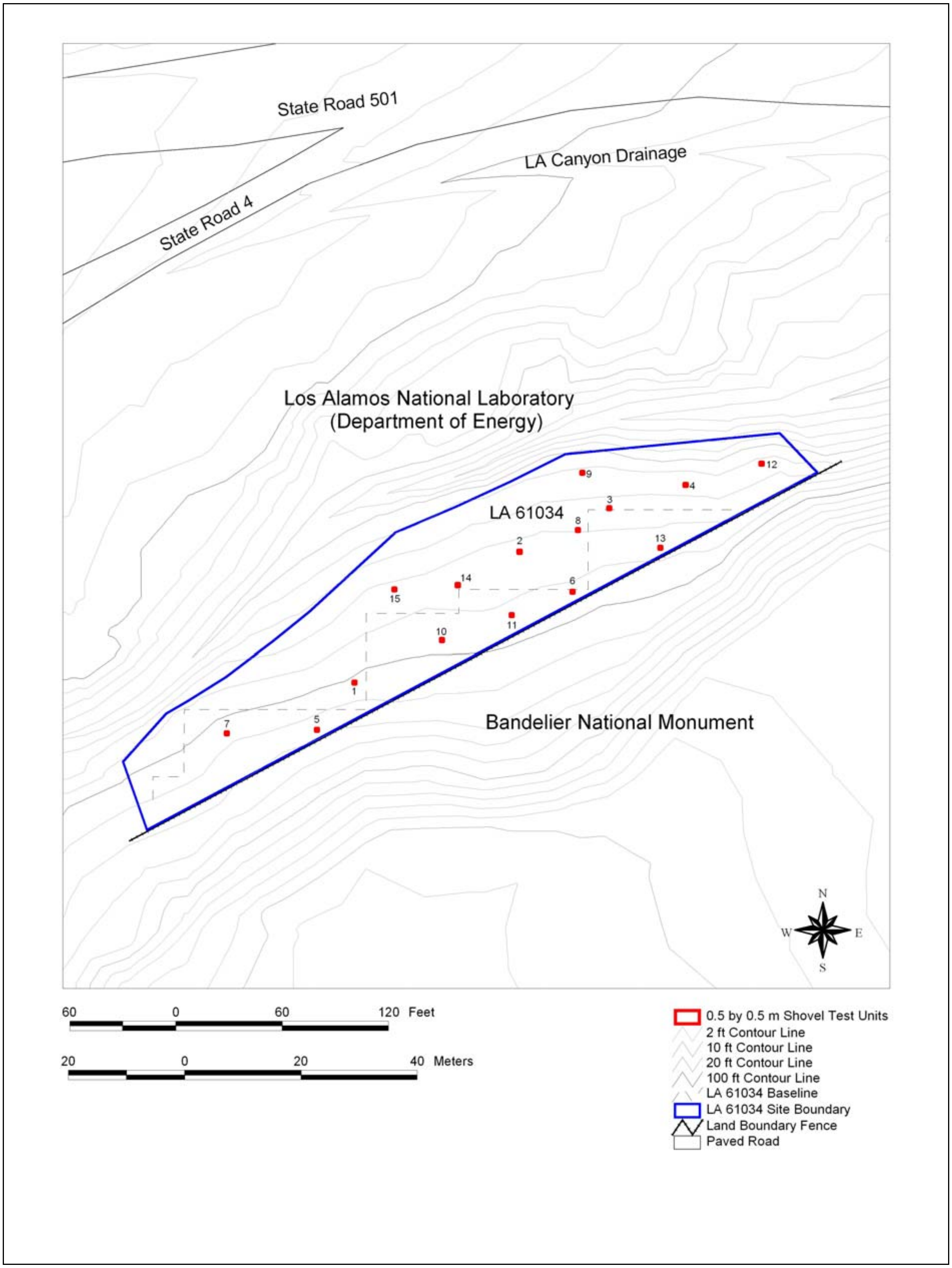

Figure 55.21. LA 61034 GPS differential map.

Table 55.3. LA 61034 infield ceramic analysis.

Ceramic Type		Total
Decorated	Wiyo Black-on-white	1
	Biscuit B	1
	Sankawi Black-on-cream	1
	Unidentified red glazeware	1
	Subtotal	**4**
Utilitywares	Smeared-indented corrugated	23
	Obliterated	1
	Micaceous plainware	3
	Potsuwi'i Incised	1
	Subtotal	**28**
Total		**32**

Obsidian artifacts formed 82 percent of the lithic debitage and Pedernal chert formed the remaining 18 percent. Biface flakes formed 58 percent of the lithic debitage while core flakes and flake fragments formed 28.5 percent and 8 percent, respectively.

Table 55.4. Lithic artifact type by material type from LA 61034.

Artifact Type		Obsidian	Pedernal	Total
Debitage	Angular debris	5	0	5
	Core flake	27	15	42
	Biface flake	76	9	85
	Microdebitage	1	1	2
	Undetermined flake	10	2	12
	Utilized flake	1	0	1
Total		**120**	**27**	**147**

Excavation

Fifteen 50- by 50-cm test units, termed shovel tests, were excavated into the site. The test units were excavated with a trowel in arbitrary 10-cm levels. With the exception of pollen, soil, and macrobotanical samples, all hand-excavated materials were screened through 1/8-in. mesh. The test units were positioned across the site with a larger number placed in the northeastern portion where the surface artifact density was higher (Table 55.5). The shovel tests varied in depth from 10 cm near the Los Alamos Canyon drainage (Shovel Test 9) that runs along the northwestern edge of the site to 70 cm in an upslope location near the Bandelier National Monument Boundary Fence where colluvial deposits are much deeper (Shovel Test 6).

Although depths and thickness varied, the soil stratigraphy was similar throughout all of the test units. The upper 4 to 6 cm was a loose sandy to silty loam (10YR5/3). Directly below this A horizon was a 10- to 16-cm-thick Bw Soil horizon deposit consisting of lightly compacted sandy clay loam (7.5YR5/4). At depths ranging from 18 to 32 cm below surface, a compact sandy clay loam was encountered (7.5YR5/4). This Btj1(b1?) soil horizon that was approximately 10- to

15-cm-thick, overlaid a 10- to 30-cm-thick Btj2(b1?) soil horizon, which was also a compact sandy clay loam that contained cicada burrows forming hard peds (7.5YR5/4). When present, the Btj2 horizon soils overlaid a sandy clay loam deposit containing numerous (60% to 70%) rounded stream cobbles (IIBC horizon). In test units that were situated closer to Los Alamos Canyon, the stream cobble deposit was encountered at fairly shallow depths (10 to 28 cm below surface), often situated directly below the Bw Soil horizon. An exception to this general soil stratigraphy sequence occurred in Shovel Test 4 where basalt bedrock was encountered from 5 to 20 cm below surface.

Lithic debitage and a few ceramic sherds were recovered from several of the test units and charcoal fragments and/or flecks were present in three of the units (Table 55.5). The lithics were recovered from throughout the soil sequence, whereas the ceramics were recovered from the upper 20 cm. The vast majority of excavation-recovered artifacts were located in the central and northern end of the site.

Table 55.5. Artifacts recovered during excavation of LA 61034.

Test Unit	Grid	Depth of Test Unit (cm)	Level (depth in cm)	Number of Lithics	No. of Ceramics	Charcoal	Total Artifacts
ST-1	83N/65E	0 to 30					0
ST-2	105N/90E	0 to 50	1 (0 to 10)	8			62
			2 (10 to 20)	6		Flecks	
			3 (20 to 30)	14			
			4 (30 to 40)	34			
ST-3	115N/105E	0 to 40	1 (0 to 10)	3			17
			2 (10 to 20)	6			
			3 (20 to 30)	8			
ST-4	120N/118E	0 to 20	1 (0 to 10)	7			9
			2 (10 to 20)	1	1	Fragment	
ST-5	75N/60E	0 to 25					0
ST-6	100N/100E	0 to 70	1 (0 to 10)		1		7
			2 (10 to 20)	2			
			5 (40 to 50)	1			
			6 (50 to 60)	1			
			1-7 (0 to 70) Unit sidewall	2			
ST-7	75N/45E	0 to 28	1 (0 to 10)	2			2
ST-8	100N/110E	0 to 66	1 (0 to 10)	2	1		16
			2 (10 to 20)	3		Fragment	
			3 (20 to 30)	6		Fragment	
			5 (40 to 50)	3			
			6 (50 to 60)	1			

Test Unit	Grid	Depth of Test Unit (cm)	Level (depth in cm)	Number of Lithics	No. of Ceramics	Charcoal	Total Artifacts
ST-9	120N/100E	0 to 14					0
ST-10	90N/80E	0 to 29					0
ST-11	95N/90E	0 to 40					0
ST-12	124N/130E	0 to 20	1 (0 to 10)		1		1
ST-13	110N/115E	0 to 40	3 (20 to 30)	2			2
ST-14	100N/80E	0 to 60	1 (0 to 10)	3			6
			2 (10 to 20)	1			
			4 (30 to 40)	1			
			5 (40 to 50)	1			
ST-15	89N/70E	0 to 20					0
Total Artifacts				**118**	**4**		**122**

The presence of artifacts situated throughout the site colluvium suggests that the artifacts have been transported from upslope and are not in place. An Archaic period site is located on a terrace situated upslope between 18 and 30 m to the southeast of LA 61034. The stratigraphic sequence suggests that Ancestral Puebloan or post-Puebloan colluvium (A and Bw horizons) overlays Archaic period colluvium (Btj1 and Btj2 horizons) that buries Holocene terrace gravel (IIBCb2 horizon). This interpretation is supported by the distribution of artifacts with ceramics and lithics found in excavation depths corresponding to the A and Bw horizons, whereas only lithics were found in excavation depths corresponding to the Btj1 and Btj2 horizons (Drakos and Reneau 2003). The artifacts observed and recovered from LA 61034 also support the presence of two cultural manifestations. The high percentage of obsidian debitage and lithic debris that indicates a biface manufacturing strategy suggests that many of the lithics are affiliated with an Archaic period area utilization, while the diagnostic ceramics suggest a Classic period utilization.

Summary

LA 61034 is located on a colluvial slope that overlies a Los Alamos Canyon stream terrace of probable Holocene age. The colluvium appears to have been deposited from an adjacent, higher Pleistocene terrace (Drakos and Reneau 2003). The test units excavated into LA 61034 indicate that the site-associated artifacts are intermixed within the colluvium and are not in a cultural context. As there are no intact cultural remains located at LA 61034, it is no longer considered eligible to the Register.

LA 61035

LA 61035 is a sparse artifact scatter situated in a 327-m² area. The site is situated on a small, narrow, fairly flat bench situated between a terrace to the south and the Los Alamos Canyon drainage to the north (Figure 55.22). The site is at an elevation of 1916 m (6285 ft) in an area that is dominated by piñon-juniper woodland. Dirt piles, assumed to have been deposited during the construction of SR 501, which is located directly north of the Los Alamos Canyon drainage, were observed on both the east and west ends of the site.

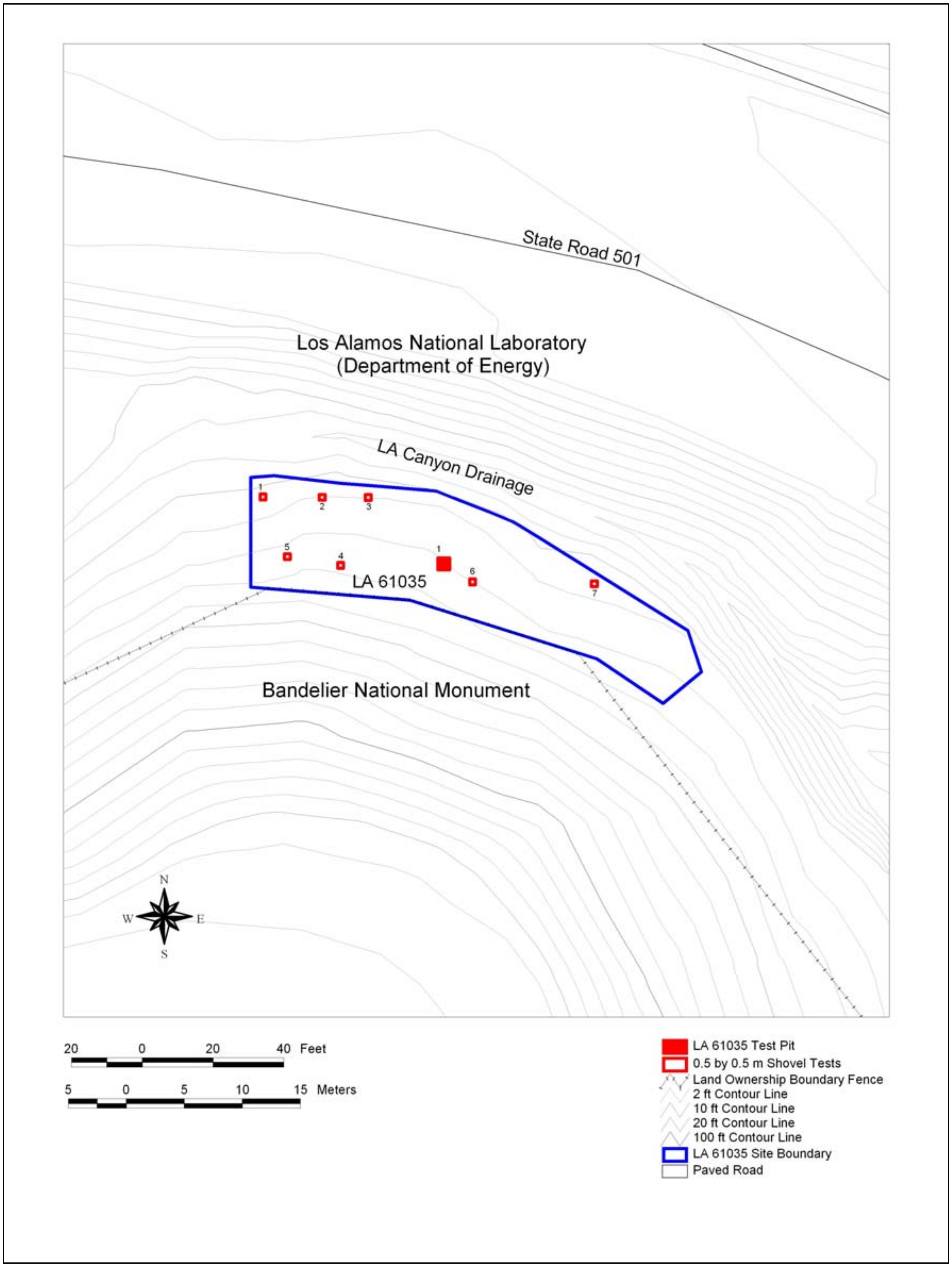

Figure 55.22. LA 61035 GPS differential map.

When originally recorded, no formal analysis was conducted on the artifacts that were assessed to number in the tens. Observed diagnostic ceramics included Sankawi Black-on-cream sherds. Lithics were mostly obsidian with a small percentage of chalcedony also present. Based on the ceramics, this site dated to the Classic period.

Testing

Before excavation of the test units, an infield artifact analysis was conducted on 100 percent of the observed surface artifacts. The infield analysis resulted in the documentation of seven ceramics (Table 55.6) and 146 lithics (Table 55.7). The four decorated ceramics are associated with the Classic period.

Table 55.6. Infield ceramic analysis from LA 61035.

Ceramic Type		**Total**
Decorated	Wiyo Black-on-white	1
	Biscuit B	1
	Unidentified biscuitware	1
	Unidentified redware	1
	Subtotal	**4**
Utilitywares	Smeared-Indented Corrugated	2
	Obliterated	1
	Subtotal	**3**
Total		**7**

The analyzed lithics included one chalcedony biface and 145 pieces of chipped stone debitage. Obsidian artifacts formed 83 percent of the lithic debitage and Pedernal chert formed 9 percent. Biface flakes formed 56 percent of the lithic debitage, while core flakes and flake fragments formed 26 percent and 7.5 percent, respectively.

Table 55.7. Lithic artifact type by material type from infield analysis at LA 61035.

Artifact Type		**Obsidian**	**Pedernal**	**Basalt**	**Chert**	**Chalcedony**	**Total**
Debitage	Angular debris	5	2	0	0	0	7
	Core flake	25	6	3	1	3	38
	Biface flake	75	3	2	1	0	81
	Microdebitage	7	0	0	0	0	7
	Undetermined flake	8	2	1	0	0	11
	Retouched flake	1	0	0	0	0	1
	Biface (Knife)	0	0	0	0	1	1
Total		**121**	**13**	**6**	**2**	**4**	**146**

Excavation

One 1- by 1-m test unit and seven 50- by 50-cm test units called shovel tests were excavated into the site. The 1- by 1-m test unit was excavated by shovel and trowel and the shovel tests were excavated by trowel. The units were excavated in arbitrary 10-cm levels unless a distinct stratigraphic change was encountered. With the exception of pollen, soil, and macrobotanical samples, all hand-excavated materials were screened through 1/8-in. mesh.

Although depths and thickness varied, the soil stratigraphy was similar throughout all of the test units with three colluvial soil horizons situated above a gravel and cobble stream terrace. The upper 8 to 12 cm of soil was loose loamy sand (A horizon) that overlaid lightly compacted loamy sand (Bw horizon). The Bw soil horizon that increased in compaction with depth extended down to depths of 40 to 45 cm below surface in locations where the terrace deposits were deeply buried. A C horizon soil that contained hard peds formed from cicada burrows intermixed with lightly compacted to loose loamy sand was situated below the Bw horizon.

The depth of colluvial deposits increased rapidly upslope to the south with increased distance away from the Los Alamos Canyon drainage channel. In the northwest corner of the site, Shovel Tests 1 and 2 were terminated at depths of 18 to 40 cm below surface, respectively, as terrace deposits of rounded stream gravels and cobbles were encountered. Shovel Tests 5 and 7 that extended down into the C horizon were also terminated at or just below contact with the gravel and cobble terrace deposit. All other test units were terminated within the C soil horizon with Test Unit 1 excavated to a depth of 1.4 m below surface (Figure 55.23).

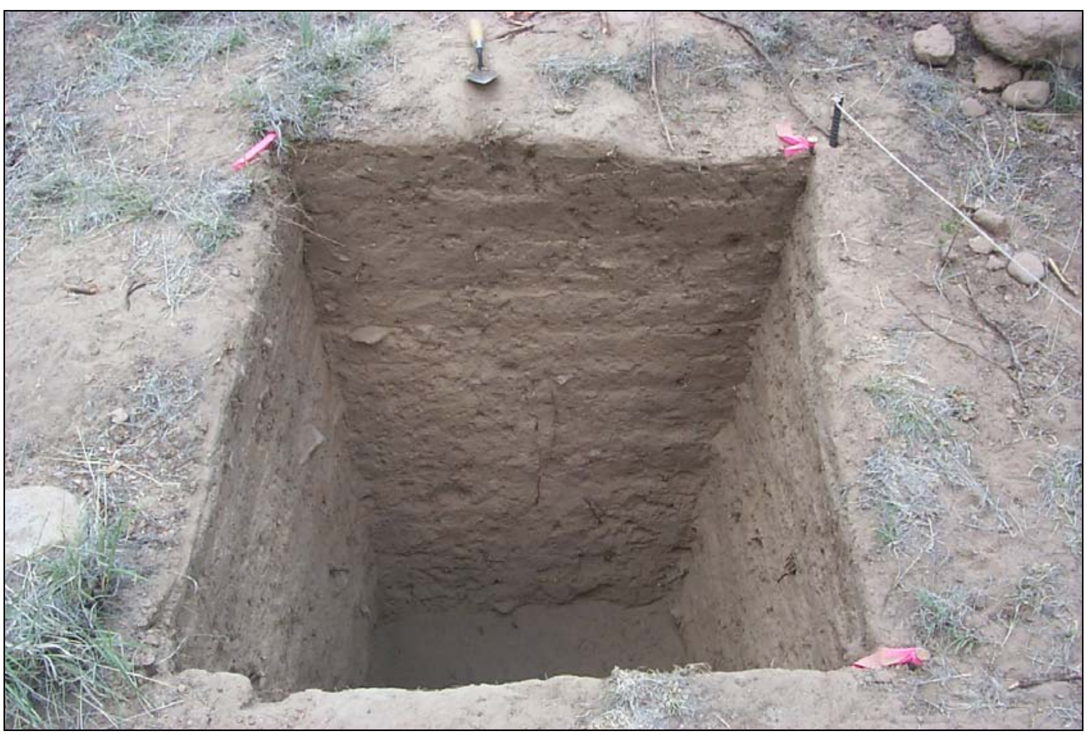

Figure 55.23. Post-excavation photo of Test Pit 1 at LA 65035.

Cultural materials were situated throughout the site colluvial deposits. Lithic debitage and ceramic sherds were recovered from the upper 40 cm, while only lithics were recovered from depths greater than 40 cm below surface. Charcoal flecks and/or fragments were noted in all of the test units except for Shovel Test 4. The charcoal was intermixed throughout the colluvial deposits, ranging from 0.05 to 1.0 m in depth. It is not known whether the charcoal was associated with a cultural occupation or whether it resulted from an area wildfire.

The presence of artifacts throughout the entire colluvial deposit suggests that the cultural materials have been transported from upslope and are not *in situ* (Table 55.8). The presence of ceramics in the upper 40 cm indicates significant colluvial deposition since the Ancestral Pueblo occupation of the site area. Although the sample of recovered ceramics is extremely small, the two diagnostic sherds recovered from test units indicate a Coalition period cultural affiliation, whereas the surface ceramics indicate a Classic period affiliation. The presence of lithic debitage and the lack of ceramics at depths greater than 40 cm below surface suggest that colluvial deposition began before the Ancestral Pueblo area utilization, likely during the Archaic cultural period (Drakos and Reneau 2003). Much of the debitage located at LA 61035 was likely derived from upslope erosion of a nearby Archaic period site. The high percentage of obsidian debitage and lithic debris that indicates a biface manufacturing strategy supports the assumption that many of the lithics are affiliated with an Archaic period area utilization.

Table 55.8. Artifacts recovered during excavation at LA 61035.

Test Unit	Depth of Test Unit (cm)	Level (depth in cm)	No. of Lithics	No. of Sherds	Ground Stone	Fauna	Char-coal	Total Arti-facts
TP-1	0 to 140	Surface (0)	1					352
		1 (0 to 10)	4					
		2 (10 to 20)	18					
		3 (20 to 30)	32					
		4 (30 to 33)	38	3		6	Flecks	
		5 (33 to 43)	12			1	Flecks	
		6 (43 to 53)	24				Flecks	
		7 (53 to 63)	35					
		8 (63 to 73)	33				Flecks	
		9 (73 to 86)	33				Flecks	
		10 (86 to 96)	37				Frag-ments	
		11 (96 to 106)	39					
		12 (106 to 116)	14					
		13 (116 to 126)	9					
		14 (126 to	13					

Test Unit	Depth of Test Unit (cm)	Level (depth in cm)	No. of Lithics	No. of Sherds	Ground Stone	Fauna	Char-coal	Total Arti-facts
		136)						
ST-1	0 to 18	1 (0 to 10)	1				Frag.	1
ST-2	0 to 40	1 (0 to 10)	2				Frags.	5
		2 (10 to 20)	3					
ST-3	0 to 80	1 (0 to 10)	1					79
		2 (10 to 20)	8					
		3 (20 to 30)	5					
		4 (30 to 40)	10	1			Flecks	
		5 (40 to 50)	20				Flecks	
		6 (50 to 60)	8				Flecks	
		7 (60 to 70)	14					
		8 (70 to 80)	12				Flecks	
ST-4	0 to 60	1 (0 to 10)	1					8
		2 (10 to 20)	2	1				
		4 (30 to 40)	2	1	1			
ST-5	0 to 68	1 (0 to 10)		1				5
		4 (30 to 40)	1					
		5 (40 to 50)	1					
		6 (50 to 60)	2				Flecks	
		7 (60 to 68)					Fleck	
ST-6	0 to 80	1 (0 to 10)	8	1				104
		2 (10 to 20)	13					
		3 (20 to 30)	10				Flecks	
		4 (30 to 40)	9				Flecks	
		5 (40 to 50)	8				Flecks	
		6 (50 to 60)	16					
		7 (60 to 70)	16				Flecks	
		8 (70 to 80)	23				Frags	
ST-7	0 to 56	1 (0 to 10)	9	4			Frags	21
		2 (10 to 20)	3				Frags	
		3 (20 to 30)	2				Frags	
		4 (30 to 40)	3					
Totals			**555**	**12**	**1**	**7**		**575**

Summary

LA 61035 is located on a colluvial slope that overlies a Los Alamos Canyon stream terrace of probable Holocene age. The colluvium appears to have been deposited from an adjacent, higher Pleistocene terrace (Drakos and Reneau 2003). The test units excavated into LA 61035 indicate that the site-associated artifacts are intermixed within the colluvium and are not in a cultural context. As there are no intact cultural remains located at LA 61035, it is no longer considered eligible to the Register.

CONCLUSION

Ten archaeological sites with an undetermined eligibility were tested to establish whether they were eligible to the Register and LA 86532, the remains of a Homestead Era structure, was re-evaluated as not eligible based on previous consultation with the SHPO. LA 110121 was only partially tested. The western three-quarters of LA 110121 is situated in a conservation zone being established by DOE, NNSA to provide protection for Historic Properties. As a result, only the eastern quarter of LA 110121 that is situated outside the conservation zone and subject to potential impacts, was tested. The testing indicated that the artifacts associated with LA 110121 lacked spatial integrity as they were mixed in with a thin colluvial deposit. It is therefore recommended that the LA 110121 site boundary be re-established along the outer edge of the conservation zone and that the site retain its undetermined eligibility status.

Of the remaining 10 tested sites, two were assessed to be eligible and eight were assessed as not eligible to the Register. LA 21596 and LA110130 retain information important to New Mexico's history and prehistory and as such are eligible to the Register under Criterion D. All of the sites assessed as not eligible to the register lack site integrity. Ceramic and/or lithic scatter sites LA 61034, LA 61035, LA 110133, and LA 117883 are located on active colluvial slopes where the associated artifacts are part of the colluvium and lack any spatial integrity. Sites LA 86528, LA 110121, and LA 110126 are situated on eroded colluvial slopes. Artifacts associated with ceramic and lithic scatter site LA 110121 are part of the colluvium and lack spatial context. The cultural remains associated with LA 86528, a potential rockshelter, and LA 110126, a one-to- three room structure, have been severely impacted by erosional processes and the associated cultural remains are mixed in with slopewash colluvium or a surface lag. Testing revealed that the structural remains assumed to be associated with LA 110132 were natural exposed terrace cobbles and not cultural materials. As LA 110132 is no longer assessed to be a cultural site, it is not eligible to the Register.

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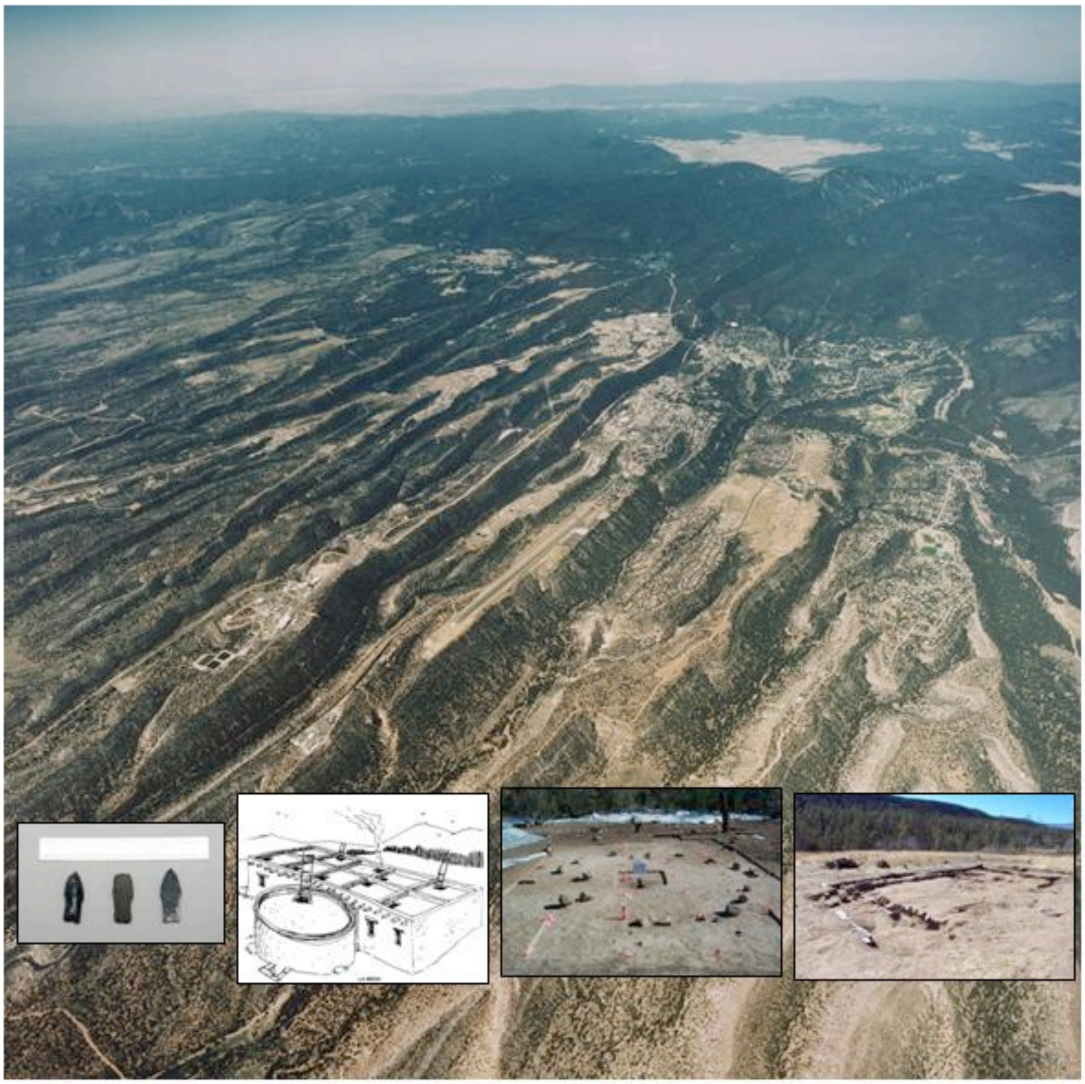
THE LAND CONVEYANCE AND TRANSFER DATA RECOVERY PROJECT: 7000 YEARS OF LAND USE ON THE PAJARITO PLATEAU



VOLUME 3: ARTIFACT AND SAMPLE ANALYSES

Edited by Bradley J. Vierra and Kari M. Schmidt

Ecology and Air Quality Group, Los Alamos National Laboratory

June 2008

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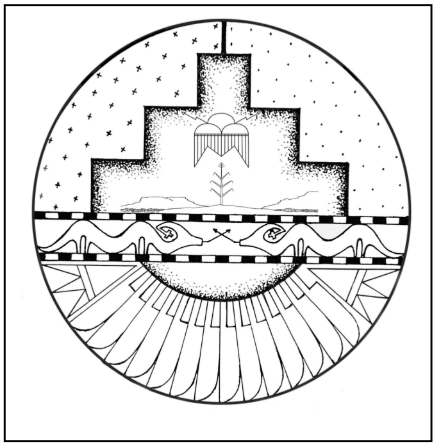

Artistic representation of the Pajarito Plateau; drawn by Aaron Gonzales.

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Title

THE LAND CONVEYANCE AND TRANSFER DATA RECOVERY PROJECT: 7000 YEARS OF LAND USE ON THE PAJARITO PLATEAU

Volume 3: Artifact and Sample Analyses

Cultural Resources Report No. 273

Prepared for

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Contents

Chapter 56: Introduction to Analyses, by Bradley J. Vierra..........1
Intra-Site Sampling..........1
Chronometric Dating..........5

Chapter 57: Surficial Units and Processes Associated with Archaeological Sites in Land Conveyance and Transfer Tracts at Los Alamos National Laboratory, by Paul G. Drakos and Steven L. Reneau..........7
Introduction..........7
Geomorphic Setting..........7
Methods..........8
White Rock Tract..........10
Airport Tract (A-3, A-7, A-5-1)..........29
Rendija Tract (A-14)..........45
TA-74 South Tract..........110
White Rock Y Tract..........119
Conclusions..........121

Chapter 58: Ceramic Analysis for the Land Conveyance and Transfer Project, Los Alamos National Laboratory, by C. Dean Wilson..........125
Introduction..........125
Ceramic Attributes..........127
Ceramic Type Descriptions..........132
Temporal Trends..........168
Origins and Influences of Ceramics on the Pajarito Plateau..........207
The Temporal Distribution of Sites by Tract..........208
Pottery Trends..........209
Vessel Use..........241

Chapter 59: Petrographic Analysis of Pottery for the Conveyance and Transfer Project, Los Alamos National Laboratory, by Elizabeth J. Miksa..........257
Introduction..........257
The Petrographic Sample..........257
Methods..........268
Results..........275
Compositional Characteristics of the Final Temper Groups..........290
Interpretation..........298
Conclusions..........305

Chapter 60: Coping with Change: Stone Tool Technology on the Pajarito Plateau, by Bradley J. Vierra and Michael J. Dilley..........307
Introduction..........307
Understanding Stone Tool Technology..........307
Stone Tool Studies on the Pajarito Plateau..........314
Analytical Methods..........316

Artifact Type Definitions 317
A Description of the Project Lithic Assemblage Groups 340
A Comparison of Temporal Lithic Assemblage Groups 371
Conclusion 385

Chapter 61: Source Provenance of Obsidian and Basalt Artifacts from the Land Conveyance and Transfer Project Data Recovery Program, Los Alamos National Laboratory, by M. Steven Shackley 387
Introduction 387
Analysis and Instrumental Conditions 387
Discussion 388

Chapter 62: Diet and Subsistence on the Pajarito Plateau: Evidence from Flotation and Vegetal Sample Analysis, by Pamela J. McBride 399
Introduction 399
Methods 405
Quantification 407
Maize and Bean Measurements 408
Results of Flotation and Vegetal Analysis 408
Discussion: The C&T Project Prehistoric Data in a Regional Perspective 497
The C&T Project Historic Data in a Regional Perspective 518
Summary and Conclusions 520

Chapter 63: Pollens' Eye View of Archaeology on the Pajarito Plateau, by Susan J. Smith 523
Introduction 523
Previous Research 526
Limitations of Pollen Data 532
Methods 534
Results 537
Comparison Between Sites 589
Conclusions: The Pollen Perspective 591

Chapter 64: Analysis of Faunal Remains from the Land Conveyance and Transfer Project, Los Alamos, New Mexico, by Kari M. Schmidt 597
Introduction 597
Flora and Fauna in Northern New Mexico 597
Analytical Methods 598
Results of the Faunal Analysis 600
Chronometric Assemblage Groups 637
Conclusions 651

Chapter 65: Analysis of Human Skeletal Remains from LA 12587, by Michael A. Schillaci 653
Introduction 653
Burials 657

Miscellaneous Human Remains 662

Chapter 66: Archaeomagnetic Dating Final Report, by Eric Blinman, J. Royce Cox, and Gary Hein 665
Introduction 665
Archaeomagnetic Dating 667
C&T Project Substrates and Sampling Techniques 669
Archaeomagnetic Results 675
Discussion 734
Conclusion 735

Chapter 67: Luminescence Dating of Ceramics from Los Alamos County, New Mexico—Summary Report, by James Feathers 739
Introduction 739
Dose Rates 740
Equivalent Dose 742
Age 744
Evaluation 744
Individual Sites 746

Chapter 68: Hydration Analysis of Obsidian Artifacts from the White Rock, Airport, and Rendija Tracts, Los Alamos, New Mexico, by Christopher M. Stevenson 749
Introduction 749
Hydration Rim Measurements 749
Hydration Rate Development 750
Soil Temperature Relative Humidity Estimation 766
Age Estimation 768
Discussion and Conclusion 769

Chapter 69: An Evaluation of Chronometric Dating Techniques on the Pajarito Plateau, by Brian C. Harmon and Bradley J. Vierra 771
Introduction 771
Obsidian Hydration Dating 771
Radiocarbon Dating 784
Archaeomagnetic Dating 790
Luminescence Dating 793
Multiple Dating Methods for the Same Reference Event 797
Ceramic Artifact Dating 799
Archaeological Site Temporal Sequence 806

Chapter 70: Ground Penetrating Radar: 2002 and 2003 Field Seasons, by Kimberly Henderson, Jennifer E. Nisengard, and John S. Isaacson 819
GPR Background 820
Results 822
Future Directions 836

Chapter 71: Intrasite Spatial Analysis, by Brian C. Harmon, Gregory D. Lockard, and Bradley J. Vierra 839
Introduction..... 839
Archaic Site Structure 839
Ancestral Pueblo Site Structure 845
Fieldhouse Site Structure..... 855
Tipi Ring Site Structure..... 857

Chapter 72: The Native American Consultation and Compliance Process for the Land Conveyance and Transfer Project, by W. Bruce Masse 859
Introduction..... 859
Legal Background 860
NAGPRA Cultural Affiliation at Los Alamos National Laboratory 860
Traditional Cultural Properties (TCP)..... 885
Consultation and Educational Outreach Field and Laboratory Visits..... 887
The NAGPRA Intentional Excavation Plan 889
NAGPRA Repatriation for the C&T Project..... 899

References Cited ..... Vol. 4

Appendices ..... Vol. 4

List of Figures

Figure 56.1. Artifacts per m^2 illustrated as a continuous sequence for the C&T Project survey data..... 4

Figure 57.1. Stratigraphic section at Fence Canyon reference site, showing uncalibrated radiocarbon dates 9

Figure 57.2. Soil stratigraphy and charcoal sample location, EG&G Gully site (see Appendix M for radiocarbon data) 10

Figure 57.3. Geomorphology, cross-section, and soil pit locations in the White Rock Tract 11

Figure 57.4. Cross-section (bottom), soil profiles, and correlations (top) through selected sites in the White Rock Tract. See Figure 57.3 for cross-section and soil description locations 12

Figure 57.5. Cross-section (bottom), soil profiles and correlations (top) showing stratigraphic relationships between alluvial fan (Unit Qf), hillslope (Unit Qc2), and mesa top (Unit Qe+Qc) deposits in the White Rock Tract 13

Figure 57.6. Left distal humerus of the extinct species of bison, *Bison antiquus* (lower

image). Humerus of a modern bison, *Bison bison* (upper image) shown for comparison... 14

Figure 57.7. Cross-section through LA 12587 ... 16

Figure 57.8. LA 12587 site map showing soil description locations, roomblocks, and rock alignments... 17

Figure 57.9. Isopach map showing the thickness of post-occupational deposits at LA 12587... 18

Figure 57.10. Roomblock 3 wall at LA 12587 constructed directly on top of Bandelier Tuff (Qbt) and remnant Pleistocene soil (Btk horizon) ... 19

Figure 57.11. Photograph and sketch of Roomblock 3 wall at LA 12587, which is built on a remnant Pleistocene soil (Btkb1) and buried by post-Puebloan soil (A-Bw profile).... 20

Figure 57.12. Photograph of excavation through LA 12587 northern rock alignment showing soil profiles... 21

Figure 57.13. Photo and sketch of soil profile across middle rock alignment at LA 12587... 22

Figure 57.14. Schematic plan view (top) and cross-section (bottom) showing soil stratigraphy at LA 128803... 26

Figure 57.15. Photo of LA 128805 showing soil profile adjacent to the fieldhouse... 27

Figure 57.16. Geomorphic map of Airport Tract ... 30

Figure 57.17. Stratigraphic correlation of the Airport Tract sites ... 32

Figure 57.18. Correlation chart for LA 135290... 33

Figure 57.19. LA 135290 soil profile fence diagram east of roomblock (looking south) ... 34

Figure 57.20. LA 135290 soil profile fence diagram east of roomblock (looking west)..... 35

Figure 57.21. Photograph and sketch through the LA 135290 roomblock showing soil developed in the roomblock fill... 36

Figure 57.22. Isopach map showing thickness of post-occupation deposits at LA 135290... 37

Figure 57.23. Schematic cross-section showing soil stratigraphy at LA 139418... 38

Figure 57.24. Grid garden schematic sketch map and cross-section from LA 139418... 39

Figure 57.25. Schematic site map and cross-section of LA 141505 40

Figure 57.26. Site stratigraphy and wall blocks at LA 141505 41

Figure 57.27. Correlation chart showing Pajarito Mesa and Airport Tract stratigraphy 43

Figure 57.28. Sketches of four archaeological sites exposed in Pajarito Mesa trenches 45

Figure 57.29. Eastern Rendija Tract geomorphology 46

Figure 57.30. Western Rendija Tract geomorphology 46

Figure 57.31. Generalized stratigraphic column for the Rendija Canyon area 47

Figure 57.32. Schematic cross-section and soil-stratigraphic correlations between selected Rendija Canyon archaeological sites located on fluvial terraces 49

Figure 57.33. Hillslope profile and catena showing artifact distribution, location of charcoal samples, and radiocarbon dates at LA 85859 50

Figure 57.34. LA 99396 stratigraphic correlation, radiocarbon dates, and artifacts 51

Figure 57.35. LA 99397 stratigraphic correlation, radiocarbon dates, and artifacts 52

Figure 57.36. Photographs showing soil stratigraphy (top) and soil pit next to fieldhouse (bottom), LA 15116 54

Figure 57.37. Schematic site map, cross-section, and site view looking south, LA 70025 . 56

Figure 57.38. Photograph of LA 85403 looking west showing cross-section and soil description locations 57

Figure 57.39. Schematic site map (bottom) and cross-section (top) from LA 85403 58

Figure 57.40. Schematic site map and cross section, LA 85404 59

Figure 57.41. Photographs showing fieldhouse constructed of large dacite boulders and soil stratigraphy at LA 85404 60

Figure 57.42. Schematic site map, cross-section, and photographs from LA 85408 62

Figure 57.43. Schematic site map, cross-section, and soil stratigraphy from LA 85411 64

Figure 57.44. Schematic site map, cross-section, and photographs from LA 85413 65

Figure 57.45. Schematic site map, cross-section, and photographs of LA 85414 67

Figure 57.46. Cross section detail and photographs showing LA 85417 soil stratigraphy 68

Figure 57.47. Topographic profile, schematic cross-sections, and photographs at LA 85417 68

Figure 57.48. Trench wall showing soil horizons at LA 85859. Greatest artifact concentration (obsidian flakes) found in Bt1b1 horizon 70

Figure 57.49. Schematic site map, cross-section, and photographs of LA 85861 72

Figure 57.50. Holocene and late Pleistocene stratigraphy exposed in gullies near sites LA 85864 and LA 99397 74

Figure 57.51. Schematic site map and soil-stratigraphic section at LA 85867 75

Figure 57.52. Site stratigraphy and sketch map of LA 85869 77

Figure 57.53. Schematic site map and photograph from LA 86605 78

Figure 57.54. Cross section and photograph showing soil stratigraphy in relation to slabs used in wall construction at LA 86605 79

Figure 57.55. Photograph showing fieldhouse and external wall and sketches showing schematic site map and soil stratigraphy at LA 86606 80

Figure 57.56. Schematic site map, cross-section, and photographs from LA 86607 82

Figure 57.57. Schematic site map and cross-section of LA 87430 83

Figure 57.58. Site map showing location of soil pits at LA 99396 85

Figure 57.59. Thin soils formed in Late Holocene eolian deposits (Qe) and slopewash colluvium (Qc) overlying bedrock (Qct or Qbog pumice) at LA 99396 86

Figure 57.60. Photograph and sketch showing stump hole with charcoal sample location and soil horizons, 99396-6 88

Figure 57.61. Site map showing location of soil pits at LA 99397 89

Figure 57.62. Soil profile #1 at LA 99397. Av-Bw horizons formed in Late Holocene colluvium and eolian deposits overlying buried Bt horizons developed in Late Pleistocene colluvium. 90

Figure 57.63. Schematic site map (bottom) and cross-section (top) at LA 127627 92

Figure 57.64. Photographs showing soil stratigraphy at LA 127627 93

Figure 57.65. Schematic site map and cross-section from LA 127633 95

Figure 57.66. Schematic site map (bottom) and cross-section (top) from LA 127634 97

Figure 57.67. Schematic site map and cross-section from LA 127635 98

Figure 57.68. Schematic site map and cross-section from LA 135291 100

Figure 57.69. Schematic site map (plan view, bottom) and cross-section (top) at LA 135292 101

Figure 57.70. Composite soil stratigraphic correlation chart for Rendija Canyon colluvial and eolian deposits 107

Figure 57.71. TA-74 South Tract (Pueblo Canyon) geomorphology 111

Figure 57.72. Coarsening-upward gravel underlying Pleistocene fluvial terrace at LA 86531 113

Figure 57.73. Soil formed in Guaje pumice at LA 110121 115

Figure 57.74. Soil stratigraphy at LA 110130; rock alignment set into/on top of Btb1 horizon 116

Figure 57.75. Pueblo Canyon schematic stratigraphic correlations chart showing the context of archaeological sites 118

Figure 57.76. Geomorphic map of White Rock Y Tract 119

Figure 57.77. Cross-sections through archaeological sites at White Rock Y Tract 120

Figure 58.1. Plain gray rim sherd from LA 86534 (FS 958-1) 134

Figure 58.2. Plain gray olla rim from LA 4618 (FS 171.1) 134

Figure 58.3. Basket impressed sherds from LA 86534 (left, FS 1555-1 and FS 1593-1) and LA 12587 (right, FS 4183-1) 135

Figure 58.4. Mudware vessel from the Pajarito Plateau 135

Figure 58.5. Indented corrugated sherd from LA 12587 (FS 3908-38) 136

Figure 58.6. Indented corrugated sherd from LA 12587 (FS 4092-16) 137

Figure 58.7. Indented corrugated jar sherd from LA 135290 (FS 2106-2) 137

Figure 58.8. Incised corrugated sherd from LA 12587 (FS 3110-8) 138

Figure 58.9. Smeared-indented corrugated sherds from LA 4618 (left, FS 684-8) and LA 12587 (right, FS 1265-4) 139

Figure 58.10. Smeared-indented corrugated vessel from LA 4712 139

Figure 58.11. Smeared-indented corrugated rim sherd from LA 86534 (FS 1248-1) 140

Figure 58.12. Smeared-indented corrugated rim sherds from LA 135290 (FS 1328-3, FS 1003-3, FS 1254-18b, and FS 2106-3) 140

Figure 58.13. Sapawe micaceous sherds from LA 128804 (left, FS 148-1) and LA 21596C (right, FS 11-16) 141

Figure 58.14. Two Sapawe micaceous vessels excavated from sites on the Pajarito Plateau 142

Figure 58.15. Potsuwi'i incised sherds from LA 21596C (FS 9-1, left, and FS 11-2, right) 143

Figure 58.16. Potsuwi'i incised vessel from LA 170 (Tsirege) 143

Figure 58.17. Santa Fe Black-on-white ladle from LA 86534 (FS 1872-1) 145

Figure 58.18. Santa Fe Black-on-white sherds from LA 135290 (FS 2570-1, FS 1313-1, 1290-1, and 1349-1) 145

Figure 58.19. Santa Fe Black-on-white sherd from LA 4618 (FS 354-2) 146

Figure 58.20. Santa Fe Black-on-white sherd from LA 12587 (FS 1693-1) 146

Figure 58.21. Santa Fe Black-on-white spindle whorl fragment from LA 127635 (FS 10-1) 147

Figure 58.22. Santa Fe Black-on-white bowl sherd from LA 135290 (FS 1254-6) 147

Figure 58.23. Santa Fe Black-on-white bowl from LA 4634 148

Figure 58. 24. Wiyo Black-on-white bowl sherds from LA 12587 150

Figure 58.25. Wiyo Black-on-white bowl sherd from LA 4618 (FS 417-4) 150

Figure 58.26. Wiyo Black-on-white bowl rim sherd from LA 86534 (FS 1206-1) 151

Figure 58.27. Wiyo Black-on-white vessel from LA 169 (Otowi).................................... 151

Figure 58.28. Biscuit A bowl sherd from LA 86534 (FS 1748-1) 153

Figure 58.29. Biscuit A bowl sherd from LA 86637 (FS 176-1) 153

Figure 58.30. Biscuit A bowl rim sherd from LA 12587 (FS 4034-1) 154

Figure 58.31. Biscuit B sherd from LA 87430 (FS 132-1) 154

Figure 58.32. Biscuit B sherd from LA 21596C (FS 4-14)... 155

Figure 58.33. Biscuit B sherd from LA 86637 (FS 153-1) 155

Figure 58.34. Biscuit B sherd from LA 128804 (FS 41-1) 156

Figure 58.35. Biscuit B interior sherd from LA 87430 (FS 132-1) 156

Figure 58.36. Biscuit B bowl (Vessel 3) from LA 170 (Tsirege)...................................... 157

Figure 58.37. Biscuit B bowl (Vessel 4) from LA 170 (Tsirege)...................................... 157

Figure 58.38. Biscuitware jar sherd from LA 86637 (FS 82-1) 158

Figure 58.39. Biscuitware jar sherd from LA 128804 (FS 93-3) 158

Figure 58.40. Sankawi Black-on-cream sherd from LA 128805 (FS 83-1)........................ 159

Figure 58.41. Sankawi Black-on-cream vessel from LA 170 (Tsirege) 160

Figure 58.42. Sankawi Black-on-cream vessel from LA 170 (Tsirege) 160

Figure 58.43. Sankawi Black-on-cream vessel from LA 170 (Tsirege) 161

Figure 58.44. Glaze-on-red sherd from LA 128804 (FS 135-3) 162

Figure 58.45. Glaze-on-red sherd from LA 128804 (FS 88-1) 163

Figure 58.46. Tularosa Black-on-white sherds from LA 12587 (FS 3140-1 and 3736-2)... 164

Figure 58.47. Wingate Black-on-red sherd from LA 128805 (FS 57-1) 165

Figure 58.48. Chupadero Black-on-white sherd from LA 86534 (FS 1686-1).................. 167

Figure 59.1. Geographic distribution of analyzed samples by sample type and ware......... 258

Figure 59.2. Box-and-whiskers plot of Tqtz percent, Tkspar+Sanid percent, Tplag+Micr percent, and Tmusc percent, for the sherds by final temper group..................................... 291

Figure 59.3. Box-and-whiskers plot of Lvf2 percent, Lvm2 percent, Lvv percent, and Claylump percent, for the sherds by final temper group.. 292

Figure 59.4. Box-and-whiskers plot of Tbiot percent, Tchlor percent, Topaq percent, and Pyr percent, for the sherds by final temper group... 293

Figure 59.5. Ternary diagram of sherd samples by final temper group. Axes are Tqtz, Tplag+Micr, and Tkspar+Sanid+Lvv. 294

Figure 59.6. Scatterplot of the first two axes of the correspondence analysis of sand and sherd samples, plotted by final temper group... 295

Figure 59.7. Bar diagram of textural attributes of the sherd samples, plotted by final temper group for each attribute 296

Figure 59.8. Box-and-whiskers plot of the mineral to lithic ratio M/M+Lv for the sherds by final temper group.. 299

Figure 59.9. Ternary diagram of sherd samples by ware and final temper group. Axes are Tqtz, Tplag+Micr, and Tkspar+Sanid+Lvv.. 300

Figure 59.10. Bar diagram of final temper group for Santa Fe Black-on-white through time, where time is based on archaeological context of recovery. Inset bar diagram shows temper type, sand versus tuff, for the ware.. 303

Figure 60.1. Mean mano grinding length for sites in the San Juan Basin.......................... 312

Figure 60.2. Cobble uniface and unidirectional (single face) core (upper). Unidirectional (multi face) core, bi-directional (bifacial) core, and hammerstone (bottom)....................... 317

Figure 60.3. Informal tools; retouched piece, notch, denticulate, and perforator 320

Figure 60.4. Uniface, scraper, and biface (upper). Biface, drill, and projectile point (lower)... 320

Figure 60.5. One- and two-hand manos.. 322

Figure 60.6. Milling stone, basin metate, and trough metate.. 323

Figure 60.7. Palette, polishing stone, and grooved abrader 323

Figure 60.8. Maul, axe, and hoe 324

Figure 60.9. Totavi Lentil gravel exposure in White Rock Canyon 331

Figure 60.10. Close up of Cerro Toledo pebble source material 331

Figure 60.11. Valles Caldera obsidian cobble source material 332

Figure 60.12. El Rechuelos source area. Polvadera Peak is in the background and the obsidian-bearing domes are in the right foreground 333

Figure 60.13. Dacite quarry in Bandelier National Monument 334

Figure 60.14. Late Paleoindian projectile point 340

Figure 60.15. Archaic projectile points from the C&T Project 342

Figure 60.16. Biface flake platform angles from LA 85859 and LA 99397 345

Figure 60.17. Archaic retouched tool types 347

Figure 60.18. Early and Middle Coalition period roomblock retouched tool types 352

Figure 60.19. Early and Middle Coalition period roomblock ground stone tool types 353

Figure 60.20. Late Coalition period roomblock retouched tool types 357

Figure 60.21. Late Coalition period roomblock ground stone tool types 358

Figure 60.22. Late Coalition period fieldhouse ground stone tool types 362

Figure 60.23. Classic period fieldhouse ground stone tool types 368

Figure 60.24. The distribution of edge angles for damaged flakes 382

Figure 60.25. The distribution of ground stone artifact types 383

Figure 60.26. Mean mano length 384

Figure 60.27. Cylindrical (left) and conical (right) shaped vent plugs (tiponis) 386

Figure 61.1. Rb, Zr, Nb three-dimensional plot of obsidian source provenance for all sites 396

Figure 61.2. Distribution of obsidian source provenance from all sites 396

Figure 62.1. Example of measured *Zea mays* kernels from LA 12587 419

Figure 62.2. Example of measured *Zea mays* cobs from LA 12587 421

Figure 62.3. Fused *Zea mays* kernel masses from Roomblock 1 at LA 12587.................. 421

Figure 62.4. *Zea mays* cobs from LA 86534.. 438

Figure 62.5. Fused *Zea mays* kernel masses from LA 135290 443

Figure 62.6. Example of measured *Zea mays* cobs from LA 135290................................ 444

Figure 62.7. *Phaseolus* (common bean) specimen from LA 135290................................ 446

Figure 62.8. Comparison of plant classes from sites on the Pajarito Plateau...................... 503

Figure 62.9. Comparison of wood classes from sites on the Pajarito Plateau..................... 509

Figure 62.10. Comparison of wood classes from hearths at Coalition and Classic period sites 510

Figure 62.11. Classic *Zea mays* cobs from LA 4624.. 515

Figure 62.12. Camp Hamilton Trail classic Z*ea mays* cobs.. 516

Figure 62.13. TA-74 IO6 and TA-39 classic *Zea mays* cobs 516

Figure 63.1. Summary percentages for arboreal pollen (AP) and non-arboreal pollen (NAP) from modern control samples, floors and fill samples from fieldhouses and pueblos (excluding Roomblock 3 at LA 12587), and gardens 544

Figure 63.2. Pollen percentages from modern surface control samples, floors and fill samples from fieldhouses and pueblos (excluding Roomblock 3 at LA 12587), and gardens 547

Figure 63.3. Cultigens, rare, and low-count pollen types in modern surface control samples and archaeological features... 550

Figure 63.4. Pollen percentages from garden plots at five sites... 555

Figure 63.5. White Rock Canyon cotton caches.. 560

Figure 63.6. LA 12587 Roomblock 1 pollen concentration data 566

Figure 63.7. LA 135290 Room 2 pollen concentration data... 581

Figure 63.8. Rendija Tract fieldhouses pollen concentrations 588

Figure 64.1. Plan view drawings of LA 4618 and LA 4624 639

Figure 64.2. Bone awls from LA 4618 641

Figure 64.3. Bone flute fragment from LA 4618.. 642

Figure 64.4. A sample of the bone beads from LA 4618 642

Figure 64.5. Taxonomic breakdown of Coalition period assemblages by geographic area 647

Figure 64.6. Distinct sizes of adult femora from LA 4618 648

Figure 64.7. Distinct sizes of adult tibiotarsi from LA 4618 649

Figure 66.1. Three archaeomagnetic dating curves are used to interpret date ranges from archaeomagnetic set results in the Southwestern United States 666

Figure 66.2. LA 12587, Room 2, Hearth 20 archaeomagnetic results for sets 1214 and 1215 679

Figure 66.3. LA 12587, Room 2, Hearth 4 archaeomagnetic results for set 1210 680

Figure 66.4. LA 12587, Room 7, Hearth 6 archaeomagnetic results for sets 1211 and 1212 682

Figure 66.5. LA 12587, Room 4/5, Hearth 1 archaeomagnetic results for set 1209a (the subset of specimens cut from the plaster lining) 684

Figure 66.6. All interpretable LA 12587 archaeomagnetic ellipses plotted against the Wolfman Curve 686

Figure 66.7. LA 86534, Room 1, Hearth 4 archaeomagnetic results for sets 1203 (earlier) and 1202 (later) 688

Figure 66.8. LA 86534, Room 2, Hearth 2 archaeomagnetic results for set 1204 690

Figure 66.9. LA 86534, Room 5, Hearth 5 archaeomagnetic results for set 1205 692

Figure 66.10. LA 86534, Kiva 9, Hearth 16 archaeomagnetic results for set 1206 693

Figure 66.11. All interpretable LA 86534 archaeomagnetic ellipses plotted against the Wolfman Curve 695

Figure 66.12. LA 135290, Room 2 archaeomagnetic results for sets 1229 (later) and 1231 (earlier) 697

Figure 66.13. LA 135290, Room 4, Floor 3 and Floor 2 archaeomagnetic results for sets 1232 (earlier) and 1227 (later) 698

Figure 66.14. LA 135290, Room 6, Floor 3 and east wall archaeomagnetic results for sets 1226 (earlier) and 1228 (contemporary or later) 700

Figure 66.15. LA 135290, Room 8, Hearth 9 archaeomagnetic results for set 1230 702

Figure 66.16. LA 135290 archaeomagnetic error ellipses plotted against the Wolfman Curve 703

Figure 66.17. LA 85417, Room 1, floor archaeomagnetic results for set 1282 706

Figure 66.18. LA 85864, tipi ring hearth archaeomagnetic result for set 1234 and a comparative result the 1860s Ft. Burgwin Hospital 709

Figure 66.19. LA 99396, Room 1, Hearth 7 archaeomagnetic result for set 1233 711

Figure 66.20. LA 127635, Room 1, Hearth 2 archaeomagnetic results for sets 1250 and 1251 713

Figure 66.21. Interpretable C&T Project archaeomagnetic ellipses plotted on the Wolfman Curve 715

Figure 66.22. Interpretable C&T Project archaeomagnetic result ellipses plotted on SWCV2000 716

Figure 66.23. Comparative archaeomagnetic VGP results from the Galisteo Basin area plotted against the Wolfman Curve 717

Figure 66.24. Comparative archaeomagnetic VGP results from the Galisteo Basin area plotted against SWCV2000 718

Figure 66.25. Comparative archaeomagnetic VGP results from the Santa Fe area plotted against the Wolfman Curve and SWCV2000 721

Figure 66.26. Comparative archaeomagnetic VGP results from the Gallina area plotted against the Wolfman and SWCV2000 curves 724

Figure 66.27. Comparative archaeomagnetic VGP results from the Pajarito Plateau plotted against the Wolfman Curve 725

Figure 66.28. Comparative archaeomagnetic VGP results from the Pajarito Plateau

plotted against SWCV2000 726

Figure 66.29. Comparative archaeomagnetic VGP results from the Cochiti area plotted against the Wolfman Curve 730

Figure 66.30. Comparative archaeomagnetic VGP results from the Cochiti area plotted against SWCV2000 731

Figure 66.31. Comparative archaeomagnetic VGP results from the San Ysidro area (LA 13197) plotted against the Wolfman and SWCV2000 curves 733

Figure 67.1. Distribution of total dose rates among ceramic samples 741

Figure 67.2. Ages of samples sorted by groups as defined in the text 746

Figure 68.1. Model of the obsidian hydration layer 750

Figure 68.2. Infrared spectra of water in obsidian 763

Figure 68.3. Photoacoustic calibration that relates infrared absorbance to hydration layer thickness in microns 763

Figure 68.4. The Arrhenius constants A (top) and E (bottom) calibrated to obsidian structural water content 764

Figure 68.5. The relationship between obsidian structural water content and density (Ambrose et al. 2004) 765

Figure 68.6. Structural water content variation in the Cerro Toledo obsidian samples 765

Figure 68.7. Structural water content variation in the Valle Grande obsidian samples 766

Figure 68.8. Structural water content variation in the El Rechuelos obsidian samples 766

Figure 68.9. Thermal cell calibration curve that relates water weight gain per day to temperature 767

Figure 69.1. Obsidian hydration dates by tract 775

Figure 69.2. Obsidian hydration dates from roomblocks and fieldhouses 776

Figure 69.3. Obsidian hydration dates from Archaic period sites 777

Figure 69.4. Obsidian hydration dates from LA 12587 and LA 12587 (Area 8) 778

Figure 69.5. Obsidian hydration dates from LA 70025 using Cerro Toledo hydration

rates for unsourced artifacts 780

Figure 69.6. The relationship between obsidian hydration dates and the established date ranges for the projectile points 781

Figure 69.7. Comparison of projectile point obsidian hydration dates with associated point cross-date ranges (after Acklen 1993:435) 783

Figure 69.8. Intrasite comparison of radiocarbon dates 790

Figure 69.9. Comparison of multiple dating methods 798

Figure 69.10. Site cluster analysis from the C&T Project 803

Figure 70.1. J. Isaacson, a University of Denver Graduate Student, and L. Conyers conduct a GPR survey at a pueblo roomblock 820

Figure 70.2. Equation and diagram demonstrating how GPR works to create a reflection of a buried item (modified from Conyers and Goodman 1997:36) 821

Figures 70.3. Reflection profiles from a pueblo roomblock site scheduled for excavation in 2003. The continuous hyperbolas are indications of buried archaeological features 823

Figure 70.4. LA 86534 amplitude slice map with excavated walls noted with solid black lines 824

Figure 70.5. LA 86534 raw data profile of Room 1; note location of walls and relationship to hyperbolic reflections 825

Figure 70.6. Raw data profiles from LA 135290 during a) the May survey and b) the December survey 826

Figure 70.7. LA 135290 amplitude slice map showing general location of roomblock...... 827

Figure 70.8. LA12587 amplitude slice maps a) without plotted excavation and b) with plotted excavation 828

Figure 70.9. LA12587 profile of Room 16 with shallow hyperbolic reflections indicating walls with room fill and wallfall 830

Figure 70.10. LA 127631, with room locations based on the amplitude time-slice map and on the profiles from the site (scale is in meters) 831

Figure 70.11. LA127631 Amplitude slice map (0 to 3 ns) with excavation overlay........... 832

Figure 70.12. LA127631 profile with annotations indicating structure walls..................... 832

Figure 70.13. LA 128803, a grid garden. Actual excavated features are identified with solid lines and the potential linear features are indicated by a dotted line........................... 834

Figure 70.14. LA128803 raw data profile. Note hyperbolic reflections indicating locations of rock alignments.. 834

Figure 70.15. LA 128805 a) amplitude slice map with location of excavations indicated by black line, b) raw data profile with severe banding due to frequency interference and decoupling, and c) raw data profile 835

Figure 71.1. LA 99396 surface distribution chipped stone debitage.................................. 841

Figure 71.2. LA 99396 surface distribution of core flakes, biface flakes, angular debris, and microdebitage (numbers represent artifact count in a given grid unit) 842

Figure 71.3. LA 99396 distribution of all chipped stone tools.. 843

Figure 71.4. LA 99397 surface artifact distribution 844

Figure 71.5. Roomblock ground plans.. 845

Figure 71.6. Room size at several Pajarito Plateau roomblocks 852

Figure 72.1. Laboratory Director Pete Nanos, Pueblo of San Ildefonso Governor John Gonzales, and Elmer Torres of the Laboratory Tribal Relations Team meet with C&T Project leadership at LA 135290 (October 16, 2003) 859

Figure 72.2. Members of the Pueblos of Santa Clara and San Ildefonso examine an archaeological site in Rendija Canyon 887

Figure 72.3. Members of the Pueblo of Santa Clara visiting site LA 135290 during excavation... 888

Figure 72.4. A Jicarilla Apache Nation elder discussing aspects of a tipi ring located at LA 85869 (October 7, 2003) 888

Figure 72.5. San Ildefonso Tribal Monitors Tim Martinez and Aaron Gonzales 897

Figure 72.6. Tim Martinez observing the leveling of LA 135290 after the completion of archaeological site excavations 899

Figure 72.7. Pueblo of San Ildefonso tribal monitors, Tim Martinez and Aaron Gonzalez, with LASO Manager, Ed Wilmot, and LANL C&T Project staff...................... 900

List of Tables

Table 56.1. Artifact and sample totals by tract and archaeological site.............................. 2

Table 57.1. Fieldhouse site summaries and relative age estimates for Rendija Canyon land transfer sites 103

Table 57.2. Geomorphic position, slope, and fieldhouse orientations, Rendija Tract sites . 108

Table 58.1. Site ceramic sample sizes by tract 125

Table 58.2. Distribution of sites by assigned Ceramic period... 172

Table 58.3. Distribution (count/percent) of ceramic types at sites of unknown age 175

Table 58.4. Distribution of ware groups (count/percent) at sites of unknown age.............. 176

Table 58.5. Distribution of ceramic types from LA 82601, a Late Developmental period site on the plateau 177

Table 58.6. Distribution of ware groups from LA 82601, a Late Developmental period site on the plateau 178

Table 58.7. Distribution (count/percent) of ceramics from indeterminate Coalition period sites 179

Table 58.8. Distribution of ware groups (count/percent) at indeterminate Coalition period sites.. 179

Table 58.9. Distribution of ceramic types (count/percent) from mixed Coalition and Classic period sites.. 181

Table 58.10. Distribution of ware groups (count/percent) from the mixed Coalition and Classic period 183

Table 58.11. Distribution of ceramic types (count/percent) from LA 85417, an indeterminate Coalition and Historic period site 184

Table 58.12. Distribution of ware groups (count/percent) from LA 85417, an indeterminate Coalition and Historic period site 184

Table 58.13. Distribution of ceramic types (count/percent) at Middle Coalition period sites 184

Table 58.14. Distribution of ware groups (count/percent) at Middle Coalition period sites 185

Table 58.15. Frequency of paint on whitewares (count/percent) from Coalition period sites 186

Table 58.16. Whiteware exterior treatment (count/percent) from Coalition period sites 186

Table 58.17. Distribution of rim shape (count/percent) by site for Santa Fe Black-on-white sherds 187

Table 58.18. Distribution of rim shape (count/percent) for Santa Fe and Wiyo Black-on-white types 187

Table 59.19. Distribution of rim orientation (count/percent) for Santa Fe and Wiyo Black-on-white types 187

Table 58.20. Distribution of rim thickness (count/percent) for Santa Fe and Wiyo Black-on-white types 188

Table 58.21. Distribution of interior surface polish (count/percent) for Santa Fe and Wiyo Black-on-white types 188

Table 58.22. Number of motifs (count/percent) noted for Santa Fe and Wiyo Black-on-white types 188

Table 58.23. Distribution of primary design motifs (count/percent) for Santa Fe Black-on-white and Wiyo Black-on-white 188

Table 58.24. Distribution of ceramic types (count/percent) at LA 12587 190

Table 58.25. Distribution of ware groups (count/percent) at LA 12587........ 191

Table 58.26. Distribution of ceramic types (count/percent) at LA 4618 192

Table 58.27. Distribution of ceramic ware groups (count/percent) at LA 4618 193

Table 58.28. Distribution of ceramic types (count/percent) at LA 4619 195

Table 58.29. Distribution of ceramic ware groups (count/percent) at LA 4619 195

Table 58.30. Distributions of ceramic types (count/percent) from non-C&T Project Late Coalition period sites 196

Table 58.31. Distribution of ware groups (count/percent) from non-C&T Project Late Coalition period sites 197

Table 58.32. Distribution of ceramic types (count/percent) from indeterminate Classic

period sites.. 198

Table 58.33. Distribution of ware groups (count/percent) at indeterminate Classic period sites 199

Table 58.34. Distribution of ceramic types (count/percent) from Early Classic period sites 200

Table 58.35. Distribution of ware groups (count/percent) at Early Classic period sites 200

Table 58.36. Distribution of ceramic types (count/percent) from mixed Classic period sites 201

Table 58.37. Distribution of ware groups (count/percent) from mixed Classic period sites 201

Table 58.38. Distribution of ceramic types (count/percent) from Late Classic period sites 203

Table 58.39. Distribution of ware groups (count/percent) from Late Classic period sites .. 204

Table 58.40. Distribution of ceramic types (count/percent) from LA 85407, the Serna Homestead 205

Table 58.41. Distribution of ceramic types (count/percent) for isolated occurrences in the White Rock Tract.. 206

Table 58.42. Distribution of ware groups (count/percent) for isolated occurrences in the White Rock Tract.. 206

Table 58.43. Distribution of ceramic tradition by ware (count/percent) at LA 82601 214

Table 58.44. Distribution of wares by temper (count/percent) at LA 82601 214

Table 58.45. Distribution of temper by ware (count/percent) at LA 99396........................ 217

Table 58.46. Distribution of temper by ware (count/percent) at LA 86534........................ 217

Table 58.47. Distribution of temper by ware (count/percent) at LA 135290...................... 217

Table 58.48. Distribution of ware by temper (count/percent) at LA 12587........................ 218

Table 58.49. Distribution of ware by temper (count/percent) at LA 4619 219

Table 58.50. Distribution of ware by temper (count/percent) at LA 4618 220

Table 58.51. Distribution of ware groups and ceramic traditions (count/percent) at Coalition period sites 225

Table 58.52. Distribution of ware groups and ceramic tradition (count/percent) at Classic period sites........ 230

Table 58.53. Distribution of ware by temper (count/percent) at LA 21596B........ 232

Table 58.54. Distribution of ware by temper (count/percent) at LA 21596C........ 232

Table 58.55. Distribution of ware by temper (count/percent) at LA 85404........ 233

Table 58.56. Distribution of ware by temper (count/percent) at LA 85861........ 233

Table 58.57. Distribution of ware by temper (count/percent) at LA 86606........ 233

Table 58.58. Distribution of ware by temper (count/percent) at LA 127635........ 233

Table 58.59. Distribution of ware by temper (count/percent) at LA 127627........ 234

Table 58.60. Distribution of ware by temper (count/percent) at LA 85413........ 234

Table 58.61. Distribution of ware by temper (count/percent) at LA 85867........ 234

Table 58.62. Distribution of ware by temper (count/percent) at LA 135291........ 234

Table 58.63. Distribution of ware by temper (count/percent) at LA 70025........ 235

Table 58.64. Distribution of ware by temper (count/percent) at LA 85411........ 235

Table 58.65. Distribution of ware by temper (count/percent) at LA 86637........ 235

Table 58.66. Distribution of ware by temper (count/percent) at LA 15116........ 236

Table 58.67. Distribution of ware by temper (count/percent) at LA 85408........ 236

Table 58.68. Distribution of ware by temper (count/percent) at LA 86605........ 236

Table 58.69. Distribution of ware by temper (count/percent) at LA 87430........ 236

Table 58.70. Distribution of ware by temper (count/percent) at LA 127634........ 237

Table 58.71. Distribution of ware by temper (count/percent) at LA 128804........ 237

Table 58.72. Distribution of ware by temper (count/percent) at LA 128805........ 237

Table 58.73. Distribution of ware by temper (count/percent) at LA 135292 238

Table 58.74. Distribution of broad temper groups of graywares (count/percent) from Classic period sites 239

Table 58.75. Distribution of broad temper groups of glazewares (count/percent) from Classic period sites 240

Table 58.76. Distribution of ware by form (count/percent) at LA 82601 242

Table 58.77. Distribution of ware by form (count/percent) at LA 99396 242

Table 58.78. Distribution of ware by form (count/percent) at LA 86534 242

Table 58.79. Distribution of ware by form (count/percent) at LA 135290 243

Table 58.80. Distribution of ware by form (count/percent) at LA 12587 243

Table 58.81. Distribution of ware by form (count/percent) at LA 4618 244

Table 58.82. Distribution of ware by form (count/percent) at LA 4619 245

Table 58.83. Distribution of ware by form (count/percent) at LA 21596B 246

Table 58.84. Distribution of ware by form (count/percent) at LA 21596C 246

Table 58.85. Distribution of ware by form (count/percent) at LA 85404 247

Table 58.86. Distribution of ware by form (count/percent) at LA 85861 247

Table 58.87. Distribution of ware by form (count/percent) at LA 86606 247

Table 58.88. Distribution of ware by form (count/percent) at LA 127635 247

Table 58.89. Distribution of ware by form (count/percent) at LA 127627 248

Table 58.90. Distribution of ware by form (count/percent at LA 85413 248

Table 58.91. Distribution of ware by form (count/percent) at LA 85867 248

Table 58.92. Distribution of ware by form (count/percent) at LA 135291 248

Table 58.93. Distribution of ware by form (count/percent) at LA 70025 249

Table 58.94. Distribution of ware by form (count/percent) at LA 85411 249

Table 58.95. Distribution of ware by form (count/percent) at LA 86637 249

Table 58.96. Distribution of ware by form (count/percent) at LA 15116 249

Table 58.97. Distribution of ware by form (count/percent) at LA 85408 250

Table 58.98. Distribution of ware by form (count/percent) at LA 86605 250

Table 58.99. Distribution of ware by form (count/percent) at LA 87430 250

Table 58.100. Distribution of ware by form (count/percent) at LA 127634 250

Table 58.101. Distribution of ware by form (count/percent) at LA 128804 251

Table 58.102. Distribution of ware by form (count/percent) at LA 128805 251

Table 58.103. Distribution of form by ware (count/percent) at LA 135292 251

Table 58.104. Distribution of basic form for whitewares (count/percent) from sites with Classic period components 252

Table 58.105. Distribution of Historic period ceramics (count/percent) at prehistoric sites 253

Table 59.1. Petrographic sample by sample type and year of petrographic analysis 259

Table 59.2. Thin-sectioned sherds by ware and year of petrographic analysis 259

Table 59.3. Thin-sectioned sherds by ware, site, and tract 259

Table 59.4. Inventory of sherds selected for petrographic analysis 261

Table 59.5. Inventory of thin-sectioned rock and sand samples 267

Table 59.6. Point count parameters and calculated parameters used for quantitative petrographic analysis 269

Table 59.7. Description of qualitative attributes recorded for the sand-sized fraction 273

Table 59.8. Qualitative grain characteristics generalized by temper type 274

Table 59.9. Generic temper group qualitative characteristics 275

Table 59.10. List of samples that were reassigned for the final temper groups, with discussion 276

Table 59.11. Temper characterization of the thin-sectioned sherds 281

Table 59.12. Cross-tabulation of original by final temper group according to the petrographic analysis of the sand-sized fraction.. 290

Table 59.13. Qualitative attributes for sand samples: texture, morphology, and grain types 297

Table 59.14. Cross-tabulation of final temper group by ware.. 298

Table 59.15. Thin-sectioned plain ware sherds, showing ceramic type, period (by context) and final temper group.. 301

Table 59.16. Cross-tabulation of thin-sectioned corrugated sherds, showing period by ceramic type, subdivided by final temper group 301

Table 59.17. Cross tabulation of point counted Santa Fe Black-on-white sherds, showing period by final temper group 302

Table 59.18. Cross-tabulation of point counted Sapawi'i Micaceous sherds showing period by tract.. 302

Table 59.19a. Cross-tabulation of biscuitware sherds showing period by final temper group 304

Table 59.19b. Period by ceramic type, separated by temper group.................................. 304

Table 60.1. Lithic materials recorded in the Rendija Canyon gravels............................... 329

Table 60.2. Cobble size recorded in the Rendija Canyon gravels (cm)............................. 329

Table 60.3. Lithic materials recorded in the Totavi Lentil formation 330

Table 60.4. Cobble size recorded in the Totavi Lentil formation (cm) 330

Table 60.5. C&T Project lithic artifact type by material type.. 336

Table 60.6. Results of the XRF analysis of obsidian artifacts 340

Table 60.7. Archaic lithic debitage material types 343

Table 60.8. Archaic obsidian source samples 344

Table 60.9. Archaic debitage types.. 344

Table 60.10. Archaic period platform types.. 346

Table 60.11. Archaic core flake condition 346

Table 60.12. Archaic biface flake condition 347

Table 60.13. Archaic mean flake length (mm) and angular debris weight (g)........ 347

Table 60.14. Early and Middle Coalition period roomblock lithic debitage material types 349

Table 60.15. Early and Middle Coalition period roomblock obsidian source samples 349

Table 60.16. Early and Middle Coalition period roomblock debitage types 350

Table 60.17. Early and Middle Coalition period roomblock platform types 350

Table 60.18. Early and Middle Coalition period roomblock core flake condition........ 351

Table 60.19. Early and Middle Coalition period roomblock biface flake condition........ 351

Table 60.20. Early and Middle Coalition period roomblock mean flake length (mm) and angular debris weight (g)........ 351

Table 60.21. Late Coalition period roomblock lithic debitage material types........ 354

Table 60.22. Late Coalition period roomblock obsidian source samples 354

Table 60.23. Late Coalition period roomblock debitage types 355

Table 60.24. Late Coalition period roomblock platform types 355

Table 60.25. Late Coalition period roomblock core flake condition........ 356

Table 60.26. Late Coalition period roomblock biface flake condition 356

Table 60.27. Late Coalition period roomblock mean flake length (mm) and angular debris weight (g) 356

Table 60.28. Late Coalition period fieldhouse lithic debitage material types........ 358

Table 60.29. Late Coalition period fieldhouse obsidian source samples........ 359

Table 60.30. Late Coalition period fieldhouse debitage types 359

Table 60.31. Late Coalition period fieldhouse platform types........ 360

Table 60.32. Late Coalition period fieldhouse core flake condition 360

Table 60.33. Late Coalition period fieldhouse biface flake condition................................ 360

Table 60.34. Late Coalition period fieldhouse mean flake length (mm) and angular debris weight (g) 360

Table 60.35. Classic period fieldhouse lithic debitage material types................................ 362

Table 60.36. Classic period fieldhouse obsidian source samples...................................... 363

Table 60.37. Classic period fieldhouse debitage types 364

Table 60.38. Classic period fieldhouse platform types.. 365

Table 60.39. Classic period fieldhouse core flake condition 366

Table 60.40. Classic period fieldhouse biface flake condition.. 366

Table 60.41. Classic period fieldhouse mean flake length (mm) and angular debris weight (g) 367

Table 60.42. Coalition period roomblock and Classic period plaza pueblo lithic debitage material types.. 369

Table 60.43. Coalition period roomblock and Classic period plaza pueblo debitage types 369

Table 60.44. Jicarilla Apache lithic debitage material types.. 370

Table 60.45. Jicarilla Apache obsidian source samples.. 370

Table 60.46. Jicarilla Apache debitage types 370

Table 60.47. Jicarilla Apache platform types.. 371

Table 60.48. Jicarilla Apache core flake condition 371

Table 60.49. Jicarilla Apache biface flake condition.. 371

Table 60.50. Jicarilla Apache mean flake length (mm) and angular debris weight (g)....... 371

Table 60.51. Lithic debitage material types 373

Table 60.52. Obsidian source samples from the White Rock and Airport Tracts.............. 373

Table 60.53. Obsidian source samples from the Rendija Tract.. 373

Table 60.54. Combined core type data for the C&T Project.. 374

Table 60.55. Core type by temporal period.. 375

Table 60.56. Reason for discard by temporal period 375

Table 60.57. Debitage types 376

Table 60.58. Debitage reduction stages 377

Table 60.59. Platform types.. 378

Table 60.60. Core flake condition 379

Table 60.61. Biface flake condition... 379

Table 60.62. Mean flake length (mm) and angular debris weight (gm) 380

Table 60.63. Retouched tool types.. 380

Table 60.64. Ground stone grinding surface location and shape...................................... 384

Table 60.65. Number of damaged loci and location of damage for hammerstones 385

Table 61.1. Elemental concentrations and source assignment for archaeological specimens. All measurements in parts per million (ppm).. 388

Table 61.2. Cross-tabulation of site by obsidian source provenance................................. 393

Table 61.3. Elemental concentrations for volcanic rock artifact samples. All measurements in parts per million (ppm)... 397

Table 62.1. List of C&T Project site numbers, tracts, number and type of samples analyzed, and period of occupation 400

Table 62.2. Charred plant taxa recovered from C&T Project flotation and macrobotanical samples 402

Table 62.3. Ubiquity of flotation sample uncharred plant remains from the C&T Project . 409

Table 62.4. Ubiquity of flotation sample carbonized plant remains from the C&T Project 411

Table 62.5. Ubiquity of flotation sample wood charcoal taxa from the C&T Project......... 414

Table 62.6. Ubiquity of vegetal sample wood charcoal taxa from the C&T Project........... 415

Table 62.7. Ubiquity of flotation sample carbonized plant remains from LA 12587.......... 416

Table 62.8. Ubiquity of flotation sample wood charcoal taxa from LA 12587 417

Table 62.9. Ubiquity of vegetal sample wood charcoal from LA 12587............................ 418

Table 62.10. *Zea mays* cob morphometrics (in mm) from LA 12587 419

Table 62.11. Flotation sample plant remains from Late Archaic contexts at LA 12587..... 425

Table 62.12. Flotation sample plant remains from Test Pits 1 and 2 at LA 86637 425

Table 62.13. Flotation sample plant remains from LA 127625... 426

Table 62.14. Flotation sample plant remains from LA 127631... 426

Table 62.15. Flotation sample wood charcoal taxa by count and weight in grams from LA 127631.. 428

Table 62.16. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 127631.. 428

Table 62.17. Flotation sample plant remains from LA 128803... 429

Table 62.18. Flotation sample wood charcoal taxa by count and weight in grams from LA 128803.. 430

Table 62.19. Flotation sample plant remains from LA 128804... 431

Table 62.20. Room fill flotation sample plant remains from LA 128805........................... 431

Table 62.21. Room fill flotation sample wood charcoal taxa by count and weight in grams from LA 128805 433

Table 62.22. Room fill, vegetal sample carbonized plant remains, by count and weight in grams from LA 128805 433

Table 62.23. Ubiquity of flotation sample carbonized plant remains from LA 86534........ 435

Table 62.24. Ubiquity of flotation sample wood charcoal taxa from LA 86534 436

Table 62.25. Ubiquity of vegetal sample wood charcoal from LA 86534.......................... 437

Table 62.26. Ubiquity of vegetal sample charred plant remains from LA 86534 438

Table 62.27. *Zea mays* cob morphometrics (in mm) from LA 86534 438

Table 62.28. Ubiquity of flotation sample carbonized plant remains from LA 135290...... 440

Table 62.29. Ubiquity of flotation sample wood charcoal taxa from LA 135290.............. 442

Table 62.30. Ubiquity of vegetal sample carbonized plant remains from LA 135290........ 442

Table 62.31. *Zea mays* cob morphometrics (in mm) from LA 135290 444

Table 62.32. Ubiquity of vegetal sample wood charcoal from LA 135290....................... 445

Table 62.33. Flotation sample plant remains from LA 139418... 448

Table 62.34. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 139418 449

Table 62.35. Flotation sample plant remains from LA 141505... 449

Table 62.36. Flotation sample wood charcoal taxa by count and weight in grams from LA 141505 450

Table 62.37. Vegetal sample plant remains, by count and weight in grams from LA 141505 450

Table 62.38. Flotation sample plant remains, count, and abundance per liter at LA 15116 451

Table 62.39. Flotation sample wood charcoal by count and weight in grams from LA 15116 452

Table 62.40. Flotation sample plant remains, count and abundance per liter from LA 70025 452

Table 62.41. Flotation sample wood charcoal by count and weight in grams from LA 70025 453

Table 62.42. Flotation plant remains, count and abundance per liter from LA 85403........ 453

Table 62.43. Flotation sample wood charcoal by count and weight in grams from LA 85403 454

Table 62.44. Flotation plant remains, count and abundance per liter from LA 85404........ 455

Table 62.45. Flotation sample wood charcoal by count and weight in grams from LA 85404 455

Table 62.46. Flotation sample plant remains from LA 85859 456

Table 62.47. Flotation sample wood charcoal taxa by count and weight in grams from LA 85859 457

Table 62.48. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 85859 458

Table 62.49. Flotation samples plant remains from LA 85864 458

Table 62.50. Flotation sample wood charcoal taxa by count and weight from LA 85864 .. 459

Table 62.51. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 85864 459

Table 62.52. Flotation sample plant remains from LA 85869 460

Table 62.53. Flotation sample wood charcoal taxa by count and weight in grams from LA 85869 461

Table 62.54. Vegetal sample taxa, by count and weight in grams from LA 85869 462

Table 62.55. Flotation plant remains, count and abundance per liter from LA 86605 462

Table 62.56. Flotation sample wood charcoal by count and weight in grams from LA 86605 463

Table 62.57. Flotation plant remains, count and abundance per liter from LA 87430 464

Table 62.58. Flotation sample wood charcoal by count and weight in grams from LA 87430 465

Table 62.59. Flotation sample plant remains from LA 99396 466

Table 62.60. Flotation sample wood charcoal taxa by count and weight in grams from LA 99396 467

Table 62.61. Vegetal sample wood charcoal taxa, by count and weight (g) from LA 99396 467

Table 62.62. Flotation sample plant remains from LA 99397 468

Table 62.63. Vegetal sample wood charcoal taxa, by count and weight in grams from

LA 99397 469

Table 62.64. Flotation plant remains, count and abundance per liter from LA 127627 469

Table 62.65. Flotation sample wood charcoal by count and weight in grams from LA 127627 470

Table 62.66. Flotation plant remains, count and abundance per liter from LA 127633 471

Table 62.67. Flotation sample wood charcoal by count and weight in grams from LA 127633 471

Table 62.68. Flotation plant remains, count and abundance per liter from LA 127634 472

Table 62.69. Flotation sample wood charcoal by count and weight in grams from LA 127634 474

Table 62.70. Flotation plant remains, count and abundance per liter from LA 127635 475

Table 62.71. Flotation sample wood charcoal by count and weight in grams from LA 127635 477

Table 62.72. Flotation plant remains, count and abundance per liter from LA 135291 478

Table 62.73. Flotation sample wood charcoal by count and weight in grams from LA 135291 480

Table 62.74. Flotation plant remains, count and abundance per liter from LA 135292 480

Table 62.75. Flotation sample wood charcoal by count and weight in grams from LA 135292 481

Table 62.76. Flotation sample plant remains, count and abundance per liter from LA 85407 483

Table 62.77. Room 1, post-occupational fill vegetal sample plant remains from LA 85407 486

Table 62.78. Flotation sample wood charcoal by count and weight (g) from LA 85407 486

Table 62.79. Flotation plant remains, count and abundance per liter from LA 85408 487

Table 62.80. Flotation plant remains, count and abundance per liter from LA 85411 488

Table 62.81. Flotation wood charcoal by count and weight in grams from LA 85411 489

Table 62.82. Flotation plant remains, count and abundance from LA 85413 490

Table 62.83. Wood charcoal taxa by count and weight in grams from LA 85413............. 491

Table 62.84. Flotation plant remains, count and abundance from LA 85414 491

Table 62.85. Flotation plant remains, count and abundance from LA 85417 492

Table 62.86. Wood charcoal taxa by count and weight in grams from LA 85417............. 493

Table 62.87. Hearth fill, flotation plant remains, count and abundance from Feature 1 at LA 85861 493

Table 62.88. Hearth fill, wood charcoal taxa by count and weight in grams from Feature 1 at LA 85861 494

Table 62.89. Flotation plant remains, count and abundance from LA 86606 494

Table 62.90. Wood charcoal taxa by count and weight in grams from LA 86606............. 495

Table 62.91. Comparison of carbonized plant remains from Coalition period sites on the Pajarito Plateau 499

Table 62.92. Comparison of carbonized plant remains from Classic period sites on the Pajarito Plateau 502

Table 62.93. Comparison of wood taxa from Coalition period sites on the Pajarito Plateau (percentage of samples with taxon) 505

Table 62.94. Contexts of Coalition wood charcoal (number of samples per context)......... 506

Table 62.95. Comparison of wood taxa from Classic period sites on the Pajarito Plateau (percentage of sample with taxon) 507

Table 62.96. Comparison of average *Zea mays* kernel measurements (in mm) from Los Alamos area sites 511

Table 62.97. Percent presence of kernels and cupules from C&T Project Coalition period sites.. 513

Table 62.98. C&T Project comparison of average *Zea mays* cob measurements 514

Table 62.99. LA 4628, Isolated Occurrence (IO) 6, TA-39, and Camp Hamilton Trail *Zea mays* cob morphometrics (in mm) 514

Table 62.100. Comparison of plant material from historic homesteads on the Pajarito

Plateau 519

Table 63.1. Number of C&T Project pollen samples analyzed by land tract and for special studies 523

Table 63.2. Number of C&T Project pollen samples by sites and contexts 524

Table 63.3. Selected references to ecological and botanical research on the Pajarito Plateau 527

Table 63.4. Previous pollen research from Bandelier National Monument and the Pajarito Plateau 528

Table 63.5. Theoretical model of pollen taphonomy in archaeological sites 533

Table 63.6. Sterile pollen samples 538

Table 63.7. Pollen types identified by taxa and common names with percent sample frequencies for C&T Project and modern analog samples 539

Table 63.8. Comparison of arboreal pollen (AP) and non-arboreal pollen (NAP) percentages from disturbed sites 545

Table 63.9. Field and control samples 552

Table 63.10. Where maize pollen occurs in field samples 553

Table 63.11. Comparison of field pollen studies in New Mexico 557

Table 63.12. Cotton pollen from Pajarito Plateau sites 561

Table 63.13. LA 12587 sample frequencies of economic taxa as a percent of samples by context 563

Table 63.14. Average pollen concentrations by context from LA 12587 (concentrations shown in gr/g and rounded to nearest 10) 565

Table 63.15. Pollen concentrations (rounded to nearest 10 gr/g) from burial samples compared to average concentrations from four midden samples at LA 12587 568

Table 63.16. LA 12587 sample frequency of maize pollen aggregates by context 569

Table 63.17. Comparison of results between fieldhouses at LA 127631 and LA 128805 .. 570

Table 63.18. LA 86534 sample frequencies of economic taxa as a percent of samples by context 572

Table 63.19. Average pollen concentrations by context from LA 86534 (concentrations shown in gr/g and rounded to nearest 10) 574

Table 63.20. LA 135290 sample frequencies of economic taxa as a percent of samples by context 576

Table 63.21. Average pollen concentrations by context from LA 135290 (concentrations shown in gr/g and rounded to nearest 10) 579

Table 63.22. Economic pollen taxa in Rendija Tract fieldhouses 585

Table 63.23. Area and distribution of top 10 samples from Rendija Tract fieldhouses with highest pollen concentration and highest maize concentrations 587

Table 63.24. Average economic taxonomic richness from floor samples by period in the Rendija Tract 587

Table 63.25. Comparison of average pollen concentrations and economic taxonomic richness from floor samples by site type 589

Table 63.26. Comparison of four Pajarito Plateau roomblocks; average pollen concentration and site rank (1 highest, 4 lowest) for the main economic taxa from floor samples 590

Table 63.27. Number of roomblocks (*n* = 4) registering the highest representation of five economic taxa and cheno-am in front or back rooms 593

Table 63.28. Average taxonomic richness per floor sample for 32 economic and potential economic pollen taxa 593

Table 64.1. Identified faunal remains from all contexts at LA 12587 601

Table 64.2. Identified faunal remains, minus probable intrusive rodents, from LA 12587 602

Table 64.3. Room 1 faunal remains by Stratum 604

Table 64.4. Room 2 faunal remains by Stratum 605

Table 64.5. Room 4/5 faunal remains by Stratum 606

Table 64.6. Room 6 faunal remains by Stratum 607

Table 64.7. Room 7 faunal remains by Stratum 607

Table 64.8. Room 9 faunal remains by Stratum 608

Table 64.9. Room 12 faunal remains by Stratum 609

Table 64.10. Room 14 faunal remains by Stratum 610

Table 64.11. Room 16 faunal remains by Stratum 610

Table 64.12. Faunal remains from outside rooms 612

Table 64.13. Quantity of Sylvilagus, Lagomorph, and Artiodactyl remains from LA 12587........ 612

Table 64.14. Identified faunal remains from all contexts at LA 86534........ 615

Table 64.15. Identified faunal remains, minus intrusive rodents, from all contexts at LA 86534........ 616

Table 64.16. Room 1 faunal remains by Stratum 617

Table 64.17. Room 2 faunal remains by Stratum 618

Table 64.18. Room 3 faunal remains by Stratum 618

Table 64.19. Room 4 faunal remains by Stratum 619

Table 64.20. Room 5 faunal remains by Stratum 620

Table 64.21. Room 6 faunal remains by Stratum 621

Table 64.22. Room 7 faunal remains by Stratum 621

Table 64.23. Room 8 faunal remains by Stratum 622

Table 64.24. Room 9 faunal remains by Stratum 623

Table 64.25. Faunal remains from outside rooms 624

Table 64.26. Identified faunal remains in heavy fraction samples from hearths at LA 86534........ 625

Table 64.27. Quantity of Sylvilagus, Lagomorph, and Artiodactyl remains from LA 86534........ 625

Table 64.28. Identified faunal remains from all contexts at LA 135290........ 626

Table 64.29. Identified faunal remains, minus pocket gophers, from LA 135290 627

Table 64.30. Room 1 faunal remains by Stratum 628

Table 64.31. Room 2 faunal remains by Stratum 629

Table 64.32. Room 3 faunal remains by Stratum 630

Table 64.33. Room 5 faunal remains by Stratum 631

Table 64.34. Room 6 faunal remains by Stratum 631

Table 64.35. Room 9 faunal remains by Stratum 632

Table 64.36. Faunal remains from outside rooms 632

Table 64.37. Faunal remains from the Coalition period roomblocks on the Pajarito Plateau 639

Table 64.38. Comparison of carbonized plant remains from Coalition period sites on the Pajarito Plateau 644

Table 64.39. A comparison of plant class ubiquity from Coalition period sites on the Pajarito Plateau 645

Table 65.1. Inventory of human remains from LA 12587 by burial number 653

Table 65.2. Cranial and postcranial metric data by burial number 655

Table 65.3. Sex estimate scores based on morphological attributes 659

Table 65.4. Sex estimate scores based on morphological attributes for Burial 3 661

Table 65.5. Miscellaneous human remains from LA 12587 by FS number and provenience 662

Table 66.1. C&T Project archaeomagnetic set results 671

Table 66.2. Sun compass declination reductions 675

Table 66.3. Archaeomagnetic, radiocarbon, and ceramic dating comparisons 676

Table 66.4. Selected Gallina area Coalition period archaeomagnetic dates 723

Table 67.1. Thermoluminescence (TL) sample numbers, sites, and proveniences 739

Table 67.2. TL dates by groups 745

Table 68.1. Obsidian hydration dates and environmental and chemical parameters........ 751

Table 68.2. White Rock Tract ground temperature and relative humidity 768

Table 68.3. Rendija Tract ground temperature and relative humidity........ 768

Table 69.1. Summary of C&T Project obsidian hydration dates (OHD) by site........ 774

Table 69.2. Frequency of obsidian hydrations dates by period per tract 775

Table 69.3. Number of hydration samples for artifact type by time period........ 776

Table 69.4. Number of hydration samples for obsidian type by time period........ 776

Table 69.5. Obsidian hydration dates compared to other site dates 777

Table 69.6. Obsidian hydration dates from projectile points 779

Table 69.7. Radiocarbon dates from the C&T Project........ 786

Table 69.8. Archaeomagnetic dates from the C&T Project 792

Table 69.9. Luminescence dates from the C&T Project 794

Table 69.10. Luminescence dates from ceramic artifacts 796

Table 69.11. Luminescence dates and overlap with most likely archaeomagnetic dates and one- and two-sigma radiocarbon date range 798

Table 69.12. Radiocarbon overlap with most likely archaemagnetic date 799

Table 69.13. Radiocarbon dates from LA 4618 and LA 4619 800

Table 69.14. Ceramic analysis groups from the C&T Project 801

Table 69.15. Percentage of whiteware and utilityware pottery by site 804

Table 69.16. Classic period fieldhouse ceramics........ 805

Table 69.17. Ancestral Pueblo site temporal sequence........ 807

Table 70.1. Excavated C&T Project sites subject to GPR survey in 2002 819

Table 71.1. Room feature information for selected roomblock sites........ 853

Table 71.2. Tipi ring dimensions and stone counts 857

CHAPTER 56
INTRODUCTION TO ANALYSES

Bradley J. Vierra

An array of artifacts and samples were collected during the course of the four-year excavation of 39 archaeological sites and the testing of 11 sites. These sites include Archaic lithic scatters, Ancestral Pueblo habitations and fieldhouses, Jicarilla Apache tipi rings, and an Hispanic homestead dating from circa 5000 BC to AD 1943. Over 150,000 artifacts and about 3500 samples were collected. The detailed results of these artifact and sample analyses are presented in this volume. Together, they provide an excellent database from which to address the project research questions presented in the data recovery plan (Vierra et al. 2002).

Table 56.1 presents the artifact and sample totals for the excavated sites. Artifact totals range from 37 to 761 for fieldhouses, from 49 to 5412 for artifact scatters, and from 12,192 to 86,304 for Ancestral Pueblo roomblock sites. The original field survey conducted for the Land Conveyance and Transfer (C&T) Project tracts identified a range of activities and intensity of site occupations (Vierra 2000). This was in part reflected in artifact density values that ranged from 0.01 to 200 artifacts per m^2. This pattern is illustrated as a continuous sequence in Figure 56.1. The greatest break is at about 150 artifacts per m^2. All but one of the sites above this value were Coalition period roomblocks, with a single Coalition period plaza pueblo. Otherwise, the highest density exhibited by the Late Coalition/Early Classic period plaza site is Little Otowi with 134 artifacts per m^2 and the Classic period plaza site of Otowi with 116 artifacts per m^2. Overall, garden plots, cavates, and one- to three-room structures exhibited the lowest artifact densities, with 0.1, 3.2, and 4.6 artifacts per m^2, respectively. Lithic and lithic/ceramic scatters have the next highest densities of 12.4 and 18.6, respectively. Lastly, roomblocks and plaza pueblo sites have the highest densities with 61.6 and 62.3 artifacts per m^2, respectively. As previously noted, this follows the general pattern as observed in Table 56.1.

INTRA-SITE SAMPLING

One-hundred percent of the collected artifacts were submitted for analysis on most of the excavated sites. However, intra-site sampling was implemented on four sites with extremely large collections. Sampled sites consist of the three Ancestral Pueblo roomblocks (LA 12587, LA 86534, and LA 135290) and a lithic scatter (LA 85859). On the other hand, the sampling strategy at LA 12587 (Area 8) was focused on the area of the scatter that represented the Late Archaic occupation and not the section that was a continuation of the surface scatter from the nearby pueblo roomblock.

Table 56.1. Artifact and sample totals by tract and archaeological site.

Tract	LA #	Ceramics	Chipped Stone	Ground Stone	Bone	Shell	Flotation	Pollen	Macrobot.	TL*	Ornament	Minerals	Adobe (other)	Metal	Glass
White Rock (A-19)	127625	28	53	3	0	0	2	0	0	0	0	0	0	0	0
	127631	12	16	9	1	0	10	9	6	0	0	0	1	0	0
	128803	0	3	1	0	0	15	21	1	0	0	0	0	0	0
	128804	255	251	3	0	0	6	6	0	0	0	0	0	0	0
	128805	206	346	18	0	0	10	8	19	0	0	1	0	0	0
	86637	120	511	28	0	0	4	4	0	0	0	0	0	0	0
	12587	70,874	14,637	793	649	30	224	307	454	14	35	40	106	0	0
	12587 Area 8	1814	2100	96	0	0	3	0	3	0	0	41	0	0	0
Airport (A-3, A-7, A-5-1)	86533	11	38	0	0	0	0	0	0	0	0	0	0	0	0
	86534	23,231	2808	282	388	1	69	61	302	11	0	12	58	0	0
	135290	10,662	1398	132	82	0	118	133	458	16	2	17	136	0	0
	139418	59	827	4	0	0	21	29	8	0	0	0	0	0	0
	141505	33	24	1	1	0	5	13	14	0	0	1	5	0	0
Rendija A-14)	15116	83	40	0	0	0	3	4	5	1	0	0	2	0	0
	70025	181	16	7	7	0	3	4	6	0	0	0	1	0	0
	85403	7	23	4	4	0	8	7	10	1	0	1	0	0	0
	85404	202	68	1	1	0	10	10	9	1	0	0	1	0	0
	85407	196	71	6	6	1	16	24	14	0	0	0	170	3487	1491
	85408	85	70	3	3	0	4	5	2	1	0	0	0	0	0
	85411	322	104	5	5	0	14	12	11	1	0	0	2	0	0
	85413	504	243	14	14	0	4	6	15	1	0	0	0	0	0
	85414	37	30	5	5	0	5	5	2	1	0	0	0	0	0
	85417	133	13	4	4	0	9	5	13	4	0	0	69	2	0
	85859	4	5404	4	4	0	44	44	14	0	0	1	5	0	0
	85861	434	101	13	13	0	11	6	17	4	0	0	22	0	0
	85864	2	0	0	0	0	5	2	8	0	0	0	0	0	0
	85867	67	53	2	2	0	4	6	8	1	0	0	2	0	0
	85869	7	427	7	7	0	9	15	9	2	158	1	0	32	0

Tract	LA #	Ceramics	Chipped Stone	Ground Stone	Bone	Shell	Flotation	Pollen	Macrobot.	TL*	Ornament	Minerals	Adobe (other)	Metal	Glass
	86605	109	74	3	3	2	8	8	11	2	0	0	5	0	0
	86606	146	19	10	3	0	7	6	5	1	0	1	8	0	0
	86607	9	0	0	0	0	4	4	1	1	0	0	0	0	0
	87430	495	89	7	0	0	18	15	30	1	0	0	2	0	0
	99396	87	1408	11	1	0	143	24	75	8	0	2	1	0	0
	99397	3	1215	3	0	0	19	19	16	0	0	0	3	0	0
	127627	85	74	12	2	0	7	9	6	1	0	0	6	0	0
	127633	1	1	1	0	0	6	7	1	1	0	0	0	0	0
	127634	153	104	3	0	0	16	7	6	1	0	0	5	0	0
	127635	382	83	1	0	0	11	7	22	1	0	1	6	0	0
	135291	80	19	14	0	0	6	5	0	0	0	0	1	0	0
	135292	92	83	3	1	0	4	4	1	1	0	0	7	0	0
TA-74 (testing) (A-18a)	21596B	270	4	3	4	0	0	9	6	0	0	0	0	0	0
	21596C	371	21	0	0	0	0	6	7	0	0	0	0	0	0
	86528	0	0	0	0	0	0	1	2	0	4	0	0	0	0
	86531	1	0	0	0	0	0	3	3	0	2	0	0	0	0
	110121	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	110126	11	4	0	1	0	0	2	2	0	4	0	0	0	0
	110130	24	7	0	0	0	0	9	8	0	0	0	0	0	0
	110133	4	0	0	0	0	0	0	0	0	0	0	0	0	0
	117883	1	144	0	4	0	0	0	0	0	4	0	0	0	0
White Rock Y (testing) (C-2)	61034	4	117	0	0	0	0	3	2	0	3	0	0	0	0
	61035	11	559	1	7	0	0	5	4	0	9	0	0	0	0
Total		**111,908**	**33,700**	**1517**	**1222**	**34**	**885**	**899**	**1616**	**77**	**221**	**119**	**624**	**3521**	**1491**

*Thermoluminescence

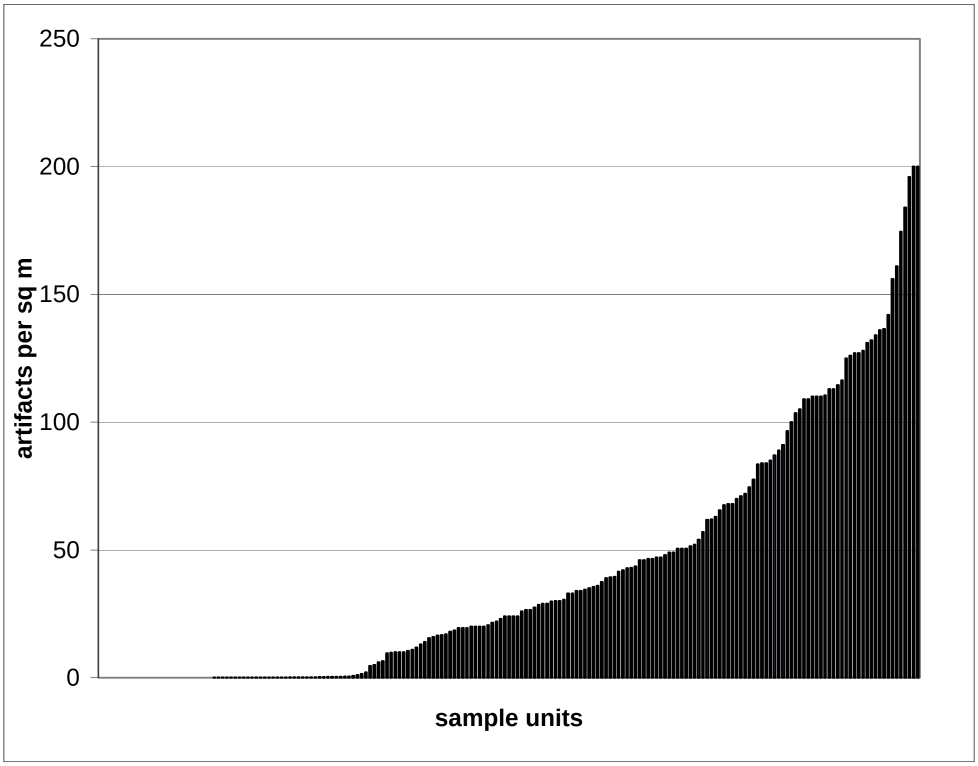


Figure 56.1. Artifacts per m^2 illustrated as a continuous sequence for the C&T Project survey data.

The sampling strategy implemented for the Ancestral Pueblo roomblocks consisted of selecting two or more 1- by 1-m grids within each room and analyzing all the artifacts from the stratigraphic column. This also included the collection of a set of flotation and pollen samples from each stratum represented within the column. All floor artifacts were analyzed and a selection of flotation and pollen samples from the floor, as well as all artifacts and samples from floor features. Exterior activity areas and middens were also systematically sampled based on the overall areal extent of the deposits. This was done primarily at LA 12587, which was the only site that contained a midden deposit. The result was that lithic samples ranged from 16 percent to 18 percent at LA 12587 and LA 86534 to 35 percent at LA 135290. In contrast, ceramic samples ranged from 15 percent to 17 percent at LA 12587 and LA 86534 to 38 percent at LA 135290. Lastly, a sample of lithic artifacts was also selected from the early Archaic lithic scatter site at LA 85859. Artifacts and samples were only analyzed from a central section of the excavation, which provided the best example of the site stratigraphy. The result was that a 38 percent sample of the lithic artifacts from the site was studied.

CHRONOMETRIC DATING

Samples were taken to derive absolute dates from several chronometric techniques. Maize was selected whenever available for Accelerator Mass Spectrometer (AMS) dating by Beta Analytic, Inc. Archaeomagnetic samples were obtained from burned features by Eric Blinman at the Office of Archaeological Studies. Ceramic and burned adobe samples were submitted to James Feathers at the University of Washington for luminescence dating. Lastly, obsidian that was sourced by Steve Shackley (University of California) was provided to Chris Stevenson (Diffusion Laboratory) for obsidian hydration dating.

Attempts were made to obtain samples of each chronometric technique from similar contexts at each site. For example, a hearth might provide maize for AMS, burned adobe for archaeomagnetic, ceramics within or adjacent to the feature for luminescence, and obsidian artifacts on the nearby floor for hydration dating. The point was to evaluate the accuracy and precision of the various dating techniques by collecting samples from similar contexts whenever possible, while dating the occupational sequence at the site.

CHAPTER 57
SURFICIAL UNITS AND PROCESSES ASSOCIATED WITH ARCHAEOLOGICAL SITES IN LAND CONVEYANCE AND TRANSFER TRACTS AT LOS ALAMOS NATIONAL LABORATORY

Paul G. Drakos and Steven L. Reneau

INTRODUCTION

Geomorphic studies were conducted in selected land conveyance parcels at Los Alamos National Laboratory (LANL) in support of archaeological investigations preceding transfer of these tracts from the Department of Energy to Los Alamos County, San Ildefonso Pueblo, or the New Mexico Highway Department. This work included mapping and description of surficial geologic units to help define the geomorphic context of archaeological sites. This investigation also focused on identification of surficial processes associated with potential erosion or burial of cultural features. Fieldwork was conducted during the 2002, 2003, 2004, and 2005 field seasons in support of excavations within the Airport (A-3, A-7, and A-5-1), White Rock (A-19), Technical Area (TA) 74 (A-18a), White Rock Y (C-2), and Rendija Canyon (A-14) land transfer parcels.

GEOMORPHIC SETTING

LANL is located on the Pajarito Plateau, east of the Jemez Mountains (the Sierra de los Valles), and west of White Rock Canyon of the Rio Grande (see Figure 3.2 in Reneau and Drakos, Volume 1). The Pajarito Plateau includes gently east-sloping mesas and numerous narrow canyons that are between approximately 1900 and 2300 m in elevation. The modern climate is semiarid, and vegetation is dominated by ponderosa pine forest to the west and piñon-juniper woodlands to the east (Allen 1989; Bowen 1990; Reneau et al. 1996a). This area has a complex geomorphic history over the last 10 to 15 thousand years, the time scale relevant to archaeological investigations (e.g., Reneau and Drakos, Volume 1; Reneau and McDonald 1996; Reneau et al. 1996a). At various times, large parts of the landscape experienced deposition of alluvial, colluvial, or eolian sediments, with an associated potential to bury and help preserve archaeological sites. The landscape has also experienced significant erosion, with the associated potential to erode archaeological sites. Mesa top settings preserve several widespread eolian events, including one event that post-dates the Middle Coalition period and a smaller eolian event that post-dates the Classic period. Periodic eolian deposition also helped provide sediment that was reworked into colluvial deposits.

Archaeological sites examined during this investigation are located on mesa tops, hillslopes, fluvial terraces, and valley bottoms. Five separate tracts of land were the focus of this investigation (see Figure 3.2 in Reneau and Drakos, Volume 1), and geomorphic maps were compiled based on original field mapping for each tract. The five tracts are the White Rock Tract, the Airport Tract, the Rendija Tract, the TA-74 Tract, and the White Rock Y Tract. The total area encompassed by the five tracts is 799 ha (1973 acres).

METHODS

Surficial geologic maps of selected land transfer tracts were prepared at a scale of 1:1200. The White Rock, Airport, and TA-74 tracts geologic maps were completed during the 2002 field season (Drakos and Reneau 2003). The Rendija Tract geologic map was completed during the 2003 field season and included an area mapped previously by Reneau (Reneau and McDonald 1996:102). The White Rock Y Tract geologic map was completed in 2006. The mapping was focused on units with potential archaeological significance. Soil descriptions were made at profiles both inside and outside of identified archaeological sites following methods discussed in Birkeland (1999). Soil horizon nomenclature is from Birkeland (1999) and Soil Survey Staff (1999). An explanation of soil horizon nomenclature, soil properties utilized in field soil descriptions, and a key to symbols used in descriptions of soil morphology are included in Appendix K. Soil descriptions are included in Appendix L. Carbonate stage for soils follows nomenclature developed by Gile et al. (1965, 1966). Preliminary age estimates for deposits were made based on soil descriptions and comparison of the general degree of soil development to previously dated sites on the Pajarito Plateau and to soils described during the present investigation where radiocarbon dates were obtained.

Radiocarbon dates, age calibrations, and additional stratigraphic data are included in Appendix M. General age estimates based on carbonate stage development are also based on rates of carbonate development described by Machette (1985). Small charcoal samples were collected for radiocarbon analysis from soil profiles at sites LA 85859, LA 99396, and LA 99397 in Rendija Canyon and from LA 135290 in the Airport Tract. A cal 5 ka (ka = thousands of years before present) radiocarbon age colluvial deposit in Fence Canyon (Stop 1-4c, Reneau and McDonald 1996:62–64), at the same general elevation as the White Rock parcel, was used as a key reference for the degree of soil development in a mid-Holocene unit on that part of the plateau (Figure 57.1; Table M.1). A cal 4.5 ka radiocarbon age valley fill deposit in "EG&G gully" on the mesa east of the Airport Tract sites (Longmire et al. 1996:48–49), at the same general elevation as the Airport Tract, was used as a key reference site for the degree of soil development in a mid-Holocene unit within the Airport Tract (Figure 57.2; Table L.1). The presence of the ca. 50 to 60 ka El Cajete pumice (age from Reneau et al. 1996b; Toyoda et al. 1995) interbedded with or overlying colluvial sediments, provided additional age control in some areas. The relation of deposits with varying soil characteristics to cultural material (e.g., potsherds and lithics) provided additional information on the age of some layers. Remnants of a Pleistocene soil with 5YR color and moderately thick clay films that has an estimated age of at least 100 to 200 ka (McFadden et al. 1996), underlying cultural deposits at some locations, provided a clear demarcation of cultural versus archaeologically sterile sediments.

Age estimates for soils in Airport Tract sites are also based on comparison with soils and stratigraphic units described in paleoseismic trenches on Pajarito Mesa (Kolbe et al. 1995; Reneau et al. 1995). Age constraints for the Pajarito Mesa eolian and colluvial slopewash deposits are provided by numerous radiocarbon dates and by stratigraphic position relative to the El Cajete pumice. The Pajarito Mesa trenches also exposed 10 inferred buried archaeological sites, including seven Ancestral Puebloan sites and three Paleoindian sites (Reneau et al. 1995), that are utilized to help define the soil stratigraphic context of mesa top archaeological sites.

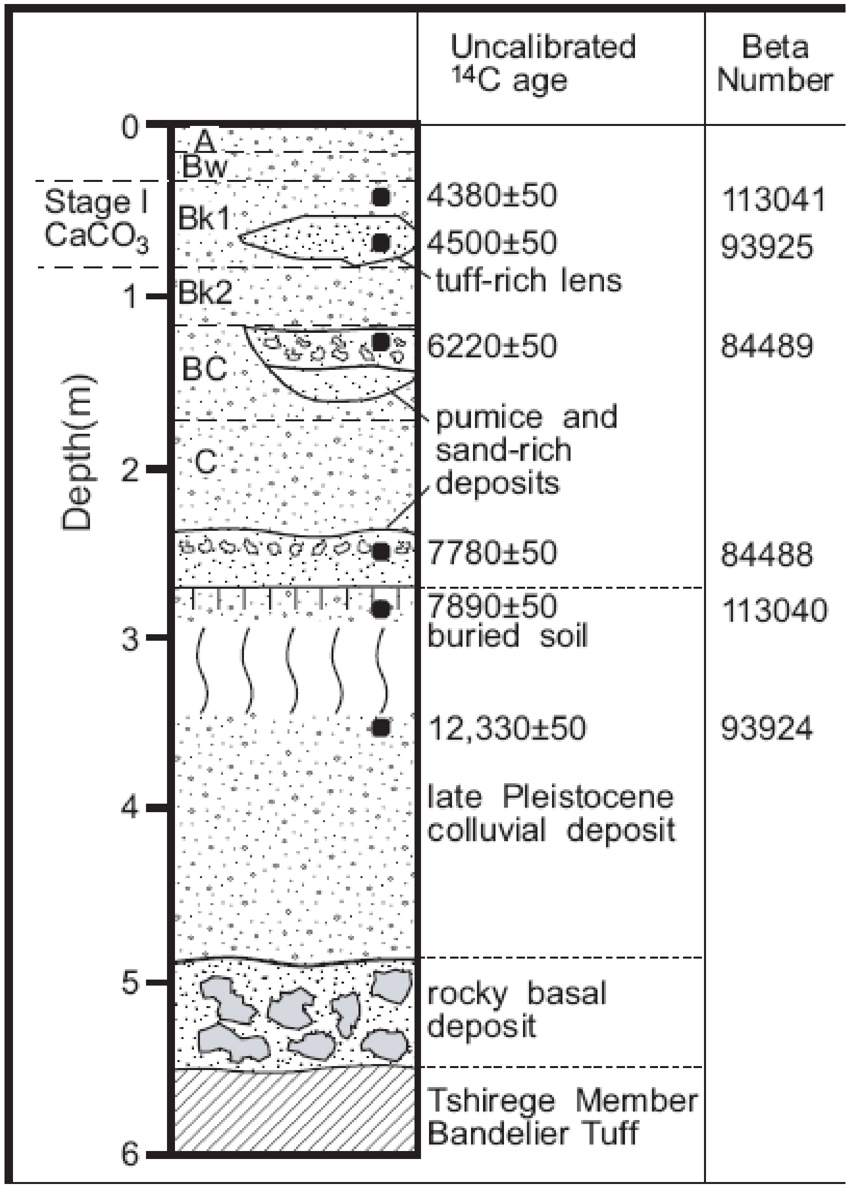


Figure 57.1. Stratigraphic section at Fence Canyon reference site, showing uncalibrated radiocarbon dates (see Appendix M, Table M.1 for radiocarbon data). Upper colluvium was deposited between ca. 8 and 4 ka 14C BP, with the surface stabilizing at ca. 4 ka. Modified from Reneau and McDonald, Figure 1-22).

Preliminary age estimates for soils in Rendija and Pueblo canyons are based on comparison with a chronosequence of Pleistocene and Holocene soils developed on a terrace sequence in Rendija Canyon (McDonald et al. 1996; Phillips et al. 1998; Reneau and McDonald 1996). Age constraints for the Rendija Canyon fluvial terraces are provided by 13 radiocarbon dates for Holocene terraces, two radiocarbon dates for Pleistocene terraces, and cosmogenic ^{21}Ne age estimates for three terraces. Additional data for Rendija Canyon soil age estimates are based on comparison with soils described in paleoseismic trenches in Chupaderos Canyon, northwest of the Rendija Tract (Gardner et al. 2003).

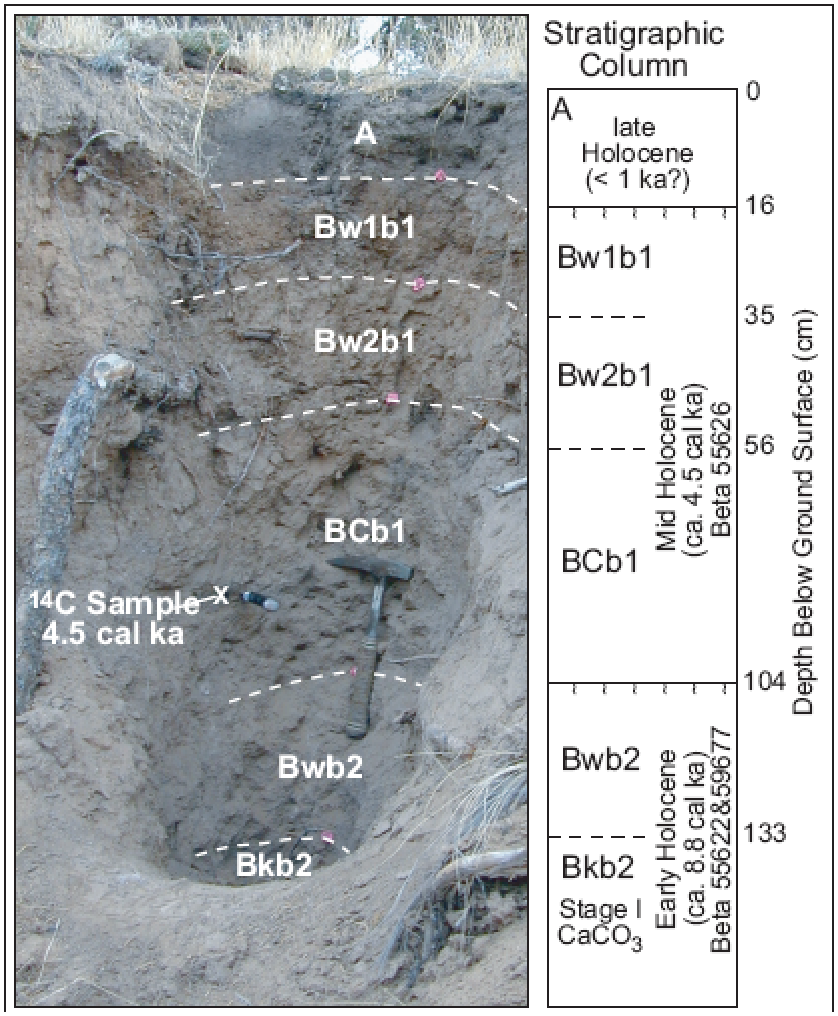


Figure 57.2. Soil stratigraphy and charcoal sample location, EG&G Gully site (see Appendix M for radiocarbon data).

The topographic profiles at individual sites were surveyed using a hand level, tape measure, and stadia rod.

WHITE ROCK TRACT

Surficial Geologic Units

The White Rock Tract (A-19) is within the Cañada del Buey watershed and includes part of the active stream channel and adjacent floodplains, colluvial slopes, and alluvial fans (Figure 57.3). Bedrock beneath most of the parcel is basalt of the Cerros del Rio volcanic field (unit Tb). The

Tshirege Member of the Bandelier Tuff (unit Qbt), which overlies the Cerros del Rio basalt, is also present along the northern margin, and as an isolated mesa in the western part of the parcel (Figure 57.4). Large parts of the parcel are covered by locally derived colluvial, alluvial fan, or slopewash deposits of a variety of ages. Geologic maps of this area have been prepared by Griggs (1964), Rogers (1995), and Dethier (1997). A detailed geomorphic map of the part of the parcel along the Cañada del Buey stream channel was previously prepared by Drakos et al. (2000). In this investigation, a surficial geologic map at a scale of 1:1200 was prepared of the White Rock Tract, focused on units with potential archaeological significance (Figure 57.3).

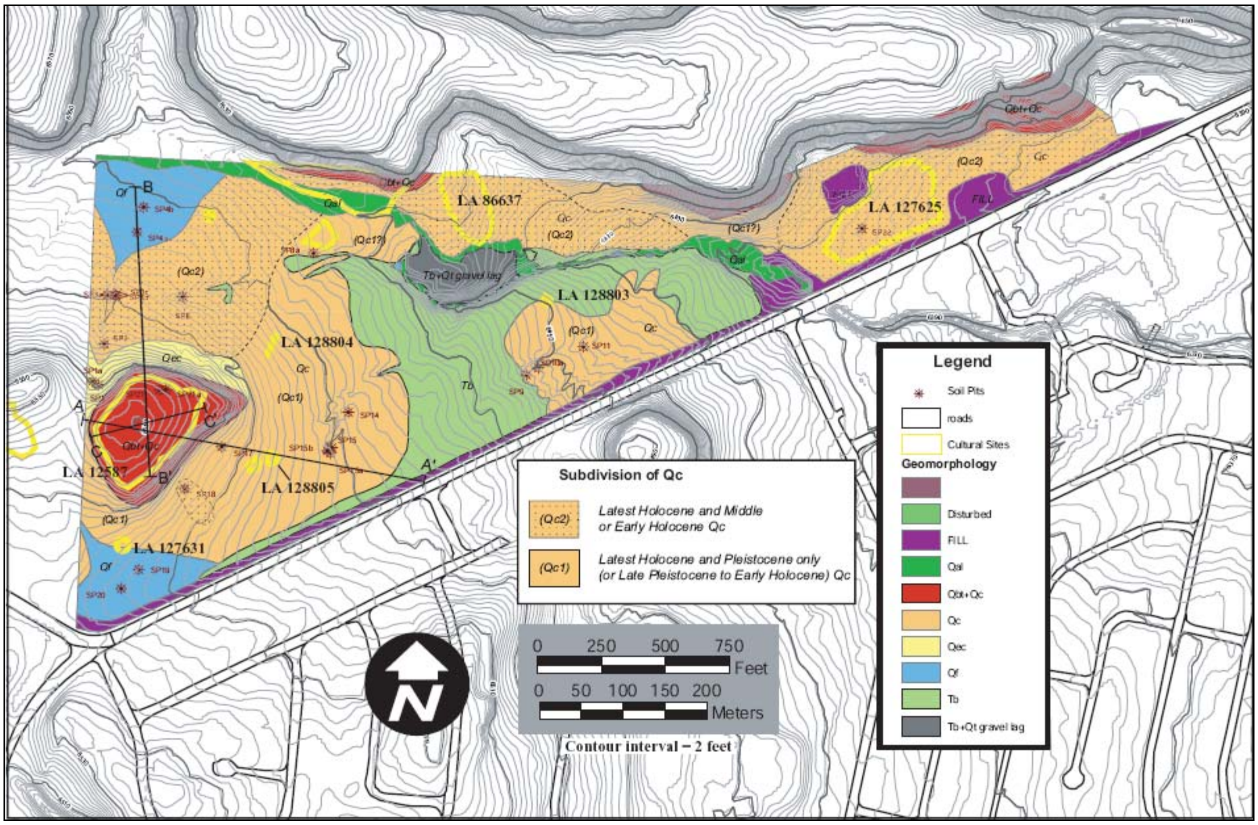


Figure 57.3. Geomorphology, cross-section, and soil pit locations in the White Rock Tract.

Unit Qal consists of young alluvium in the main stream channel of Cañada del Buey and tributary drainages and adjoining floodplains and stream terraces. Sediment ranges in size from silt to coarse sand and gravel and is dominated by coarse sand in the main channels and very fine sand on the floodplains (Drakos et al. 2000). The upper sediment layers along the main channel and floodplains (approximately 0.5 to 2.0 m thick) are largely historic in age, although older sediment may be locally present at depth. Higher stream terraces along Cañada del Buey are generally above the level of historic flooding and are inferred to be late Holocene to Pleistocene in age. The stream terraces are in part overlain by colluvium (unit Qc). These areas could have been used for agriculture.

Unit Qf consists of young alluvial fans that emanate from side drainages, typically below eroding areas of colluvium. Qf is dominated by stratified fine to very fine sand and also includes coarse sand and fine gravel layers. The upper parts of these deposits are historic in age, and older deposits are commonly present at depth. Greater than 1 m of late Holocene sediment can be present in Qf units. There is potential for burial of archaeological sites in these areas. A buried Pleistocene soil was observed at a depth greater than 1 m in one Qf soil profile. Soil descriptions of sites in Qf are presented in Appendix L (Tables L.1. and L.2) (locations 4a, 4b, 19, and 20).

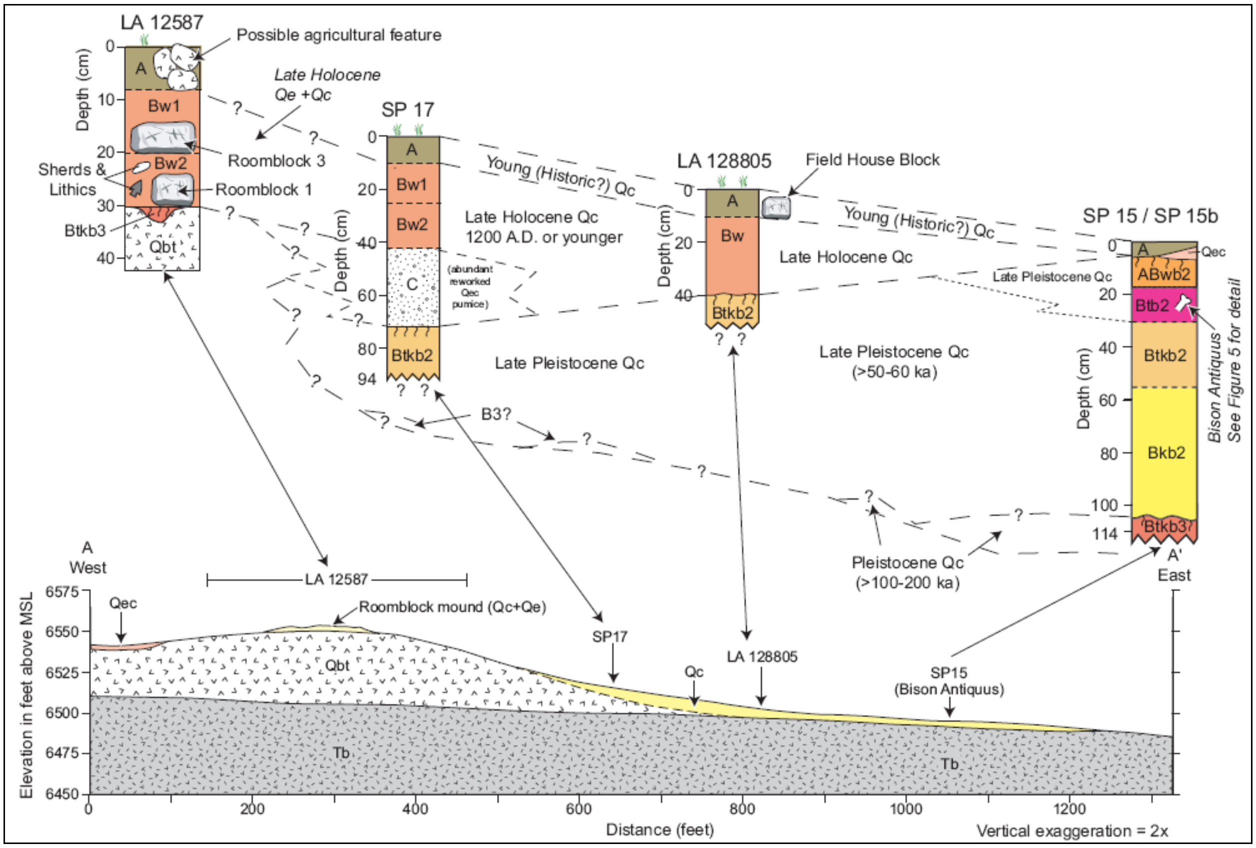


Figure 57.4. Cross-section (bottom), soil profiles, and correlations (top) through selected sites in the White Rock Tract. See Figure 57.3 for cross-section and soil description locations.

Unit Qc is dominated by relatively fine-grained (fine to very fine sand) slopewash colluvium deposited by overland flow, and also includes rocky colluvium on hillslopes below mesas. Qc likely includes alluvial fan surfaces and underlying deposits and eolian deposits and/or locally reworked eolian sediment. Qc deposits have a wide range in age and typically have buried soils that indicate pauses in deposition, in part accompanied by local erosion. Several soil profiles include surficial and buried deposits that indicate at least two episodes of colluvial deposition since mid-Holocene time, with a lower colluvial layer likely deposited around 2 to 4 ka and an upper colluvial layer that was likely deposited within the past 1000 years, possibly during post-Puebloan time (locations 3a, 6, 18, 3b, 3c, and 19; Appendix L, Tables L.1 and L.2). However, in many locations, the upper colluvial layer overlies late Pleistocene or early Holocene to latest Pleistocene deposits. The early Holocene to latest Pleistocene deposits could potentially contain buried archaeological sites, although no buried sites were observed in gullies that cross many parts of this unit. In other areas Qc is older than 50 to 60 ka. Upper layers in many areas are probably latest Holocene in age.

Although unit Qc is characterized by spatial complexity in its depositional history, as indicated by soil descriptions (Tables L.1 and L.2), an attempt was made to subdivide Qc into Qc1 and Qc2. Unit Qc1 is characterized by latest Holocene (<1 ka?) Qc overlying Pleistocene or late Pleistocene to early Holocene Qc (Figure 57.4). In the area east of the Bandelier Tuff mesa and LA 12587, the late Holocene Qc thins downslope from 0.7 m thick at the base of the mesa to less than 0.1 m thick at SP15 (see Figure 57.4). Unit Qc2 is characterized by latest Holocene (<1 ka?) Qc overlying middle or early Holocene Qc. Middle Holocene deposits in Unit Qc2 are approximately 1 m thick at SP6 and are overlain by approximately 0.2 to 0.7 m of late Holocene deposits (Figure 57.5). In general, Qc1 underlies east- and southeast-facing slopes in areas of relatively thin colluvial deposits overlying bedrock units Tb (Cerros del Rio basalt) and Qbt (Bandelier Tuff) (Figures 57.3 and 57.4). Unit Qc2 underlies aggrading toe slopes below embayments in the Qbt mesa north of the tract and the north-facing slope between the small Qbt mesa and Cañada del Buey within the western part of the White Rock Tract (Figure 57.5).

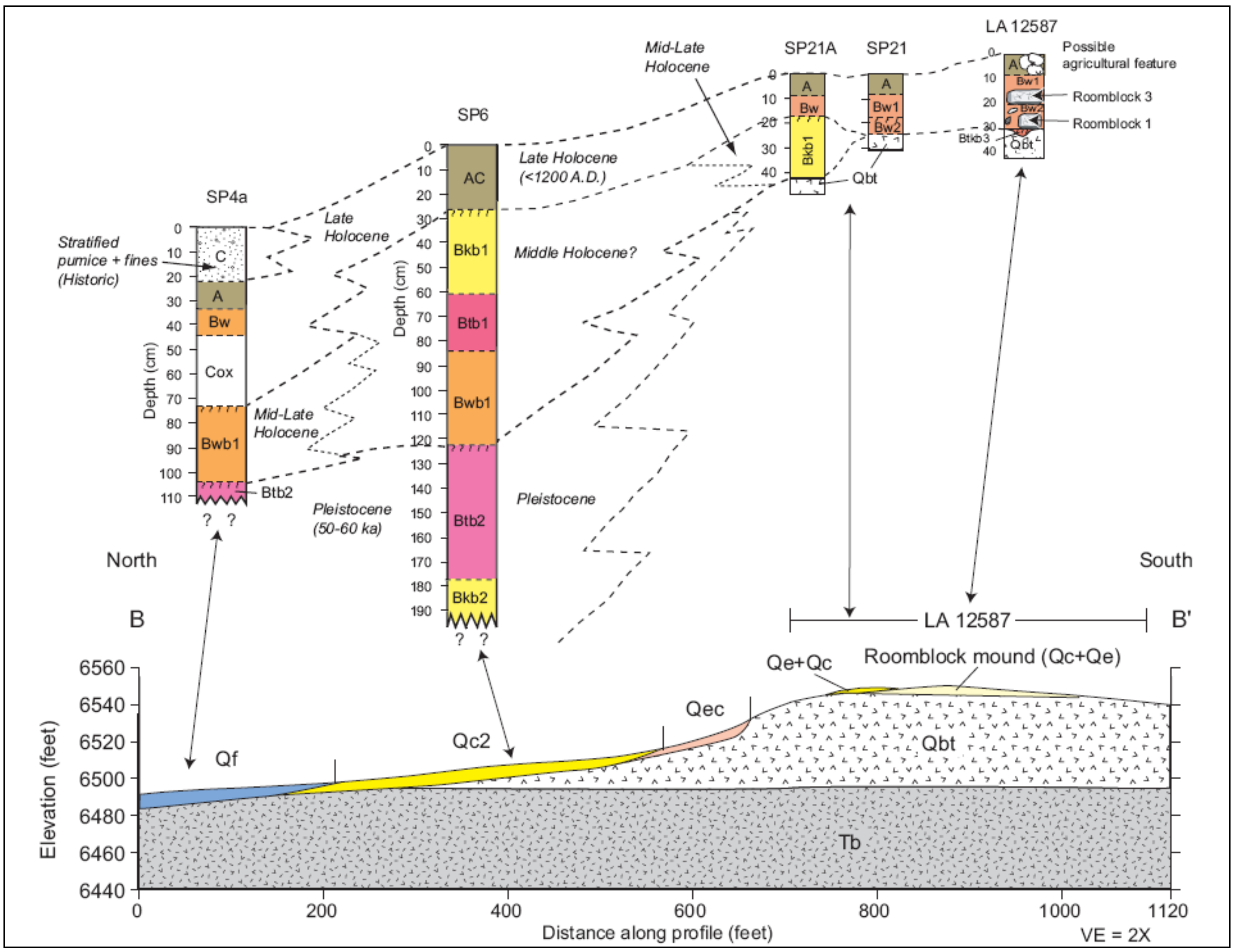


Figure 57.5. Cross-section (bottom), soil profiles and correlations (top) showing stratigraphic relationships between alluvial fan (Unit Qf), hillslope (Unit Qc2), and mesa top (Unit Qe+Qc) deposits in the White Rock Tract.

Sediment in unit Qc with estimated ages younger than ca. 5 ka, based on comparison with the Fence Canyon reference section, ranges in thickness from 6 cm to >1 m (soils lack Stage I carbonate or Bt horizons). The thickest deposit was recorded in the eastern parcel, where greater than 1.1 m of late Holocene colluvium is present at location 22, within site LA 127625. Farther west, 70 to 80 cm of colluvium younger than ca. 4 ka is present on the south side of an isolated mesa of Bandelier Tuff (locations 17 and 18). The total thickness of Holocene or possibly latest Pleistocene sediment (<~10 to 15 ka) reaches about 1.7 m in a gullied area in the northwestern part of the parcel (location 3a).

At one location in the south-central parcel (location 15), a piece of fossilized bone was found at a depth of about 20 to 30 cm eroding out of a gully wall stratigraphically below the ca. 50 to 60 ka El Cajete pumice. This bone was collected by Gary Morgan, New Mexico Museum of Natural History, who identified it as part of a humerus of an extinct species of bison, *Bison antiquus* (Figure 57.6, catalogue number NMMNH 37623, locality number L-5214). Notably, this is apparently the first recorded Pleistocene fossil from Los Alamos County and is also one of very few bison records in New Mexico with dates older than about 20 ka (G. Morgan, per. comm.).

Figure 57.6. Left distal humerus of the extinct species of bison, *Bison antiquus* (lower image). Humerus of a modern bison, *Bison bison* (upper image) shown for comparison. New Mexico Museum of Natural History catalog number NMMNH 37623 and NMMNH locality number L-5214. Photograph and fossil identification by Gary Morgan, NMMNH.

Unit Qc includes areas that presently experience dispersed overland flow and either local erosion or deposition. Qc also includes gullied areas where significant erosion presently occurs. Agricultural potential probably varies significantly within Qc. The areas with the highest probability of agricultural use are inferred to be at locations with relatively thick loose soils situated below long slopes and/or below mesa tops. These sites therefore receive overland flow from nearby highlands (e.g., locations 17 and 18, Tables L.1 and L.2) and are likely areas of active deposition and cumulic soil profiles. Location 17 has approximately 0.7 m of late Holocene (younger than 1 to 2 ka?) sediment overlying a Pleistocene soil. Areas with older, more consolidated soils present at shallow depths are inferred to have a lower probability of agricultural use. A grid garden is present at one location near the boundary between Qc and Tb (LA 128803), and several sites are located on Qc (LA 86637, LA 127631, and LA 128805).

Unit Qec is the ca. 50 to 60 ka El Cajete pumice. It is present in a relatively thick (≥50 cm) layer within Qc on the north side of the isolated Bandelier Tuff mesa in the western parcel (locations 1 and 1a, Table L.2), and thin remnants were observed within Qc farther east (site 15b, Table L.1). This unit may have a high agricultural potential associated with well-drained soils.

Unit Qbt is the Tshirege Member of the Bandelier Tuff. There are no soils or only thin soils present in much of this unit, particularly along the edges of mesas, and consequently there is a high potential for erosion of cultural material. Thin, discontinuous, fine-grained deposits dominated by very fine sand occur on the isolated mesa top in the western parcel (locations 21 and 21a, Tables L.1 and L.2) and represent either eolian or locally reworked eolian sediment. These thin deposits overlying Qbt are in part late Holocene in age (likely less than 1 ka) based on the degree of soil development. The largest set of roomblocks in the parcel is located on this unit (LA 12587).

Unit Tb is basalt of the Cerros del Rio volcanic field. There are no soils or only thin soils present throughout the area of exposure of this unit, and consequently there is a high potential for erosion of cultural material in such locations. In other areas discontinuous colluvial or eolian sediments overlie unit Tb. Bedrock metates or grinding slicks were observed at one location in this unit along Cañada del Buey.

LA 12587 (Ancestral Puebloan Roomblock and Archaic Lithic Scatter)

Site Geomorphology and Stratigraphy

LA 12587 is a multi-component Ancestral Puebloan roomblock site situated on a small isolated Bandelier Tuff mesa and a separate lithic scatter located south of the roomblocks. Component 1 includes Roomblock 1, which is built either directly on Bandelier Tuff or on remnants of Pleistocene soils preserved in depressions in the undulating tuff surface. Component 2 consists of a second, younger roomblock (Roomblock 3) located west of Roomblock 1. Some sections of Roomblock 3 are built on colluvium derived from the Roomblock 1 (Figure 57.7). In other areas, Roomblock 3 is built either directly on Bandelier Tuff or on remnants of Pleistocene soils. Component 3, the most recent, includes a fieldhouse (Roomblock 2) constructed on top of the

Roomblock 1 rubble (Figure 57.8) and rock alignments north of the roomblocks that may represent agricultural features. The rock alignments overlie aligned shaped blocks that may represent Roomblock 3.

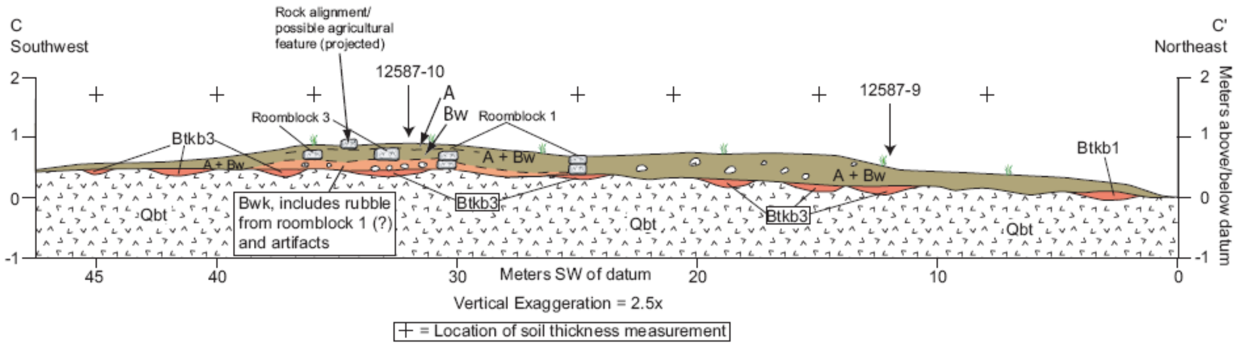


Figure 57.7. Cross-section through LA 12587. Location of line of section shown in Figure 57.3.

The discontinuous Pleistocene soil underlying LA 12587 consists of an eroded Btk horizon (Bt horizon with Stage I carbonate) (Table L.3). Pleistocene soil thickness in the site vicinity ranges from 0 to 16 cm. The remnant Pleistocene soil is inferred to be 100 to 200 ka or older, based on correlation with soils described by McFadden et al. (1996) and Reneau et al. (1995). The Pleistocene soil at LA 12587 is a polygenetic soil in which the Bt horizon formed during the Pleistocene, and the Stage I carbonate formed later, probably during the Holocene.

In the vicinity of the roomblocks, the Bt horizon is overlain by Bw horizons formed in eolian or reworked eolian sediment plus colluvium derived in part from the roomblock. In areas where roomblocks are located close to one another, the Component 2 walls (Roomblock 3) are built on top of a lower Bwk or Bw horizon (typically a Bw2), that is overlain by an A-Bwk1 or A-Bw1 profile (e.g., Table L.3, profiles 12587-10, 12587-11, and 12587-12; see Figure 57.7). These soils are formed in eolian or reworked eolian sediment plus colluvium derived in part from the roomblock. Total thickness of post-occupational soils in the vicinity of the roomblocks ranges from 10 to 54 cm. Greater sediment thickness corresponds in general to the roomblock locations, except for a mound of relatively thick sediment located immediately east and north of Roomblock 1 (Figure 57.9). Outside of the colluvial mound surrounding the roomblocks, post-occupational soil thickness ranges from 0 cm on stripped bedrock surfaces east, north, and west of the roomblocks (Figure 57.9), to 17 cm at Location 21A (Table L.1). The 17-cm A-Bw profile at Location 21 overlies a stripped Btk horizon and likely represents eolian deposition that occurred both during the Late Coalition period and that post-dates the Puebloan occupation.

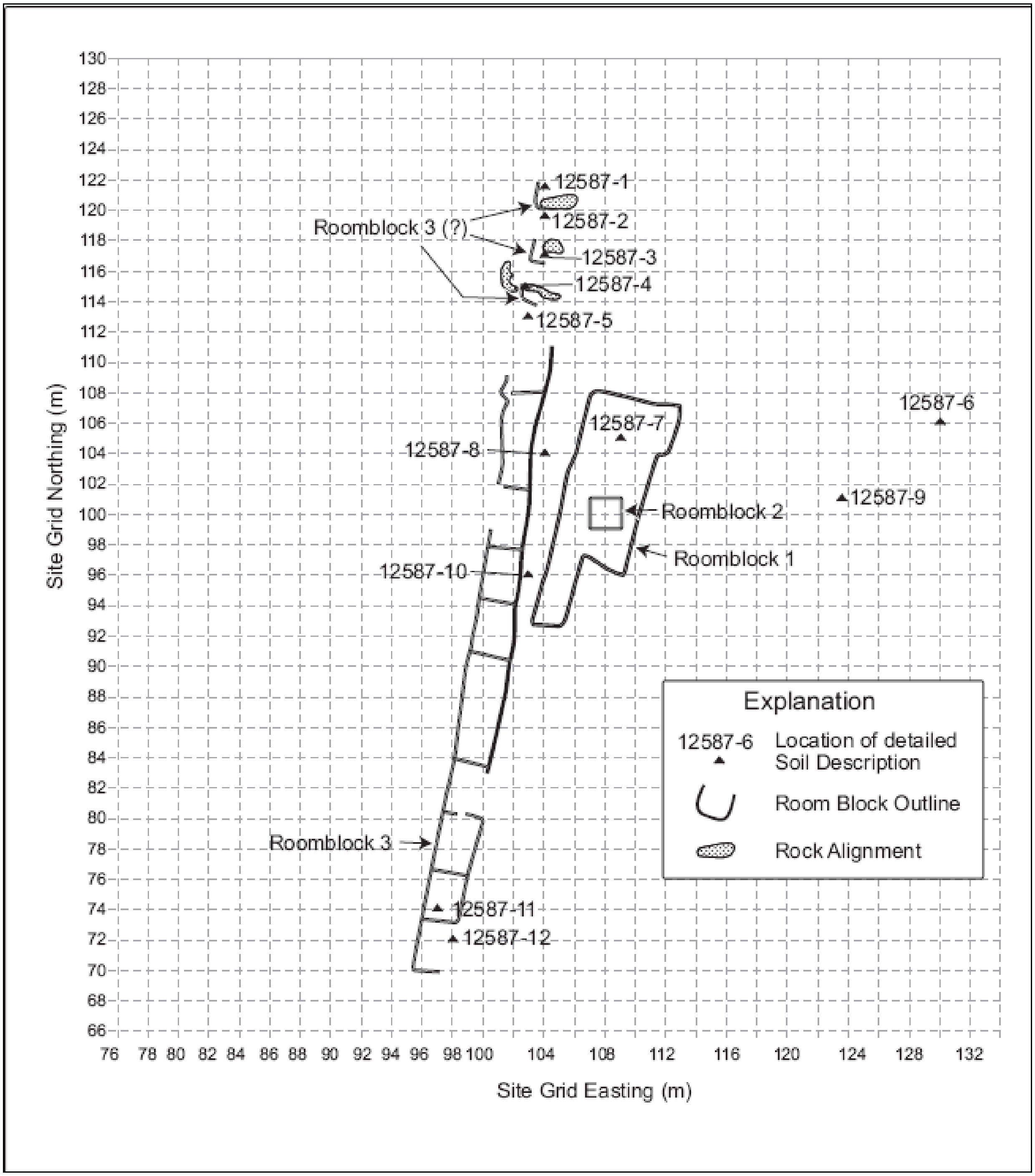


Figure 57.8. LA 12587 site map showing soil description locations, roomblocks, and rock alignments.

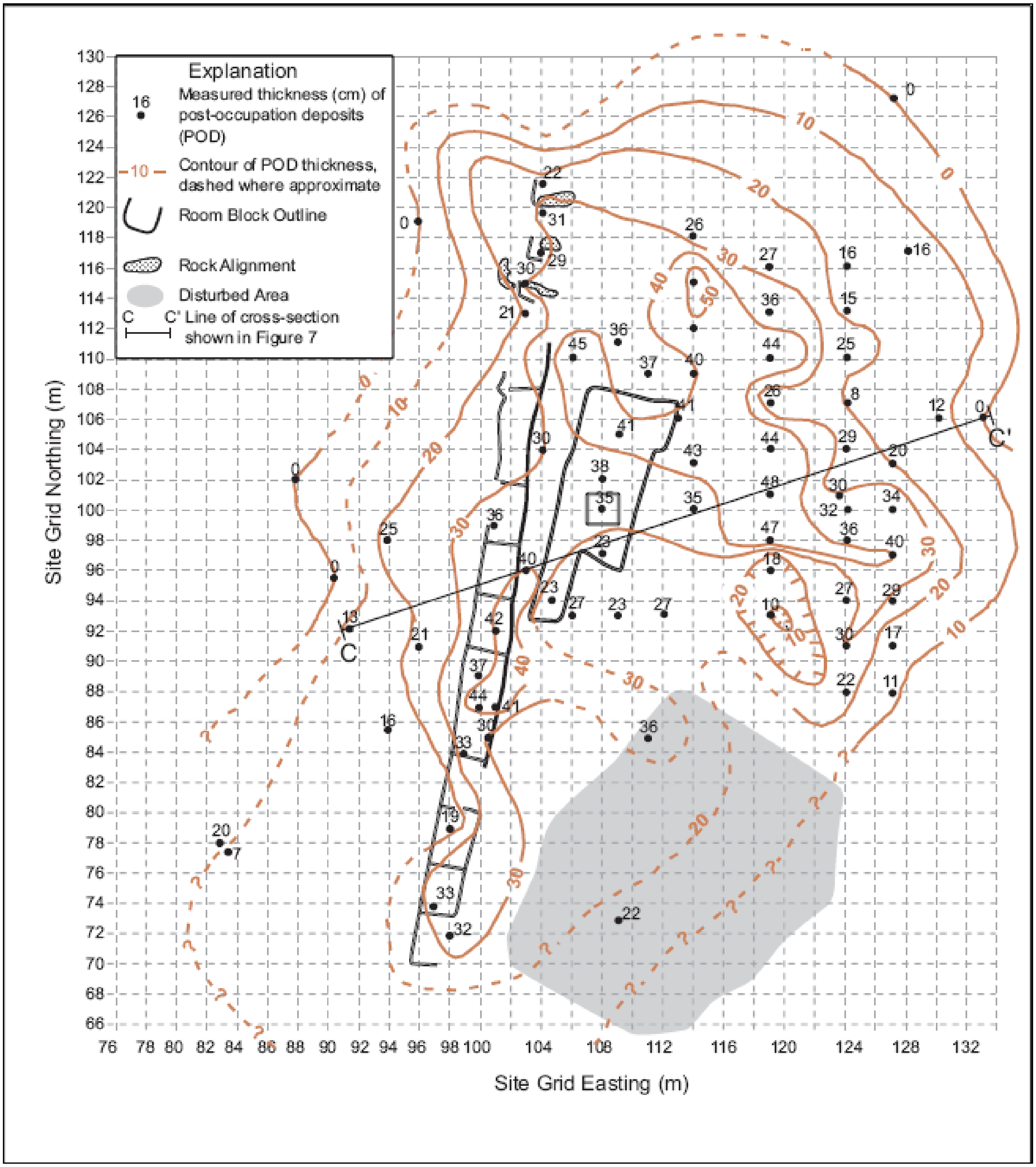


Figure 57.9. Isopach map showing the thickness of post-occupational deposits at LA 12587.

Component 1 (Roomblock 1 and Sheet Trash Deposits)

Roomblock 1 is an Ancestral Puebloan roomblock built either directly on Bandelier Tuff or on the remnant stripped Pleistocene soil (Figure 57.10 – example from Roomblock 3). Eolian or reworked eolian sediment is interpreted to largely comprise the upper soil that partially buries blocks of tuff derived from wall collapses. The upper soil also includes clasts of tuff derived from the roomblocks and a variety of ceramic and lithic artifacts, and is inferred to also contain the dissolved remnants of mortar and roofing material. The different soil components are well mixed, which indicates extensive bioturbation of the post-occupational soil by burrowing and other processes. Roomblock 1 is typically buried by 30 to 40 cm of young material that overlies the former floor, the underlying Btk horizon, or Bandelier Tuff. The upper soil layers that post-date occupation are anomalous in that Bw or Bwk horizons typically strongly effervesce, indicating the presence of calcium carbonate, (soil description 12587-7, 8, 9, and 10, Table L.3), whereas other young soils nearby do not effervesce (Table L.1, Location 21A). The reason for this is not certain. One hypothesis is that calcium carbonate was present in the mortar used in wall construction, and that this material is weathered out of the mortar and concentrated in the post-occupation soil. A soil profile with post-occupational A-Bw horizons described in sheet trash deposits approximately 17 m east of Roomblock 1 also strongly effervesce, indicating that sediments derived from the roomblock contain significant calcium carbonate (Table L.3, description 12587-9). A isopach map of post-occupational deposits at the site shows that sediments derived from the roomblock have been reworked east and north of the ruin, forming a colluvial apron at least 30 cm thick extending approximately 21 m east and 16 m north of the center of the roomblock (Figure 57.9).

Figure 57.10. Roomblock 3 wall at LA 12587 constructed directly on top of Bandelier Tuff (Qbt) and remnant Pleistocene soil (Btk horizon).

Component 2 (Roomblock 3)

Roomblock 3 is an Ancestral Puebloan roomblock that is younger than Roomblock 1. In some areas, wall blocks are set on top of a lower (Bw2 or Bwk2) horizon that contains rubble and artifacts inferred to be derived from Roomblock 1 (e.g., profiles 12587-10, 11, and 12, Table L.3). In other areas, Roomblock 3 walls are built either directly on Bandelier Tuff or on the remnant stripped Pleistocene soil (Figures 57.10 and 57.11). Roomblock 3 is typically buried by 20 to 30 cm of young soil that overlies the former floor, underlying soil horizons, or Bandelier Tuff. Post-occupational soils in Roomblock 3 also contain calcium carbonate. The isopach map shows a much smaller colluvial apron emanating from Roomblock 3 (the 30-cm-thick deposit extends approximately 4 m east of Roomblock 3) than is associated with Roomblock 1 (Figure 57.9), suggesting that Roomblock 3 walls were not built as high as were the walls forming Roomblock 1. These data support the hypothesis that Roomblock 3 was not completed.

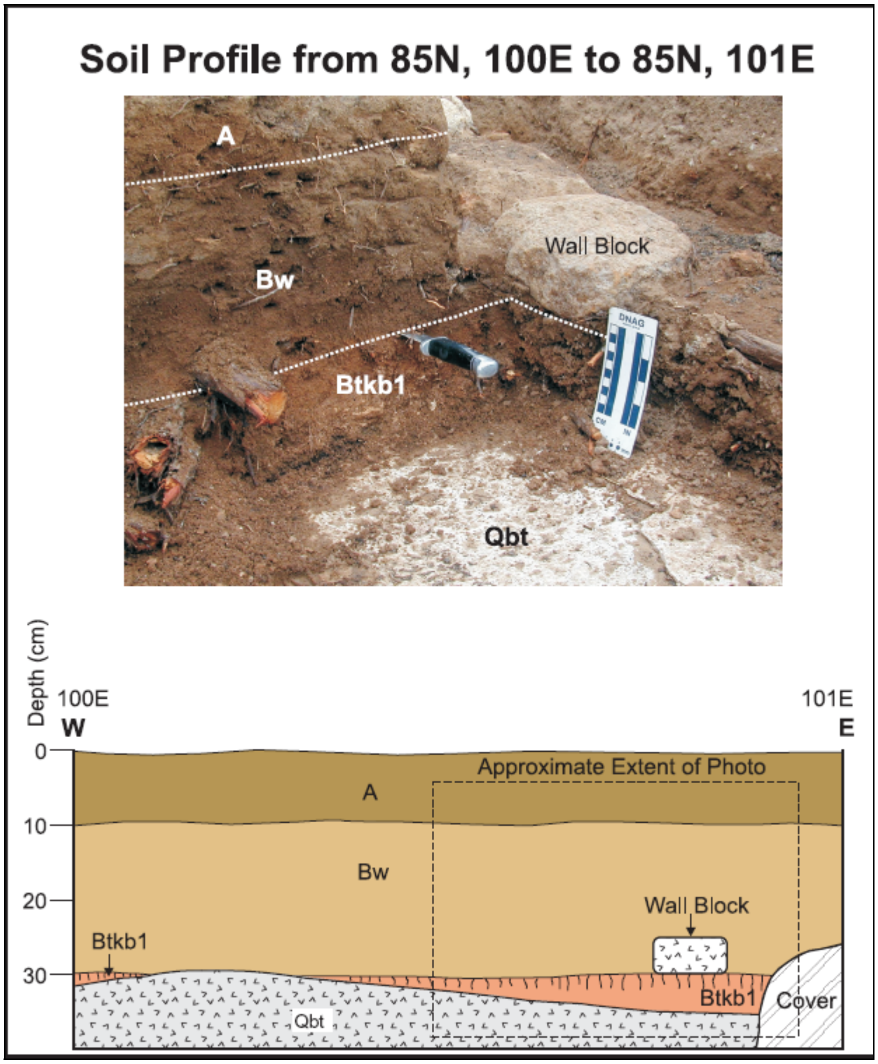


Figure 57.11. Photograph and sketch of Roomblock 3 wall at LA 12587, which is built on a remnant Pleistocene soil (Btkb1) and buried by post-Puebloan soil (A-Bw profile).

Component 3 (Roomblock 2 and Possible Agricultural Rock Alignments)

Roomblock 2 is a fieldhouse constructed on top of Roomblock 1. Soils were not described inside of Roomblock 2. A series of five soil descriptions were completed in the vicinity of the rock alignments located north of Roomblock 2 (see Figure 57.8). The rock alignments were constructed on top of a post-occupational Bw horizon 16 to 23 cm thick and lie within or are partly buried by an A or AC horizon that was 9 to 15 cm thick (Figures 57.12 and 57.13). Shaped blocks, inferred to be part of the Roomblock 3 construction, occur within the Bw horizon and below the rock alignments (Figure 57.12).

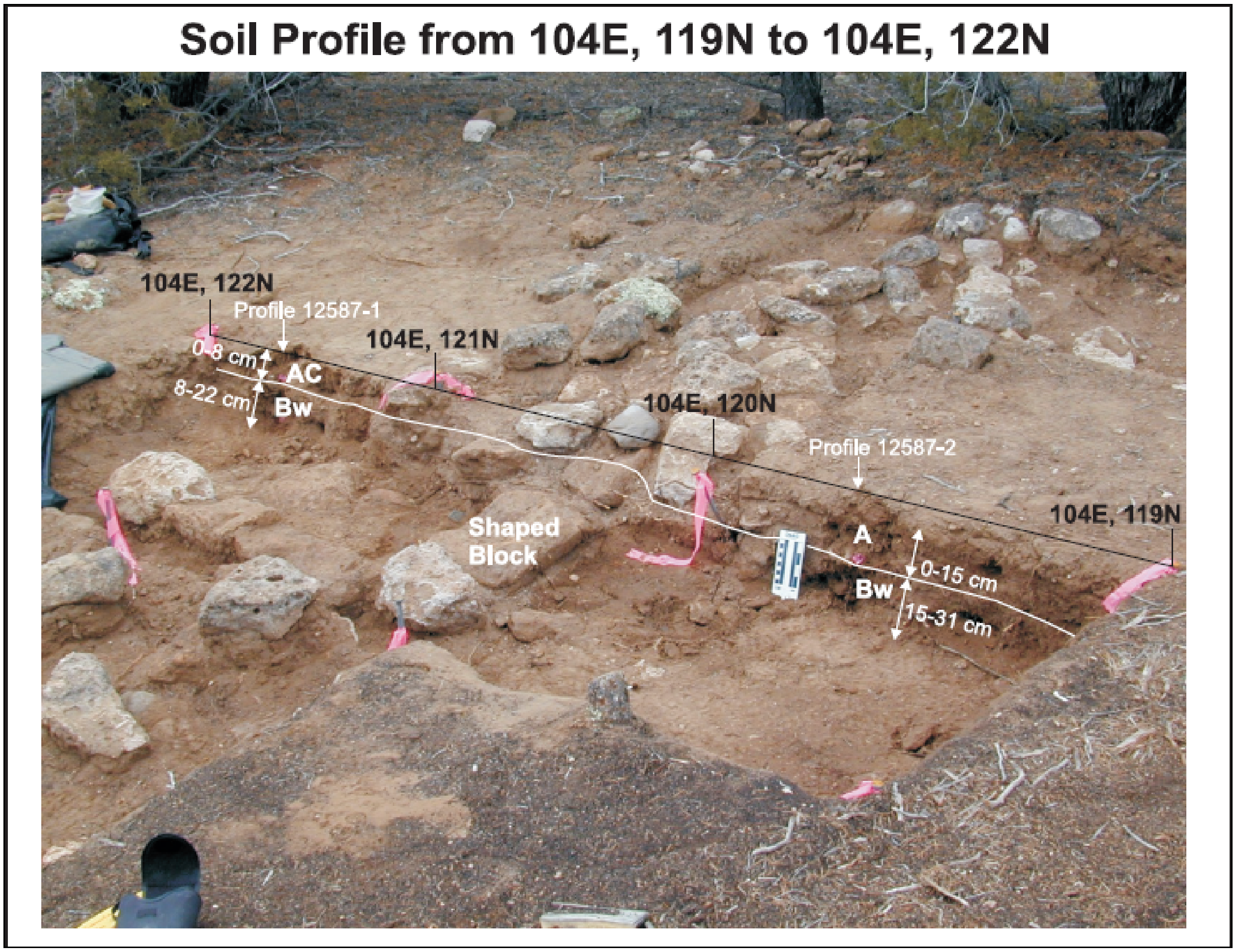


Figure 57.12. Photograph of excavation through LA 12587 northern rock alignment showing soil profiles.

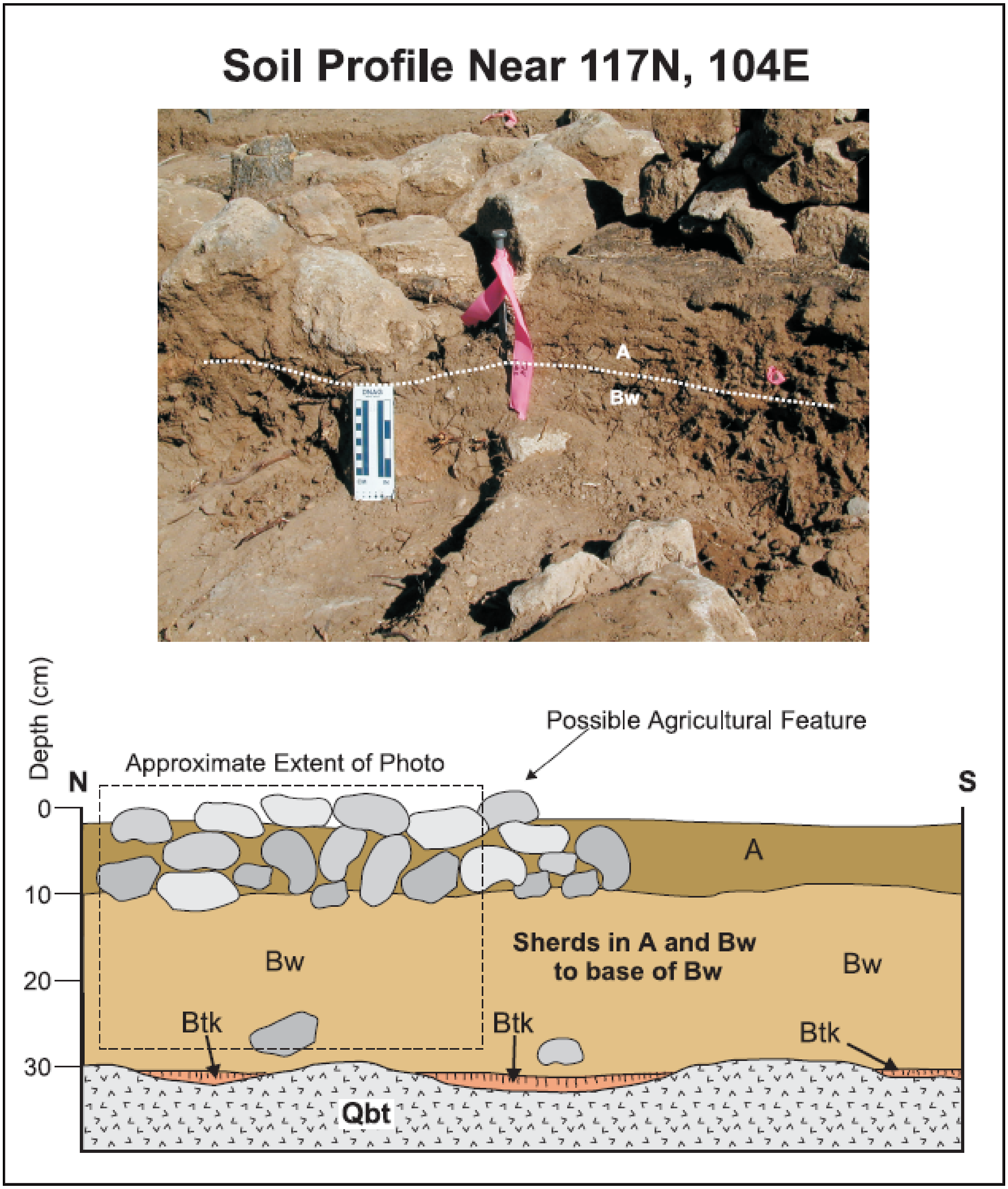


Figure 57.13. Photo and sketch of profile across the middle rock alignment at LA 12587.

Two profiles (12587-1 and 12587-5) were described outside and three profiles (12587-2, 12587-3, and 12587-4) were described inside the rock alignments (Table L.3). No textural differences were observed between profiles described inside versus outside the rock alignments. Soils described inside the rock alignments have a greater thickness (average 30 cm versus average 22 cm) than do the soils described immediately outside the rock alignments, due to generally thicker A horizons (Table L.3). This is observed most clearly in comparing profiles 12587-2 and 12587-1, where the A or AC horizon thins from 15 cm inside to 8 cm outside the northern rock alignment (see Figure 57.12). These observations indicate that the rock alignments are either acting to preferentially trap eolian or slopewash sediment, or that dirt was placed inside the alignments. The placement of dirt inside the rock alignments is suggested by the greater A horizon thickness and the absence of textural differences inside versus outside the rock alignments and by the orientation of the alignments oblique to a slope with a relatively shallow gradient.

The presence of a 16- to 23-cm-thick Bw horizon formed in sediment composed predominantly of eolian or reworked eolian sediment underlying the agricultural (?) rock alignments is evidence for significant eolian deposition during the Coalition (likely Late Coalition) period. Roomblock 1 was built on a stripped bedrock surface with remnant Pleistocene soils; therefore, deposition of sediment underlying the possible agricultural rock alignments occurred subsequent to construction of Roomblock 1. In contrast, eroding roomblocks provided a source for coarse colluvium, the predominantly fine-grained nature of upper Bw horizons indicates an eolian source for most of the sediment burying Component 2 features. Additional, thinner (9 to 15 cm) sediment partially buries the rock alignments, indicating smaller inputs of eolian sediment or reworked eolian sediment following the Component 3 occupation. This sediment deposition could date to the latest Coalition period, the Classic period, or the Historic period.

Lithic Scatter (Area 8)

LA 12587 also includes an Archaic lithic scatter at the south part of the mesa. This material is in an area of thin soils over tuff bedrock where significant erosion has occurred. The lithic scatter may in part represent a lag left following erosion of an unknown thickness of mesa top soils. Excavation into relatively thick pockets of soil (up to 28 cm thick) inside the main artifact scatter revealed the presence of both ceramics and obsidian flakes to the base of a weakly developed soil (Table L.3, profile 12587-13). An excavation completed outside the main artifact scatter revealed a young colluvial deposit of similar thickness (20 cm) and a weakly developed soil (Table L.3, profile 12587-14). Soils in the vicinity of the lithic scatter lack the Bw horizons typically observed in older post-occupational soils and instead exhibit A-BC or A-C horizons. This weak soil development is consistent with a post-occupational, possibly less than 500-year, age for the colluvium. This observation is consistent with the interpretation that this is an actively eroding surface with minimal potential for preserving an intact archaeological record.

LA 86637 (Fieldhouse and Lithic/Ceramic Scatter)

LA 86637 includes a fieldhouse with large tuff blocks on a deeply eroded colluvial slope. The fieldhouse is situated on a pedestal >0.5 m high between channels incised into the colluvial slope. The site also includes a lithic and ceramic scatter, which is inferred to represent reworked material transported down the colluvial slope. Because of the extensive erosion in this area, there is considered to be minimal potential for the preservation of an intact archaeological record.

Soils were described in two test pits at the site. Soil profile 86637-1 has an AC-Bw1b1-Bw2b1-Btkb2 horizon sequence interpreted to represent very young colluvium from 0 to 6 cm, overlying post-Coalition period colluvium that was observed to a depth of 43 cm (Table L.3). The young colluvium overlies a Pleistocene colluvial soil. Artifacts (lithics and ceramics) scattered throughout the AC, Bw1b1, and Bw2b1 horizons are interpreted to be part of the young colluvial package and therefore are not in archaeological context.

Soil profile 86637-2 has an AC-Bwk1b1-Bwk2b1-Bkb2 horizon sequence interpreted to represent deposition of young colluvium from 0 to 10 cm, overlying 2 to 4 ka colluvium with Stage I carbonate from 10 to 46 cm (Table L.3). The age estimate for the Bwk horizons with Stage I carbonate is based on comparison with the Fence Canyon borrow pit description (Table L.1), which exhibits a Stage I carbonate with a surface age of approximately 4 ka and an 8 ka age at depth (Reneau and McDonald 1996). The Holocene colluvium overlies a Pleistocene colluvial soil. Ceramics and lithics observed in the upper 10 cm are part of the young colluvial package and are not in archaeological context. Only lithics were observed in the Bwk1b1 horizon and are interpreted to be part of an older (middle to late Holocene) colluvial package. The lithics in the Bwk1b1 horizon were apparently reworked from an Archaic site upslope and are therefore likely not in archaeological context at this location.

LA 127625 (Lithic and Ceramic Scatter)

LA 127625 includes scattered sherds and lithic fragments in an area of thick late Holocene colluvium with little soil development (Table L.2, Location 22; see Figure 57.3). The colluvium here may post-date Ancestral Puebloan occupation of this area, and the cultural material was likely transported to the site in runoff from nearby slopes. The cultural material is therefore not in archaeological context at this location.

LA 127631 (Fieldhouse)

LA 127631 is a fieldhouse at the base of a low gradient colluvial hillslope, with an area of fan deposition to the southwest. Excavations at the site show the hillslope is mantled by a thin (<25 cm) layer of young colluvium overlying a Pleistocene soil (Table L.3, description 127631-1). Colluvium is a fine to very fine sand and may be composed primarily of reworked eolian sediment. The fieldhouse is buried by 10 to 19 cm of colluvium, with blocks set within a Bw horizon, at the boundary between a Bw1 and Bw2 horizon (Table L.3, description 127631-2). The site stratigraphy is consistent with the fieldhouse construction corresponding to the time of construction of Component 2 (Roomblock 3) at LA 12587. Scattered lithics and sherds occur on the surface in this area and may largely represent a lag or may consist of material transported by surface runoff.

LA 128803 (Grid Gardens)

LA 128803 consists of a grid garden in an area of discontinuous thin colluvial soils over basalt bedrock. There is a long colluvial slope west of LA 128803 that provides surface runoff to the site. The grid gardens may be partially buried by slopewash colluvium. Northeast of here the soils thin and the slope steepens above an incised channel of Cañada del Buey.

Four soil profiles were described upslope, in, and downslope of the rock alignments forming the grid garden (Figure 57.14). Soils were moist when described, and therefore weakly developed soil structure, if present, was difficult to discern. However, two trends are apparent in the soils described in the immediate vicinity of the grid garden. One trend is that the thickness of post-occupational soil is greater upslope and within the grid garden, ranging from 16 to 21 cm (Table L.3, descriptions 128803-1, 128803-2, and 128803-3), than was observed downslope of the grid garden, where the post-occupational soil thickness was 10 cm (Table L.3, description 128803-4). A second trend is that upper-horizon post-occupational soils are finer-grained (a silt loam) within and immediately downslope of the grid garden (Table L.3, descriptions 128803-2, 128803-3, and 128803-4), than was observed upslope of the grid garden (a sandy loam; Table L.3, description 128803-1). Both trends are consistent with the rock alignments acting to retain surface runoff and fine-grained slopewash and are consistent with the rock alignments functioning as a grid garden.

An additional observation was the absence of remnant Pleistocene soils in relatively deep pockets in the basalt within the rock alignments (Table L.3, descriptions 128803-2, and 128803-3), although such soils were present outside the rock alignments (Table L.3, description 128803-4, and in a test pit south of the alignments). This observation suggests that the area inside the alignments may have been prepared by first excavating the relatively dense, clay-rich Pleistocene soils and replacing this material with looser soil. Soils at LA 128803 are very weakly developed and apparently lack development of Bw horizons observed in Coalition period soils. It is therefore inferred that LA 128803 is likely a Classic period feature.

LA 128804 (Check Dam)

LA 128804 is an apparent 6-m-long check dam consisting of tuff clasts up to 60 cm long aligned across a shallow drainage on a colluvial slope. The dam has been partially breached by an incised channel, and some of the tuff has been transported downslope. Additional tuff blocks are scattered down a gradient along this same channel to the east and may represent the eroded remnants of similar structures.

Profile 128804-1 was described at Test Pit #1 and shows that the check dam was constructed on top of young stratified alluvium, possibly less than 100 years old, deposited in an aggrading stream channel (Table L.3). Deposition of approximately 16 cm of young alluvium has occurred at Test Pit #1 and behind the west part of the dam, with minimal deposition apparent elsewhere. Soils and geomorphic data indicate that LA 128804 is a recent structure, post-occupational in age, and likely less than 100 years old.

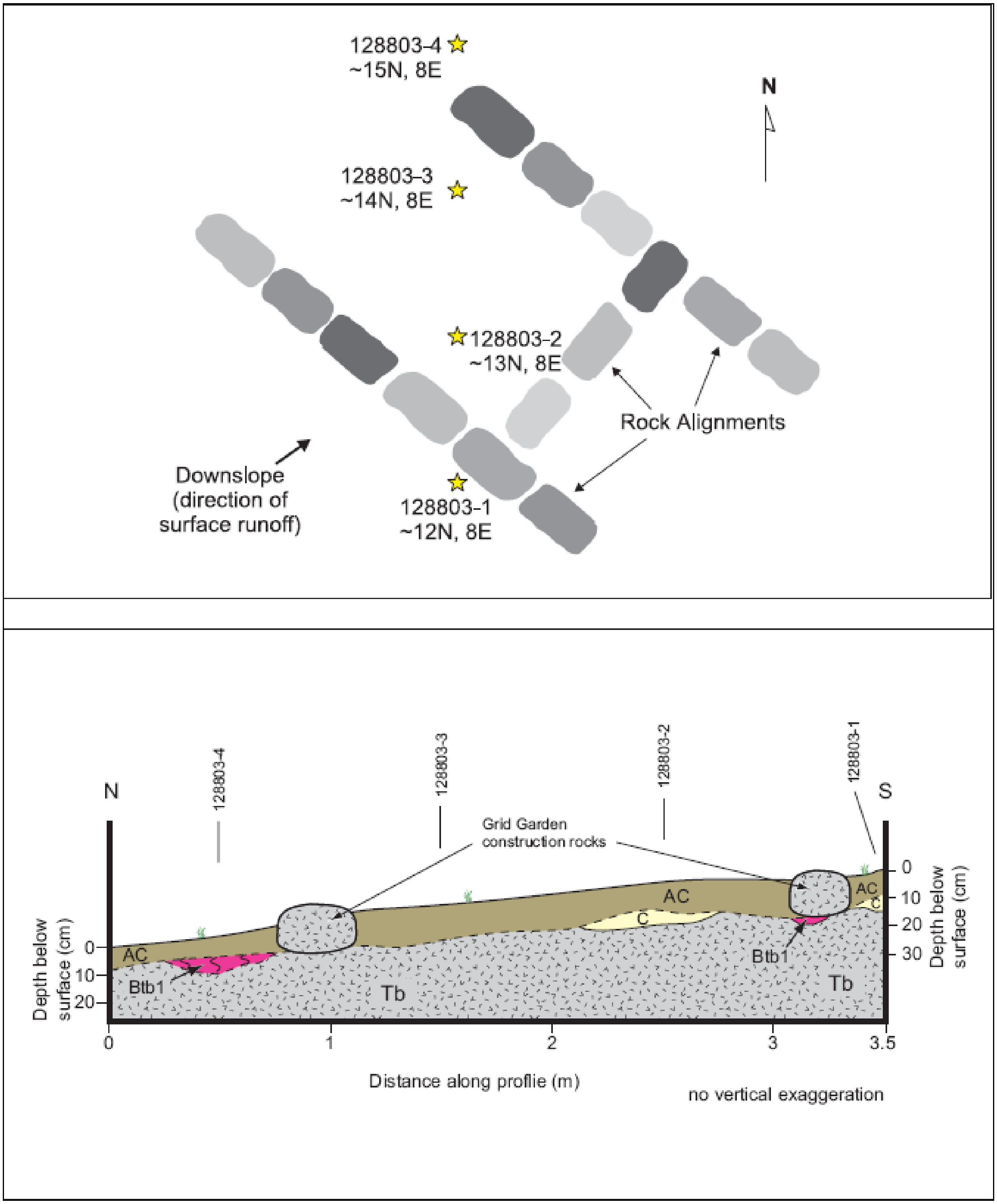


Figure 57.14. Schematic plan view (top) and cross-section (bottom) showing soil stratigraphy at LA 128803.

LA 128805 (Fieldhouse)

LA 128805 includes a Classic period fieldhouse on a broad colluvial slope that displays abundant evidence for active erosion. The fieldhouse is at the upslope end of eroding channels that extend to the east, with about 0.5 m of recent erosion estimated on the southeast side. Eroded channels also wrap around the northwest side of the structure. The tuff blocks in the fieldhouse appear to be acting as a local armor, protecting the area occupied by the fieldhouse from erosion while surrounding slopes are stripped. There is potential for some deposition of slopewash colluvium on the upslope (west) side of the fieldhouse, whereas other adjacent areas are experiencing erosion.

An examination of soils in a test pit located 1 m southeast of the southeast corner of the structure suggests that LA 128805 was constructed on an aggrading colluvial slope that experienced post-occupational deposition before the recent erosion that occurred at the site. A thin (10-cm-thick) A horizon is inferred to post-date occupation of the site (i.e., less than 500 yrs old). The A horizon overlies a buried (Bwb1) horizon, with soil structure development similar to that observed for older post-Coalition period soils and is inferred to be 500 to 800 years old (Table L.3, description 128805-1; Figure 57.15). The Bwb1 horizon overlies a buried Pleistocene soil formed in colluvium. The sequence of buried soils at this site suggests rapid deposition of colluvium, possibly during the Coalition period, with continued aggradation after abandonment of this Late Classic period fieldhouse, followed by recent erosion.

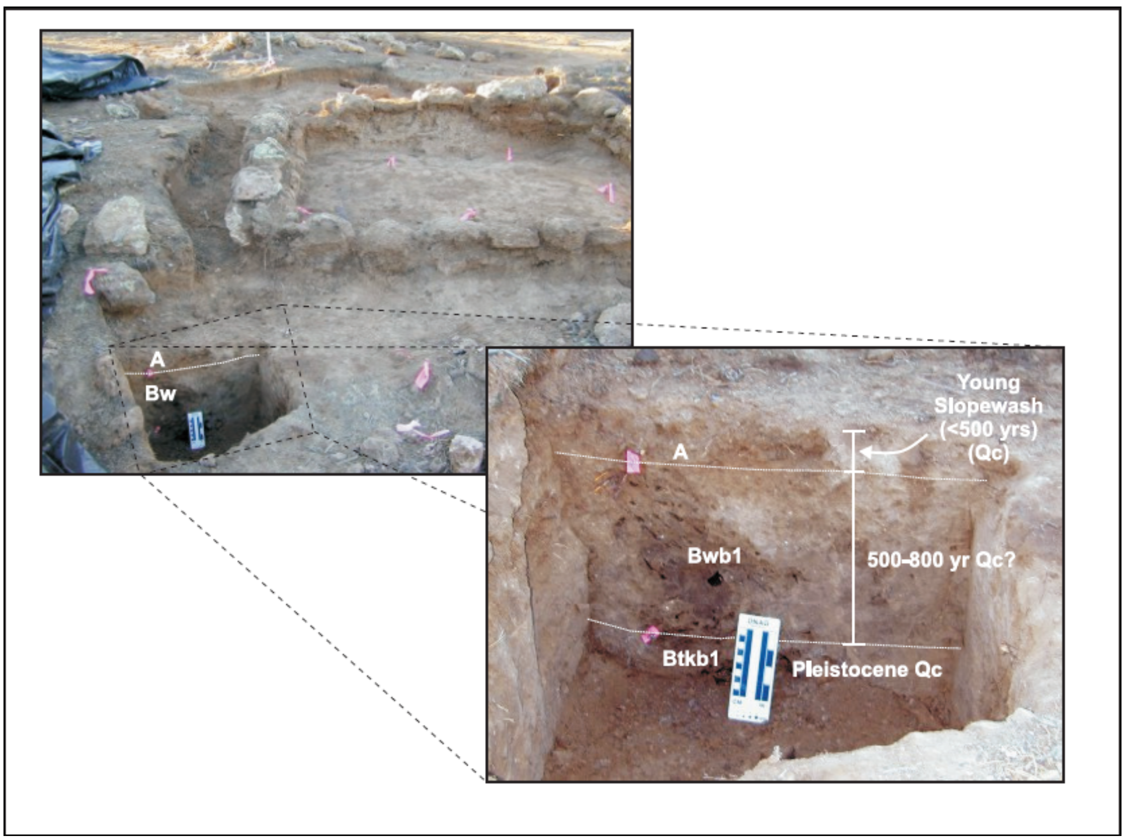


Figure 57.15. Photo of LA 128805 showing soil profile adjacent to the fieldhouse.

Geomorphic Summary of White Rock Tract

Hillslopes in the White Rock Tract are underlain by a sequence of truncated Pleistocene and Holocene soils that are inferred to represent colluvial deposition and soil formation followed by erosion in the mid-Pleistocene (buried soil "b3"), the late Pleistocene (buried soil "b2"), and the middle to late Holocene (buried soil "b1") (see Figures 57.4 and 57.6). The presence of middle to late Holocene deposits in several areas of the White Rock Tract indicates that there is potential for the preservation of buried Archaic sites.

An examination of colluvial stratigraphy at sites throughout the parcel indicates that there have been two episodes of relatively widespread colluvial deposition in the area since the middle Holocene. An episode or several episodes of colluvial deposition occurred during the middle to late Holocene (Archaic time), likely around 2 to 5 ka (e.g., buried soil b1, see Figure 57.6), and a second period of colluvial deposition occurred within the past 800 years, likely contemporaneous with and/or post-dating Puebloan occupation (A-Bw surficial soil profiles, see Figures 57.4 and 57.6). Many sites also exhibit a thin (typically less than 10 cm thick), very young colluvial layer, likely deposited within the past 100 years. In addition, a less extensive middle (?) Holocene colluvial deposit was locally preserved (e.g., SP6, see Figure 57.6). Areas of the White Rock Tract where middle to late Holocene colluvial deposits were preserved are mapped as Qc2 (see Figure 57.3). Areas of the White Rock Tract where middle to late Holocene colluvial deposits are not preserved are mapped as Qc1. Archaic sites are unlikely to be preserved in the Qc1 map unit area.

Two episodes of widespread Pleistocene colluvial deposition were recorded as buried soils b2 and b3 (see Figure 57.4). The b2 soil is overlain by El Cajete pumice (Figure 57.4, SP15 and SP17) and is therefore older than 50 to 60 ka. The b3 soil is discontinuously preserved, often as remnant stripped soils in bedrock depressions. The b3 soil exhibits 5YR color and moderately thick clay films and, based on comparison with previous soils investigations on the Pajarito Plateau, has an estimated age of at least 100 to 200 ka (McFadden et al. 1996). Evidence for the polygenetic nature of Pleistocene soils in the White Rock Tract is shown by several profiles where peds in Btk horizons exhibit translocated clay in ped interiors but are coated with carbonate.

Although a depositional record is recorded on many colluvial slopes, other slopes have experienced recent erosion. As a result of active transport and deposition on colluvial slopes, artifact scatters on colluvial slopes are typically part of the colluvial deposit and are not in archaeological context.

Mesa top locations in the White Rock Tract are characterized by Bandelier Tuff bedrock overlain by thin, discontinuous remnant Pleistocene soils and recent eolian or reworked eolian deposits typically less than 20 to 30 cm thick (see Figures 57.6 and 57.7). Similar thin, discontinuous deposits not greater than 20 to 30 cm thick were noted during archaeological excavations on the Mesita del Buey mesa top approximately 1 km west of LA 12587 (Steen 1982). Before the Coalition period, mesa top surfaces were characterized by stripped surfaces with remnant eroded

Pleistocene (b3) soils and exposed bedrock. Although erosion and some colluvial transport has occurred across mesa top surfaces, roomblocks and associated artifacts are in relatively good archaeological context. Roomblocks were an effective trap for eolian sediment, and the eroding walls were a local source of coarse colluvium after site abandonment. Two eolian events are recorded in the vicinity of the mesa top sites. At LA 12587, the older Coalition period roomblocks are buried by eolian deposits with Bw horizon development, whereas Classic period rock alignments are constructed on top of the Bw horizon (see Figure 57.7). Classic period features are partially buried by a younger eolian deposit. The earlier eolian event likely occurred during the Late Coalition period (AD 1250 to 1325), and the latter eolian event could date to the latest Coalition period, the Classic period, and/or the Historic period.

Sites investigated within the White Rock Tract include a multi-component ancestral Puebloan roomblock site situated on a small isolated Bandelier Tuff mesa (LA 12587), fieldhouse sites, lithic scatters, a grid garden site, and a check dam. The mesa top roomblock site is buried by eolian deposits and is in good archaeological context. As a result of active transport and deposition on colluvial slopes, artifact scatters on unit Qc are typically part of the colluvial deposit (e.g., LA 127625, LA 86637, and LA 12587) and are not in archaeological context. LA 128805, LA 127631, LA 86637, and LA 128803 are also located on colluvial slopes. LA 128805 and LA 86637 are fieldhouses situated on eroded hillslopes that do not preserve a geomorphic record that would allow correlation with other sites in the area. Soil-stratigraphic relationships observed at LA 128803 indicate that the rock alignments there were acting to retain surface runoff and fine-grained slopewash and are consistent with the rock alignments functioning as a grid garden. Soils at LA 128803 are very weakly developed and are consistent with interpretation of LA 128803 as a Classic period feature. Soil and stratigraphic context indicates that the LA 127631 construction corresponds approximately to the time of construction of Roomblock 3 at LA 12587. The check dam at LA 128804 is likely less than 100 years old.

AIRPORT TRACT (A-3, A-7, A-5-1)

Surficial Geologic Units

The Airport land transfer tract includes a gently east-sloping mesa between a tributary to Pueblo Canyon on the north and DP Canyon, a tributary to Los Alamos Canyon, on the south (see Figure 3.2, Volume 1). Bedrock beneath the mesa consists of the Tshirege Member of the Bandelier Tuff (unit Qbt). Here, Bandelier Tuff is designated as Qbt, undifferentiated. At the Airport site location, the Bandelier Tuff has been mapped as unit Qbt-3 by Goff (1995). The mesa is capped by colluvium that thins to exposed bedrock near the mesa edge (Figure 57.16), overlain by fine-grained soils that likely constitute either eolian sediments or locally reworked eolian sediments. Recent (Holocene) soils and sediments unconformably overly thin Pleistocene soils. Eolian deposits located in the approximate center of the mesa top include latest Holocene and middle or early Holocene deposits overlying Pleistocene soils and bedrock (map unit Qc2), whereas deposits near the edge of the mesa top consist of latest Holocene deposits overlying Pleistocene soils and bedrock (map unit Qc1) (Figure 57.16). A tributary drainage to Pueblo Canyon that heads in the tract is shallowly incised, to a depth of up to 20 m below the mesa top. The tributary drainage contains a narrow strip of young (historic in age) alluvium consisting of gravelly medium to coarse sand. Geologic maps of this area have been prepared by Griggs (1964), Smith et al. (1970), Goff (1995), and Rogers (1995).

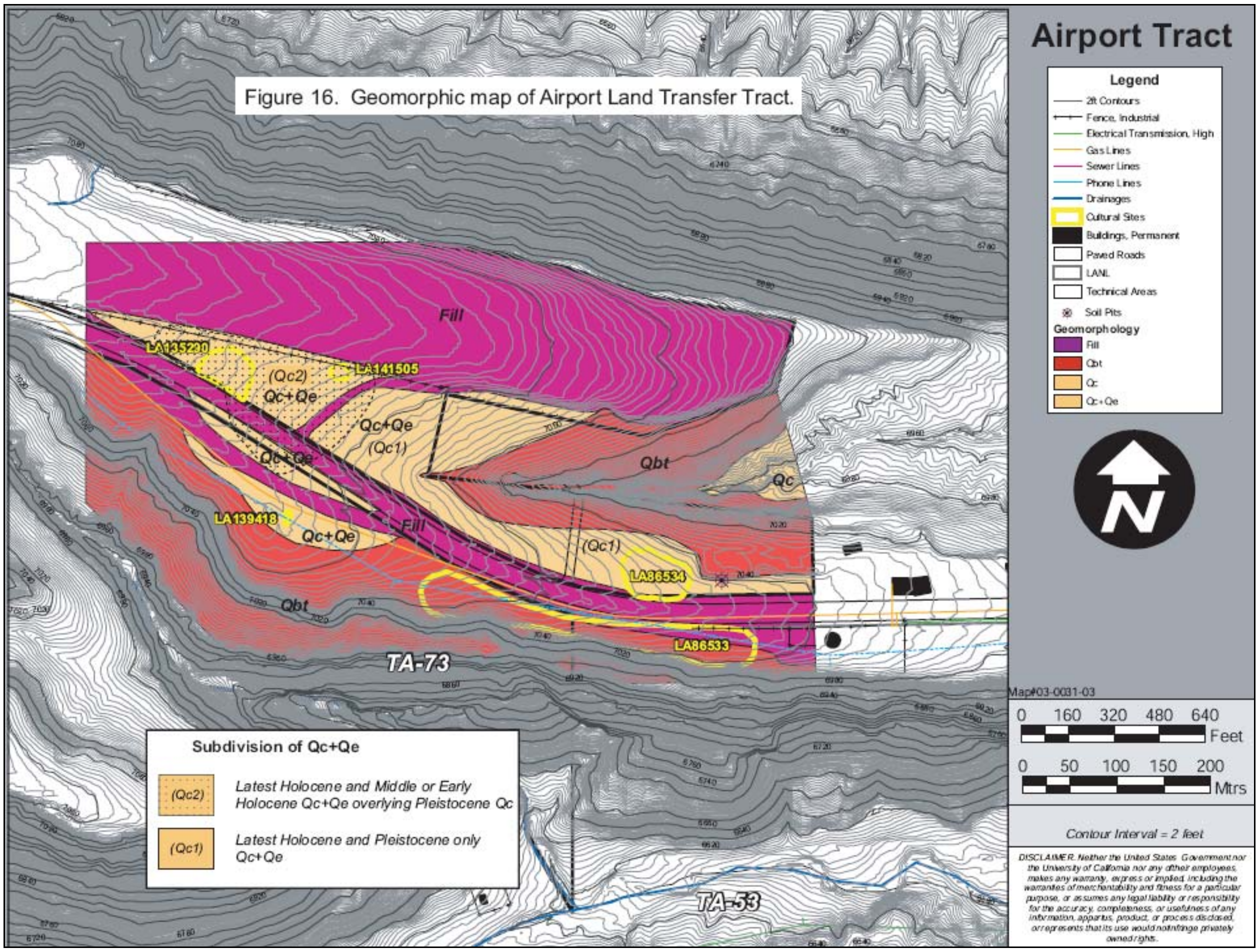


Figure 57.16. Geomorphic map of Airport Tract.

Soils were described at four archaeological sites within the Airport Tract. Soils were also described in a ca. 4.5 cal ka valley fill deposit overlying a ca. 8.8 cal ka deposit in "EG&G gully" east of the Airport Tract sites (Figure 3.2, Volume 1). These ages are based on three radiocarbon dates from charcoal collected from an upper and a lower soil at the site (see Figure 57.2; Longmire et al. 1996). The age of the upper soil, with an A-Bw1b1-Bw2b1-BCb1 profile, is constrained by one sample that yielded an age of 4020±80 BP (Beta-55626) and a date of cal 4543 BP with a two-sigma date range of cal 4297 to 4824 BP (Table M.1; calibrated ages for all samples discussed in this report from CALIB 5.01, Stuiver et al. 2005). The age of the lower soil, with a Bwb2-Bkb2 profile and Stage I carbonate horizon (see Figure 57.2), is constrained by two samples statistically the same at the 95 percent confidence level (Beta-55622 and Beta-59677) that were combined to yield an age of 7949±72 BP and a date of cal 8810 BP with a two-sigma date range of cal 8607 to 8997 BP (Table M.1).

LA 86533 (Coalition Lithic and Ceramic Scatter)

LA 86533 is a probable Coalition period site consisting of a dispersed lithic and ceramic scatter. LA 86533 is situated near the mesa edge on top of shallow soils in a highly eroded area with exposed bedrock (see Figure 57.16). Sparse artifacts are part of a thin colluvial cover overlying Bandelier Tuff bedrock. The archaeological context at the site is poor, and the lithics appear to represent a lag deposit.

LA 86534 (Middle Coalition Period Roomblock)

Site Geomorphology and Stratigraphy

LA 86534 is an Ancestral Puebloan roomblock that dates to the Middle Coalition period. The site is underlain by a thin (15- to 20-cm-thick) Pleistocene Bt horizon inferred to be 100 to 200 ka or older, based on correlation with soils described by McFadden et al. (1996). The Bt horizon is a reddened (5YR) silty to sandy clay that is a potential clay source, and is correlated with remnant Btb3 soils described at other Airport Tract sites. Roomblocks were apparently built on top of the Bt horizon. Close to the roomblock, the Bt horizon is overlain by Bw horizons formed in colluvium derived in part from the roomblock. Outside of the rubble mound surrounding the roomblock, the Bt horizon is overlain by a 20- to 25-cm eolian deposit that apparently post-dates the Puebloan occupation. The Bt horizon appears to be the lower part of an originally thicker Pleistocene soil that has been partially stripped by erosion. The presence of only a thin Pleistocene soil underlying young eolian deposits in the vicinity of LA 86534 suggests that erosional processes predominated in this area before the Coalition period.

Approximately 3 m northeast of the roomblock, two episodes of mixed colluvial and eolian deposition are recorded in soil profile 86534-2 (Table L.4). A 5-cm-thick AC horizon that is inferred to be less than 200 years old overlies a 27-cm-thick buried soil (Bw1b1-Bw2b1) formed in sediments derived in part from erosion of the roomblock. The Bw1b1-Bw2b1 soil is therefore less than 750 to 850 years old and overlies the Pleistocene Bt horizon. The Bw2-Bw1 horizon sequence is developed in a colluvial deposit derived from erosion of the roomblock, with fines representing likely eolian deposition. The greater abundance of tuff clasts (60% to 70% gravel) in the lower (Bw2b1) horizon is indicative of sediment derived primarily from the roomblock, whereas a decrease in gravel content to 10 percent in the Bw1b2 horizon suggests eolian deposition in the rough surface created by wall remnants and the rubble mound surrounding the ruin.

Scattered tuff blocks were observed on the surface to the west and north of the roomblock. These tuff blocks were originally thought to represent the location of a structure. However, the tuff blocks occur within or on top of an A horizon that overlies fine-grained deposit dominated by silt and very fine sand with little soil development (Bw horizon, location 86534-1, approximately 8 m west and 3 m north of the roomblock). This deposit, extending to a depth of 25 cm, apparently post-dates Puebloan occupation here. The presence of tuff blocks overlying a fine-grained, post-occupational soil lacking colluvium derived from the roomblock indicates that the surficial tuff blocks are not in place. These blocks may have been moved during highway construction. Beneath the post-occupational deposit is the reddish, clay-rich Pleistocene Btb3 soil horizon that directly overlies tuff bedrock. The contact between the two soil horizons is abrupt and probably records stripping of part of the older soil followed by fairly recent burial of the horizon by eolian sediments.

The mesa top soil described outside of the roomblock rubble mound (86534-3) comprises a non-gravelly AC horizon overlying an eroded Bt horizon (Table L.4). The AC horizon consists of well-sorted fine sand and extends to a depth of 21 cm. This horizon likely represents eolian deposition, possibly mixed with fine-grained colluvium. Based on the relative absence of soil structure, the AC horizon is inferred to post-date site occupation. The 21-cm-thick AC horizon and eolian deposit at 86534-3 is roughly correlated to the 25-cm-thick A-Bw profile and eolian deposit at 86534-1 and is similar to the thickness of other post-Coalition period eolian deposits throughout the Airport Tract (Figure 57.17). Based on soil-stratigraphic relationships observed at other Airport Tract sites (discussed below) and at the White Rock Tract mesa top site LA 12587, most of the eolian deposition likely occurred soon after abandonment of the LA 86534 roomblock or during the Late Coalition period (AD 1250 to 1325).

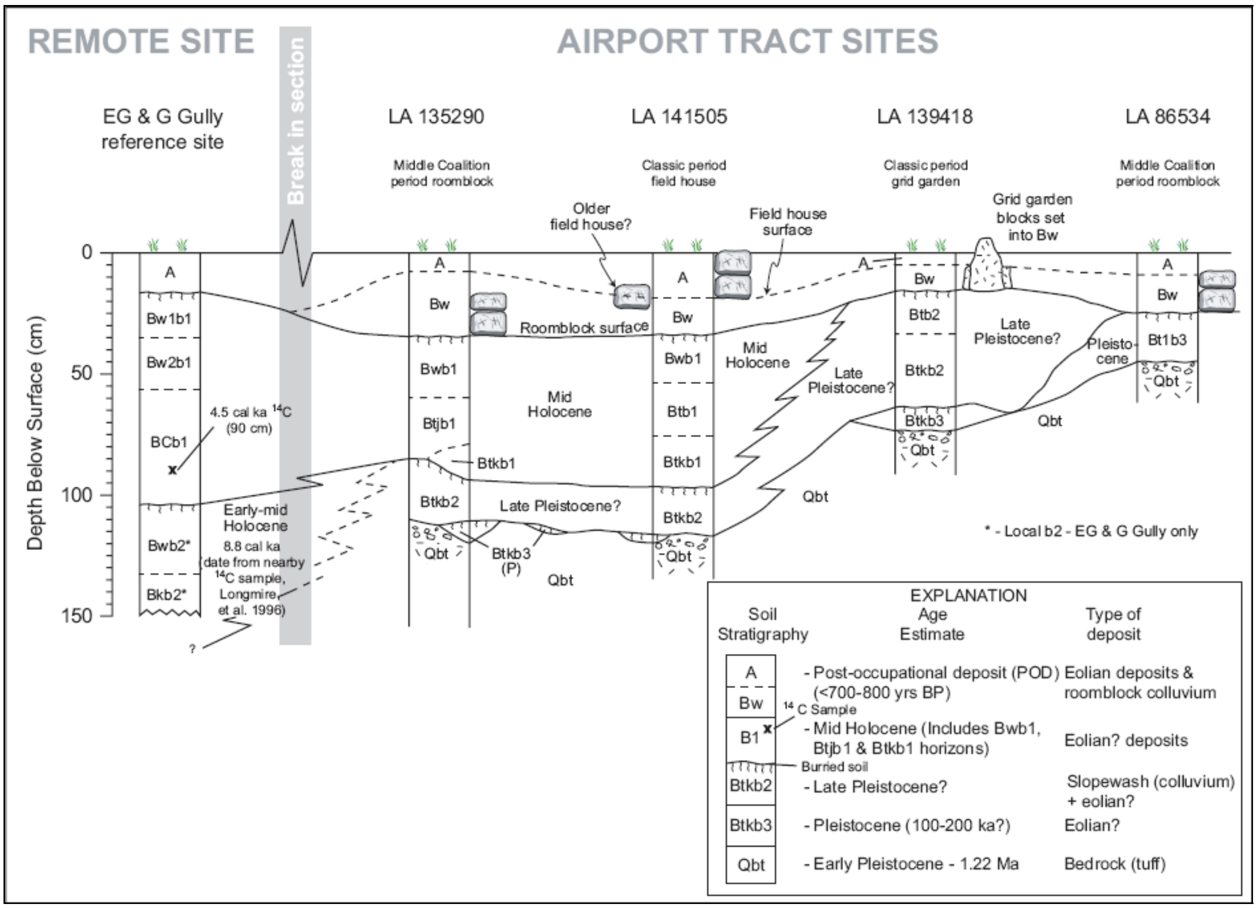


Figure 57.17. Stratigraphic correlation of the Airport Tract sites.

LA 135290 (Middle Coalition Period Roomblock)

LA 135290 is an Ancestral Puebloan roomblock on the mesa top that dates to the Middle Coalition period. The site is underlain by a sequence of stacked Holocene and Pleistocene soils (Figure 57.18; Table L.4). The older (b2 and b3) soils of inferred Pleistocene age are present as remnant soils that were eroded and subsequently buried by swale fill and/or eolian deposits (Figure 57.18). Thickness of buried Pleistocene deposits ranges from 0 to approximately 35 cm (see Figure 57.3; Table L.4). The inferred mid-Holocene (b1) soil formed in fine-grained silty deposits of likely eolian origin (Table L.4). An increase in gravel percentage from less than 2 percent in the overlying b1 soil to approximately 5 percent in the underlying b2 soil is suggestive of a stone line or erosion of the underlying bedrock by biological or slopewash processes during the late Pleistocene.

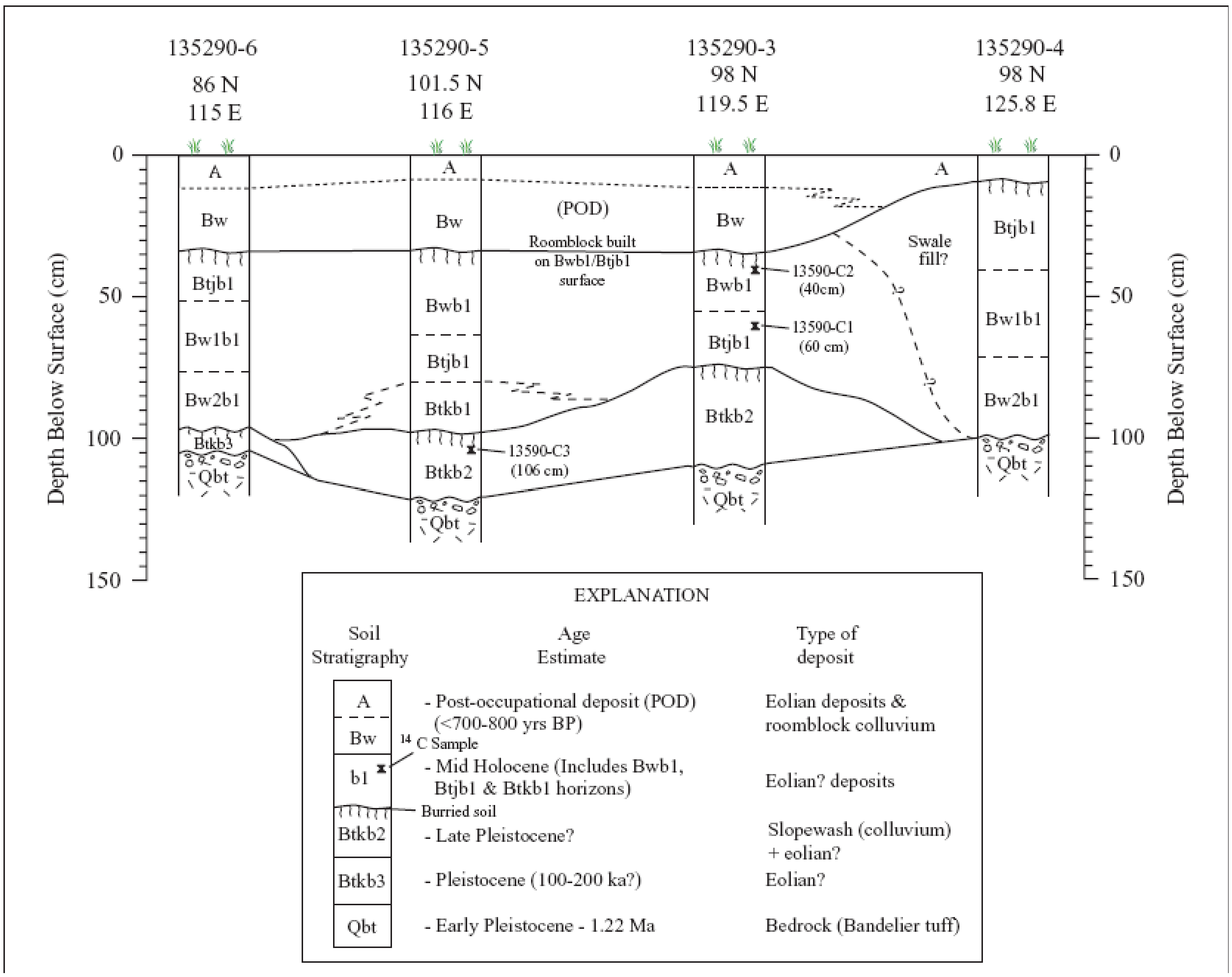


Figure 57.18. Correlation chart for LA 135290.

Burial of an undulating Bandelier Tuff surface and alternating periods of erosion and deposition have resulted in variable thicknesses of Pleistocene and Holocene sediments underlying the site (Figures 57.19 and 57.20). A buried swale trends west-northwest to east-southeast, east of the roomblock (Figure 57.20). Pleistocene soils are discontinuously preserved, indicating extensive erosion of the mesa top between the late Pleistocene and the mid-Holocene (Figures 57.18, 57.19, and 57.20). The 40- to 90-cm-thick mid-Holocene eolian deposit comprising the b1 soil was partially stripped (truncated) before occupation of LA 135290. Pleistocene and possibly Holocene soils are likely reworked and deposited as a swale fill sequence in the vicinity of profile 4 (Figure 57.18). The top of the mid-Holocene eolian deposit and the upper surface of Holocene swale fill deposits comprise the occupation surface for LA 135290. The mid-Holocene deposits are overlain by mixed colluvium derived from the roomblock and eolian deposits less than 700 to 800 years old, referred to herein as post-occupation deposits.

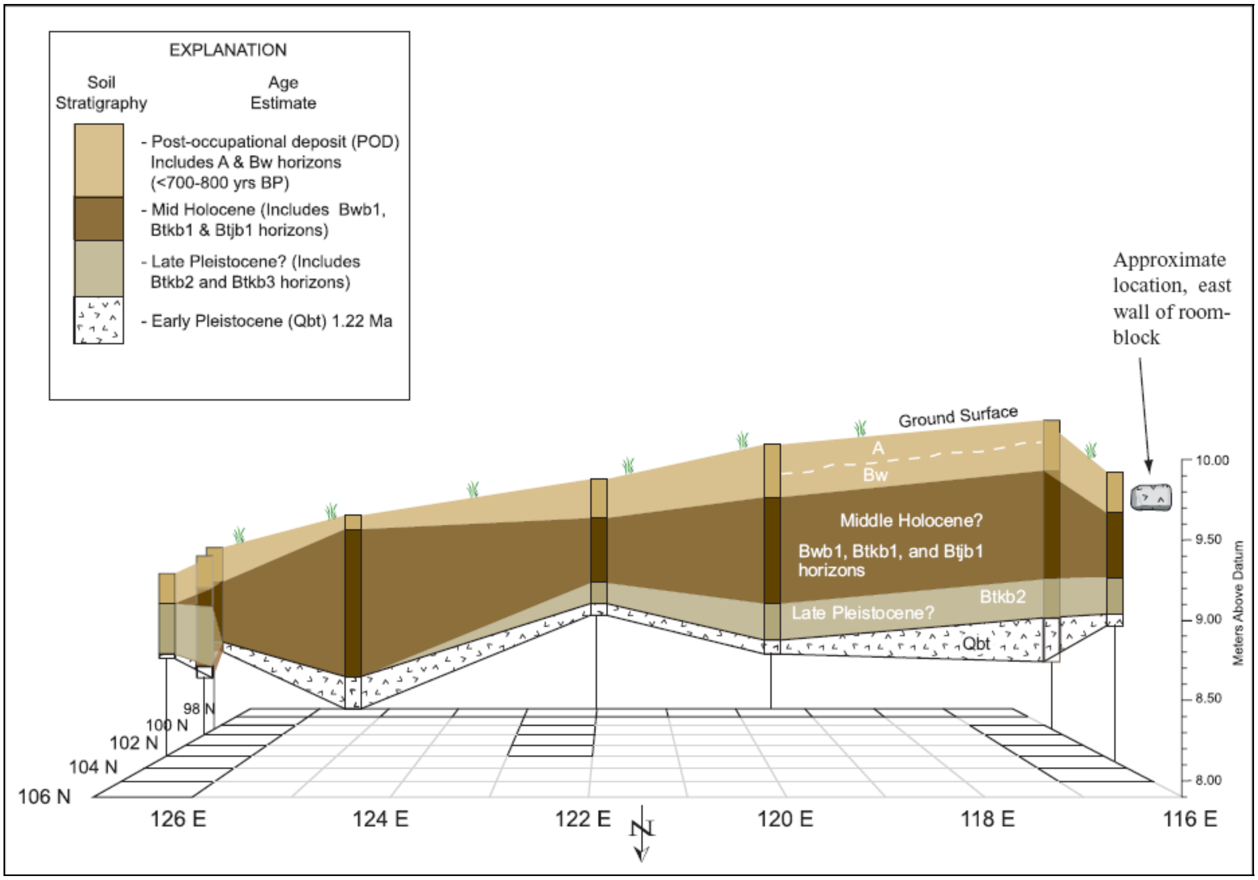


Figure 57.19. LA 135290 soil profile fence diagram east of roomblock (looking south).

Age estimates for soils underlying the roomblock are based on correlation with soils on the Pajarito Plateau for which age control is available. Although three charcoal samples were collected from soils underlying the occupation surface (Figure 57.18), due to their small sample size these samples have been unsuitable for analysis. Based on the estimated age of the roomblock, the A-Bw post-occupational deposit is less than 700 to 800 years old. The buried soil (b1) underlying post-occupational deposit includes Bw, incipiently developed Btj, and Btk horizons with Stage I carbonate (Figure 57.18; Table L.4, profiles 135290-3, 4, 5, and 6). The b1 soil has an inferred mid-Holocene age (4 to 6 ka BP), based on correlation with profile EG&G-1, described in "EG&G gully" east of the Airport Tract sites (Table L.4; Longmire et al. 1996). EG&G-1 has Bw1 and Bw2 horizons developed in a ca. 4.5 cal ka deposit and a Bk horizon with Stage I carbonate developed in an underlying 8.8 cal ka deposit (Figure 57.2, Table L.4). The mid-Holocene b1 soil is underlain at some locations by a Btkb2 soil of inferred late Pleistocene age, based on the age of the overlying soil and the additional time required to develop a Bt (argillic) horizon with 7.5YR color and common, moderately thick clay films. The Btkb2 soil exhibits clay films and color similar to the Rendija Canyon Qt4 soil that has an estimated age of 63±8 ka based on ^{21}Ne analyses and 68 to 78 ka based on soils (McDonald et al. 1996; Phillips et al. 1998; Reneau and McDonald 1996), and may correlate with the Pajarito Mesa pre-El Cajete (greater than 50 to 60 ka) unit 3b soil (Reneau et al. 1995). The underlying thin (0 to 8 cm thick) Pleistocene Btkb3 horizon is inferred to be 100 to 200 ka or older, based on correlation with soils described by Reneau et al. (1995) and McFadden et al. (1996). The Btkb3 horizon is a reddened (5YR) silty clay, likely of eolian origin, which is a potential clay source for making ceramics.

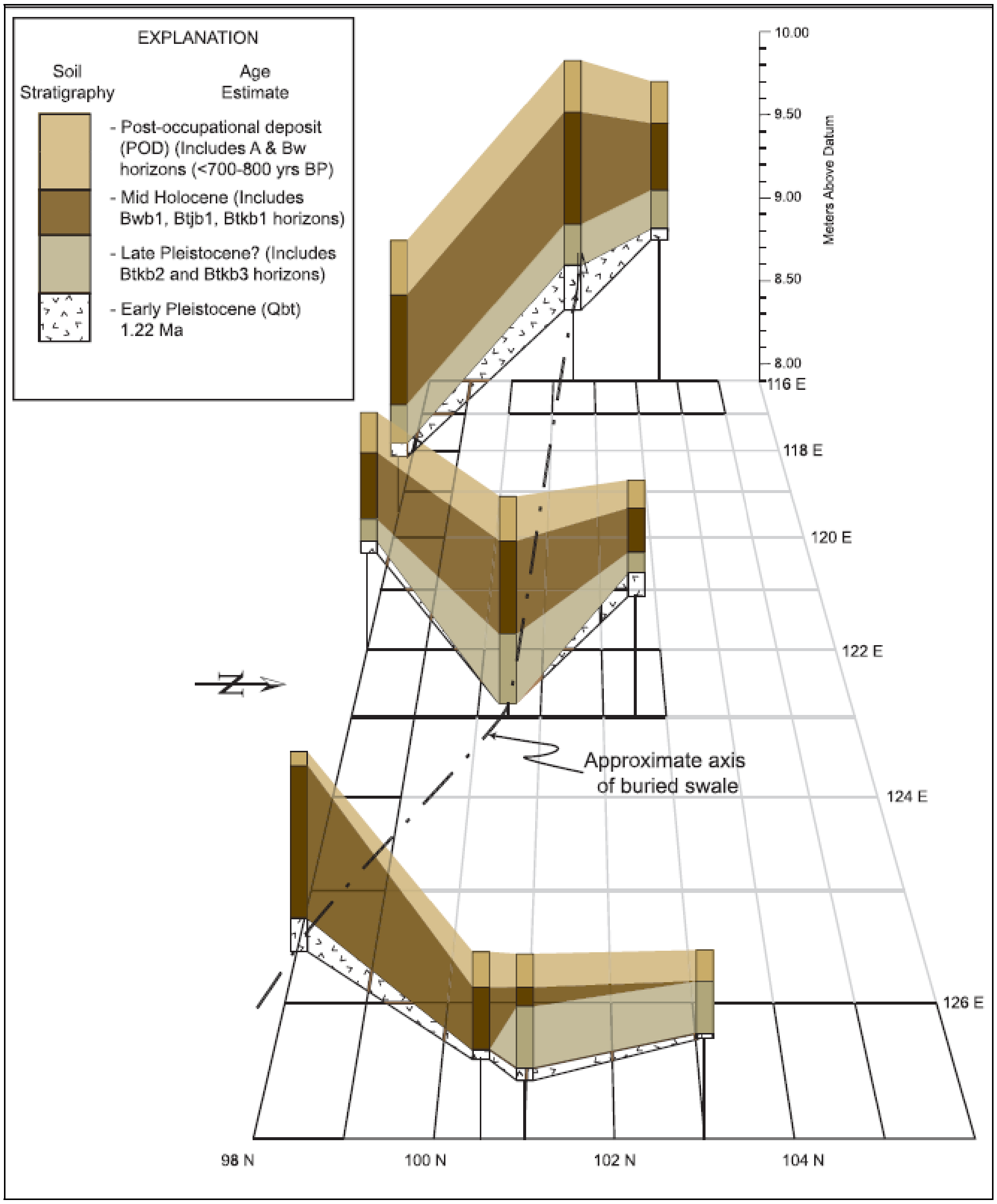


Figure 57.20. LA 135290 soil profile fence diagram east of roomblock (looking west).

Roomblocks were apparently built on top of the b1 soil (either on top of the Bwb1 or Btjb1 horizon) (Figure 57.18). Soils formed in and surrounding the roomblock (post-occupational deposit) typically exhibit A-Bw1-Bw2 profiles developed in silty eolian sediment mixed with roomblock-derived colluvium (Figure 57.21, Table L.4, profiles 135290-1 and 2). The A and Bw horizons include a variety of ceramic and lithic artifacts. Eolian or reworked eolian sediment is interpreted to largely comprise the A horizon that partially buries blocks of tuff derived from wall collapses. The different soil components are well-mixed, which indicates extensive bioturbation of the post-occupational soil by burrowing and other processes.

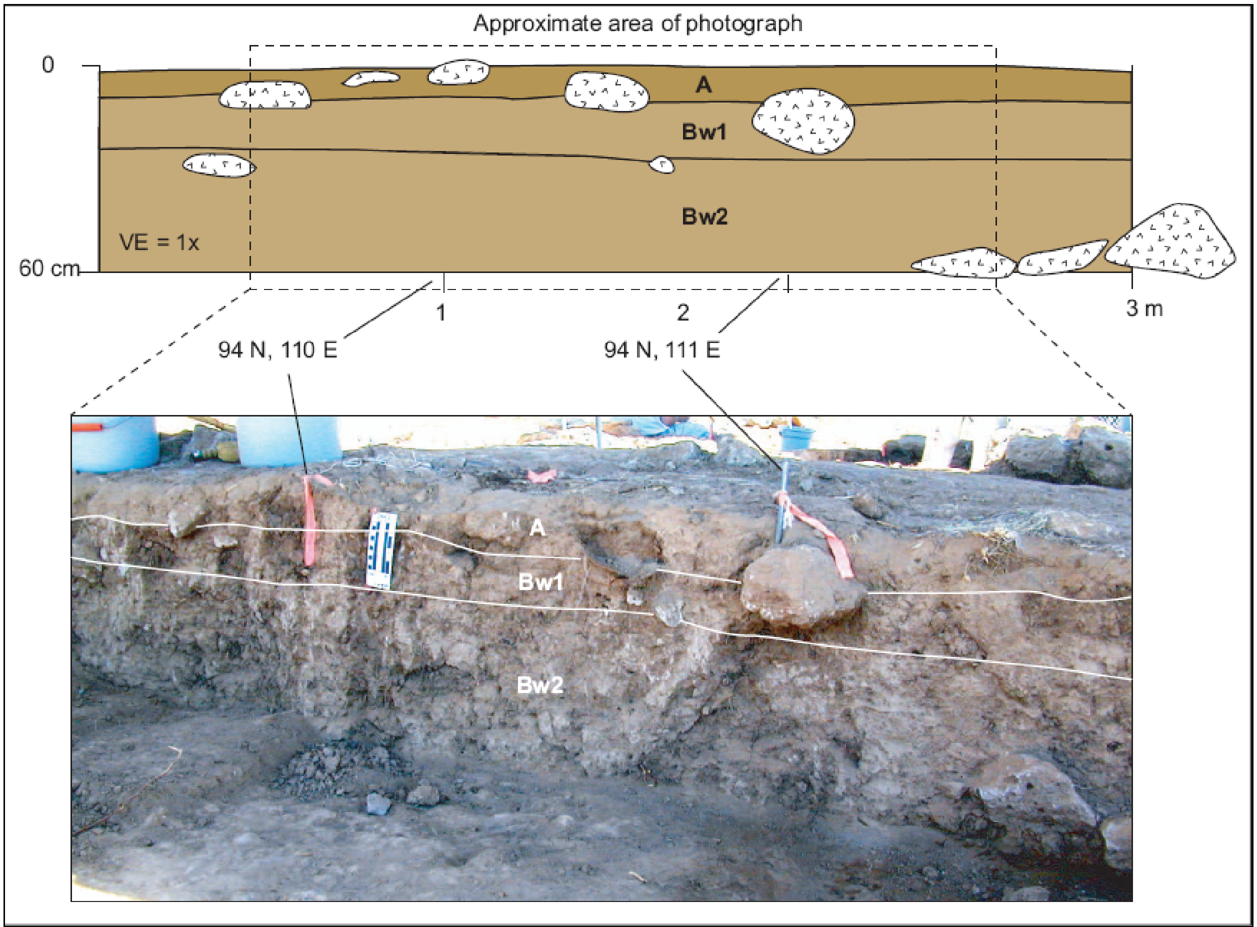


Figure 57.21. Photograph and sketch through the LA 135290 roomblock showing soil developed in the roomblock fill.

The presence of pockets of reddened (7.5YR) soil with minor gravel immediately underneath the roomblock floor (e.g., 135290-7, 135290-8, and 135290-9; Table L.4) suggests that the roomblock is underlain by imported fill at some locations. At locations 135290-7 and 135290-9, the 7.5YR soil immediately underneath the roomblock floor overlies a less reddened Bwb1 horizon, suggesting that an older, more reddened soil was used as fill material. The slight increase in gravel percentage in the Bw versus the Bwb1 horizon at 135290-7 suggests that some gravel was also utilized in the fill material, possibly picked up from the mesa edge, or that the soil used for the fill contained more gravel than the original soil at the site. The thickness of the fill below the roomblock floor in the three soil profiles where the fill material was observed ranges from 11 to 14 cm.

Total thickness of post-occupational deposits in the vicinity of the roomblocks ranges from 40 to 70 cm (Figure 57.22). The colluvial mound surrounding the roomblock (defined by the location of the 20-cm isopach) extends approximately 10 to 12 m east-southeast and approximately 4 m west and north of the roomblock (Figure 57.22), illustrating the transport of roomblock colluvium to the east-southeast by slopewash processes. Outside of the colluvial mound surrounding the roomblocks, post-occupational soil thickness ranges from 5 to 10 cm or more (Figure 57.22), to 16 cm on the south side of the mesa top near the LA 139418 grid garden (see profile 139418-4, Table L.4). Non-cultural sediments post-dating the Ancestral Puebloan sites within the Airport Tract appear to be primarily eolian in origin, are up to 20 cm thick, and likely represent at least two separate eolian depositional events (discussed below). The thicker post-occupational deposits inside the roomblocks than outside is probably due to a combination of enhanced eolian deposition in the roomblock, erosion of roomblock walls, and contributions to the soil from adobe at the site.

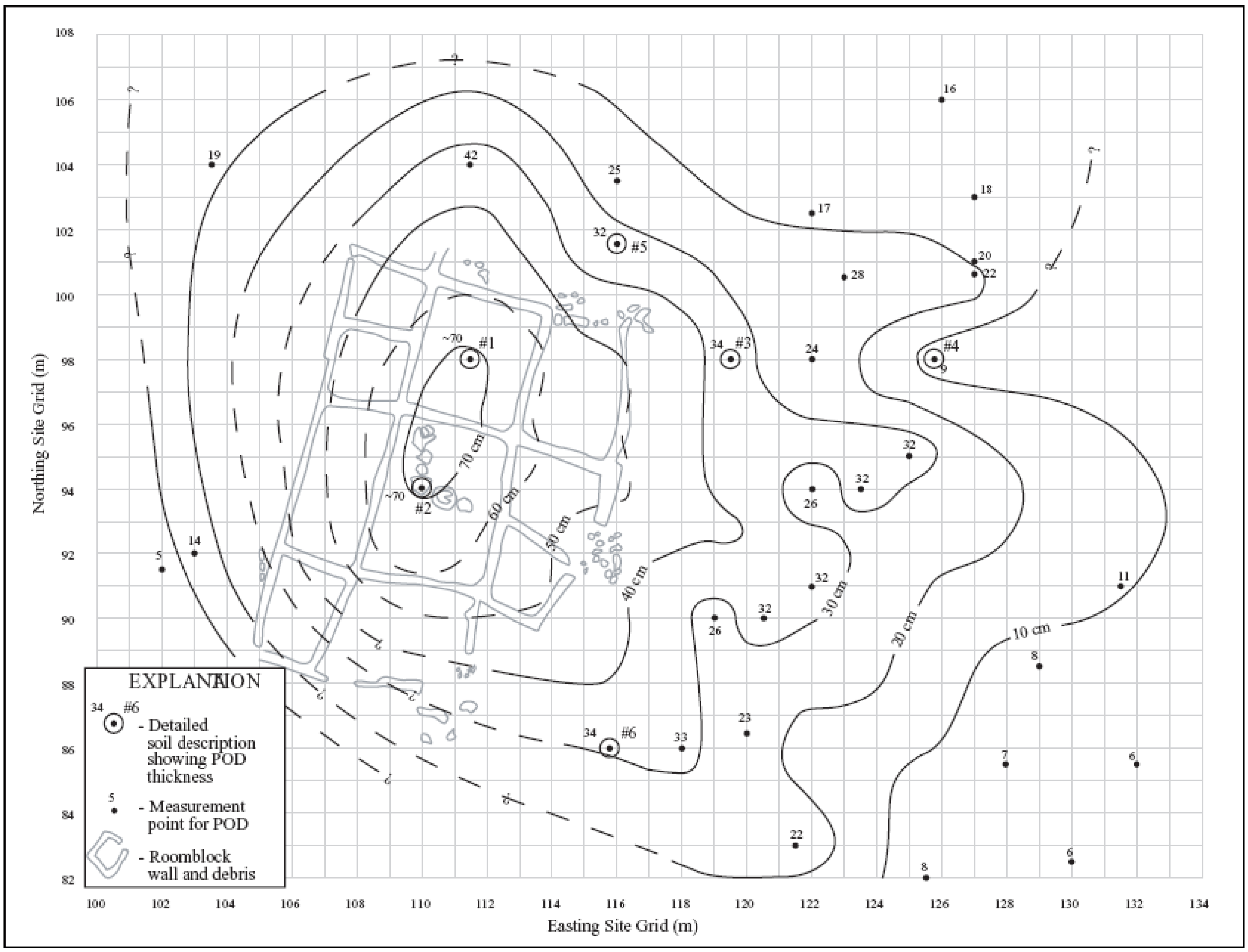


Figure 57.22. Isopach map showing thickness of post-occupation deposits at LA 135290.

LA 139418 (Grid Garden)

LA 139418 consists of a grid garden on the mesa top in an area of stripped Pleistocene soils overlain by thin, weakly developed soils inferred to be less than 600 to 700 years old (Figure 57.23). Depth to Bandelier Tuff bedrock, observed 15 m east of the grid garden, was less than 1 m. The grid garden is located on a gently southeast-sloping area of the mesa that affords minimal surface runoff to the site.

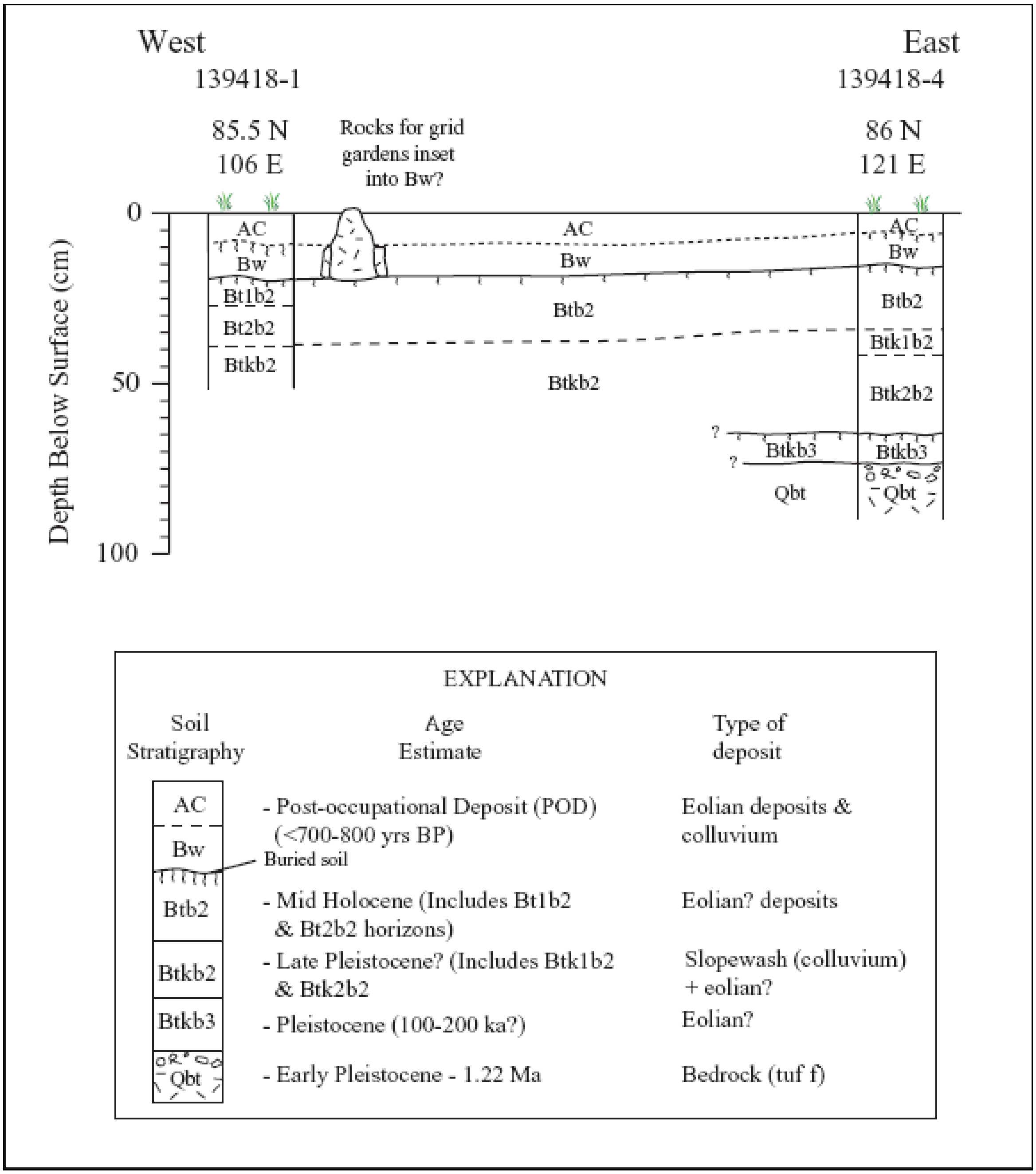


Figure 57.23. Schematic cross-section showing soil stratigraphy at LA 139418.

Two soil profiles (139418-1 and 2) were described within the rock alignments forming the grid garden, one profile (139418-3) was described just outside, slightly downslope, and one profile (139418-4) was described well outside of the rock alignments (Figure 57.24). Rocks forming the grid garden appear to have been set into the Bw horizon, with the smaller rocks that faced larger rocks set to the top of the Bw horizon (Figures 57.23 and 57.24). Soils described inside and outside of the grid garden have similar texture, color, structure, and consistence (Table L.4). AC horizons described inside the grid garden have a slightly greater thickness (1 to 3 cm) than do the AC horizons described outside the grid garden, suggesting that the rock alignments trapped some relatively minimal additional eolian silt, either acting as dust traps or by capturing some overland flow, relative to deposition outside the grid garden.

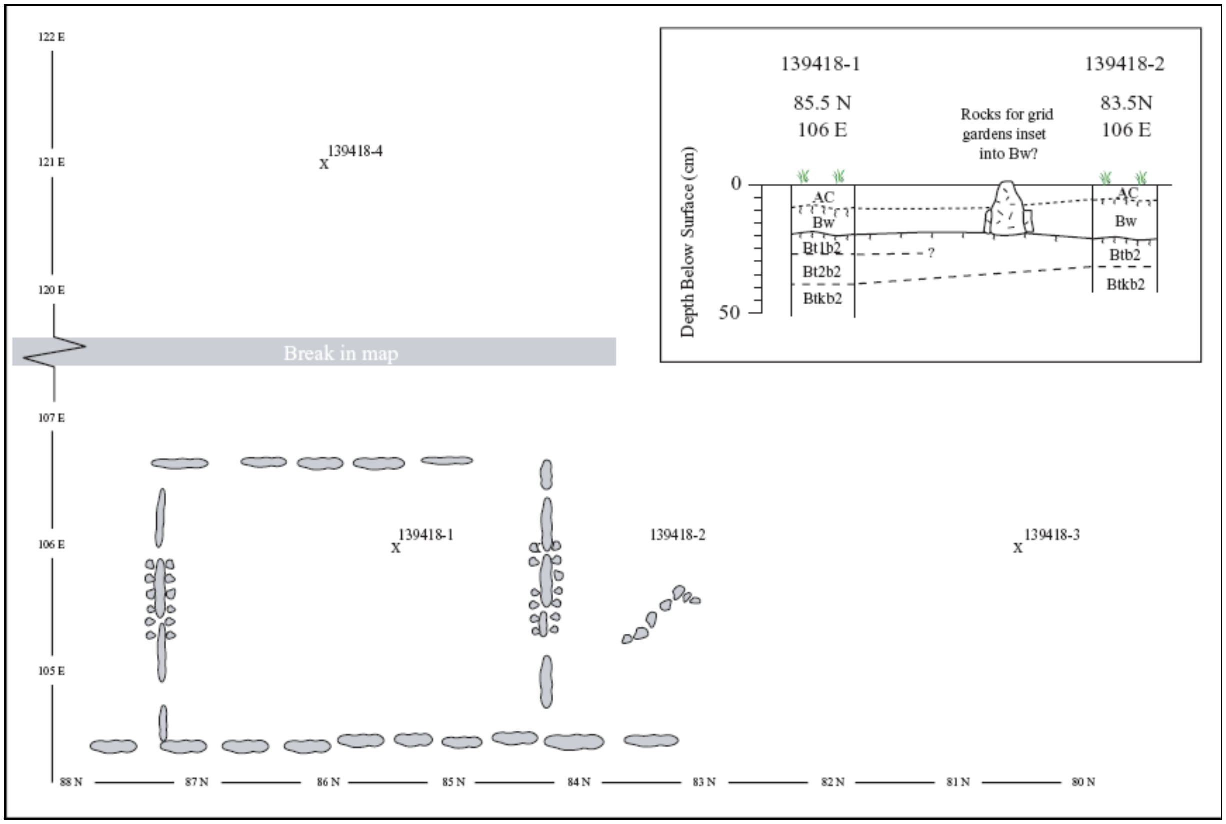


Figure 57.24. Grid garden schematic sketch map and cross-section from LA 139418.

Based on soil characteristics, the AC-Bw horizons at LA 139418 are interpreted to be correlative with post-occupational deposits at LA 135290. It is inferred from the site stratigraphy that approximately 10 cm of sediment was deposited after occupation of the LA 135290 roomblock but before construction of the LA 139418 grid garden. Based on stratigraphic relationships, LA 139418 is a more recent site than is LA 135290 (see Figure 57.17). Soils burying LA 139418 are very weakly developed, have developed only an AC horizon, and apparently lack development of Bw horizons observed in Coalition period soils. The soils and related stratigraphy are therefore consistent with interpretations that LA 139418 is a Classic period feature.

LA 141505 (Fieldhouse)

LA 141505 includes two partially overlapping fieldhouse structures (Rooms 1 and 2) and associated large tuff blocks grouped into Features 2, 3, 4, and 5 on the mesa top east of LA 135290 (Figure 57.25). Soils were described in two test pits at the site. Site stratigraphy is similar to that observed at LA 135290 and includes post-occupational deposits overlying a sequence of buried mid-Holocene and stripped late Pleistocene soils (Figures 57.17 and 57.26; Table L.4). Depth to Bandelier Tuff bedrock, observed below the west wall of the structure, is approximately 1.2 m (Figure 57.26).

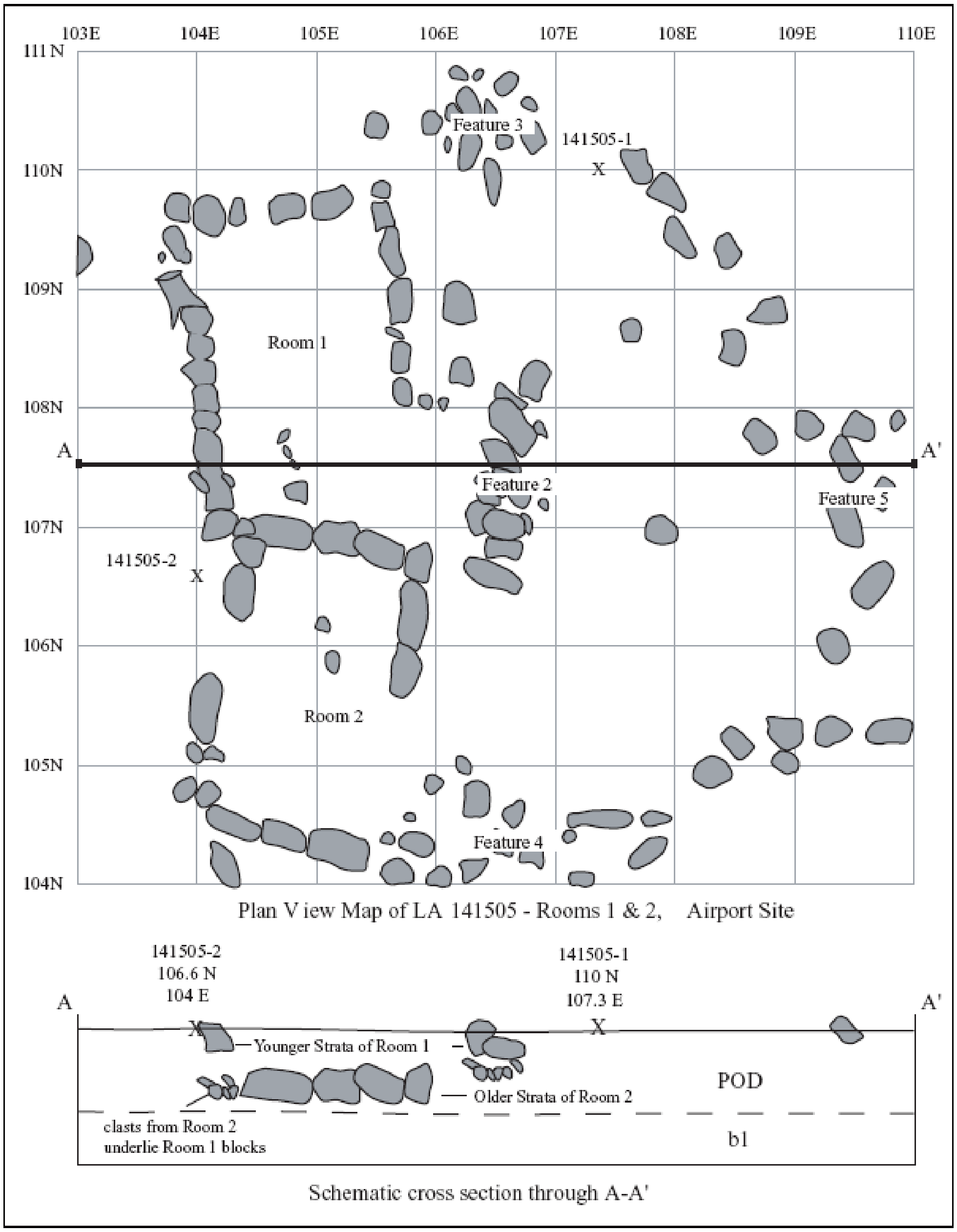


Figure 57.25. Schematic site map and cross-section of LA 141505.

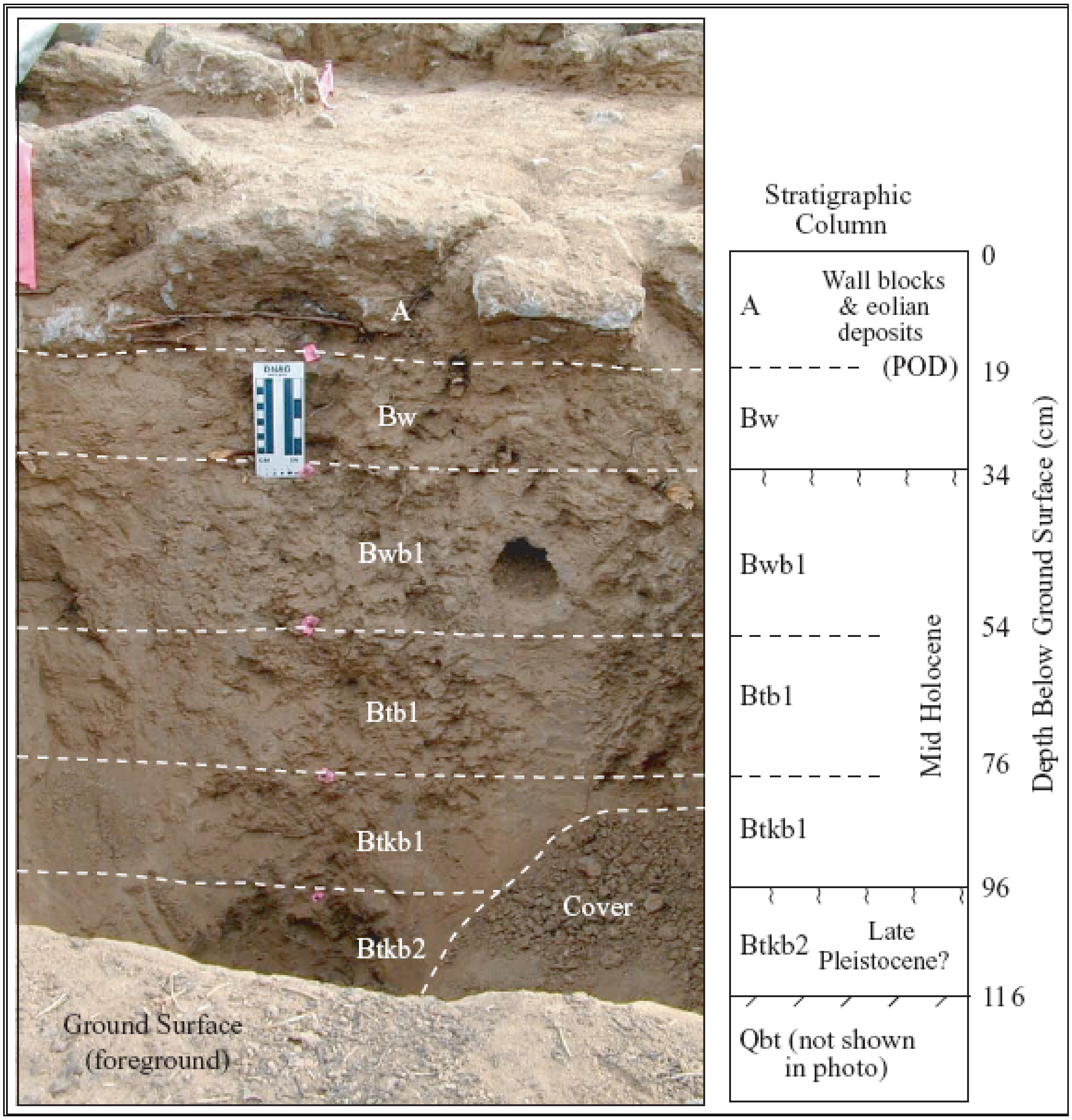


Figure 57.26. Site stratigraphy and wall blocks at LA 141505.

Blocks for the southeastern one-room structure (Room 2) are set into the Bw horizon, whereas blocks for the northwestern one-room structure (Room 1) are set on top of the Bw horizon. Tuff clasts inferred to be derived from Room 2 also lie underneath Room 1 (see Figure 57.25). The soil-stratigraphic relations therefore indicate that Room 2 is older than Room 1. Soil-stratigraphic relationships also indicate that Features 2 through 5 are associated with the later construction of Room 1. In addition, based on their stratigraphic position set into or on top of the Bw horizon, which is inferred to be correlated with post-occupational deposits, the LA 141505 fieldhouses are more recent features than the LA 135290 roomblock (see Figure 57.17). It is inferred from the soil stratigraphy that Room 1 is roughly correlated with the LA 139418 grid garden and that Room 2 may be slightly older than the grid garden. Thin, weakly developed soils burying features at LA 141505, including an A horizon at profile 141505-2 comprising 80 percent to 90 percent tuff blocks with minor eolian sediment, are consistent with a Classic period site.

Airport Tract Summary

A total of four Coalition to Classic period Ancestral Puebloan sites and one Late Archaic dispersed artifact scatter were investigated within the Airport Tract during the 2002 and 2003 field seasons. The sites are situated on a Bandelier Tuff mesa top north of Los Alamos Canyon. Results of the site investigations show that Airport Tract Ancestral Puebloan sites are partially buried, primarily by recent (less than 700- to 800-year-old) eolian deposits and are underlain by less than 1.5 m of Pleistocene and Holocene deposits overlying 1.22 Ma Bandelier Tuff bedrock (see Figure 57.17). The total thickness of Pleistocene deposits ranged from 0.2 to 0.6 m.

The Airport Tract sites are underlain by a sequence of truncated Pleistocene and Holocene soils that are inferred to represent deposition and soil formation followed by erosion in the mid-Pleistocene (buried soil “b3”), the late Pleistocene (buried soil “b2”), and the mid-Holocene (buried soil “b1”) (see Figure 57.17). It is inferred that the mid-Holocene b1 soil is correlated to the cal 4.5 ka b1 soil at EG&G gully. Locally, relatively thick gully fill deposits include an early Holocene stratigraphic record (e.g., the 4-m-thick early Holocene deposit at EG&G gully; see Longmire et al. 1996:49). The thickness of deposits is likely controlled by geomorphic position, with thicker deposits filling mesa top swales and shallow valleys (e.g., LA 135290 and EG&G gully) and stripped surfaces located near the mesa edges or mesa top (e.g., LA 86534 and LA 139418). The presence of mid-Holocene deposits underlying unit Qc2 in the west-central part of the Airport Tract indicates that there is potential for the preservation of buried Archaic sites in this area.

Stratigraphic relationships indicate that LA 141505 and LA 139418 are more recent than LA 135290 and LA 86534. LA 141505 and LA 139418 are constructed on top of the lower section (Bw horizon) of post-Coalition age deposits, which bury LA 135290 and LA 86534 (see Figure 57.17). Soils burying LA 141505 and LA 139418 are very weakly developed, exhibiting thin A or AC horizons but apparently lacking development of Bw horizons observed in Coalition period soils. It is therefore inferred that LA 139418 and LA 141505 are likely Classic period sites. In contrast, Coalition period sites LA 135290 and LA 86534 are built on mid-Holocene to Pleistocene soils, or directly on Bandelier Tuff, and are buried by a thicker soil with an A-Bw profile (Figure 57.17).

It is inferred that most of the recent eolian deposition observed at the Airport Tract sites occurred sometime after the Middle Coalition period but before the Classic period; e.g., during the Late Coalition period (ca. AD 1250 to 1325). This corresponds to "The Great Drought" of AD 1276–1299 and a locally drier period from AD 1250–1255, inferred from tree-ring data, and a major regional event associated with the abandonment of Mesa Verde (Rose et al. 1981). This is consistent with soil stratigraphic relationships observed at LA 12587 that are also indicative of eolian deposition that occurred during the Late Coalition period. Where it has not been eroded, the Late Coalition period eolian deposit is approximately 15 to 20 cm thick. A second, more recent eolian event, occurred after abandonment of the Early Classic (?) period sites, resulting in deposition of an additional 5 to 10 cm of fine-grained sediment across the mesa top since approximately AD 1500. Eolian deposits are thicker inside and next to roomblocks than elsewhere on the mesa, which is due to the greater trapping efficiency at these sites. Animal burrowing also seems to be more active in the abandoned roomblocks, which results in mixing of material at these sites.

Soil-Stratigraphic Correlations with Pajarito Mesa Deposits

Some soil-stratigraphic correlations may be made between surficial deposits on the Airport Tract mesa top and surficial deposits on Pajarito Mesa, located approximately 2.5 mi (4 km) to the southwest (see Figure 3.2, Volume 1). Surficial deposits on Pajarito Mesa were described in exploratory trenches totaling 1340 m in length as part of a paleoseismic hazards investigation (Kolbe et al. 1994; Reneau et al. 1995). Pajarito Mesa soils are formed in a mixture of Bandelier Tuff, post-Bandelier alluvium and pumice, and eolian fine sand and silt (Reneau et al. 1995). The 50-60 ka El Cajete pumice forms a marker bed within Pajarito Mesa soils that is absent in the Airport Tract soils (see Figures 57.17 and 57.27).

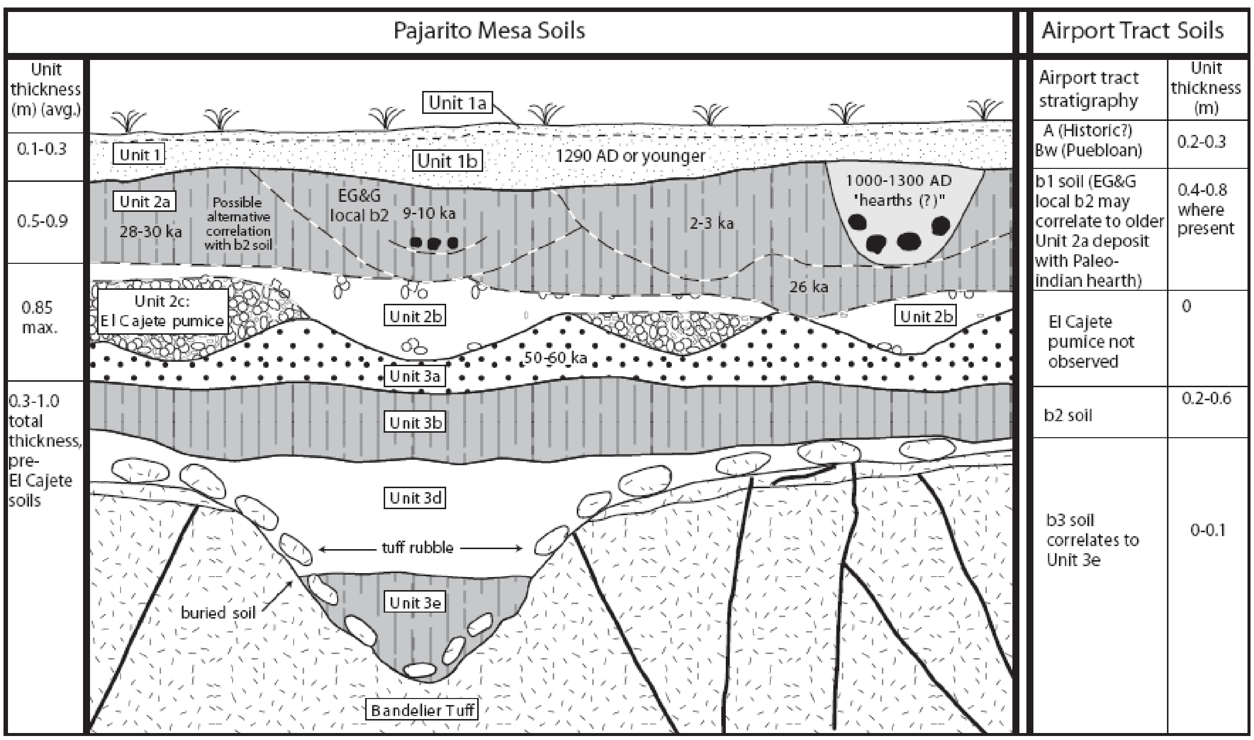


Figure 57.27. Correlation chart showing Pajarito Mesa and Airport Tract stratigraphy.

The Airport Tract late Pleistocene b2 soil is a relatively well-developed soil, although partially eroded, with 7.5YR hue, moderately thick clay films, and Stage I carbonate. The degree of soil development exhibited by the b2 soil, as shown by its color and clay content, is much greater than that observed in the overlying b1 soil and suggests a period of landscape stability and soil development before erosion of the b2 soil. The b1 soil is overlain by a less-than-750-year-old eolian deposit.

The relationships observed in the Airport Tract soils are similar to stratigraphy of Pajarito Mesa units 3b, 2a, and 1 (Reneau et al. 1995). Pajarito Mesa Unit 1 dates to AD 1290 or younger, has a thickness of 0.1 to 0.3 m (Reneau et al. 1995), and is inferred to correlate with the Airport Tract post-Middle Coalition period soils (see Figure 57.27). However, Pajarito Mesa Unit 2a is a composite of deposits dated at 2 to 3 ka, 9 to 10 ka, 26 ka, and 28 to 30 ka in different parts of the trenches (Figure 57.27).

The Airport Tract b1 soil is likely correlated with either the 2 to 3 ka Pajarito Mesa deposit, or is a mid-Holocene deposit not observed or not dated during the Pajarito Mesa investigation. The Airport Tract b2 soil may be correlated with pre-El Cajete Unit 3b, or could be correlated with a Unit 2a Pleistocene or early Holocene deposit. However, unit thickness and soil characteristics are consistent with the interpretation that Airport Tract b1 soil is correlated with a Pajarito Mesa Unit 2a Holocene deposit, and the Airport Tract b2 soil is correlated with Pajarito Mesa pre-El Cajete Unit 3b deposit (Figure 57.27). The early Holocene b2 deposit at EG&G gully may correlate with the Pajarito Mesa Unit 2a 9 to 10 ka deposit. Unit 3b/buried soil b2 and Unit 2a/buried soil b1 include significant components of silt, indicating a common genesis as eolian deposits. The Airport Tract b3 soil and Pajarito Mesa Unit 3e deposit are both characterized by well-developed stripped soils with 5YR to 7.5YR hue formed in part in Bandelier Tuff rubble and preserved in bedrock pockets in the undulating tuff surface and appear to be correlated with one another.

The stratigraphic correlations observed between Pajarito Mesa and the Airport Tract mesa top deposits is consistent with concurrent periods of eolian deposition and erosion in these parts of the Pajarito Plateau since eruption of the Bandelier Tuff. It is significant that the last 750 years have been characterized by net deposition on the crest of both mesas, resulting in the burial and preservation of Ancestral Puebloan and older sites. It is likely that many Pajarito Plateau mesa tops have experienced net deposition over the past 750 years. Previous surveys of Pajarito Plateau archaeological sites, while not explicitly noting net deposition, did note that erosion on the mesa surfaces has been negligible since "pre-Columbian" occupation and that sites are typically buried just below the "sod line" (Steen 1977).

The extensive trenching conducted for the Pajarito Mesa investigation exposed 10 buried cultural sites that had no surface expression (Figure 57.28), including seven Ancestral Puebloan sites (Kolbe et al. 1995; Reneau et al. 1995). Notably, three of the buried sites were inferred hearths that yielded calibrated radiocarbon ages of 8.8 to 9.5 ka (Figure 57.28) that correspond to the Paleoindian period (Vierra et al. 2002). The preservation of latest Holocene and latest Pleistocene/early Holocene eolian deposits on mesa top settings may result in the preservation of Ancestral Puebloan and Paleoindian sites, whereas less extensive preservation of mid-Holocene deposits results in less common preservation of Archaic sites.

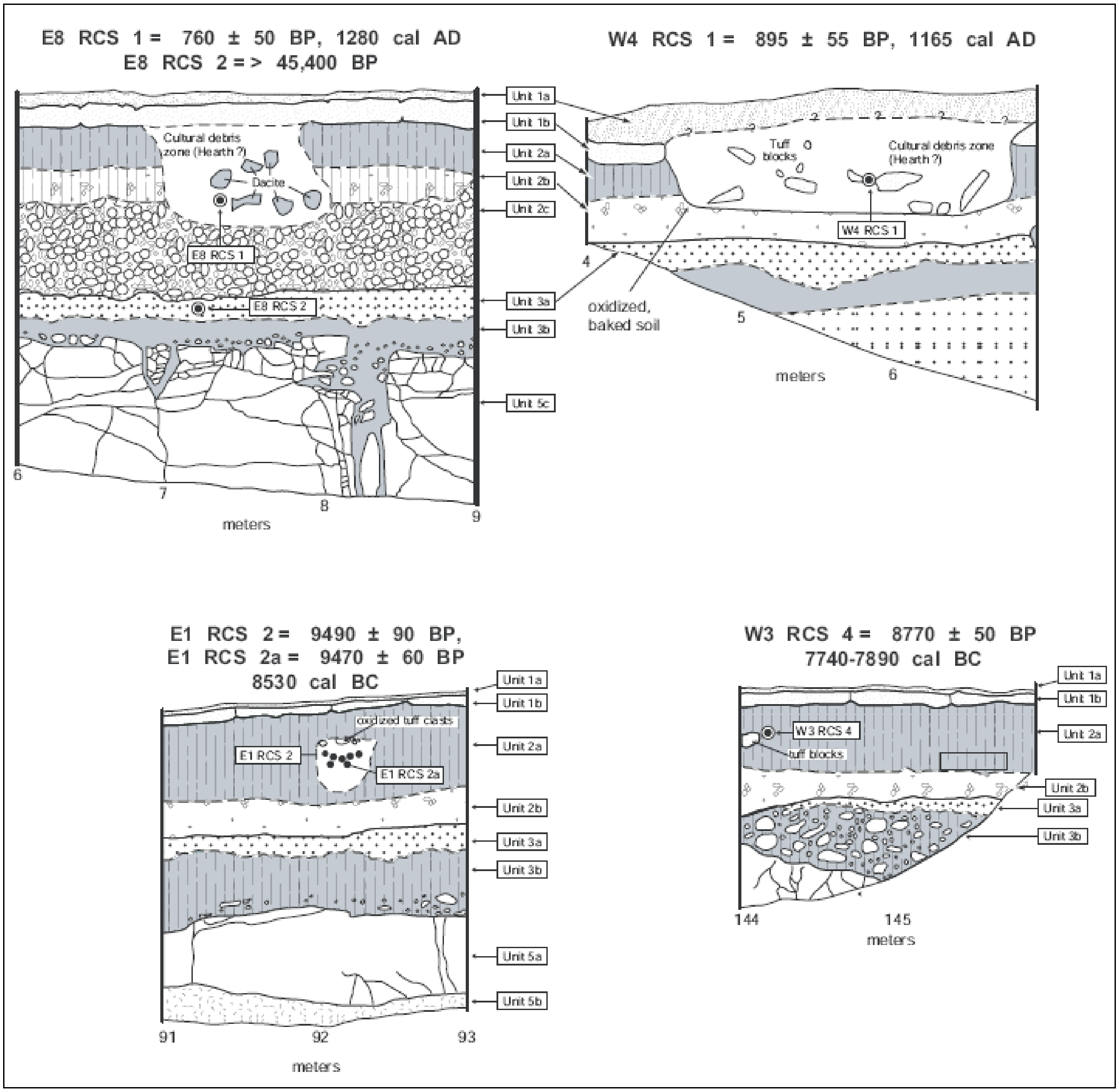


Figure 57.28. Sketches of four archaeological sites exposed in Pajarito Mesa trenches (from Kolbe et al. 1995; Reneau et al. 1995).

RENDIJA TRACT (A-14)

Surficial Geologic Unit

The Rendija Tract is located within the Rendija Canyon watershed and includes part of the active stream channel and adjacent floodplains, tributary drainages, fluvial terraces, colluvial slopes, ridge crests, and mesitas (Figures 57.29 and 57.30).

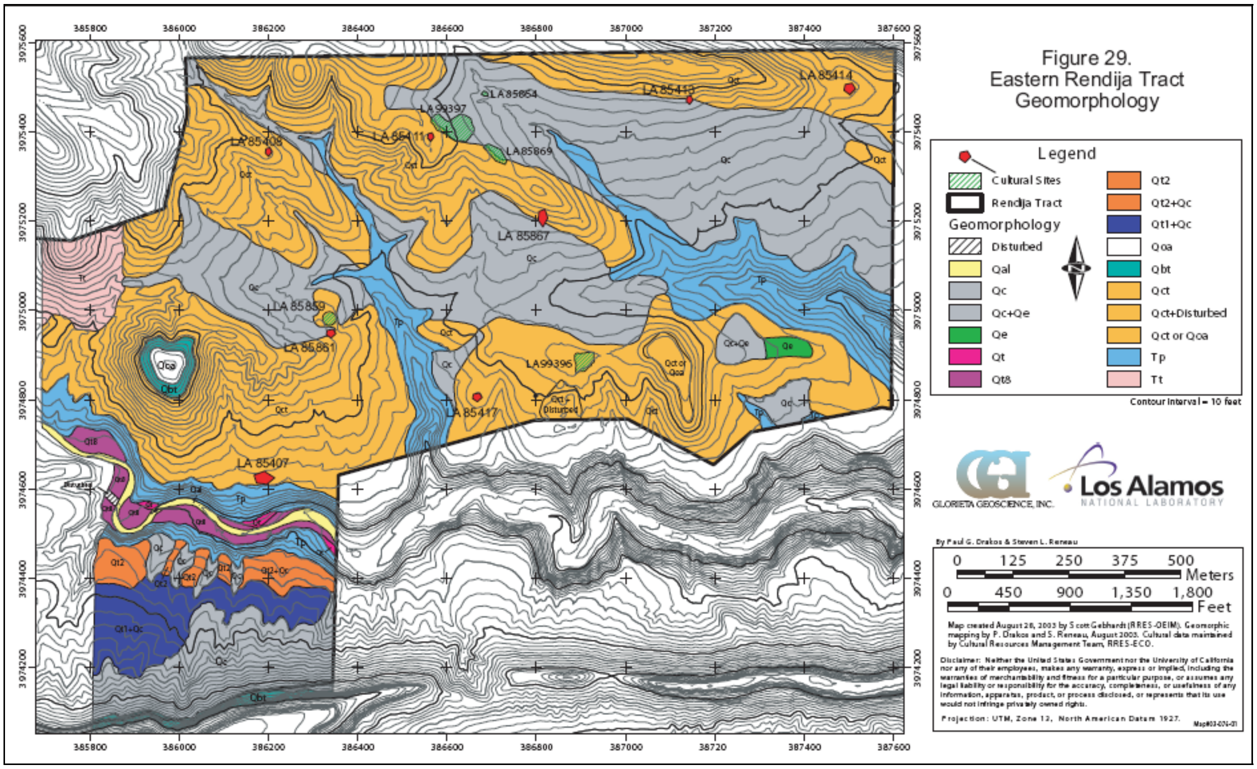


Figure 57.29. Eastern Rendija Tract geomorphology.

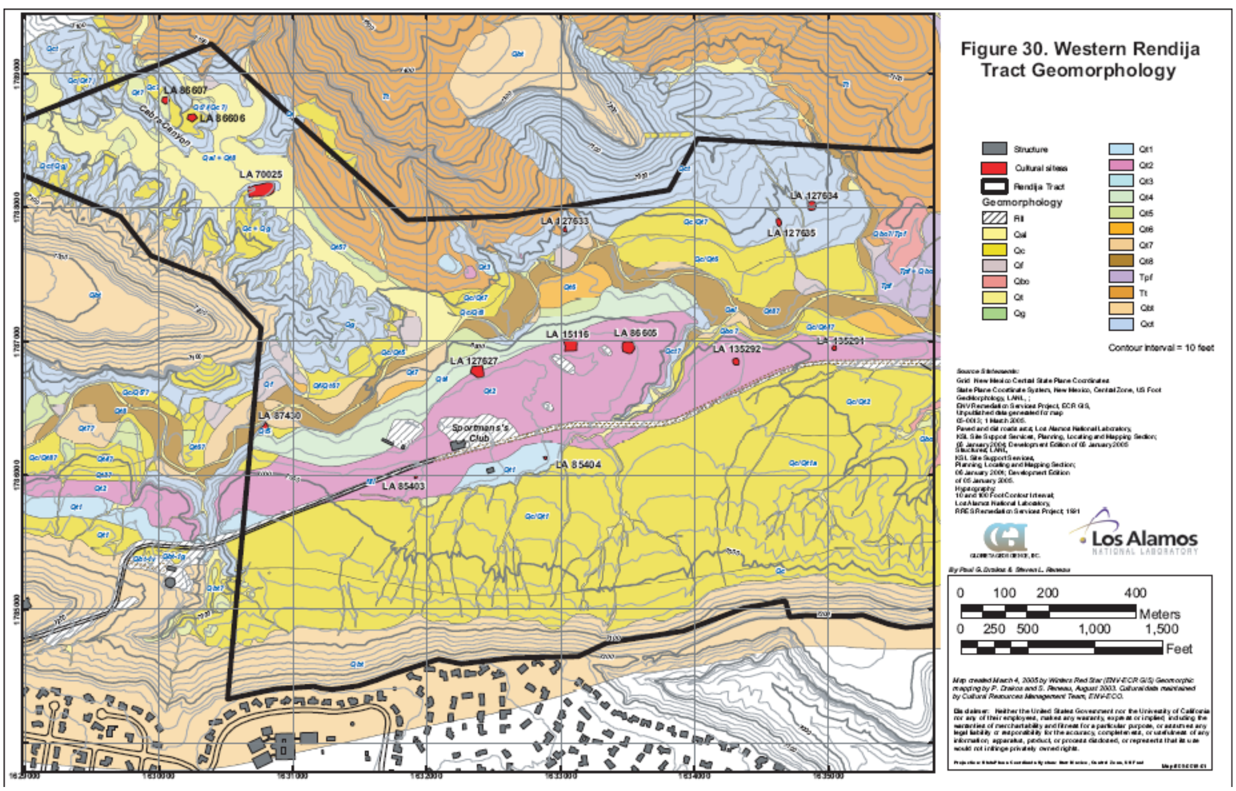


Figure 57.30. Western Rendija Tract geomorphology.

Bedrock units beneath the Rendija Tract include, from oldest to youngest, Tschicoma Formation dacite lavas (unit Tt); Puye Formation (unit Tp), an alluvial fan complex derived from the Tschicoma highlands that includes abundant Tschicoma dacite cobbles; Cerro Toledo interval (unit Qct) pumice beds and dacite-rich alluvium with minor obsidian pebbles; the Tshirege Member of the Bandelier Tuff (unit Qbt), and older alluvium (unit Qoa) (Figure 57.31). Unit Qoa is stratified alluvium deposited on top of the Bandelier Tuff generally before incision of the modern canyons (Kempter and Kelley 2002), possibly within 100,000 years of eruption of Qbt (Reneau and McDonald 1996; Reneau et al. 2002). Unit Qct may include the Guaje Pumice Bed of the Otowi Member, Bandelier Tuff (Qbog).

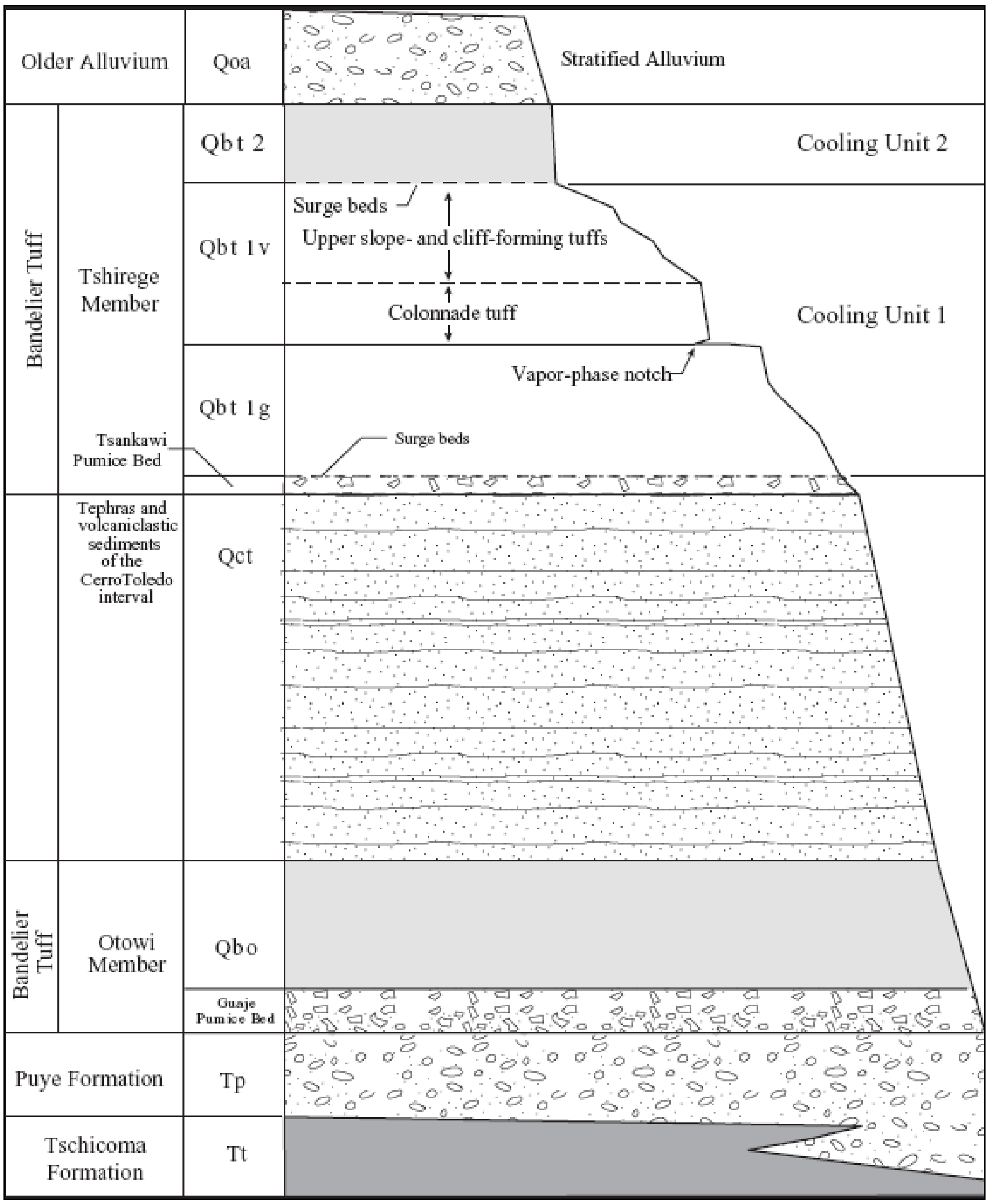


Figure 57.31. Generalized stratigraphic column for the Rendija Canyon area (from Brookton and Reneau 1995).

Bedrock on hillslopes and ridge tops comprising the western half of the tract includes Tschicoma Formation dacite overlain by pumice and alluvium of the Cerro Toledo interval. Tschicoma dacite crops out along a ridge north of the confluence between Rendija and Cabra canyons, forms ridges along the northern tract boundary, and forms the highlands leading up to Guaje Mountain north of the tract (see Figure 57.30; Kempter and Kelley 2002). Puye Formation gravels and the Otowi Member of the Bandelier Tuff crop out in Rendija Canyon and along tributary drainages incised below the Cerro Toledo interval deposits (see Figure 57.12). Bedrock on hillslopes and ridge tops beneath most of the eastern half of the tract is pumice and alluvium of the Cerro Toledo interval. Puye Formation gravels crop out in Rendija Canyon and along tributary drainages incised below the Cerro Toledo interval deposits (see Figure 57.29). Cerro Toledo deposits also crop out in the western half of the tract along the south side of Cabra Canyon, the north side of Cabra Canyon west of the Tschicoma dacite ridge, and along the north side of Rendija Canyon east of the Tschicoma dacite ridge (see Figure 57.30).

The Tshirege Member of the Bandelier Tuff forms the mesa top between Cabra and Rendija canyons west of the Rendija Tract, crops out near the top of an isolated mesa near the western edge of the eastern part of the Rendija Tract, and crops out along the base of the mesa escarpment along the southern boundary of the tract (see Figures 57.29 and 57.30). Remnants of unit Qoa are present on top of the isolated Bandelier Tuff mesa and may cap other ridges in the tract but could not be unequivocally identified. Large parts of the tract are covered by locally derived colluvial or slopewash deposits of a variety of ages. Fluvial terraces are locally preserved near the canyon bottom and are inset into, or interfinger with, colluvial deposits on north-facing slopes south of the Rendija Canyon drainage (see Figure 57.30).

Rendija Canyon possesses what may be the most extensive and best-preserved set of stream terraces on the Pajarito Plateau, locally including at least five Pleistocene surfaces and four Holocene surfaces (Reneau and McDonald 1996; McDonald et al. 1996). Geologic maps of this area have been prepared by Griggs (1964), Smith et al. (1970), and Kempter and Kelley (2002). The Rendija Canyon terrace sequence was first examined by Gonzalez and Gardner (1990) and later by McDonald et al. (1996), Reneau and McDonald (1996), and Phillips et al. (1998). In this investigation, a 1:3000 scale surficial geologic map was prepared that encompasses the eastern half of the Rendija Tract, focused on units with potential archaeological significance (see Figure 57.29). A detailed surficial geologic map of the western part of the tract was previously prepared by Reneau (Reneau and McDonald 1996:102), and is modified for this investigation in Figure 57.30.

Unit Qal consists of young alluvium in the main stream channel of Rendija Canyon. Sediment sources for Rendija Canyon alluvium include Bandelier Tuff and Cerro Toledo beds that provide sand and pumice and Puye Formation beds and Tschicoma Formation dacite outcrops that provide the majority of the pebble to boulder-size gravel (McDonald et al. 1996).

Unit Qt includes several stream terraces flanking the Rendija Canyon stream channel. Stream terraces are labeled Qt1 through Qt8, from oldest to youngest. The Holocene terraces (Qt5 through Qt8) are typically strath terraces, with 0.5 to 2 m channel deposits overlain by fine-grained floodplain sediments (Reneau and McDonald 1996). Pleistocene terraces (Qt1 through Qt4) are typically overlain by more significant aggradational sequences consisting of 4 to 10 m of gravelly deposits. Terraces are in part overlain by colluvium (unit Qc). The older, higher terraces are more extensively buried by colluvium, and many of the Qt1 terraces are completely buried (see Figures 57.29 and 57.30). A high terrace, Qt2, forms a large, relatively flat surface sloping to the east on which several fieldhouse sites are located (see Figures 57.30 and 57.32). Fieldhouse sites excavated during this field investigation are also located on Qt1, Qt4(?), and Qt5 (Figure 57.32).

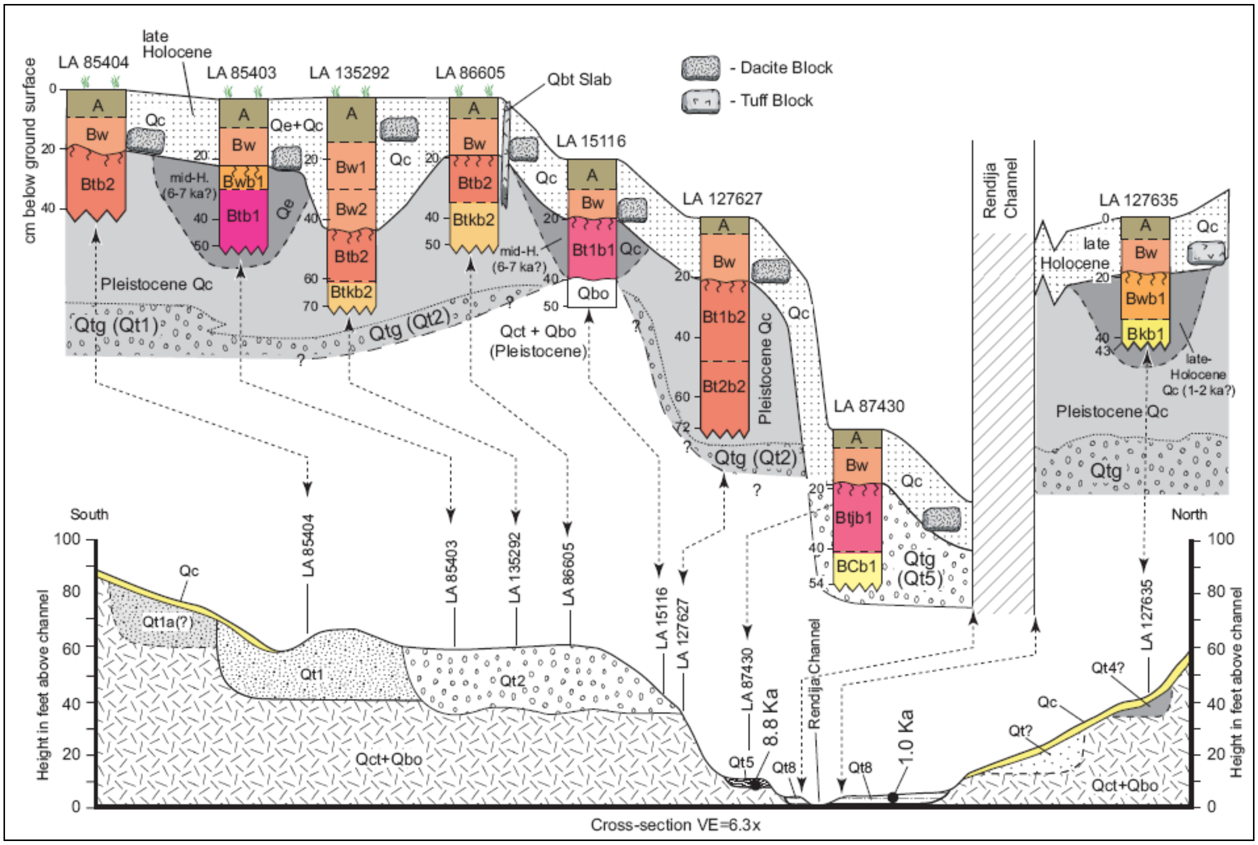


Figure 57.32. Schematic cross-section and soil-stratigraphic correlations between selected Rendija Canyon archaeological sites located on fluvial terraces.

Unit Qc includes a mixture of gravelly and fine-grained (fine to very fine sand and silt) slopewash colluvium deposited by overland flow, and also includes rocky colluvium on hillslopes below mesas and ridge crests. Qc includes valley-filling colluvial deposits that were locally reworked by fluvial processes and eolian deposits and/or locally reworked eolian sediment. Qc includes deposits with a wide age range and typically has buried soils that indicate pauses in deposition, in part accompanied by local erosion. However, at least two relatively widespread episodes of colluvial deposition are inferred from an examination of soil profiles at the Rendija Canyon sites. These depositional events include colluvium of inferred late Pleistocene to middle Holocene age, typically less than 1.5 m thick, overlain by a late Holocene colluvial deposit less than 25 cm thick. Some areas of relatively thin colluvium are mapped as the underlying bedrock or terrace unit. Terraces with a clear geomorphic expression are mapped as terrace units, although they are typically overlain by a thin colluvial deposit (Figure 57.32).

Local swale-fill deposits preserve early to middle Holocene colluvial deposits buried by late Holocene deposits that could potentially contain buried Archaic or Paleoindian sites. LA 85859 provides an example of an Archaic site in a locally preserved 7.4 to 6.7 cal ka colluvial deposit (Figure 57.33). The site is preserved in a hillslope swale in an extensively bioturbated deposit with well-developed soil (Bt) horizons (see site description section for a more detailed description of soils and radiocarbon data). Local middle to late Holocene swale-fill deposits are preserved in colluvial deposits overlying fluvial terraces (see Figure 57.30) and at hillslope sites LA 99396 and LA 99397 (Figures 57.34 and 57.35). Relatively thick (greater than 1 m) early to middle Holocene colluvium is locally preserved as gully-fill deposits (Figure 57.35).

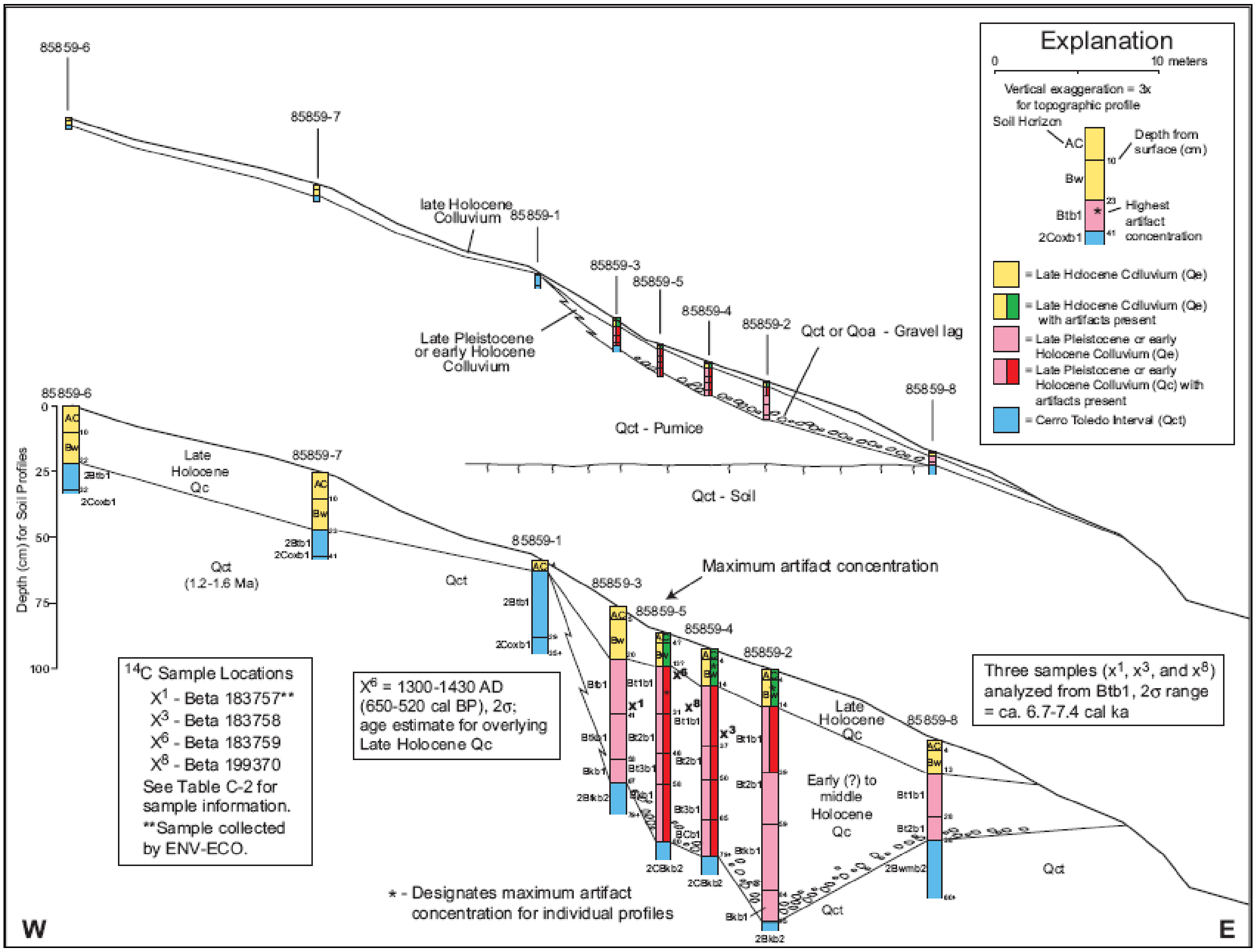


Figure 57.33. Hillslope profile and catena showing artifact distribution, location of charcoal samples, and radiocarbon dates at LA 85859.

Unit Qe is restricted to one small ridge top area near the eastern boundary of the Rendija Tract (see Figure 57.29). Unit Qe is situated east of, and presumably on the leeward side of, a hill capped by Qct gravels or Qoa. Unit Qe appears to be a relatively young deposit and has the potential to preserve buried archaeological sites.

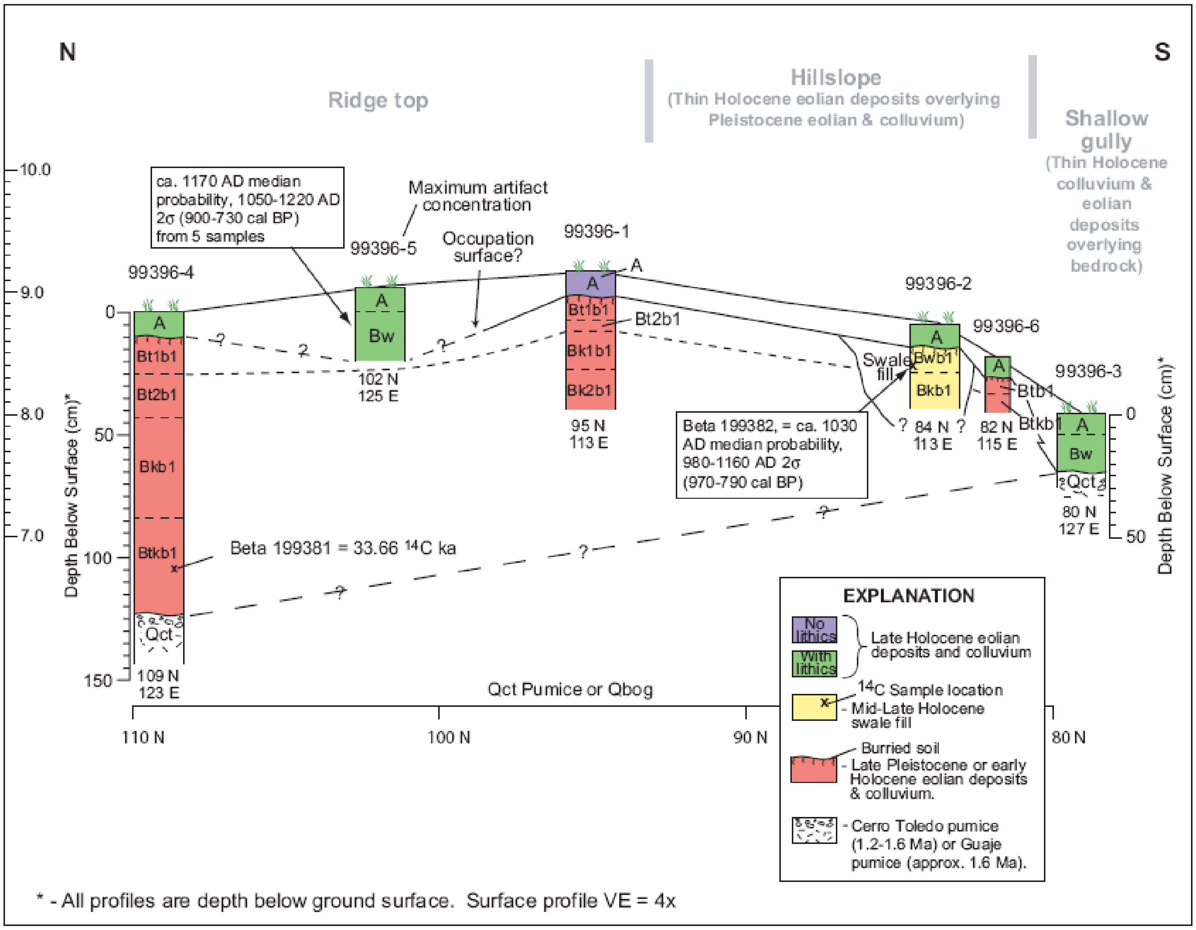


Figure 57.34. LA 99396 stratigraphic correlation, radiocarbon dates, and artifacts.

Age of Colluvial and Eolian Deposits

Age estimates for colluvial and eolian deposits are based on calibrated radiocarbon ages obtained from charcoal samples collected from soils described in Rendija Canyon during this investigation, from stratigraphic relationships with dated cultural materials, and based on comparison with soils described at Coalition and Classic period sites in the Airport and White Rock tracts. Age estimates are also based on comparison with a chronosequence of Pleistocene and Holocene soils developed on a terrace sequence in Rendija Canyon (Reneau and McDonald 1996; McDonald et al. 1996; Phillips et al. 1998). However, parent material for colluvial soils likely includes sediment derived from erosion of older soils that may contain clay-rich horizons. This may lead to more rapid soil development than observed for soils developed in fluvial terrace deposits with lower initial clay contents.

The age of latest Holocene (post-Coalition period) Qc at hillslope sites is constrained by two, statistically indistinguishable radiocarbon dates from charcoal collected at LA 85859 and LA 99397. A charcoal sample from the base of the Bw horizon at LA 99397 yielded an age of 530±40 BP (Beta-199385) and a date of cal AD 1406 with a two-sigma date range of cal AD

1312–1359, and a charcoal sample from the top to the Bt1b1 horizon 3 cm below the base of the Bw horizon at LA 85859 yielded an age of 570±40 BP (Beta-183759) and a date of cal AD 1353 with a two-sigma date range of cal AD 1299–1429 (Table M.2; calibrated ages for all samples discussed in this report from CALIB 5.01, Stuiver et al. 2005). These two radiocarbon dates from charcoal within the soil profiles at different sites suggest the same Rendija Canyon fire event, with a mean probability of AD 1397 with a two-sigma date range of cal AD 1314–1432 and indicate a similar maximum age constraint for the post-Coalition period Qc.

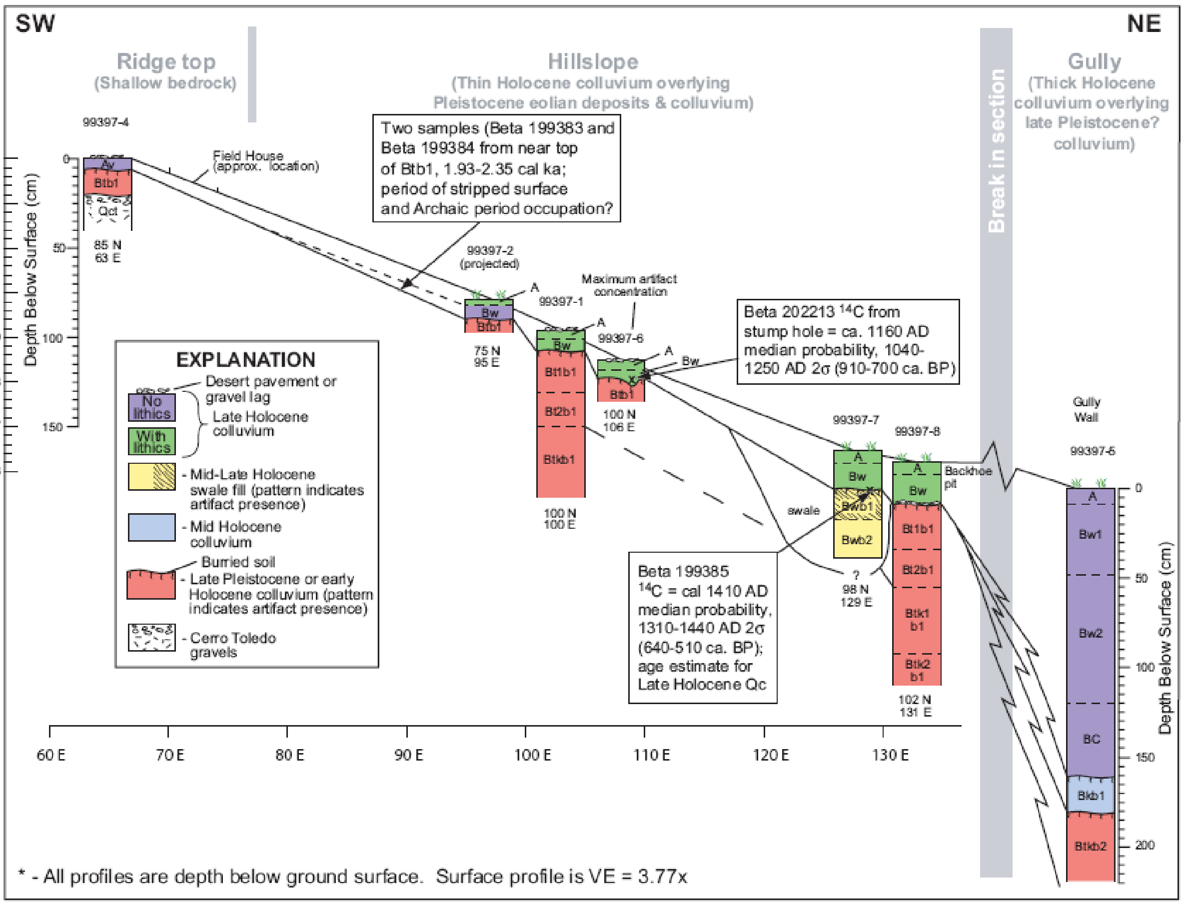


Figure 57.35. LA 99397 stratigraphic correlation, radiocarbon dates, and artifacts.

The age of middle to late Holocene swale fill deposits underlying the younger than cal AD 1400 Qc is constrained by one radiocarbon date from charcoal collected at LA 99396 and by two radiocarbon dates from charcoal collected at LA 99397. A sample collected from the Bwb1 horizon at 99396-2 (Figure 57.34) yielded an age of 1000±40 BP (Beta-199385) and a date of cal AD 1032 with a two-sigma date range of cal AD 975–1155. This provides a minimum age for the Bwb1 soil and the late Holocene swale fill deposits at LA 99396. Two charcoal samples were collected from near the top of the Btb1 horizon at LA 99397. One sample yielded an age of 2110±60 BP (Beta-199383) and a date of cal 2090 BP with a two-sigma date range of cal 1933–2307 BP. A second sample yielded an age of 2280±40 BP (Beta-199384) and a date of cal 2263 BP with a two-sigma date range of cal 2157–2352 BP (Table M.2). These ages are similar but statistically different and are interpreted to date the age of the stripped surface that included the site occupation at LA 99397. The late Holocene swale fill deposit is either contemporaneous or post-dates the age of the stripped surface. Soil description data are interpreted to indicate that the middle to late Holocene swale fill deposits at LA 99396 and LA 99397 are correlative deposits. Therefore, the age of the late Holocene swale fill deposit at LA 99396 and LA 99397 is ca 1 to 2 ka. Based on soil correlations, the middle to late Holocene colluvial/swale fill deposit underlying LA 127635 (Figure 57.32) is likely a correlative 1 to 2 ka deposit.

The colluvial deposit at LA 85859 contained numerous discrete but small charcoal fragments. Dates were obtained from three samples from the Btb1 horizon that yielded the following ages: 6010±40 BP (Beta-183757) and a date of cal 6851 BP with a two-sigma date range of cal 6745–6948 BP; 6310±50 BP (Beta-183758) and a date of cal 7238 BP with a two-sigma date range of cal 7031–7416 BP; and 6140±40 BP (Beta-199370) and a date of cal 7047 BP with a two-sigma date range of cal 6931–7163 BP (Figure 57.33; Table M.2). The ages of these three samples are statistically different, suggesting a period of colluvial aggradation from ca 6.7 to 7.4 ka that included site occupation. Soil characteristics include 7.5YR color, many moderately thick clay films as bridges, colloidal stains, pore fillings, and on ped faces, and maximum Stage II- carbonate (see site description section). Based on soil correlations, the swale fill (?) deposits underlying LA 85403 and LA 15116 (see Figure 57.32) are likely correlative early to middle Holocene deposits.

Age estimates for underlying Pleistocene colluvial and eolian deposits is provided by one radiocarbon date from charcoal collected from an eolian deposit at LA 99396 and by comparison with the Rendija Canyon soil chronosequence. A sample collected from the Btkb1 horizon at 99396-4 (see Figure 57.34) yielded an age of 33,660±320 BP (Beta-199381) that is beyond the range of calibration. Soil characteristics include 7.5YR color, common to many thin clay films as bridges and on ped faces, and maximum Stage II- carbonate (see site description section). Although less-well-developed than soils described at LA 85859, the degree of soil development observed in the 99396-4 b1 soil is similar to that observed in late Pleistocene soils previously described in Rendija Canyon (McDonald et al. 1996; Phillips et al. 1998) and is consistent with the development of Stage II carbonate in warm to temperate semiarid locations in late Pleistocene soils (Machette 1985). This inferred late Pleistocene colluvial soil exhibits much better soil development than the mid Holocene (5.3 to 7.0 ka) Rendija Canyon Qt6 soil, which has 64- to 99-cm-thick Bw horizons, but lacks development of Bt horizons. Incipient Btj horizon development is observed in the early Holocene (8.8 ka) Qt5 soil described at LA 87430, which exhibited 10YR color and few thin clay bridges and pore fillings (Figure 57.32; see site description section for soil description).

The Btb1 and Btkb1 soils described at LA 85859 and LA 99396 exhibit similar field soil properties including 7.5YR color, thin to moderately thick clay films, strong soil structure, and maximum Stage II- carbonate. As discussed above, based on comparison with numerous other soil profiles in the area, these soil properties are typically associated with late Pleistocene soils. However, radiocarbon dates indicate that only the b1 soil at LA 99396 is a late Pleistocene (33.7 ka) soil, whereas the soil at LA 85859 is middle to early Holocene (6.7 to 7.4 ka) soil. The unusually rapid soil formation (based on comparison with other Pajarito Plateau soils for which age control is available) is likely due to site-specific geomorphic factors including erosion of older, clay-rich soils upslope and deposition of clay-rich colluvium in a hillslope depression with clay-formation perhaps enhanced on a northeast-facing hillslope.

LA 15116 (Fieldhouse)

LA 15116 consists of a fieldhouse situated on a north-facing slope below the Qt2 terrace surface (see Figure 57.30). The structure measures approximately 2.5 m north-south by 1.9 m east-west (inside), or 3 m north-south by 2.5 m east-west (outside dimensions). Soils were described in one test pit at the site, located 1 m west of the west side of the fieldhouse. Site stratigraphy consists of an A-Bw soil overlying a buried middle Holocene (?) stripped soil (Btb1 horizon; Figure 57.36, Table L.5). Depth to Otowi tuff (?) bedrock, observed west of the structure, is approximately 0.4 m (Figure 57.36).

Figure 57.36. Photographs showing soil stratigraphy (top) and soil pit next to fieldhouse (bottom), LA 15116.

The fieldhouse was constructed primarily from dacite blocks, with some tuff blocks also utilized. The occupation surface at the site is the top of the Btb1 horizon, and post-occupation colluvial deposits are 20 cm thick at the described profile. Dacite blocks, inferred to be wallfall, were observed in the A and Bw horizons (Figure 57.36). Although intensively burned during the Cerro Grande fire, the site does not show evidence of extensive erosion. Soils burying LA 15116 are relatively weakly developed, but have developed A-Bw horizons. The soils and related stratigraphy are therefore consistent with LA 15116 being a Classic, or possibly a Coalition period, feature, and the site is in relatively good archaeological context.

LA 70025 (Fieldhouse)

LA 70025 consists of a fieldhouse in Cabra Canyon situated on a narrow ridge that forms part of a deeply dissected colluvial slope overlying fluvial terrace or Cerro Toledo gravel. The structure measures approximately 1.8 m by 1.6 m (inside), or 2.2 m by 2 m (outside dimension), situated with the long axis oriented N20°W (Figure 57.37). Soils were described in one test pit at the site, located 2 m west of the west side of the fieldhouse (Figure 57.37; Table L.5). Site stratigraphy consists of an A-Bw1-Bw2 soil overlying a buried middle to late Holocene Btjb1 horizon (Figure 57.37; Table L.5).

The fieldhouse was constructed primarily from tuff blocks, with some dacite blocks also utilized. The occupation surface at the site is the top of the Btjb1 horizon (Figure 57.37). The site is situated in an erosional setting, with the potential for transport of artifacts from the ridgetop to the hillslope below. Soils burying the LA 70025 occupation surface outside the structure are relatively thick in a local low area on the ridge, 29 cm thick at the described soil profile, and include the development of Bw1 and Bw2 horizons. Soils inside the structure on a local topographic high are relatively thin and likely indicate erosion of the site. The soils data and related stratigraphy are consistent with a Coalition or Early Classic period age for LA 70025. The site is in relatively poor archaeological context.

LA 85403 (Fieldhouse)

LA 85403 consists of a fieldhouse situated on a relatively flat Qt2 terrace surface (see Figure 57.30). The structure measures approximately 2.1 m by 1.8 m (inside), or 2.5 m north-south by 2.1 m east-west (outside dimensions), and contains an opening facing east (Figures 57.38 and 57.39). Soils were described in two test pits at the site. A complete soil profile was described 1.4 m west of the west wall of the fieldhouse, and a partial profile was described below the west wall (Figures 57.38 and 57.39; Table L.5). Site stratigraphy consists of an A-Bw soil overlying a buried middle Holocene Bwb1-Btb1 soil (Figure 57.39; Table L.5).

The fieldhouse was constructed primarily from dacite slabs and blocks, with a minor component of tuff blocks also utilized. The wall blocks were partially buried by a fine-grained eolian deposit and were observed to protrude up to 5 to 10 cm above present ground surface. Exposed wall blocks were lichen covered. Based on the absence of evidence of significant surface erosion and the observed burial of the site by eolian material, the site appears to be in good archaeological context.

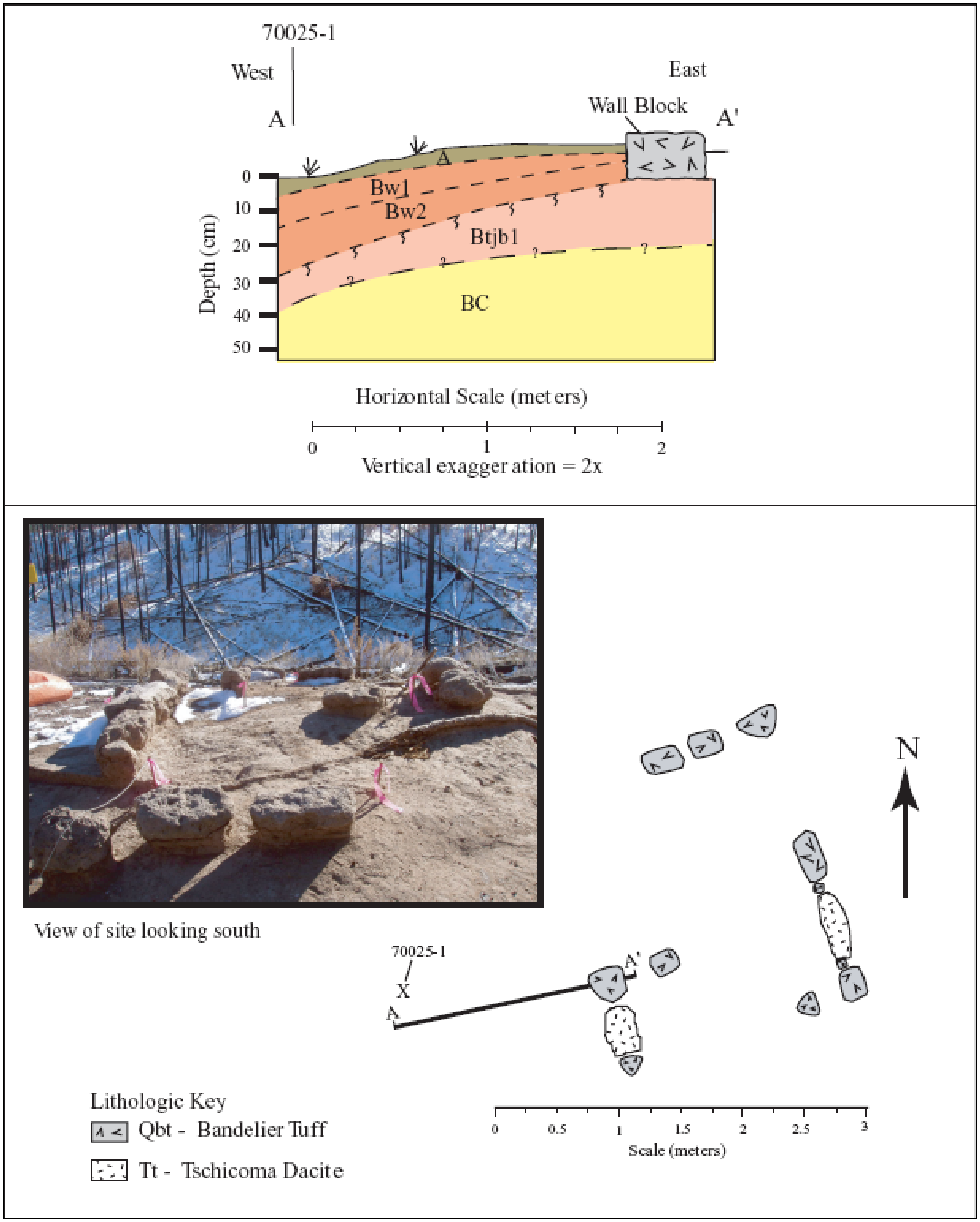


Figure 57.37. Schematic site map, cross-section, and site view looking south, LA 70025.

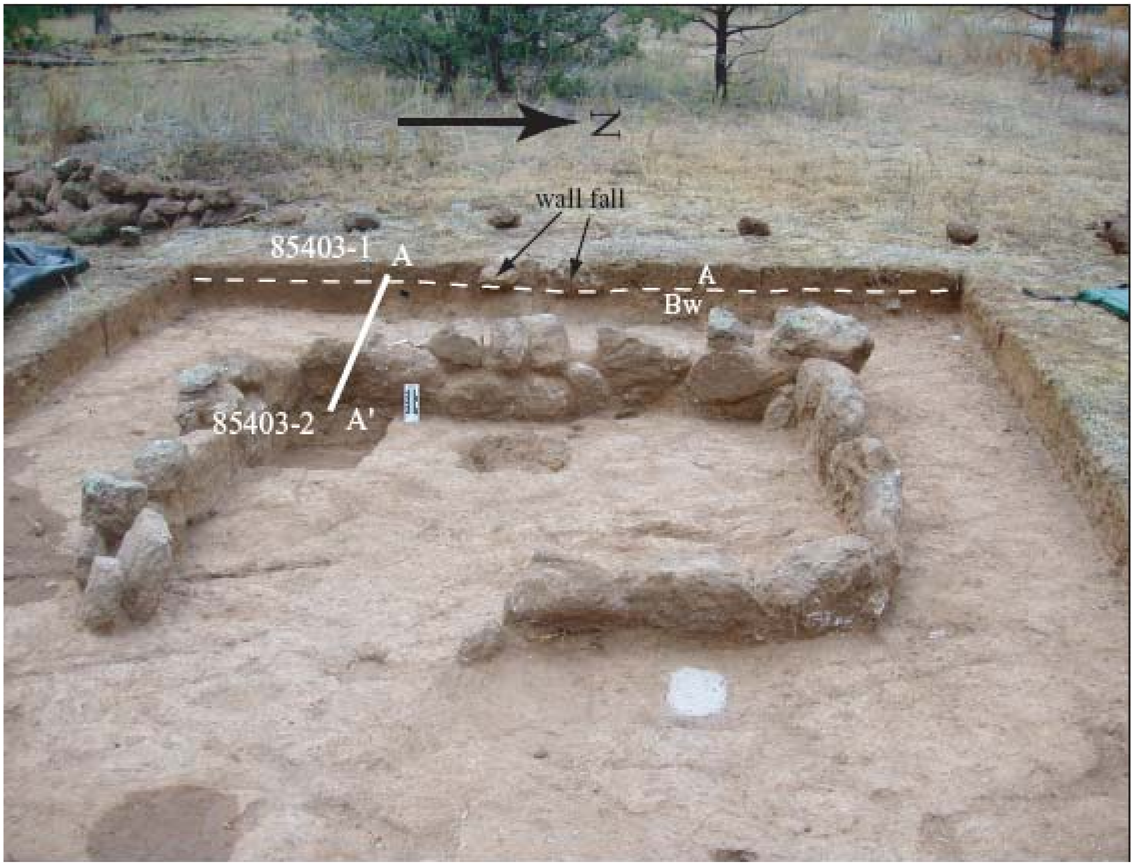


Figure 57.38. Photograph of LA 85403 looking west showing cross-section and soil description locations.

Dacite slabs were set into the Bwb1 horizon and possibly into the Bw horizon (Figures 57.38 and 57.39). Evidence for the actual occupation surface outside the structure was not conclusive, and this surface may have been either the top of the Bwb1 horizon or the top of the Bw horizon. However, the prevalence of wallfall in the A horizon, observed in the excavation wall west of the fieldhouse (Figures 57.38 and 57.39), is evidence that the top of the Bw horizon was the occupation surface. Post-occupation eolian deposition was therefore 9 cm, with the A horizon developing after site abandonment. Based on soil stratigraphy at other sites (Drakos and Reneau 2004), the interpretation that the occupation surface was the top of the Bw horizon is consistent with a Classic period age for the site. A charcoal sample from maize in a prehistoric pit fill at LA 85403 yielded a radiocarbon age of 310±40 BP (Beta-215549) and a date of cal AD 1564 with a two-sigma date range of cal AD 1472–1653 (Table M.2), also indicating a Classic period age for LA 85403.

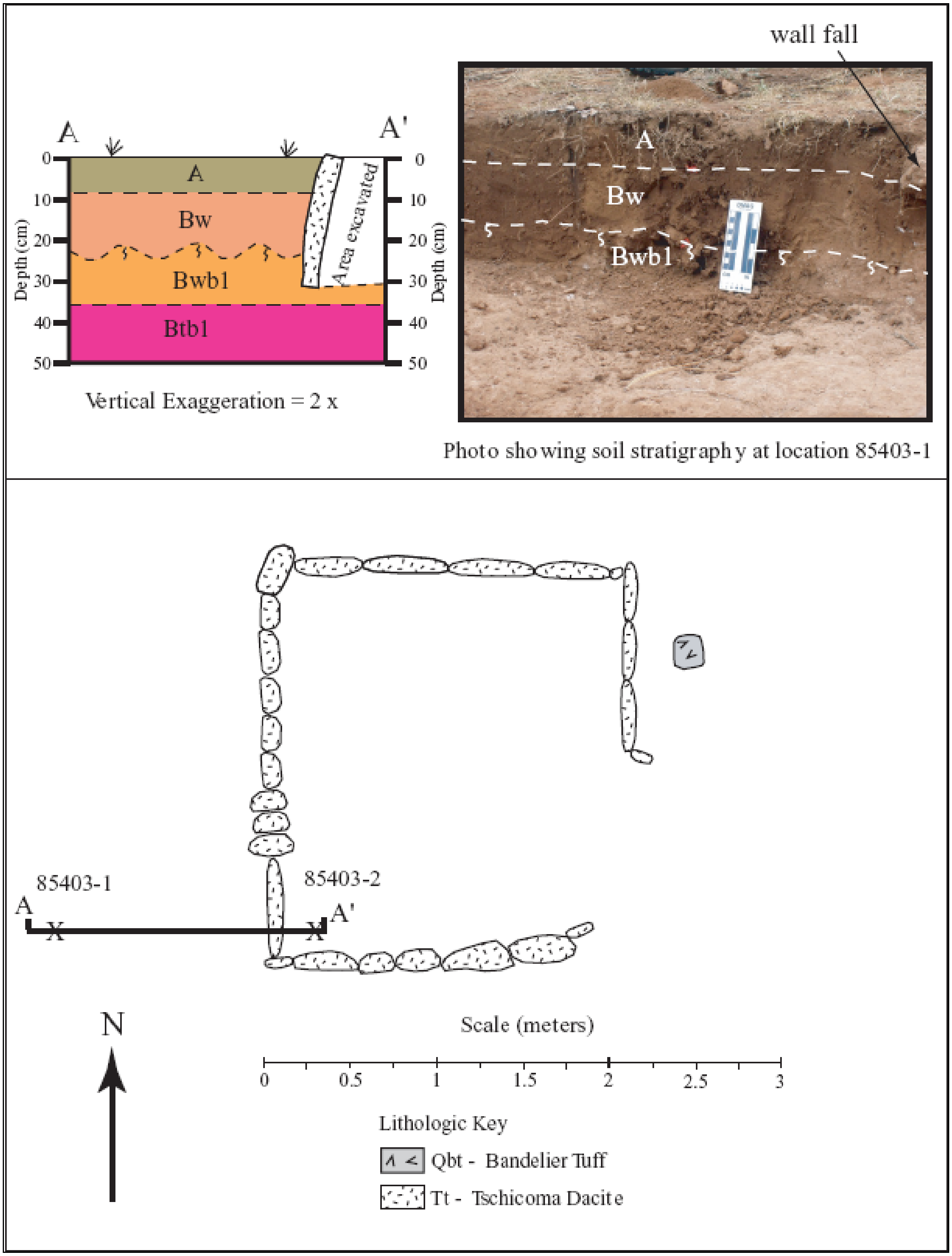


Figure 57.39. Schematic site map (bottom) and cross-section (top) from LA 85403.

LA 85404 (Fieldhouse)

LA 85404 consists of a fieldhouse situated on the gently sloping, east-facing edge of a Qt1 terrace surface (see Figure 57.30). The fieldhouse outside dimensions are approximately 3 m north-south by 2.5 m east-west on the north side of the structure and 1.8 m east-west on the south side of the structure (Figure 57.40).

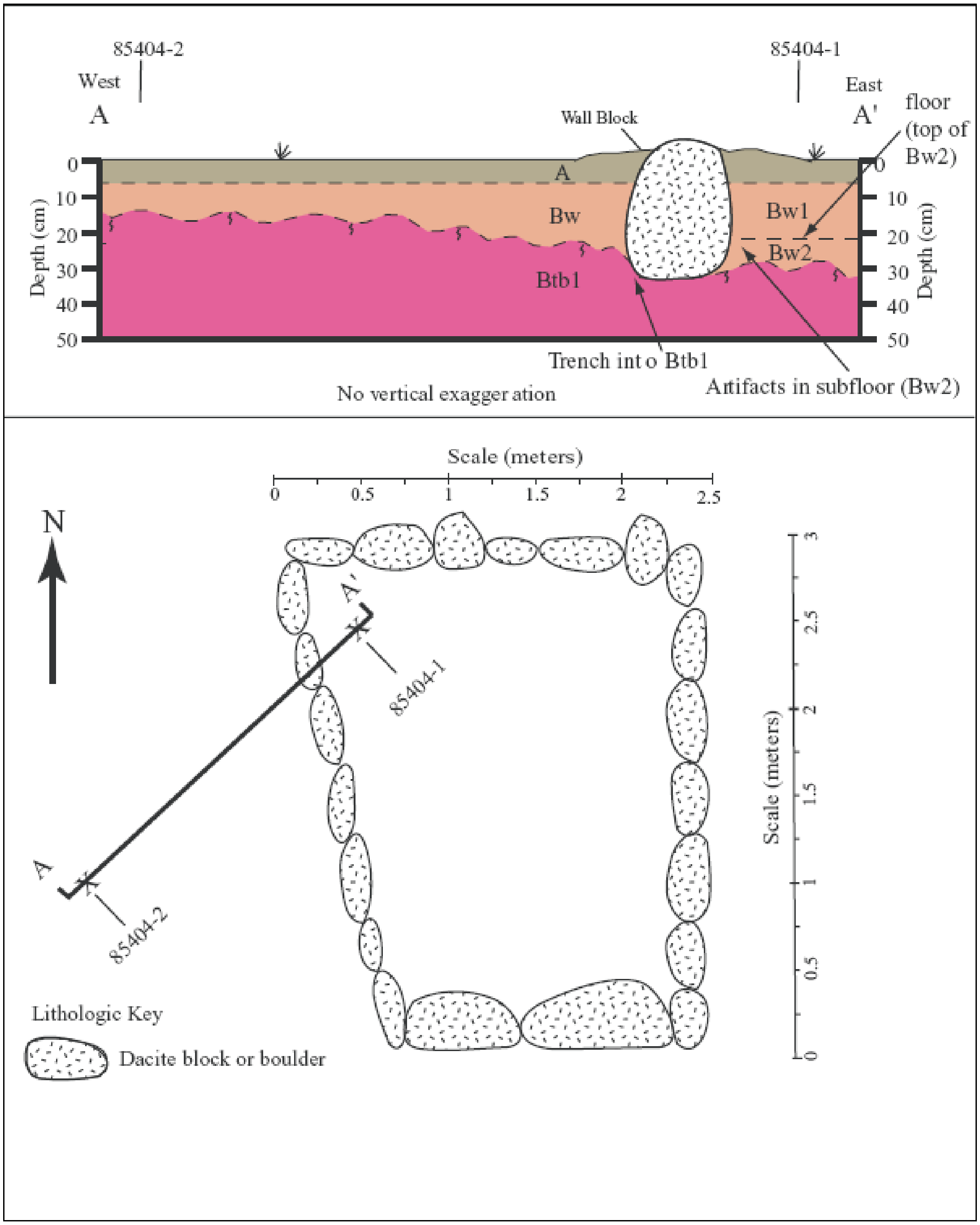


Figure 57.40. Schematic site map and cross-section, LA 85404.

Inside dimensions are approximately 1.2 to 1.7 m east-west by 2.2 m north-south. Soils were described in two test pits at the site; profile 85404-1 was described inside the structure and profile 85404-2 was described 1.5 m west of the west wall of the fieldhouse (Figures 57.40 and 57.41; Table L.5). Site stratigraphy consists of an A-Bw soil overlying a buried Pleistocene Btb1 soil outside the structure and an A-Bw1-Bw2 profile overlying the Pleistocene soil inside the structure (Figure 57.40).

Figure 57.41. Photographs showing fieldhouse constructed of large dacite boulders and soil stratigraphy at LA 85404.

The fieldhouse was constructed from locally derived dacite blocks that appear to have been set into a trench dug into the Btb1 horizon (Figure 57.40). The top of the Btb1 horizon outside the structure and the top of the Bw2 horizon inside the structure constitutes the likely occupation surface. The Bw2 horizon inside the structure contained worked chert with clay films plus possible reworked peds that suggests earlier use of this site and preparation of a sub-floor. The site did not exhibit extensive erosion and appears to be in good archaeological context. The thin colluvial soil observed outside the structure, about 9 cm thick, indicates a relatively young age for this site. The soils and related stratigraphy are therefore consistent with LA 85404 being a Classic period site and are supported by radiocarbon analysis of charcoal sample from maize in the ground floor room level at LA 85404 that yielded an age of 400±40 BP (Beta-215550) and a date of cal AD 1490 with a two-sigma date range of cal AD 1432–1632 (Table M.2).

LA 85407 (Homestead)

This site was only visited during mapping of the Rendija Tract, and the authors did not visit the site during excavation. LA 85407 is situated on a south-facing bench along the contact between Cerro Toledo interval and Puye Formation gravels (see Figure 57.29). The site overlooks the Rendija Canyon channel immediately to the south.

LA 85408 (Fieldhouse)

LA 85408 consists of a fieldhouse situated on a southeast-sloping Qct spur ridge (see Figure 57.29). The structure measures approximately 2.5 m by 1.6 m (inside), or 2.7 m 3.1 m (outside dimensions), situated with the long axis (outside dimension) of the structure oriented N48°E (Figure 57.42). Soils were described in one test pit at the site, located 2 m west of the northwest corner of the fieldhouse. Site stratigraphy includes an A horizon in late Holocene colluvium overlying sandy Qct alluvium with a remnant Qct soil (Figure 57.42, Table L.6). Depth to bedrock in the site vicinity ranges from 9 to approximately 20 cm (Figure 57.42). The absence of early or middle Holocene deposits suggests extensive erosion before deposition of the thin late Holocene colluvium.

The fieldhouse was constructed primarily from dacite blocks, with some tuff blocks and possibly whitish Qct sandstone also utilized. Wall rocks were set into Qct. Shallow, circular pits located approximately 1 m west-southwest of the northwest corner of the fieldhouse were apparently dug into the Qct soil (Figure 57.42). The occupation surface at the site is the top of the Qct soil, and post-occupation colluvial deposits are 9 cm thick at the described profile. The site shows evidence of erosion, as evidenced by a colluvial apron extending 4 to 5 m downslope to the northeast. Soils burying LA 85408 are relatively thin and weakly developed. The soils and related stratigraphy are therefore consistent with a Classic period age for LA 85408. The site is somewhat eroded and is therefore in moderate to poor archaeological context.

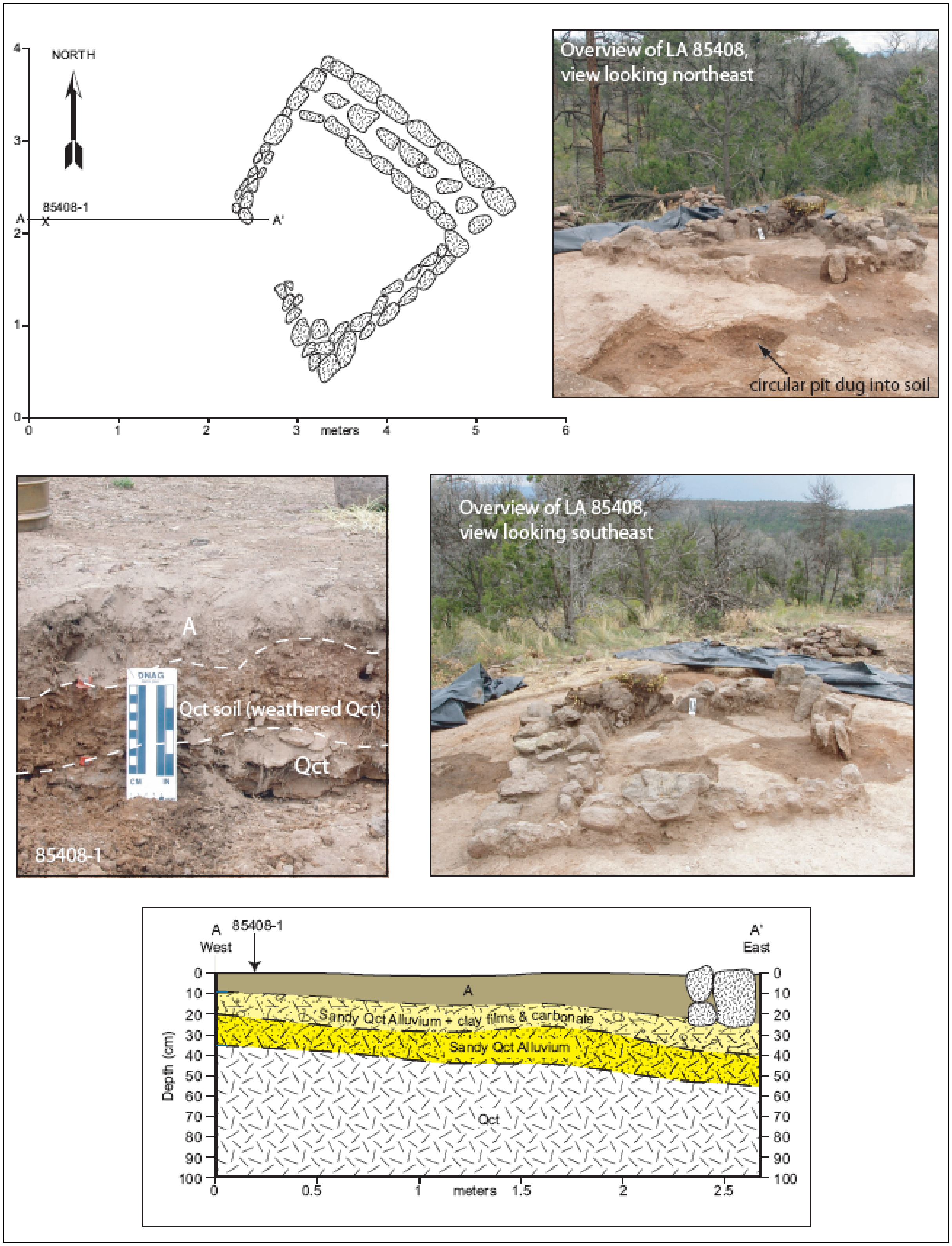


Figure 57.42. Schematic site map, cross-section, and photographs from LA 85408.

LA 85411 (Multi-room structure)

LA 85411 is a two-room (?) structure situated on the northeast-sloping side of a Qct ridge top approximately 7 m northeast of the ridge crest, upslope from LA 99397. The structure measures 7.5 m east-west by 4 m north-south (outside dimensions), with walls of the western room oriented along a northwest-southeast axis (Figure 57.43). Soils were described in two test pits at the site. A detailed soil profile (85411-1) was described 2.3 m east of the southeast corner of Room 2, and a general soil-stratigraphic partial profile (85411-2) was described below the west wall of Room 1 (Figure 57.43; Table L.6). Site stratigraphy consists of an A-Bw soil overlying a buried middle to late Holocene Bwb1 or Btjb1 horizon with variable clay content (Figure 57.43; Table L.6). The buried soil is reddened (7.5YR hue), contains some clasts with clay films, and is possibly reworked from an older soil upslope. Soils are formed in sandy colluvium lacking a significant eolian component. Qct bedrock, consisting of consolidated pumice-rich sandstone, was encountered at a depth of 30 cm at 85411-1. The absence of early Holocene deposits suggests extensive erosion at this site during or before the middle to late Holocene.

The two-room structure was constructed from dacite blocks. Wall rocks were set into the Bwb1/Btjb1 horizon and were locally set directly on Qct bedrock (Figure 57-43). The occupation surface at the site is the top of the Bwb1/Btjb1 horizon, and post-occupation colluvial deposits range from 14 cm thick at 85411-1, outside the structure, to approximately 20 cm thick at 85411-2, adjacent to the west wall (Figure 57.43). The soils and related stratigraphy are consistent with a Classic period age for LA 85411. Although the eastern part of the site appears to be somewhat eroded, the remainder of the site is relatively intact and is in good archaeological context.

LA 85413 (Fieldhouse)

LA 85413 includes a fieldhouse situated on a south-facing slope, at the approximate contact between Qct overlain by thin Holocene colluvium (map unit Qct) and Qct overlain by thicker Pleistocene and Holocene colluvium (map unit Qc) (Figure 57.44). The structure measures approximately 2.0 m by 1.7 m (inside), or 2.9 m by 2.2 m (outside dimensions), situated with the long axis of the structure oriented approximately N75°E (Figure 57.44). Soils were described in two test pits at the site; profile 85413-1 was described 3 m southeast of and downslope from the southeast corner of the structure, and profile 85413-2 was described below the east wall of the fieldhouse (Figure 57.44; Table L.6). Site stratigraphy consists of an A-Bw soil overlying Qct, in the immediate vicinity of the fieldhouse, or an A-Bw soil overlying Btk1b1-Btk2b1 horizons formed in Pleistocene colluvium, south of the fieldhouse (Figure 57.44; Table L.6). Holocene colluvium described at 85413-1 is relatively coarse-grained, with pebble- to cobble-size gravel (Figure 57.44). The absence of middle Holocene deposits suggests extensive erosion at this site during or before the late Holocene.

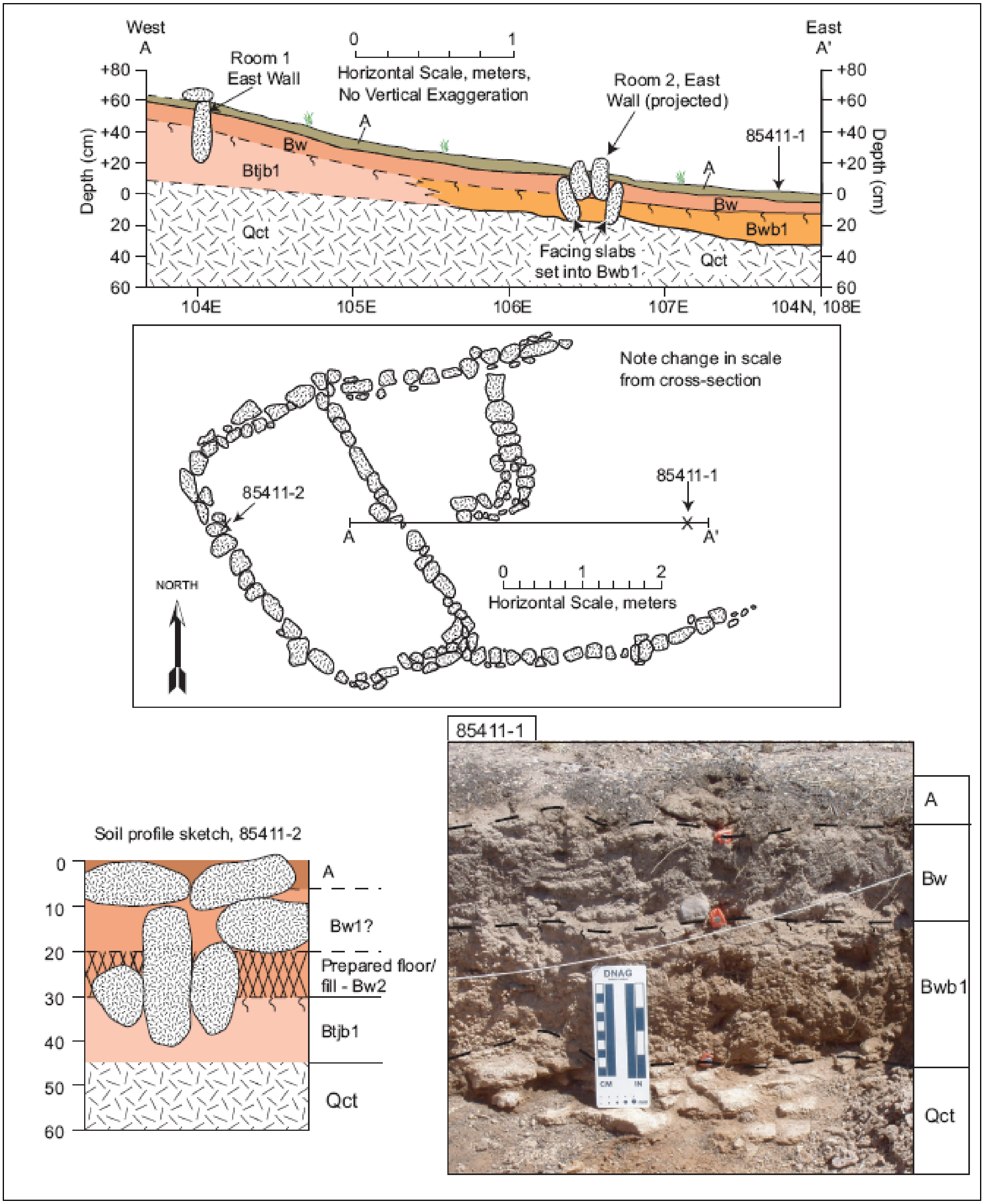


Figure 57.43. Schematic site map, cross-section, and soil stratigraphy from LA 85411.

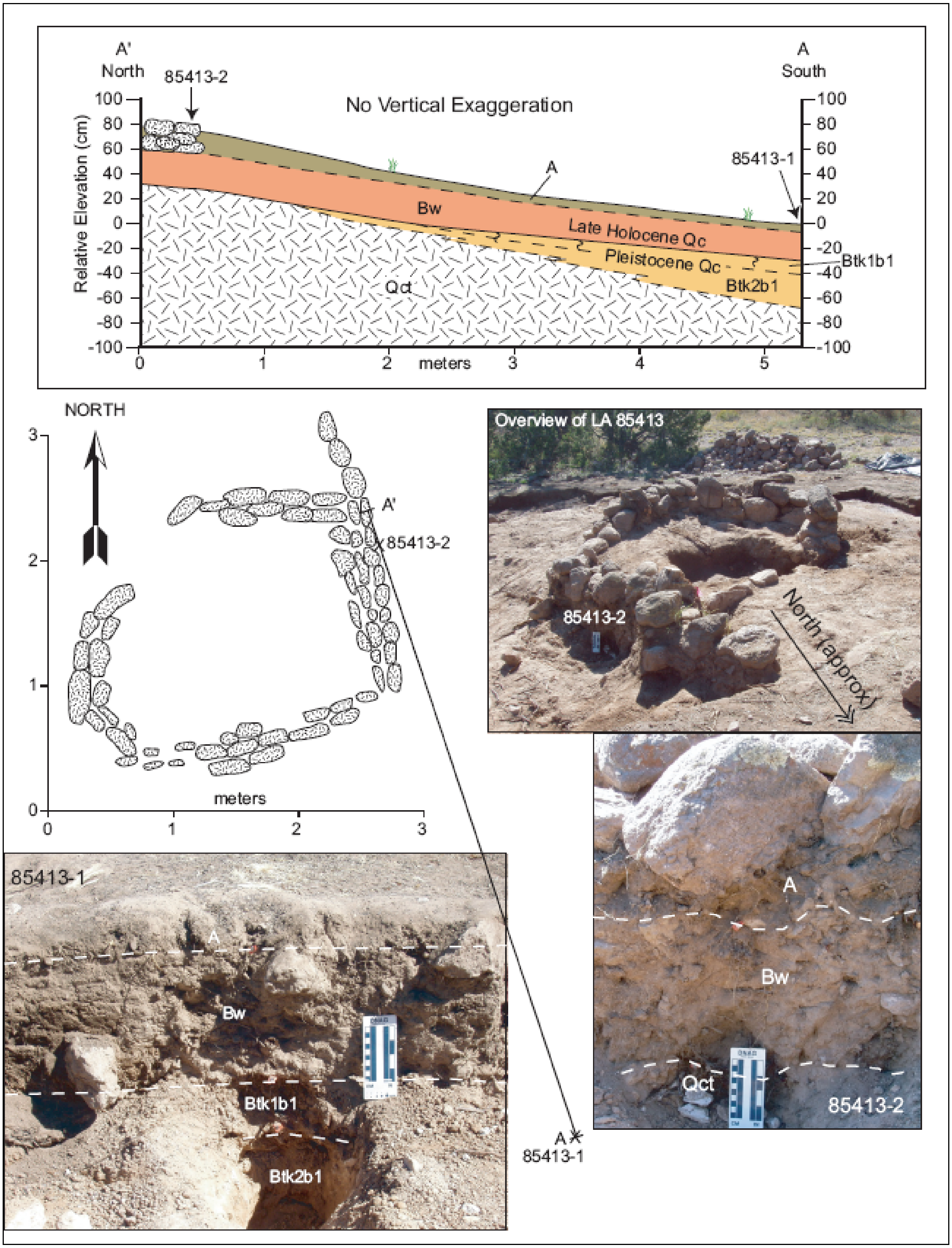


Figure 57.44. Schematic site map, cross-section, and photographs from LA 85413.

The fieldhouse was constructed primarily from dacite blocks. Wall rocks were generally set on top of the Bw horizon (Figure 57.44). The occupation surface at the site is the top of the Bw horizon, and post-occupation colluvial deposits range from 7 cm thick at 85413, outside the structure, to approximately 18 cm thick at 85413-2, adjacent to the east wall (Figure 57.44). The thin, weakly developed soils (A horizon only) that post-date the site and related stratigraphy are consistent with a Classic period age for LA 85413. The site is not extensively eroded and is in good (?) archaeological context.

LA 85414 (Fieldhouse)

LA 85414 is a fieldhouse site situated on an east-facing Qct bench. The structure measures approximately 1.7 m by 1.2 m (inside), and 2.3 to 2.7 m by 1.8 m (outside dimensions), situated with the long axis of the structure oriented approximately N20°E (Figure 57.45). Soils were described in two test pits at the site; profile 85414-1 was described 1.5 m east of the northeast corner of the structure, and profile 85414-2 was described below the east wall of the fieldhouse (Figure 57.45; Table L.6). Site stratigraphy consists of an A-Bw soil formed in late Holocene (both pre- and post-occupation) colluvium overlying a thin Btb1 horizon formed in Pleistocene colluvium (Figure 57.45; Table L.6). The thin Pleistocene colluvial deposits overlie weathered Qct. The absence of early or middle Holocene deposits indicates extensive erosion at this site before deposition of the late Holocene colluvium.

The fieldhouse was constructed primarily from dacite blocks and boulders. Wall rocks were set on top of and into the Bw horizon, with some rocks set to the top of the Btb1 horizon (Figure 57.45). It appears that some large dacite boulders in the Btb1 horizon were left *in situ* and incorporated in the structure (Figure 57.45). The occupation surface at the site is the top of the Bw and top of the Btb1 horizon, and post-occupation colluvial deposits are 8 to 10 cm thick (Figure 57.45). The thin, weakly developed soils (A horizon only) that post-date the site and related stratigraphy are consistent with a Classic period age for LA 85413. The site is not extensively eroded and is in good archaeological context.

LA 85417 (Fieldhouse)

LA 85417 is a fieldhouse site situated on a rocky Qct knob overlain by eolian fines and thin, locally derived colluvium. The structure is oriented north-south by east-west with an east-facing doorway and measures approximately 1.6 m by 1.6 m (inside), and 2 m by 2 m (outside dimensions). Soils were described in two test pits at the site; profile 85417-1 was described 2 m west of the west wall of the structure, and profile 85417-2 was described at the inside of the west wall of the fieldhouse (Figures 57.46 and 57.47; Table L.6). An east-west topographic profile across the site was also constructed, using a hand level and tape, and additional soil-stratigraphic measurements were made along the topographic profile (Figures 57.46 and 57.47). Site stratigraphy consists of an A-Bw soil formed in late Holocene (both pre- and post-occupation) eolian fines and colluvium overlying a thin, discontinuous Btb1 horizon formed in Pleistocene colluvium (Figure 57.47; Table L.6). The soils are exceptionally rocky, with the rocks representing a lag following erosion of overlying units. The thin Pleistocene colluvial deposits overlie a Qct pumice bed, and the absence of early or middle Holocene deposits suggests extensive erosion before deposition of the late Holocene eolian sediment.

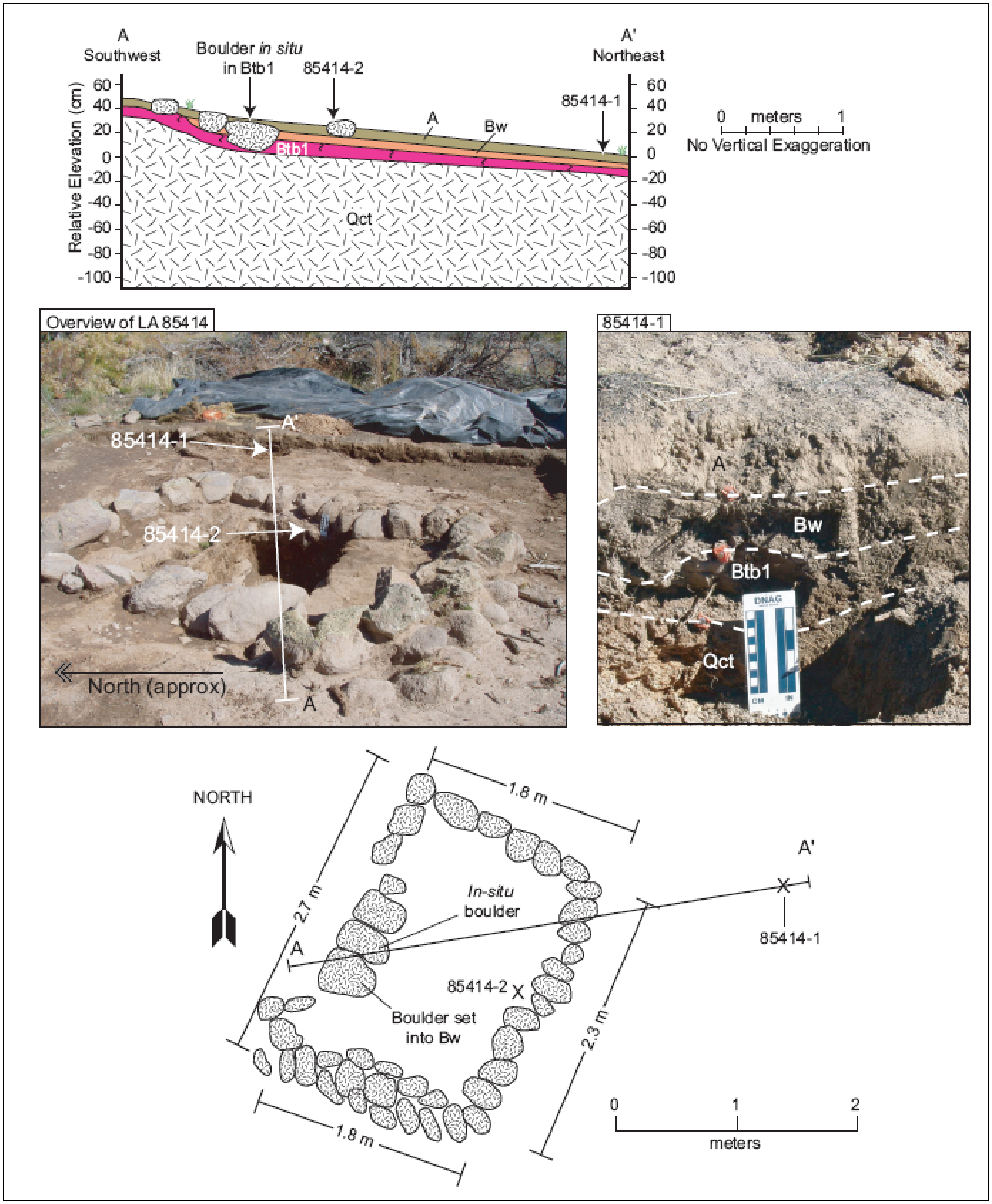


Figure 57.45. Schematic site map, cross-section, and photographs of LA 85414.

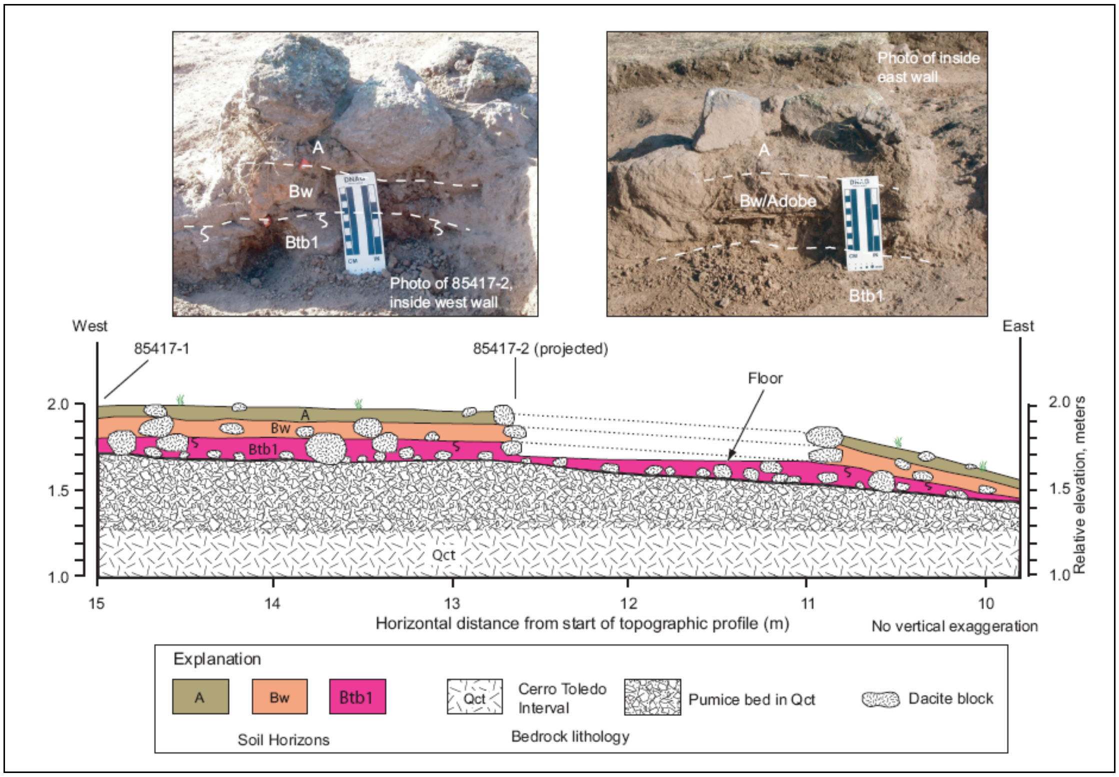


Figure 57.46. Cross-section detail and photographs showing LA 85417 soil stratigraphy.

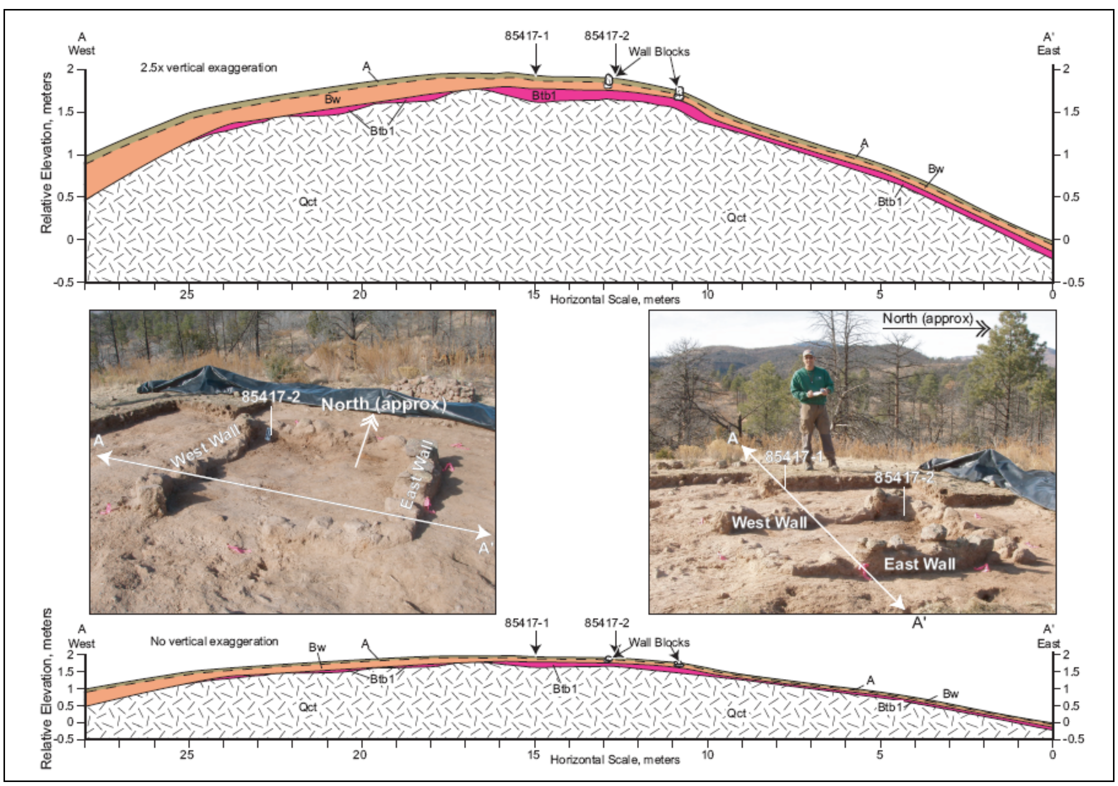


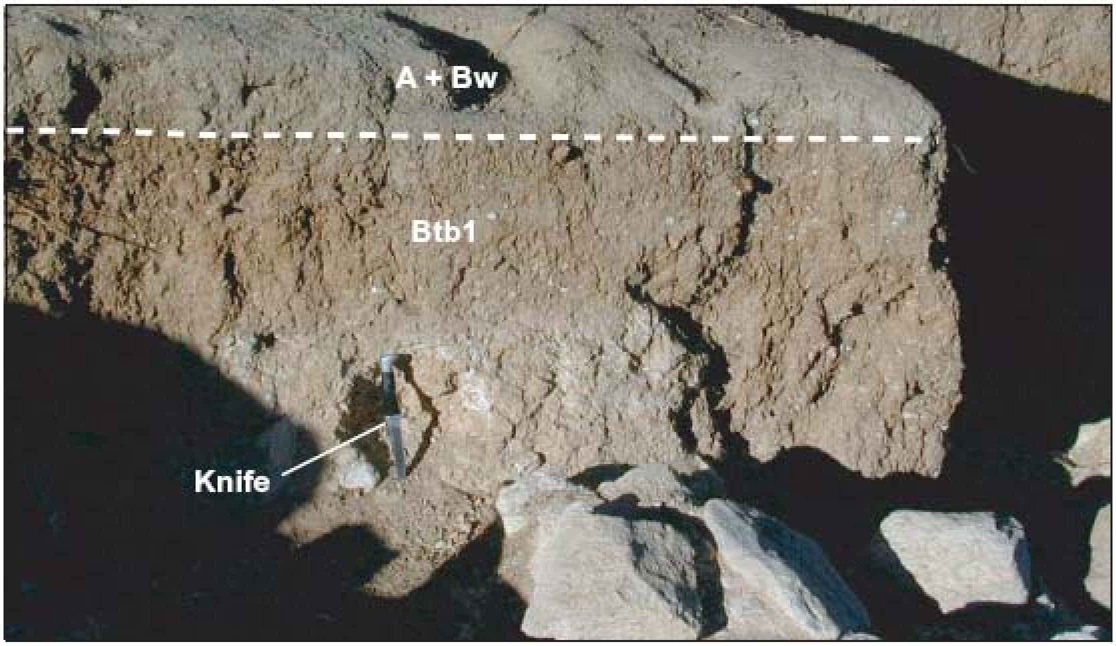
Figure 57.47. Topographic profile, schematic cross-sections, and photographs at LA 85417.

The fieldhouse was constructed primarily from dacite blocks. Wall rocks were set on top of and into the Bw horizon, with some rocks set to the top of the Btb1 horizon (Figure 57.46). The floor was cut into the Btb1 horizon in the northwest corner of the fieldhouse and is coincident with the top of the Btb1 horizon in the east side of the fieldhouse (Figure 57.46). The occupation surface at the site is the top of the Bw and the top of or within the Btb1 horizon, and post-occupation colluvial deposits are less than 10 cm thick (Figure 57.46). Although the thin soils present at the site are likely in part a result of the erosional setting, making age inferences based on soils problematic, the thin, weakly developed soils (A horizon only) that post-date the site and related stratigraphy are consistent with a Classic period age for LA 85417. The site is in good archaeological context.

LA 85859 (Archaic Lithic Scatter)

LA 85859 is an Archaic lithic scatter on a northeast-facing hillslope underlain by Qct pumice and thin colluvial deposits (see Figures 57.29 and 57.33). Qct is overlain by a buried soil in colluvium (b1), up to 80 cm thick, that has an inferred middle Holocene age of 6.7 to 7.4 ka based on three radiocarbon dates from three discrete charcoal fragments (Table M.2). The ages of these three samples are statistically different, suggesting a period of colluvial aggradation from ca. 6.7 to 7.4 ka that included site occupation. The middle Holocene soil profiles are truncated and are overlain by a late Holocene colluvial deposit less than 25 cm thick. An age estimate for the late Holocene colluvium is based on a charcoal sample from the top to the Bt1b1 horizon 3 cm below the base of the Bw horizon at LA 85859 that yielded an age of 570±40 BP (Beta-183759) and a date of cal AD 1353 with a two-sigma date range of cal AD 1299–1429 (Table M.2). Soils described at LA 85859 represent a catena, wherein a series of soil profiles developed in the same parent material that have a similar age, exhibit lateral variability in soil properties that is related to hillslope position. The term catena was proposed by Milne (1935a, 1935b), who emphasized that each soil on a slope bears a relationship to the soils above and below it. Birkeland (1999) discusses catenas at length. At LA 85859, the upper hillslope is underlain by a thin (less than 25 cm thick) late Holocene colluvial deposit overlying Qct (profiles 85859-6 and 7), and a lower hillslope with thin Holocene colluvium overlying up to 81 cm of late Pleistocene or early Holocene colluvium and Qct (profiles 85859-2, 3, 4, 5, and 8; Figures 57.33 and 57.48; Table L.7). The upper and lower hillslopes are separated by an area with bedrock at or near the surface (85859-1; Figure 57.33).

It is inferred from the site stratigraphy that the upper hillslope was eroded during early to middle Holocene time and that colluvium derived from Qct bedrock and/or Qct soils was deposited on the concave part of the hillslope below 85859-1. The base of this colluvial unit includes common dacite clasts, up to small boulder size, that represents a lag left after almost complete erosion of an older alluvial unit (Qoa or a gravel layer within Qct). A second period of erosion likely occurred sometime during the late Holocene, during which the upper hillslope was stripped to bedrock and the middle Holocene soils on the lower hillslope were truncated. The stripped Qct on the upper hillslope and truncated late middle Holocene soils on the lower hillslope were then buried by a thin late Holocene colluvial deposit.



Opposite side of trench wall showing A & Bw horizons (late Holocene colluvium) overlying Btb1 horizon. Dacite gravel lag at base. Knife (length = 22 cm) for scale.

Figure 57.48. Trench wall showing soil horizons at LA 85859. Greatest artifact concentration (obsidian flakes) found in Bt1b1 horizon.

Artifacts are found in both the middle Holocene colluvium and the late Holocene colluvium at LA 85859 (Figure 57.33; Table E-1 of Drakos and Reneau 2004, more than one artifact must be found in a given horizon to confirm artifact occurrence in a particular stratigraphic unit). The maximum artifact concentration at the site was found in the vicinity of 85859-5, and the highest artifact concentration near 85859-5 was in the Bt1b1 horizon. Artifacts were found in the Bt horizons near profiles 85859-2 and -4, downslope from 85859-5, but not near 85859-3, located 3 m upslope from 85859-5 (Figure 57.33; Table E-1 of Drakos and Reneau 2004). Artifacts were also found in the late Holocene colluvium near profiles 85859-2, 4, and 5, with the highest density also near 85859-5. This artifact distribution suggests that the occupation surface was within the upper part of the middle Holocene colluvium, and that the artifacts found in the late Holocene colluvium were supplied from local bioturbation of the underlying b1 soils. Some artifacts were also likely eroded from the upper Bt horizon and redeposited in the late Holocene colluvium. The absence of artifacts upslope near 85859-3 provides evidence that the artifacts found near 85859-5 were not transported from upslope, but that the main occupation area was near 85859-5

Some artifacts were also observed in deeper horizons and immediately above the Qct pumice. Evidence of extensive burrowing was observed immediately above the Qct contact, and it is inferred that these artifacts have been transported to deeper soil horizons by animal burrowing (e.g., the Bkb1 horizon at 85859-5 and the BCb1 horizon at 85859-4; note the occurrence of a rodent bone in the Bkb1 horizon at 85859-5; see Table E-1 of Drakos and Reneau 2004). Additional downward movement of artifacts into other horizons from bioturbation is also inferred to have occurred after site abandonment (e.g., the decrease from 282 artifacts in the Bt1b1 to three artifacts in the Bt3b1 at 85859-5). The dispersion of artifacts through the entire thickness of the soil profile near 85859-4 and 85859-5 provides evidence for substantial bioturbation and vertical transport of artifacts since site abandonment. The precise depth of the occupation surface is therefore not well constrained, but may occur somewhere in the Bt1b1 horizon, at a depth of 13 to 31 cm, where artifact concentrations are highest. Based on the maximum artifact density occurrence in the best-developed soil horizon (Bt1b1), it is inferred that most of the bioturbation occurred relatively soon after deposition of the colluvium and site abandonment, before development of these soil horizons. Because the peak artifact density occurs in the upper part of the b1 soil, site occupation also apparently occurred late in the period of deposition of this unit.

The b1 soil at LA 85859 would have an inferred late Pleistocene age based on comparison with the chronosequence of Pleistocene and Holocene soils developed on a terrace sequence in Rendija Canyon (Reneau and McDonald 1996; McDonald et al. 1996). However, radiocarbon analyses of three charcoal samples collected from Btb1 and Bt1b1 horizons, provided calibrated radiocarbon dates of ca. 6.7 to 7.4 cal ka (Table M.2) that are much younger than age estimates based on soil development. The radiocarbon dates are consistent with the age estimates for two diagnostic points found on the ground surface in the vicinity of LA 85859, providing supporting evidence for the radiocarbon age estimates. Soil properties including development of reddened (7.5YR) Bt horizons with moderately thick clay films reflect rates of soil development that are more rapid on this northeast-facing colluvial hillslope than have been observed in Rendija Canyon terrace deposits or in mesa top deposits at Airport Tract sites, on Pajarito Mesa, or in White Rock Tract sites.

LA 85861 (Fieldhouse)

LA 85861 consists of a large fieldhouse with an internal hearth situated on a broad, gently east-sloping Qct ridge crest below a steeper slope leading to a higher ridge crest south of the site. Due to its location on a bench below a steeper slope, LA 85861 was almost completely buried by slopewash colluvium before excavation. The structure measures approximately 3.0 m by 1.7 m (inside) and 3.3 m by 1.9 m (outside dimensions), situated with the long axis of the structure oriented approximately N10°W (Figure 57.49).

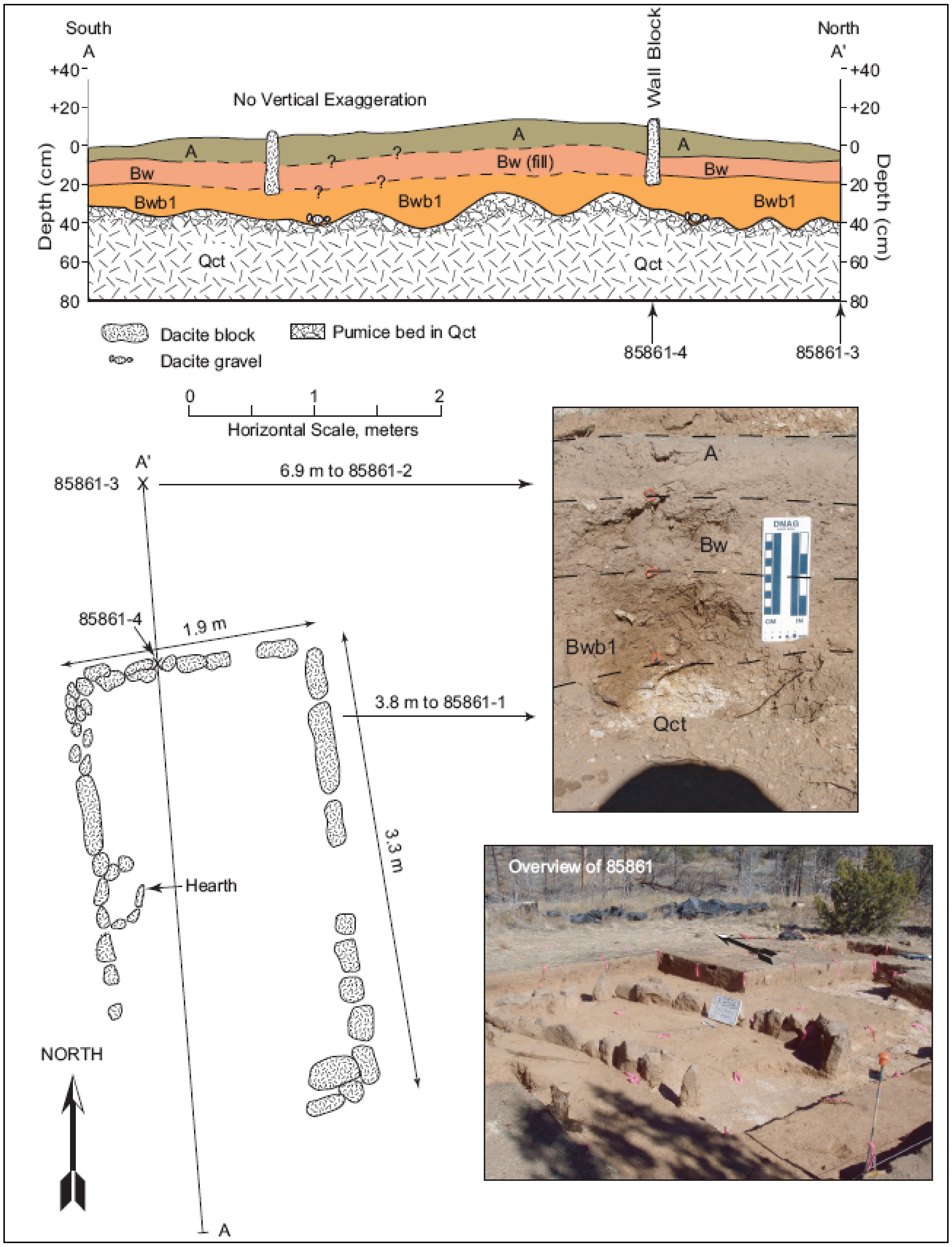


Figure 57.49. Schematic site map, cross-section, and photographs of LA 85861.

Soils were described in four locations at the site; profile 85861-1 was described 4 m east of and downslope from the east wall, profile 85861-2 was described 6.2 m northeast of and downslope from the east wall, profile 85861-3 was described 1.5 m north of the north wall, and profile 85861-4 was described on the north side of the north wall of the structure (Figure 57.49). A north-south topographic profile across the site was also constructed, using a hand level and tape (Figure 57.49). Site stratigraphy consists of an A-Bw-Bwb1 soil formed in sandy Holocene colluvium overlying a Qct pumice bed. Holocene colluvium is 27 to 50 cm thick in the site vicinity and includes a middle to late Holocene deposit (Bwb1 horizon) and an overlying late Holocene deposit (A-Bw horizons). The Bwb1 horizon is reddened (7.5YR4/6 dry color) and may be derived in part from reworking of older soils upslope. The site apparently experienced significant erosion in the early and/or middle Holocene, before deposition of the middle to late Holocene colluvium.

The fieldhouse was constructed primarily from dacite blocks. Wall rocks were generally set into the Bw and Bwb1 horizons, with fill adjacent to wall blocks having the same color as the Bwb1 horizon at profile 85861-4 (Figure 57.49; Table L.6). The occupation surface at the site is the top of the Bwb1 horizon, and post-occupation colluvial deposits are 15 to 31 cm thick (Figure 57.49; Table L.6). The soils (A and Bw horizons) that post-date the site and related stratigraphy are consistent with either a Late (?) Coalition or Classic period age for LA 85861. The site is in very good archaeological context.

LA 85864 (Apache tipi ring site)

LA 85864 is a tipi ring outlined by dacite cobbles located on a gullied Qc valley bottom. The tipi ring is situated on a preserved valley bottom remnant between two 2- to 3-m-deep southeast-sloping gullies (see Figure 57.29). Soil stratigraphy at the tipi ring includes an A horizon from 0 to 9 cm overlying an Ab1 horizon (Table L.6, profile 85864-1). Tipi ring rocks are set on top of or into the Ab1 horizon. The occupation surface may have been on top of the Ab1 horizon or may have been on top of the underlying Bwb1 horizon. The thickness of the A horizon indicates approximately 9 cm of deposition that post-dates construction of the tipi ring during the middle to late 1800s. The deep gully incision in the area apparently post-dates the tipi ring site.

The gullies adjacent to LA 85864 and LA 99397 (discussed below) preserve 1.5- to 2-m-thick middle to late Holocene colluvial deposits (Figure 57.50). The Holocene colluvium buries late Pleistocene to early Holocene colluvium that is exposed near the base of gully walls. The Holocene section exposed in gullies has excellent potential for preservation of Archaic or older sites, but none were observed during mapping or stratigraphic descriptions during the 2003 field season.

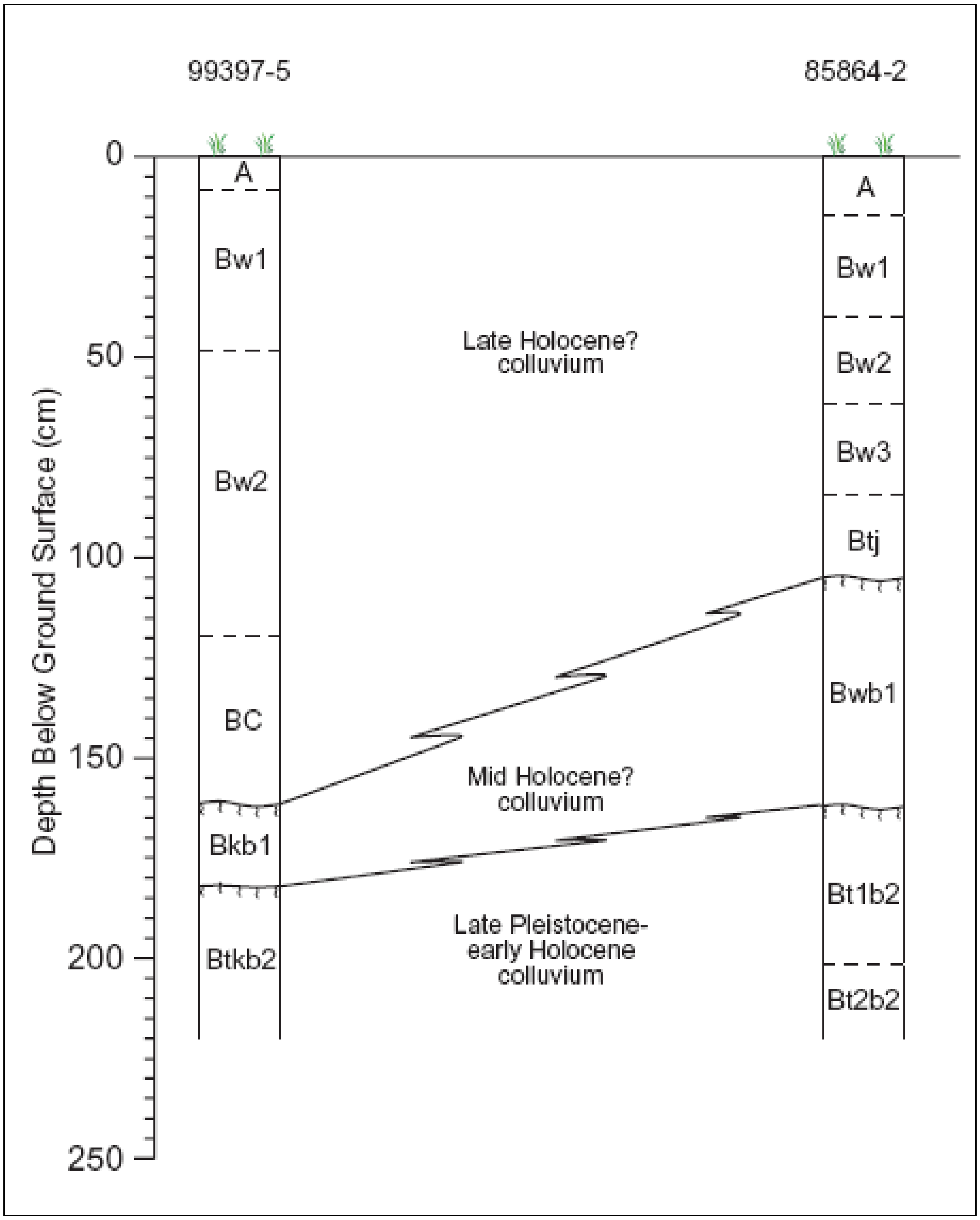


Figure 57.50. Holocene and late Pleistocene stratigraphy exposed in gullies near sites LA 85864 and LA 99397.

LA 85867 (Fieldhouse)

LA 85867 consists of a fieldhouse situated on a south-facing Qc slope below a Qct ridge. The structure is oriented north-south by east-west with a north-facing opening and measures approximately 2.2 m by 1.3 m (inside), or 2.7 m to 3.1 m by 2.0 m (outside dimensions) (Figure 57.51). Soils were described in one test pit at the site, located on the inside of the south wall, 0.8 m west of the southeast corner of the fieldhouse. Site stratigraphy consists of an A-Bw1-Bw2-

Bw3 soil overlying Qct at a depth of greater than 100 cm (Figure 57.51, Table L.6). The soil at this location is a cumulic soil formed in a late (?) Holocene aggradational colluvial deposit.

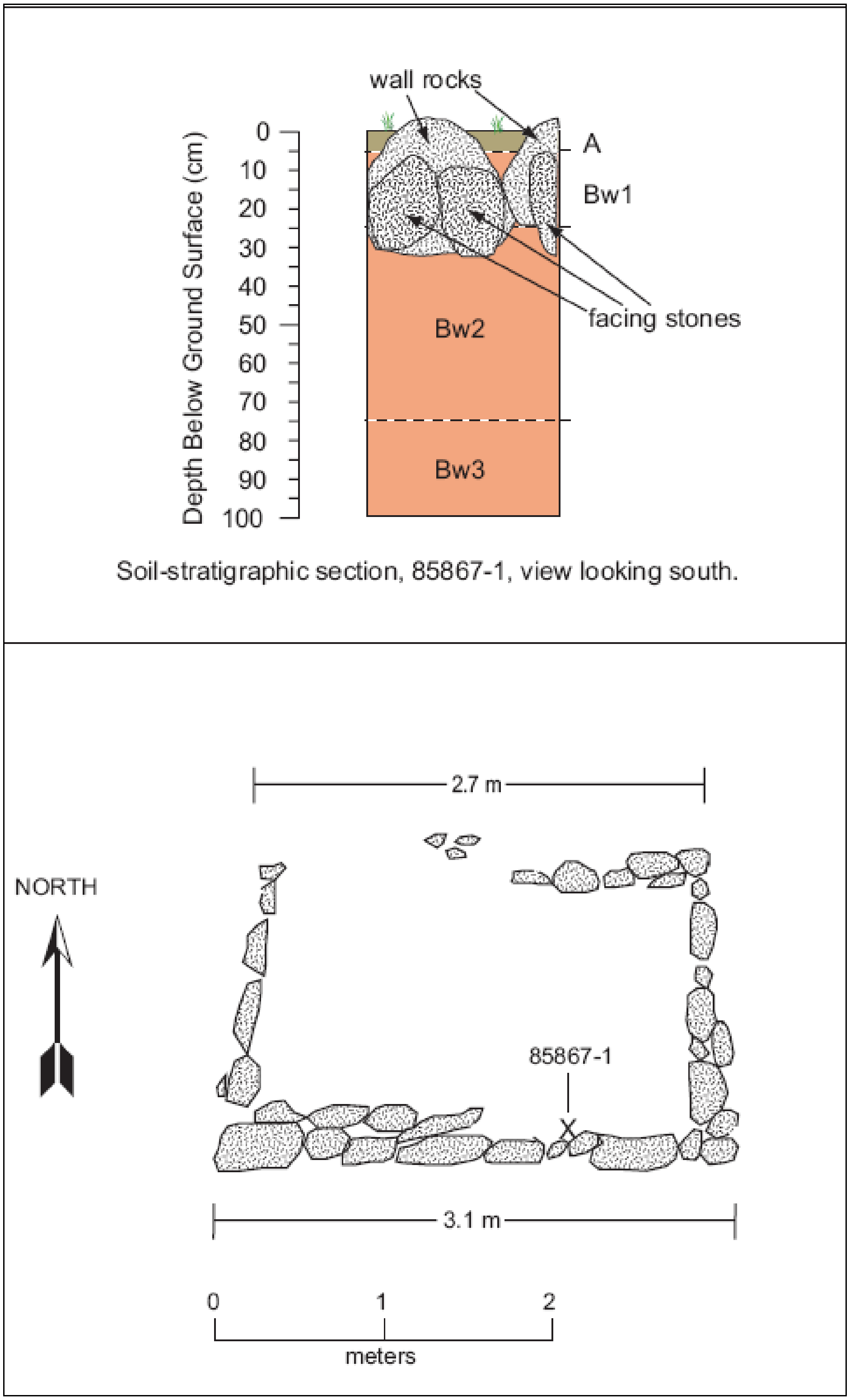


Figure 57.51. Schematic site map and soil-stratigraphic section at LA 85867.

The fieldhouse was constructed primarily from dacite blocks. Wall rocks were set into Bw1 and Bw2 horizons (Figure 57.51). The occupation surface at the site is inferred to be the top of the Bw1 horizon, and post-occupation colluvial and eolian deposits are 5 cm thick at the described profile. Soils burying LA 85408 are relatively thin and weakly developed. The soils and related stratigraphy are therefore consistent with a Classic period age for LA 85867. The north side of the site has been somewhat disturbed due to its proximity to a two-track dirt road, but the remainder of the site has been buried by young colluvium and is apparently in good archaeological context.

LA 85869 (Apache tipi ring site)

LA 85869 includes two tipi rings (Features 2 and 4) defined by dacite cobbles situated on the north shoulder of a northwest-to-southeast-trending ridge, adjacent to the ridge top (see Figures 57.29 and 57.52). Soil stratigraphy at the tipi ring includes an A horizon from 0 to 4 cm that contains beads, chipped stone, ceramics, and metal artifacts overlying a Bw horizon (Figure 57.52; Table L.6). Tipi ring rocks are set on top of the Bw horizon, which corresponds to the occupation surface. The thin A horizon that post-dates construction of the tipi ring indicates minimal deposition has occurred at this site since the middle to late 1800s. The Bw horizon overlies a Btb1 horizon with common to continuous moderately thick clay films. The Btb1 soil is of inferred Pleistocene age. The total thickness of late Holocene deposits in the vicinity of LA 85869 is less than 20 cm (Figure 57.52; Table L.6). The absence of early and middle Holocene deposits suggests extensive erosion at this site before or during the late Holocene.

LA 86605 (Fieldhouse)

LA 86605 consists of a fieldhouse situated on the broad, gently sloping, east-facing shoulder of the Qt2 terrace (see Figure 57.30). The structure measures approximately1.7 m north-south by 1.5 m east-west (inside dimensions), or 2.1 m north-south by 2 m east-west (outside dimensions), and contains an opening facing east (Figure 57.53). Soils were described in two test pits at the site; profile 86605-1 was described 1.1 m west of the west wall of the fieldhouse and profile 86605-2 was described inside the structure, approximately 0.4 m east of the west wall (Figure 57.53; Table L.5). Site stratigraphy consists of an A-Bw soil overlying a buried Pleistocene or early Holocene Btb1-Btkb1 soil outside the structure and an A-Bw1(?)-Bw2(?) profile overlying the buried soil inside the structure (Figure 57.54). The Bw2 horizon inside the structure contains disseminated charcoal and tuff clasts below the level of the bottom of the roomblock walls, providing evidence for an earlier period of occupation at this site.

The fieldhouse was constructed utilizing dacite and tuff blocks and slabs, with two large Bandelier Tuff slabs used to construct most of the west wall (Figure 57.53). The dacite was likely obtained from the local Qt2 terrace gravels, and the tuff may have been obtained from outcrops in a nearby drainage to the east. The slabs are set into a trench dug into the Bw, Btb1 and Btkb1 horizons (Figure 57.54). Sherds were observed in the clayey fill in the trench, providing additional evidence that the structure was built on top of an older site. The top of the

Btb1 horizon (outside the structure) and the top of the Btkb1 horizon (inside the structure) is the likely occupation surface for the first occupation of this site.

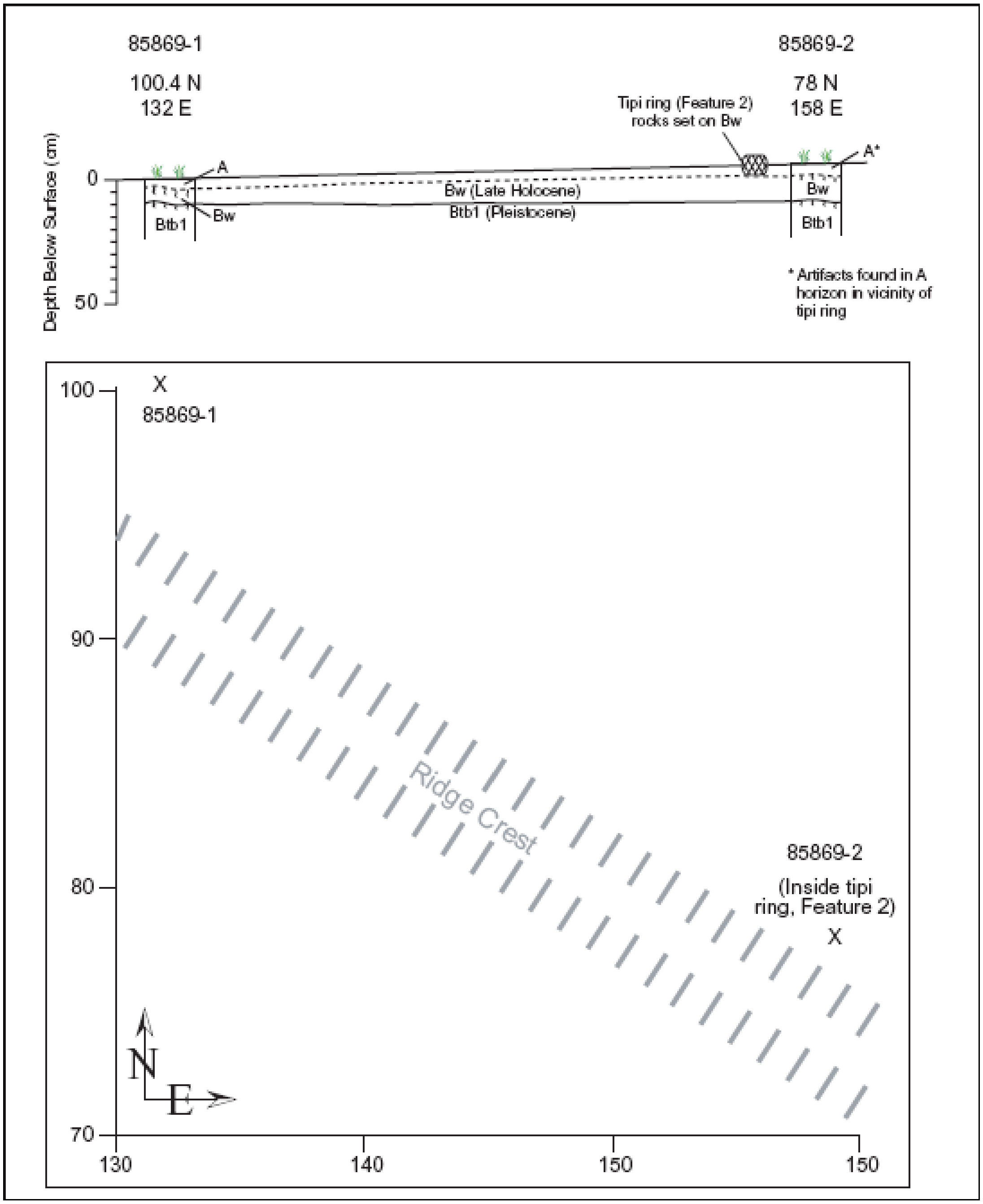
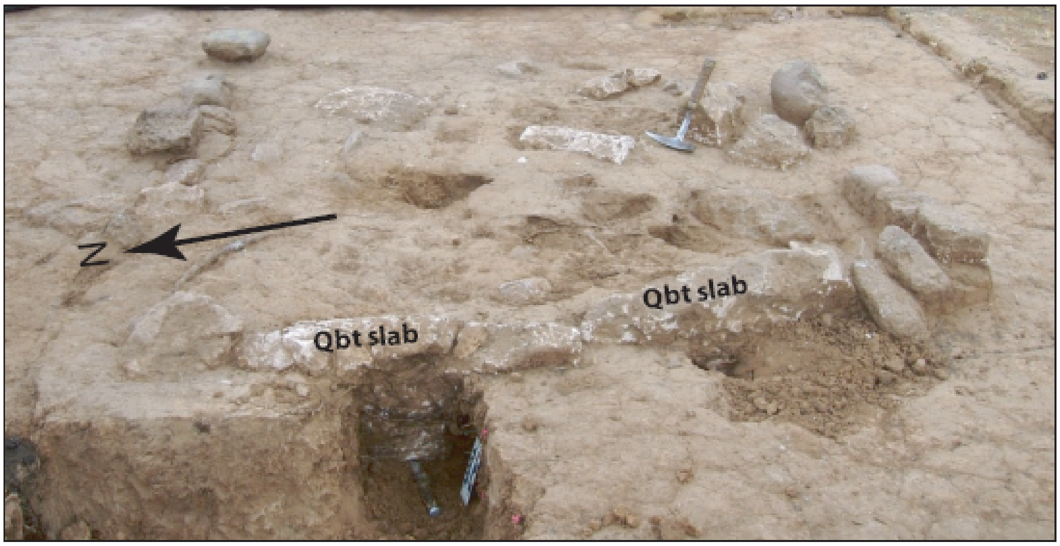


Figure 57.52. Site stratigraphy and sketch map of LA 85869.

The second period of construction appears to have recycled clasts from the earlier construction phase and built on top of old fill. The top of the Bw2 horizon inside the structure constitutes the likely occupation surface for the latest occupation at this site. Outside the structure the relations are less clear. The occupation surface for the inferred first occupation at this site was likely at the top of the Btb1 horizon, and for the latest occupation could have been at this level but, based on the shallow trench fill next to the slab that appears to extend through the Bw horizon, was likely the top of the Bw horizon. Total deposition outside the structure since initial occupation was about 19 cm and, since the latest occupation, may have been as little as 7 cm.



Photograph of LA 86605 during excavation. Note Qbt slabs, opening in structure facing east.

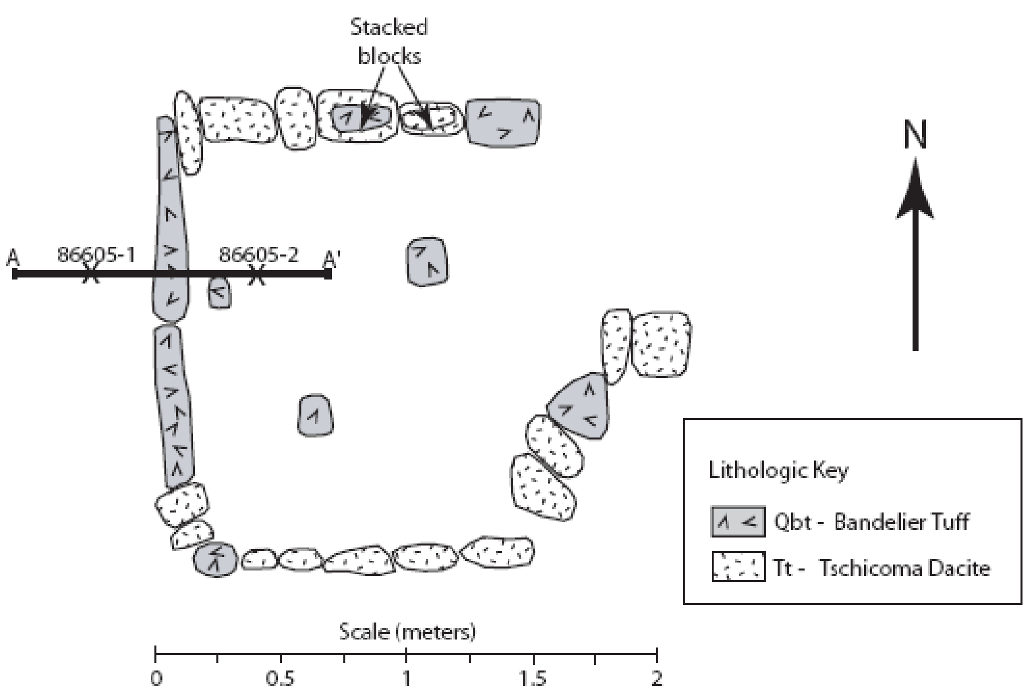


Figure 57.53. Schematic site map and photograph from LA 86605.

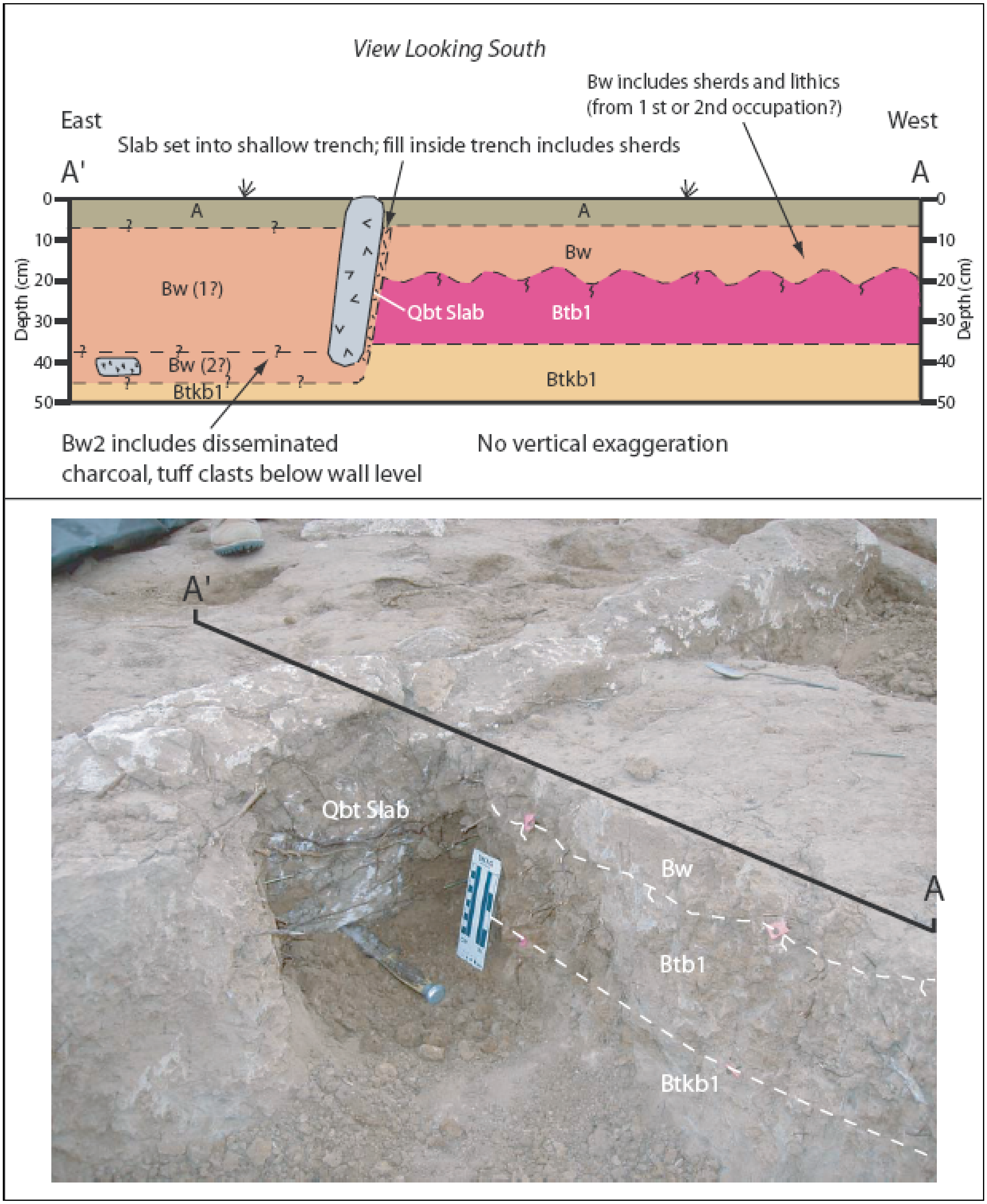


Figure 57.54. Cross-section and photograph showing soil stratigraphy in relation to slabs used in wall construction at LA 86605.

LA 86605 is buried by slopewash colluvium and reworked eolian fine sand, but did not exhibit extensive erosion and appears to be in good archaeological context. The Bw horizon that buries this site is reddened and has a hard consistence, suggesting a relatively older site age for the first occupation, whereas the thin A horizon burying the likely occupation surface at the top of the Bw horizon suggests a relatively young age for the second occupation. The soils and related stratigraphy are therefore consistent with LA 85404 having an earlier Coalition period occupation and a later, likely Classic period, occupation. A maize sample from a possible living surface at LA 86605 yielded a radiocarbon age of 360±40 BP (Beta-215551) and a date of cal AD 1542 with a two-sigma date range of cal AD 1450–1635 (Table M.2), also indicating a Classic period age for the second occupation at LA 86605.

LA 86606 (Fieldhouse)

LA 86606 consists of a fieldhouse and separate wall situated on a prominent gently east-sloping bench overlooking the Cabra Canyon floor. The bench is likely a Cabra Canyon Pleistocene terrace overlain by colluvium derived from the hillslope west of the site. The fieldhouse is oriented north-south by east-west and measures approximately 1.8 m by 1.7 m (inside), or 2.5 m by 2.0 m (outside dimensions) (Figure 57.55).

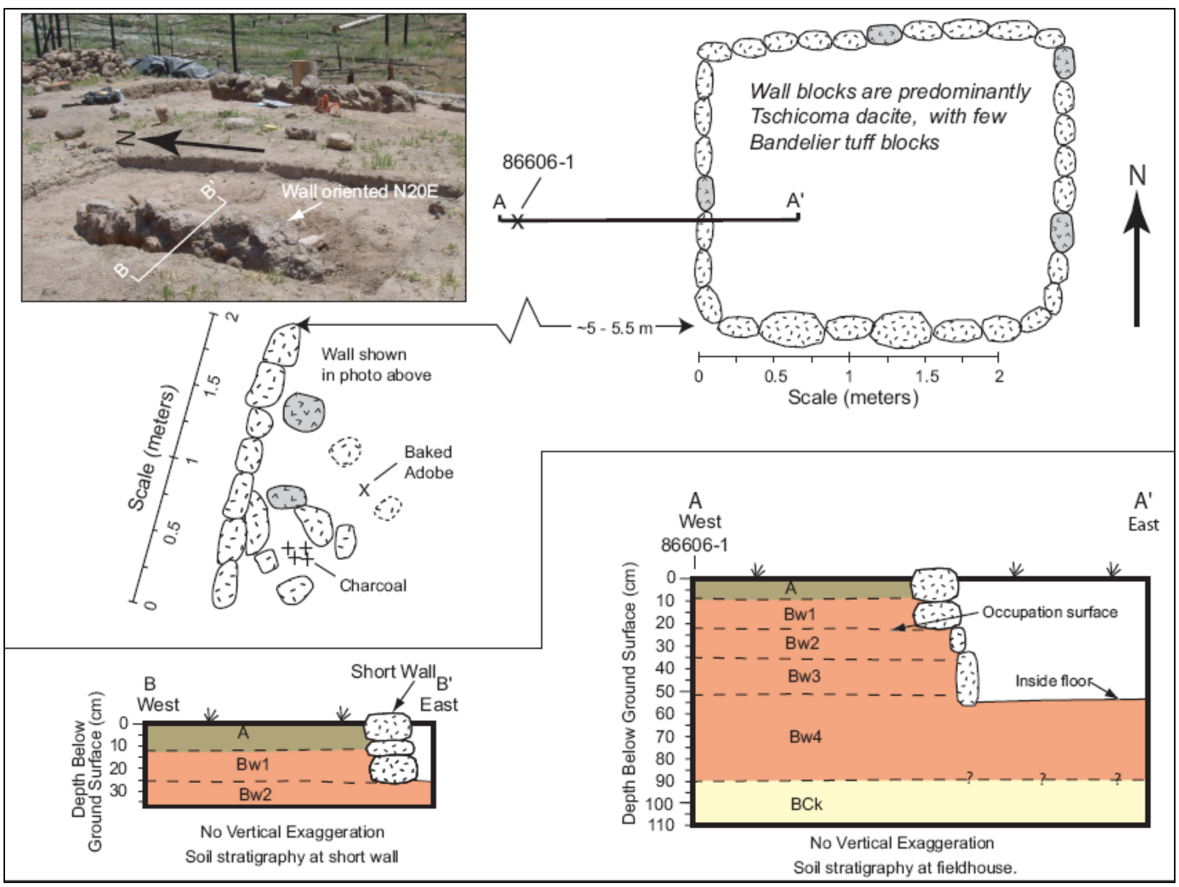


Figure 57.55. Photograph showing fieldhouse and external wall and sketches showing schematic site map and soil stratigraphy at LA 86606.

A separate 2-m-long wall is located 5 to 5.5 m west of the fieldhouse and is oriented N20°E (Figure 57.55). Soils were described in one test pit at the site, located 1.2 m west of the west wall of the fieldhouse. Site stratigraphy consists of an A-Bw1-Bw2-Bw3-Bw4-BCk soil to a depth of 120 cm (Figure 57.55; Table L.6). The soil at this location is a gravelly cumulic soil formed in a middle to late (?) Holocene aggradational colluvial deposit that likely overlies a fluvial terrace deposit. The absence of early Holocene deposits suggests extensive erosion at this site before or during the middle to late Holocene.

The fieldhouse was constructed primarily from dacite blocks, with some (approximately 5%) tuff blocks also utilized. Wall rocks were set to a depth of approximately 25 cm on the outside of the structure, to the top of the Bw2 horizon, and foundation rocks and/or facing slabs were set to a depth of approximately 55 cm inside the fieldhouse, into the Bw4 horizon (Figure 57.55). The occupation surface at the site is inferred to be the top of the Bw2 horizon and inferred post-occupation colluvial deposits are 22 cm thick at the described profile. The separate wall was also set on top of the Bw2 horizon and therefore appears to be contemporaneous with the fieldhouse. Charcoal and baked adobe were present east of the wall (Figure 57.55), suggesting an outside use area. The soils and related stratigraphy are consistent with a Classic period, or possibly (less likely) a Coalition period age for LA 86606. The site is currently in a depositional setting and, with the exception of some minor erosion observed on the east side of the fieldhouse, is in good archaeological context.

LA 86607 (Fieldhouse)

LA 86607 consists of a fieldhouse situated on a ridge spur between Cabra Canyon and a tributary drainage. The ridge spur is a possible high terrace remnant or Qct gravel overlain by thin Holocene colluvium. The fieldhouse is oriented approximately north-south by east-west and measures approximately 2.2 m by 2.0 m (inside), or 2.8 m by 2.6 m (outside dimensions) (Figure 57.56). Soils were described in one test pit at the site, located 1.5 m west of the west wall of the fieldhouse. Site stratigraphy consists of an A horizon formed in late Holocene (post-occupation) colluvium overlying a clay-rich Pleistocene Btb1 horizon (Figure 57.56; Table L.6). The absence of early or middle Holocene deposits suggests extensive erosion before deposition of the late Holocene colluvium sediment.

The fieldhouse was constructed primarily from dacite blocks, with some tuff blocks also utilized. Wall rocks were set to a depth of approximately 5 cm below the top of the Btb1 horizon (Figure 57.56). The occupation surface at the site is inferred to be the top of the Btb1 horizon, and post-occupation colluvial deposits are 4 cm thick at the described profile. Soils burying LA 86607 are thin and weakly developed. The soils and related stratigraphy are consistent with a Classic period age for LA 86607; however, the weak soil development may also be related to the setting of the site. The site is in an erosional setting and is in relatively poor archaeological context.

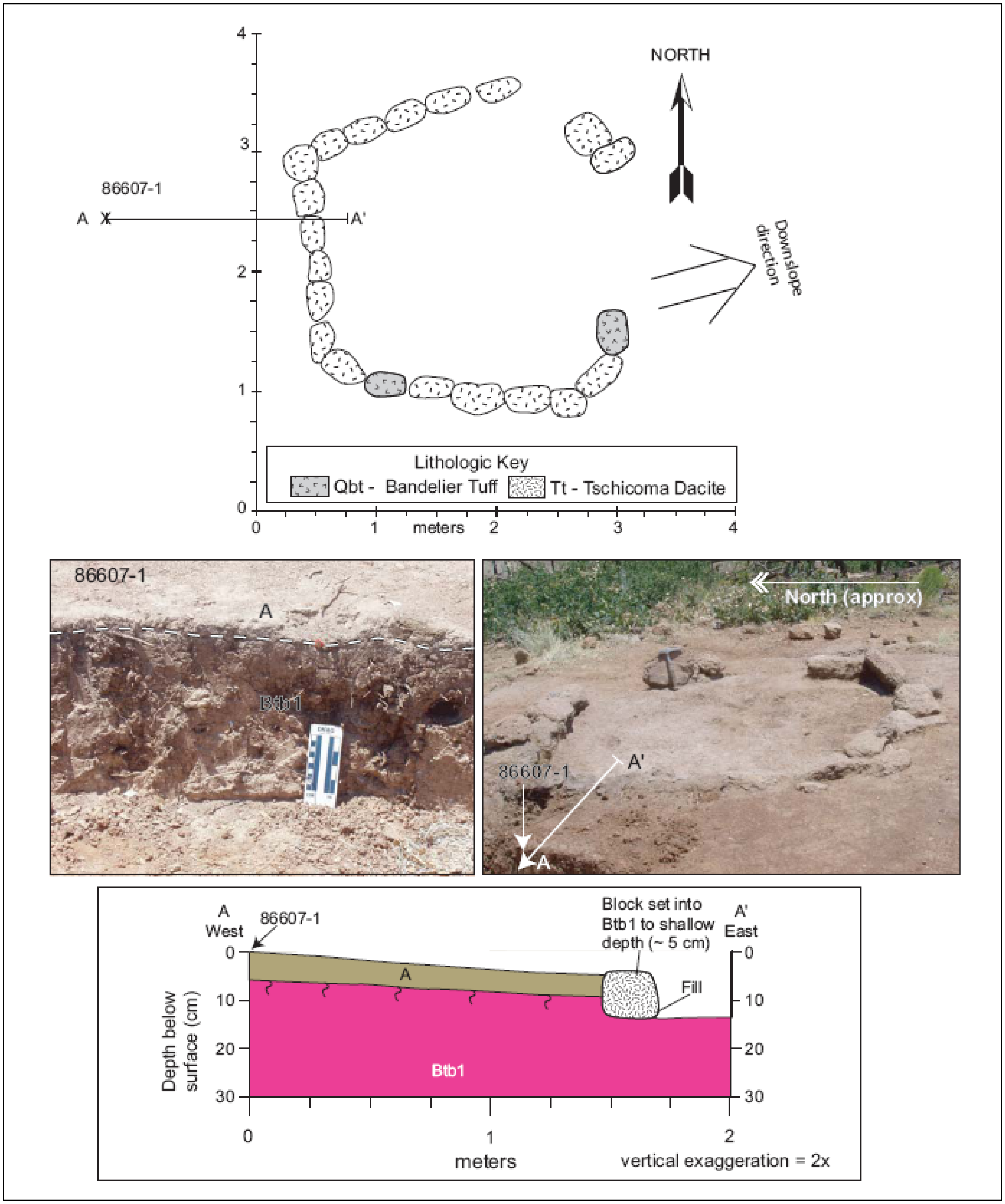


Figure 57.56. Schematic site map, cross-section, and photographs from LA 86607.

LA 87430 (Fieldhouse)

LA 87430 includes a fieldhouse with an external hearth situated on the north edge of a Qt5 terrace overlooking the Rendija Canyon stream channel (Figure 57.57). The structure measures approximately 1.85 m north-south by 2.1 m east-west (inside dimensions), or 2.4 m north-south by 2.4 to 2.8 m east-west (outside dimensions), situated with the short axis of the structure oriented N20°E, and contains an opening facing east-southeast (Figure 57.57). Soils were described in one test pit at the site, located 2 m east of the east side of the fieldhouse (Figure 57.57; Table L.5). Site stratigraphy consists of an A-Bw soil overlying a buried mid Holocene Btb1 horizon (Figure 57.57; Table L.5).

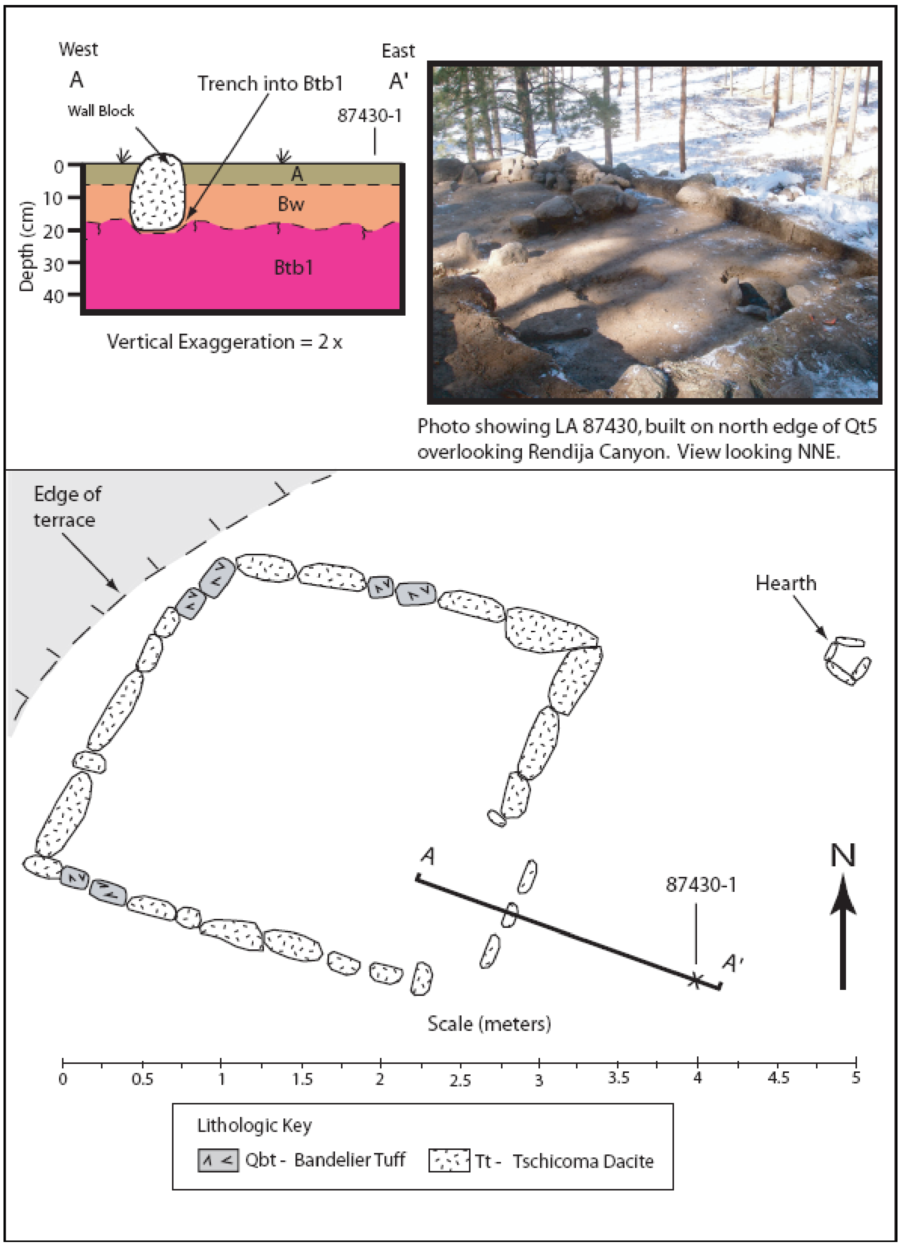


Figure 57.57. Schematic site map and cross-section of LA 87430.

The fieldhouse was constructed primarily from dacite blocks, with some tuff blocks also utilized. The occupation surface at the site is on, or just above, the top of the Btb1 horizon (Figure 57.57). Rocks for wall construction were either set on top of, or in some cases, into a shallow trench into the Btb1 horizon (Figure 57.57). The site has been subject to some erosion on the north side and deposition on the south side of the structure. Although built on the edge of the terrace above a steep streambank, the walls appeared to be relatively well preserved and the site is likely in good archaeological context. LA 87430 is buried by a weakly developed soil in a colluvial deposit that is 18 cm thick where described. The soils data and related stratigraphy are suggestive of a Classic period age for LA 87430. Two samples of maize collected from ash surrounding the external hearth yielded radiocarbon ages of 370±40 BP (Beta-215552) and 390±40 BP (Beta-215553). The dates are statistically indistinguishable, allowing summing of probabilities and a refined age estimate of 380±28 BP and a date of cal AD 1500 with a two-sigma date range of cal AD 1445–1631 (Table M.2), also indicating a Classic period age for LA 87430.

LA 99396 (Multi-component Archaic Lithic Scatter and Puebloan Structure)

LA 99396 includes an Archaic lithic scatter and a one-room Puebloan structure with a hearth and an artifact scatter that includes sherds. The site is situated on a broad, low-relief, approximately east-west-trending ridge crest and on the south-facing hillslope below the ridge and is located just west of a saddle (see Figures 57.29 and 57.58). LA 99396 is underlain by thin eolian and colluvial deposits that overlie Qct or Qbog pumice (Figures 57.34 and 57.59). Many of the soil horizons at the site are fine-grained, silty deposits with less than 2 percent gravel, indicating a significant component of eolian deposition (Table L.7; Figure 57.59).

Site stratigraphy includes late Holocene (younger than AD 1400, based on correlation with radiocarbon dated deposits at LA 85859 and LA 99397) eolian or slopewash deposits generally less than 15 cm thick outside the Feature 2 structure overlying late Pleistocene or early Holocene eolian deposits (99396-1, 99396-4, 99396-5), late Holocene (1 to 2 ka) swale fill deposits (99396-2), or Qct/Qbog pumice (99396-3) (Figures 57.34 and 57.59; Table L.7). A charcoal sample collected from the Bwb1 horizon at 99396-2 yielded a radiocarbon age of 1000±40 BP (Beta-199385) and a date of cal AD 1032 with a two-sigma date range of cal AD 975–1155. This provides a minimum age for the Bwb1 soil and the late Holocene swale fill deposits at LA 99396. The maximum thickness of late Pleistocene or early Holocene eolian deposits observed at LA 99396 was 113 cm at 99396-4 and likely represents a cumulic soil profile. A charcoal sample collected from the Btkb1 horizon at 99396-4 (see Figure 57.34) yielded a radiocarbon age of 33,660±320 BP (Beta-199381) that is beyond the range of calibration. Soil characteristics include 7.5YR color, common to many thin clay films as bridges and on ped faces and maximum Stage II- carbonate. Although less well-developed than soils described at LA 85859, the degree of soil development observed in the 99396-4 b1 soil is similar to that observed in late Pleistocene soils previously described in Rendija Canyon (McDonald et al. 1996; Phillips et al. 1998) and is consistent with the development of Stage II carbonate in warm to temperate semiarid locations in late Pleistocene soils (Machette 1985). Although the 33.7 ka b1 soil at LA 99396 (including Bt, Bk, and Btk horizons) is somewhat similar to the 6.7 to 7.4 ka b1 soil at LA 85859, the different soil ages, based on radiocarbon dates, show the importance of local geomorphic setting on soil development. The late Pleistocene soils are truncated, indicating erosion of the area in the vicinity of LA 99396 some time during the Holocene, before deposition of the late Holocene eolian and colluvial deposits. The development of shallow drainages and their subsequent filling is recorded by the middle to late Holocene swale fill deposit at 99396-2 (Figure 57.34). The swale fill deposits are reddened, exhibiting 8.75YR to 7.5YR color, but lack clay films (Table L.7). From these soil properties it is inferred that the swale fill deposits are derived from reworking of older soils upslope.

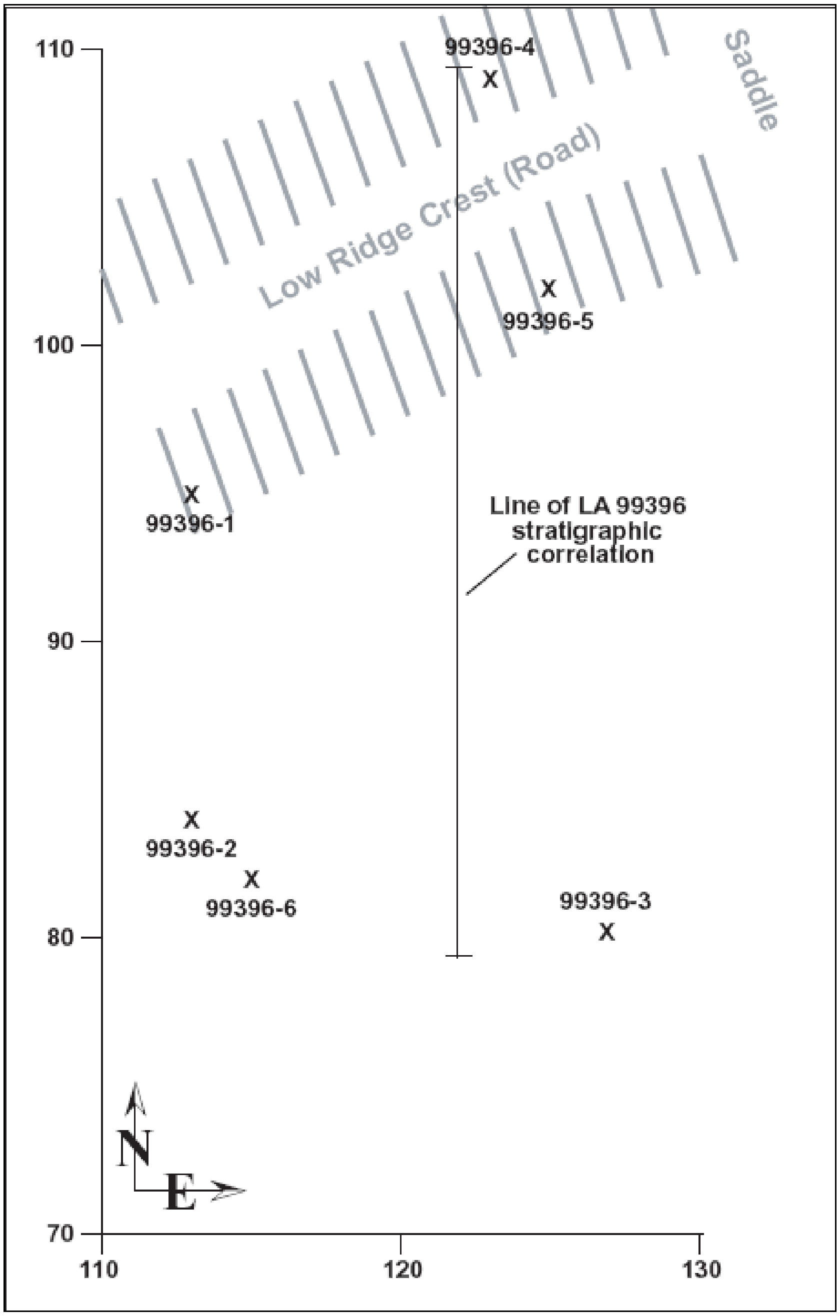
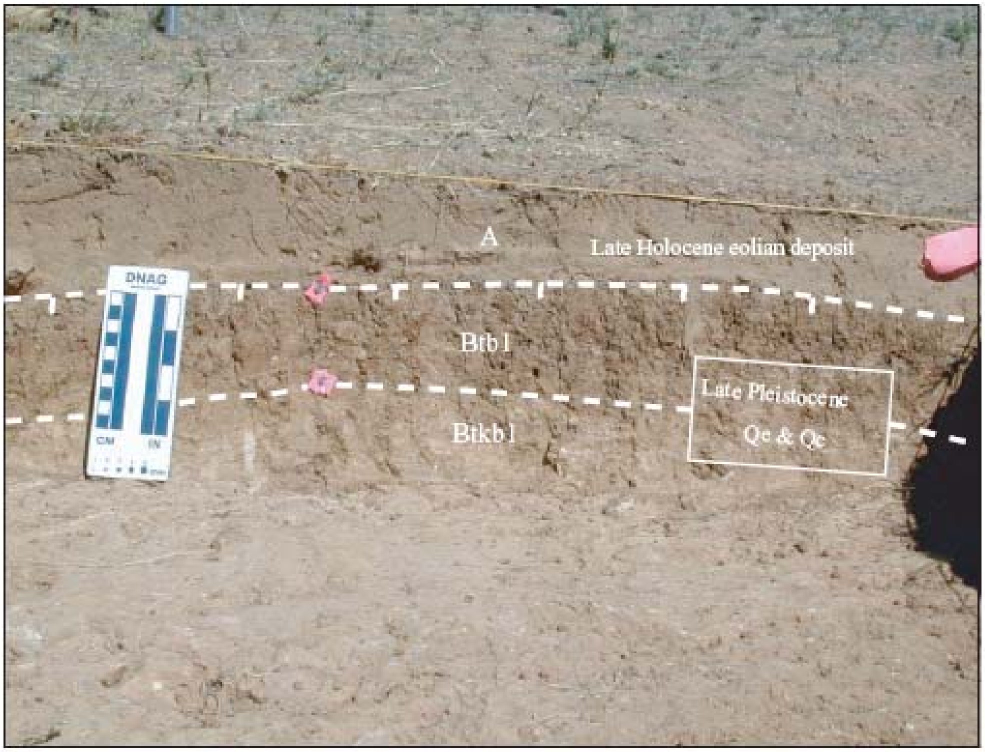


Figure 57.58. Site map showing location of soil pits at LA 99396.



Late Holocene eolian deposit (Qe) over truncated late Pleistocene Btb1 horizon.

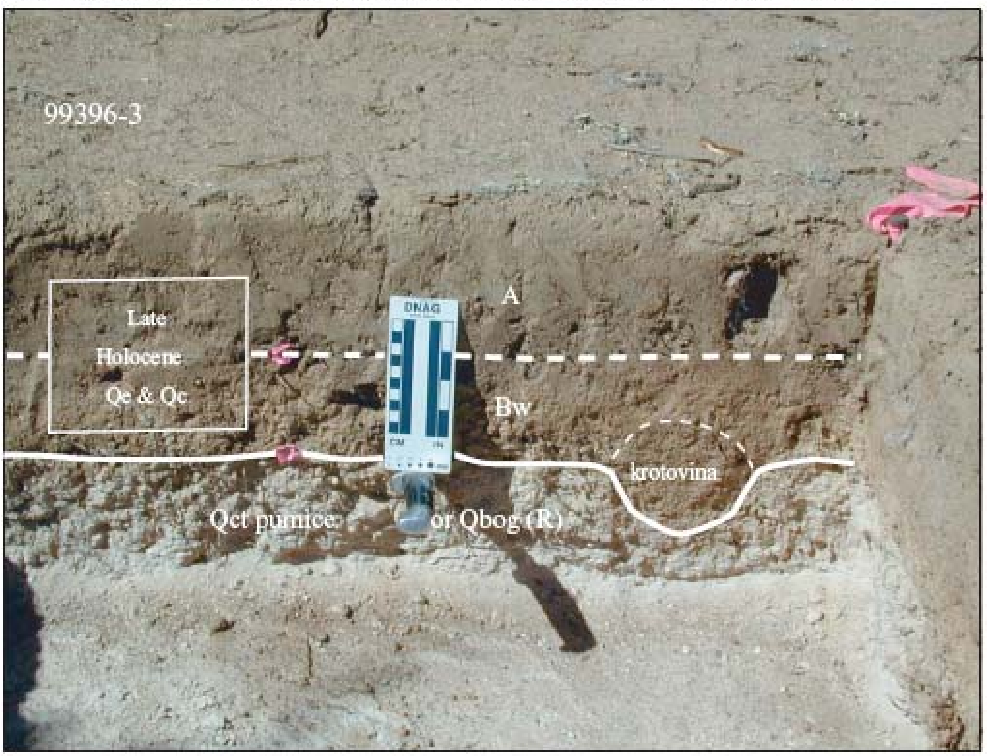


Figure 57.59. Thin soils formed in late Holocene eolian deposits (Qe) and slopewash colluvium (Qc) overlying bedrock (Qct or Qbog pumice) at LA 99396.

Artifacts were found in both the late Holocene deposits and near the top of the upper horizon (Bt1b1) of the late Pleistocene soil at LA 99396 (Figure 57.34; Table E-2 of Drakos and Reneau 2004). The maximum subsurface artifact concentration at the site was observed in the vicinity of 99396-4 and 99396-5, on the ridge crest, and within the one-room structure. Artifacts were observed near the top of the Btlb1 horizon at 99396-4 and at 99396-6 (Table E-2 of Drakos and Reneau 2004). The occupation surface was likely the top of the Btb1 horizon, and some artifacts may have been reworked into the upper Btb1 horizon as a result of bioturbation, anthropogenic, or pedogenic processes. Soil-stratigraphic relationships therefore do not definitively indicate an Archaic component to the site, and the lithic artifacts could be associated with the Puebloan occupation. Artifacts were observed in the late Holocene deposits in several profiles where soils were described, including 99396-2, 99396-3, 99396-4, 99396-5, and 99396-6. These include locations on the ridge crest and on the slopes both to the north and the south. With the exception of one obsidian flake recovered from the Bt1b1 horizon, artifacts were not observed at 99396-1, located west of 99396-5, in a slightly upslope direction (Figure 57.58). The presence of Feature 2, a one-room structure, with a concentration of artifacts including a sherd in the Bw horizon of 99396-5, indicates an Ancestral Puebloan component to the site. The weakly developed soils with thin A-Bw horizons that bury the LA 99396 occupation surface, and within which artifacts occur, is consistent with an Ancestral Puebloan age for Feature 2.

The subsurface artifact distribution at LA 99396 suggests that the Ancestral Puebloan occupation surface was on top of the late Pleistocene eolian deposits and that the site was centered in the vicinity of the one-room structure and LA 99395-5. Artifacts have been transported in late Holocene slopewash colluvium and are concentrated in the shallow gully examined at 99396-3. The site likely extended northward to the vicinity of 99396-4.

The absence of lithics in profile 99396-2, in the 1 to 2 ka swale fill deposit, is consistent with only an Ancestral Puebloan occupation. The subsurface distribution of artifacts suggests that the Archaic site, if present, was likely centered in the vicinity of 99396-4 and possibly also near 99396-6 (Figures 57.34 and 57.58). However, surface lithic density is highest in the vicinity of the shallow gully near 99396-3. These data suggest that much of the Archaic site component has been eroded, with the artifacts transported downslope and concentrated in the shallow gully below the site. In contrast, ceramics associated with Feature 2 are located close to the Ancestral Puebloan structure, both on the surface and in the subsurface, indicating less erosion and downslope transport than for the Archaic components. The concentration of artifacts in the Bt1b1 horizon at 99396-4 and in the Btb1 horizon at 99396-6 (Figure 57.60), near the top of the b1 soil profile, suggests that the Archaic occupation surface was also near the top of the b1 soil, and that the Archaic site was buried by late Holocene eolian deposits.

With the exception of the site disturbance related to development of the two-track road through the site, the Ancestral Puebloan Feature 2 structure and artifacts in its vicinity are in reasonably good context. It is also possible that the Archaic artifacts in the Btb1 horizon at LA 99396 are close to their original location. However, it is likely that the occupation surface has eroded away leaving only a few artifacts in the Btb1 horizon that are not in their precise original location. While not in good archaeological context, the artifacts in the Btb1 horizon are considerably closer to their original context than are those in the late Holocene slopewash colluvium and eolian deposits.

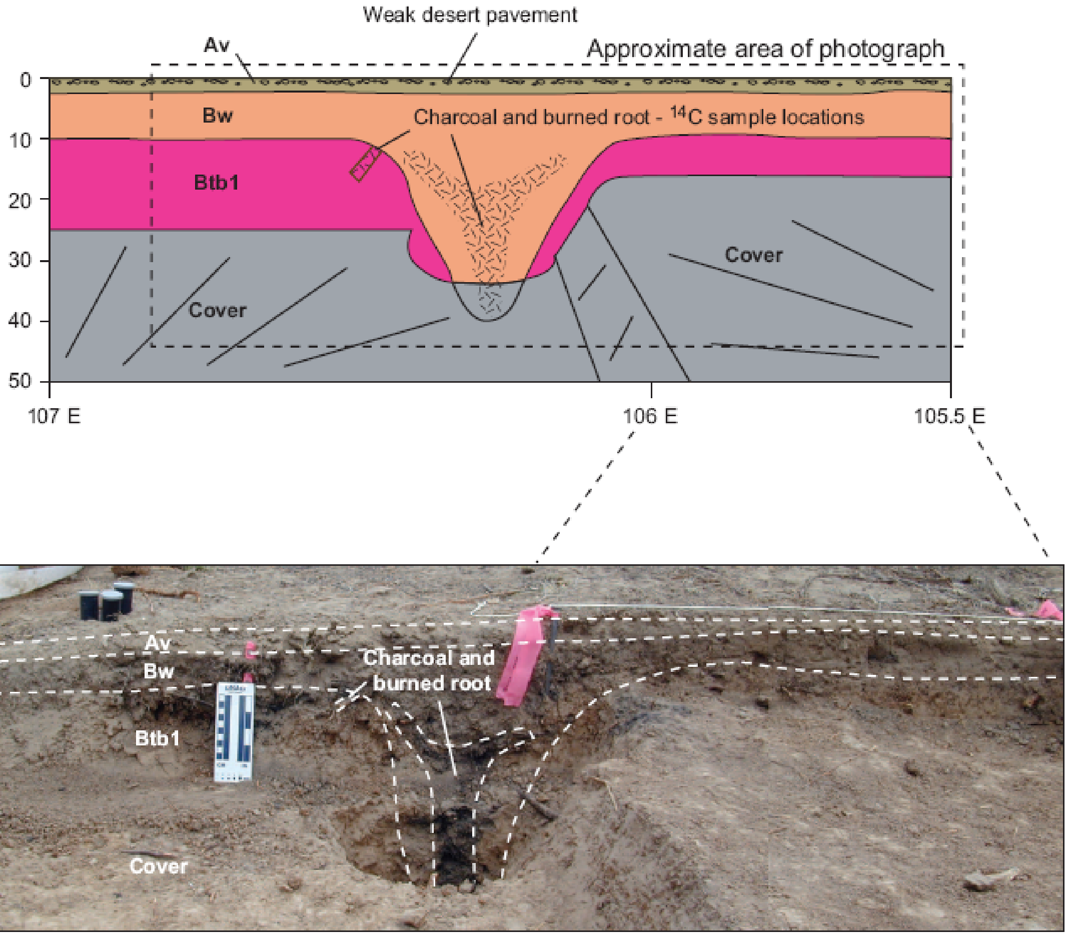


Figure 57.60. Photograph and sketch showing stump hole with charcoal sample location and soil horizons, 99396-6.

LA 99397 (Archaic lithic scatter)

LA 99397 is situated on a northeast-facing hillslope that forms the shoulder of a generally southeast-to-northwest-trending ridge crest, slightly northwest of LA 85869 and southwest of LA 85864 (see Figures 57.29 and 57.61). A fieldhouse (LA 85411) is located just upslope from LA 99397. LA 99397 is underlain by a thin late Holocene colluvial and eolian deposit that overlies Pleistocene colluvium and Qct gravel (see Figure 57.35; Table L.7). Several areas of the site exhibit a surface gravel cap or weak desert pavement, discontinuous Av (vesicular A) horizon, and rubification (reddening) of the underside of surface clasts, all of which indicate a late Holocene eolian influx leading to the formation of a weak desert pavement (Table L.7, 99397-1, 99397-3, 99397-4, and 99397-6; Figure 57.35; see McFadden et al. [1987] for a discussion of eolian dust influx and the formation of desert pavements). Some of the late Pleistocene and

Holocene soil horizons at the site are fine-grained, silty deposits with 5 percent or less gravel, indicating a significant eolian component to the colluvium (Table L.7).

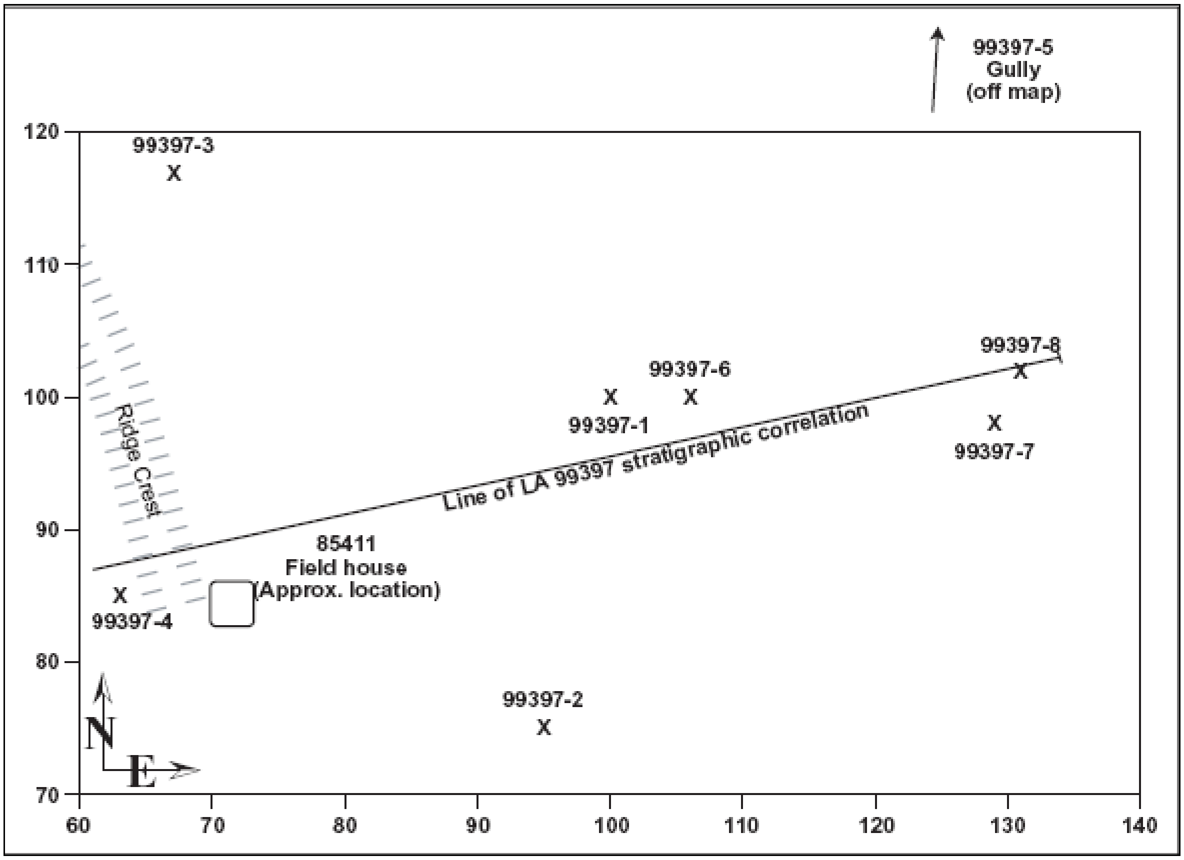


Figure 57.61. Site map showing location of soil pits at LA 99397.

Site stratigraphy includes thin late Holocene colluvial and eolian deposits less than 25 cm thick overlying late Pleistocene to early Holocene colluvial deposits or late Holocene (1 to 2 ka) swale fill deposits (99397-7) (Figures 57.35 and 57.62; Table L.7). The maximum age of the latest Holocene colluvial deposit is constrained by a charcoal sample from the base of the Bw horizon that yielded a radiocarbon age of 530±40 BP (Beta-199385) and a date of cal AD 1406 with a two-sigma date range of cal AD 1312–1359. Late Pleistocene to early Holocene colluvial deposits observed at LA 99397 range in thickness from approximately 15 cm to greater than 114 cm, with deposit thickness generally increasing downslope (Figure 57.35; Table L.7). The late Pleistocene or early Holocene soils are truncated, indicating erosion of the area in the vicinity of LA 99397 sometime during the Holocene, before deposition of the late Holocene colluvium. The development of shallow drainages and their subsequent filling is recorded by the approximately 1 to 2 ka (late Holocene) swale fill deposit at 99397-7 (Figure 57.35). The A-Bw-Bwb1-Bwb2 profile at 99397-7 represents episodic deposition in a swale.

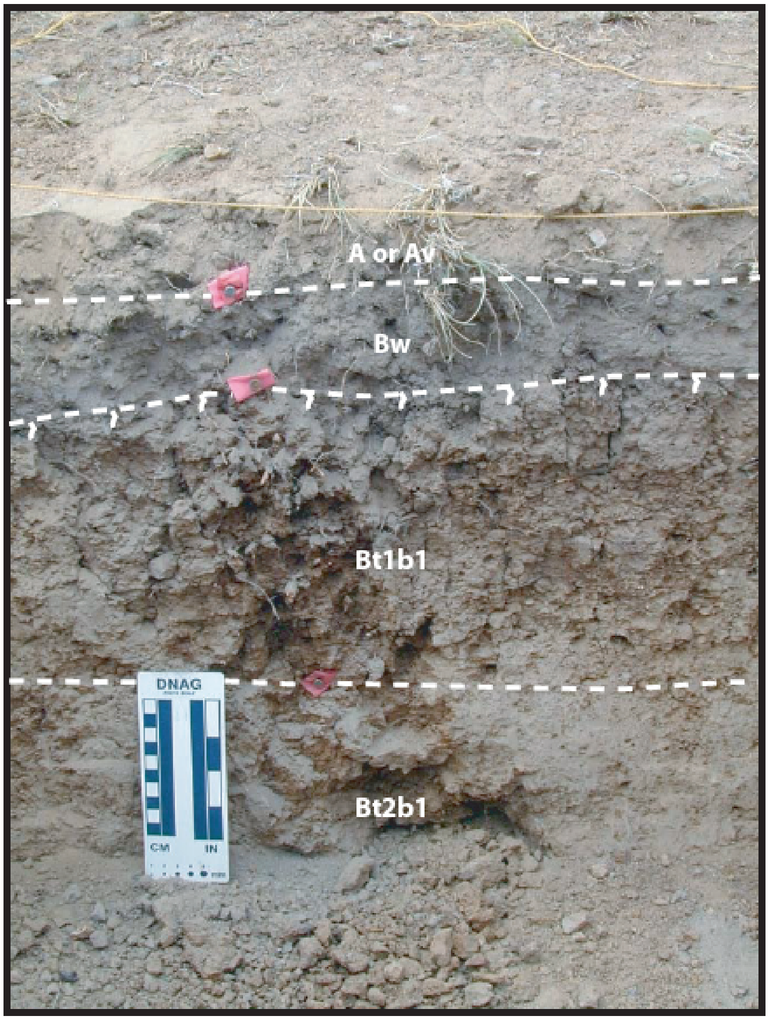


Figure 57.62. Soil profile #1 at LA 99397. Av-Bw horizons formed in late Holocene colluvium and eolian deposits overlying buried Bt horizons developed in late Pleistocene colluvium.

Two charcoal samples were collected from near the top of the Btb1 horizon at LA 99397. One sample yielded a radiocarbon age of 2110±60 BP (Beta-199383) and a date of cal 2090 BP with a two-sigma date range of cal 1933 to 2307 BP. A second sample yielded a radiocarbon age of 2280±40 BP (Beta-199384) and a date of cal 2263 BP with a two-sigma date range of cal 2157 to 2352 BP (Table M.2). These ages are similar but statistically different and are interpreted to date the age of the stripped surface that included the site occupation at LA 99397. The late Holocene swale fill deposit is either contemporaneous or post-dates the age of the stripped surface.

Artifacts including lithics and rare sherds were found concentrated in the late Holocene deposits and locally in the underlying late Pleistocene or early Holocene Btb1 horizon at LA 99397 (Figure 57.35; Table E-3 of Drakos and Reneau 2004). The maximum artifact concentration at the site was observed in the vicinity of 99397-6, where several artifacts were also found in the Btb1 horizon. Artifacts were observed in the A and Bw horizons in 99397-1, 99397-6, and

99397-7 and in the A horizon only in 99397-2. Artifacts were not observed in 99397-3 or 99397-4, located upslope from both the fieldhouse and the artifact concentration at LA 99397. The artifact distribution at LA 99397 suggests that the occupation surface was likely on top of the late Pleistocene or early Holocene colluvial deposits and that usage was centered in the vicinity 99397-6. Artifacts have been transported in late Holocene slopewash colluvium downslope from the vicinity of 99397-6 and are also concentrated in the upper swale fill deposit at 99397-7 (Figure 57.35; Table E-3 of Drakos and Reneau 2004). Artifacts found in the A horizon only at 99397-2 are inferred to have been transported downslope from the fieldhouse (LA 85411).

Several of the b1 soils at LA 99397 (including Bt and Btk horizons) are similar to the b1 soil at LA 99396 and are also inferred to be late Pleistocene in age, based on relative soil development in Rendija Canyon (Reneau and McDonald 1996; McDonald et al. 1996). The Stage II- carbonate horizon observed at 99397-1 and 99396-8 suggests an early Holocene age for these deposits, based on the development of Stage I carbonate in 4 to 8 ka deposits at the Fence Canyon site and the development of Stage II+ carbonate in a greater than 50 to 60 ka colluvial deposit on the White Rock Tract, Location 6 (Drakos and Reneau 2002; Reneau and McDonald 1996), and on carbonate soils described in Machette (1985). However, as discussed above, radiocarbon ages from LA 85859 indicate an age of ca. 6.7 to 7.4 ka, and an age of either late Pleistocene or early to middle Holocene is considered possible for the b1 soil at LA 99397 based on available data.

The remnant truncated mid-Pleistocene (?) soil with 5YR color and continuous, moderately thick clay films on the ridge crest at 99397-4 indicates that older, clay-rich soils are present in locations above LA 99397 where they could have been sources for clay in downslope colluvial deposits. Deposition of clay derived from the erosion of old soils with clay-rich Bt horizons could possibly result in accelerated Bt horizon development in the b1 soil underlying the site, as was observed at LA 85859.

Most of the artifacts at LA 99397 appear to have been reworked into the younger than AD 1312–1444 colluvium and the ca 1 to 2 ka late Holocene swale fill deposits and are not in good archaeological context. It is possible that the Archaic artifacts in the Btb1 horizon at LA 99397 are close to their original location. However, it is likely that the occupation surface has eroded away leaving only a few artifacts in the Btb1 horizon that are not in their precise original location. While not in good archaeological context, the artifacts in the Btb1 horizon are considerably closer to their original context than are those in the late Holocene slopewash colluvium and eolian deposits. Artifacts found in the A horizon only at 99397-2 are inferred to have been transported downslope from the fieldhouse (LA 85411) and are not in good context.

LA 127627 (Fieldhouse)

LA 127627 consists of a fieldhouse situated on a northwest-facing slope below the Qt2 terrace surface (see Figure 57.30). The structure measures approximately 1.9 m by 1.7 m (inside dimensions), or 2.3 m by 2.1 m (outside dimensions), situated with the long axis of the structure oriented approximately N40°W, and contains an opening in the northeast corner (Figure 57.63).

Soils were described in one test pit at the site, located 0.5 m east of the east corner of the fieldhouse (Figures 57.63 and 57.64; Table L.5). Site stratigraphy consists of an A-Bw soil overlying a buried Pleistocene Btb1 soil (Figure 57.63; Table L.5).

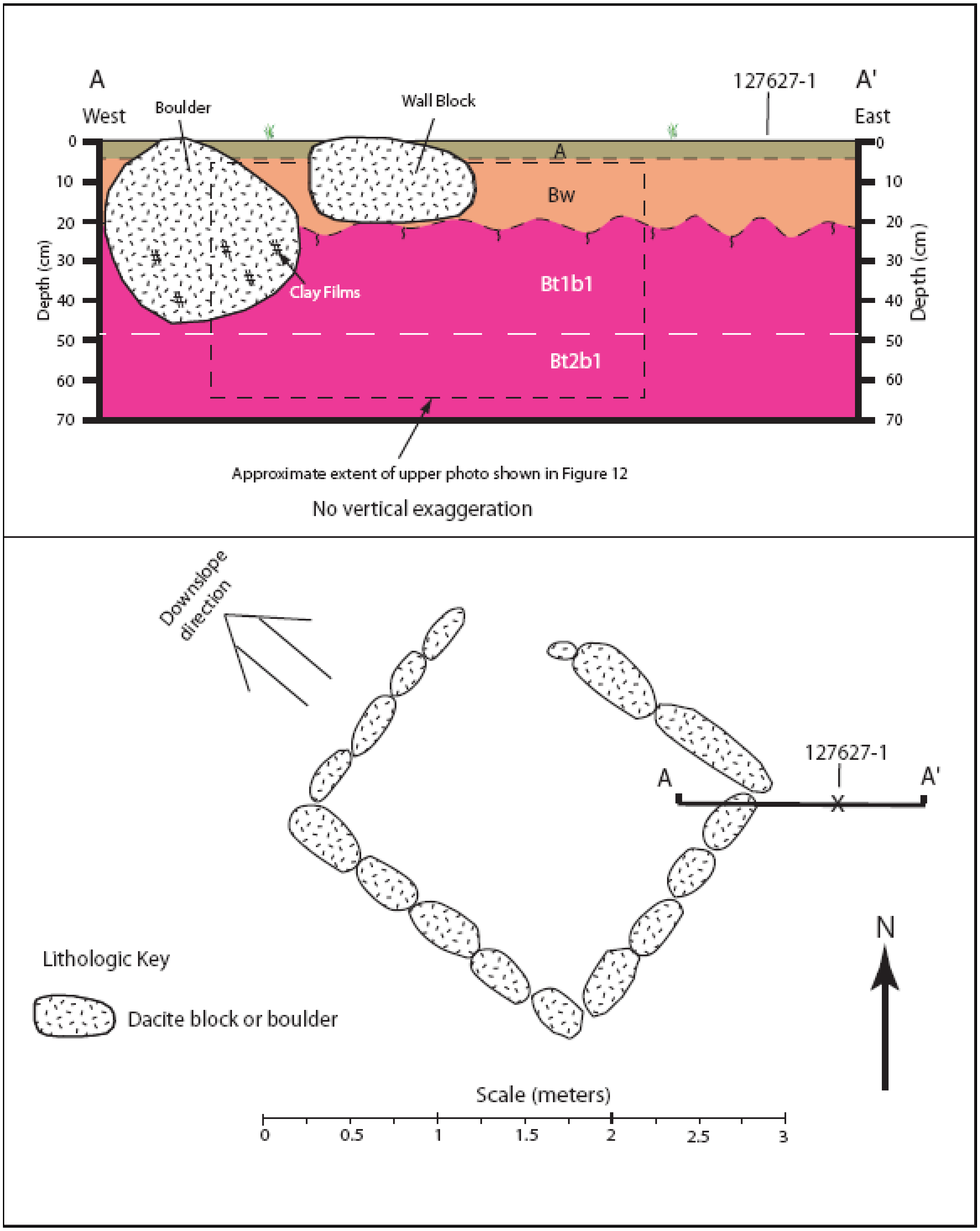


Figure 57.63. Schematic site map (bottom) and cross-section (top) at LA 127627.

Figure 57.64. Photographs showing soil stratigraphy at LA 127627.

The fieldhouse was constructed primarily from dacite blocks, presumably obtained from the Qt2 terrace deposit. Some *in situ* dacite boulders were utilized for fieldhouse construction, as evidenced by the presence of clay films on the lower half of the boulders (Figure 57.63). The LA 127627 structure was constructed on a slope, and the floor appears to have been leveled by cutting into the slope above and filling on the downslope side of the fieldhouse. The occupation surface at the site is the top of the Bt1b1 horizon (Figures 57.63 and 57.64). LA 127627 is buried by a relatively weakly developed soil in a colluvial deposit, but the Bw horizon has a hard consistence. Post-occupation colluvial deposits are 21 cm thick at the described profile near the east wall. The soils data and related stratigraphy are suggestive of a Classic period or possibly Coalition period age for LA 127627. Two samples of maize, collected from the top of the living surface and from under a rock in the room, yielded radiocarbon ages of 380±40 BP (Beta-215554) and 400±40 BP (Beta-215555). The dates are statistically indistinguishable, allowing summing of probabilities and a refined age estimate of 390±28 BP and a date of cal AD 1486 with a two-sigma date range of cal AD 1441–1629 (Table M.2), also indicating a Classic period age for LA 127627. The site has been subject to some erosion and transport of wall blocks as part of the colluvium but still has relatively intact walls, and site preservation has been aided by colluvial deposition. The site is in poor to moderate archaeological context.

LA 127633 (Storage Bin or Fieldhouse)

LA 127633 consists of a slab-lined storage bin on a sloping, south-southeast-facing colluvial hillslope that may be graded to the middle to late Holocene Qt7 terrace. The storage bin is located near the top of a 25° hillslope below a ridge spur. This small structure measures approximately 1.0 m by 0.7 m (inside dimensions), or 1.3 m by 1 m (outside dimensions), situated with the long axis of the structure oriented N77°E (Figure 57.65). Soils were described in two test pits at the site; profile 127633-1 was described several meters southwest of the structure, and profile 127633-2 was described outside of the west wall of the structure (Figure 57.65; Table L.5). Site stratigraphy consists of an A-BC or A-BC-C soil overlying a buried middle (?) Holocene Bw or Btjb1 soil (Figure 57.65; Table L.5).

The storage bin was constructed utilizing dacite slabs and tuff blocks (Figure 57.65). The dacite slabs were likely obtained from a dacite outcrop located a short distance upslope from the site. The slabs were set into a young aggrading colluvial deposit, with some additional burial of the slabs occurring after construction of the storage bin. The likely occupation surface at LA 127633 is within the upper part or at the top of the BC horizon. The dark staining on the slabs (see Figure 57.65) was caused by subsurface weathering and suggests a greater than historic age for this structure. The dark staining may indicate burial of the structure soon after abandonment, or may have occurred subsequent to the slabs having been emplaced in the subsurface. If the slabs were emplaced in the subsurface, the storage bin only experienced partial burial in the last 100 years. The weak soil development both above and below the structure indicates a likely Classic period age. The upper 5 to 10 cm of colluvium buries a small (17-cm-diameter) ponderosa pine with an estimated age of less than 100 years, indicating 5 to 10 cm of post-AD 1900 colluvial deposition at the site. This approximately corresponds to the thickness of the A horizon and of the “no lichen” band on the slabs (Figure 57.65), indicating that the A horizon formed in very young colluvium and that the staining likely requires more than 100 years for formation.

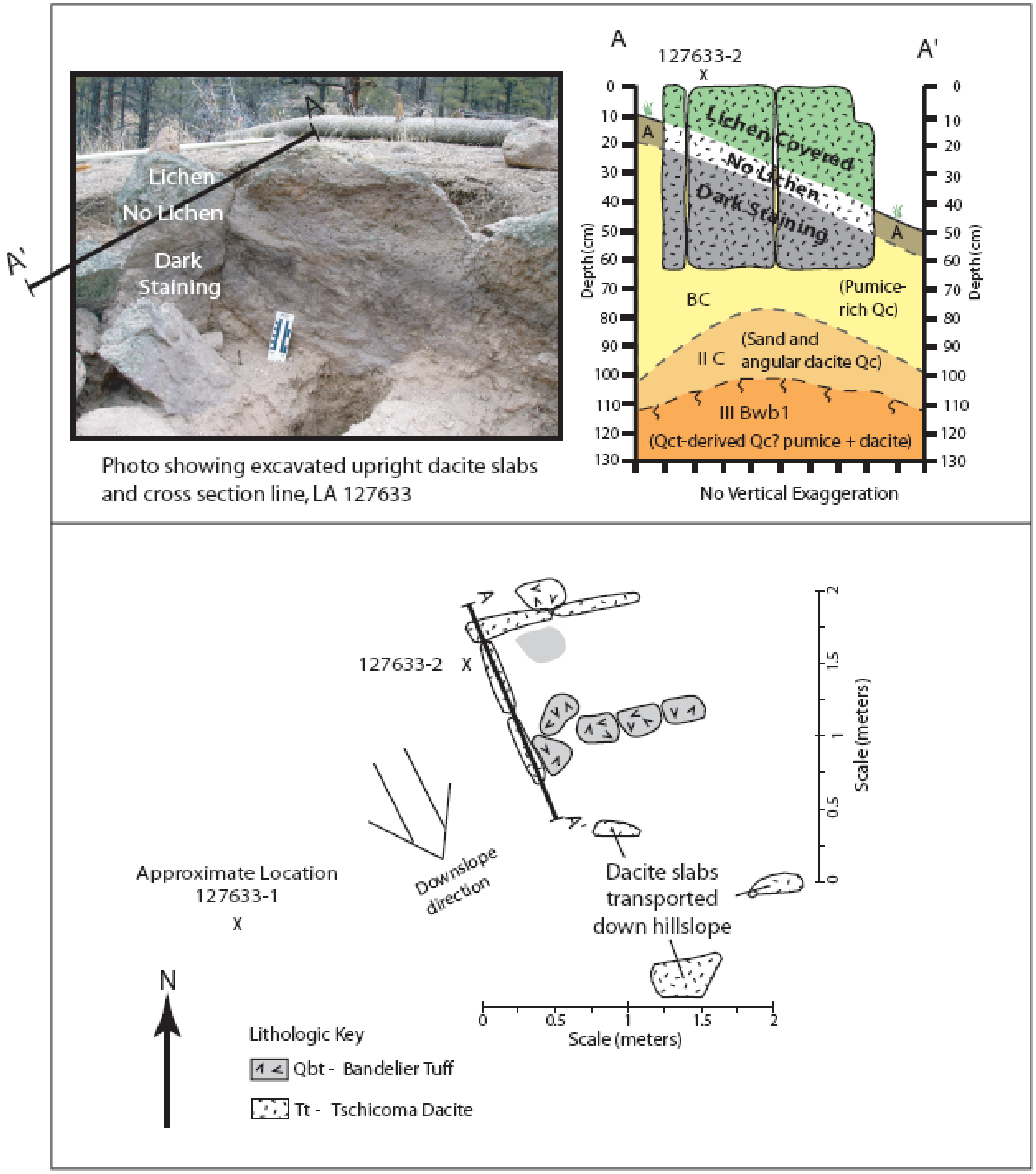


Figure 57.65. Schematic site map and cross-section from LA 127633.

The site is relatively steep and has been subject to some erosion and downslope transport of archaeological materials, including several dacite slabs as part of the colluvium. The site is therefore in moderate to poor archaeological context.

LA 127634 (Fieldhouse)

LA 127634 consists of a fieldhouse situated on a south-facing Qct or Qbog hillslope (see Figure 57.30). The structure measures approximately 2.5 m east-west by 1.8 m north-south (inside dimensions), or 3 m east-west by 2 m north-south (outside dimensions), and contains a south-facing entryway and a hearth in the southeast corner (Figure 57.66). Soils were described in one test pit at the site, located 2 m west of the northwest corner of the fieldhouse (see Figure 57.15; Table 57.1). Site stratigraphy consists of an A horizon overlying a buried late Pleistocene or Holocene Btkb1 soil (Figure 57.66; Table L.5). The Btkb1 horizon is developed in a thin colluvial deposit overlying a Qct or Qbog pumice deposit.

The fieldhouse was constructed from a mixture of dacite and tuff blocks. The occupation surface at the site is a prepared clay floor constructed on top of the Btkb1 horizon (Figure 57.66). LA 127634 is buried by a thin, weakly developed soil in a colluvial deposit, with only an A horizon. Post-occupation colluvial deposits are 6 cm thick at the described profile 2 m west of the west wall. The soils data and related stratigraphy are consistent with a Classic period age for LA 127634. Two samples of maize, collected from fill in the lower and upper part of the hearth, yielded radiocarbon ages of 350±40 BP (Beta-215556) and 340±40 BP (Beta-215557). The dates are statistically indistinguishable, allowing summing of probabilities and a refined age estimate of 345 ± 28 BP and a date of cal AD 1559 with a two-sigma date range of cal AD 1466–1636 (Table M.2), also indicating a Classic period age for LA 127634. The site is buried by a thin colluvial deposit and is not extensively eroded and therefore appears to be in relatively good archaeological context.

LA 127635 (Fieldhouse)

LA 127635 is a fieldhouse situated on a colluvial wedge on the back (south) side of a pre-Qt6 terrace remnant on the north side of Rendija Canyon (see Figure 57.30). The terrace remnant buried by colluvium forms a small spur between drainages. The structure measures approximately 3 m east-west by 2 m north-south (outside dimensions), situated with the long axis of the structure oriented approximately N75°E, and contains an opening facing east-northeast (Figure 57.67). A hearth is located adjacent to the north wall on the inside of the structure. Soils were described in one test pit at the site, located 0.5 m east of the east side of the fieldhouse. Site stratigraphy consists of an A-Bw soil overlying a buried middle to late Holocene Bwb1-Bkb1 soil (Figure 57.67; Table L.5).

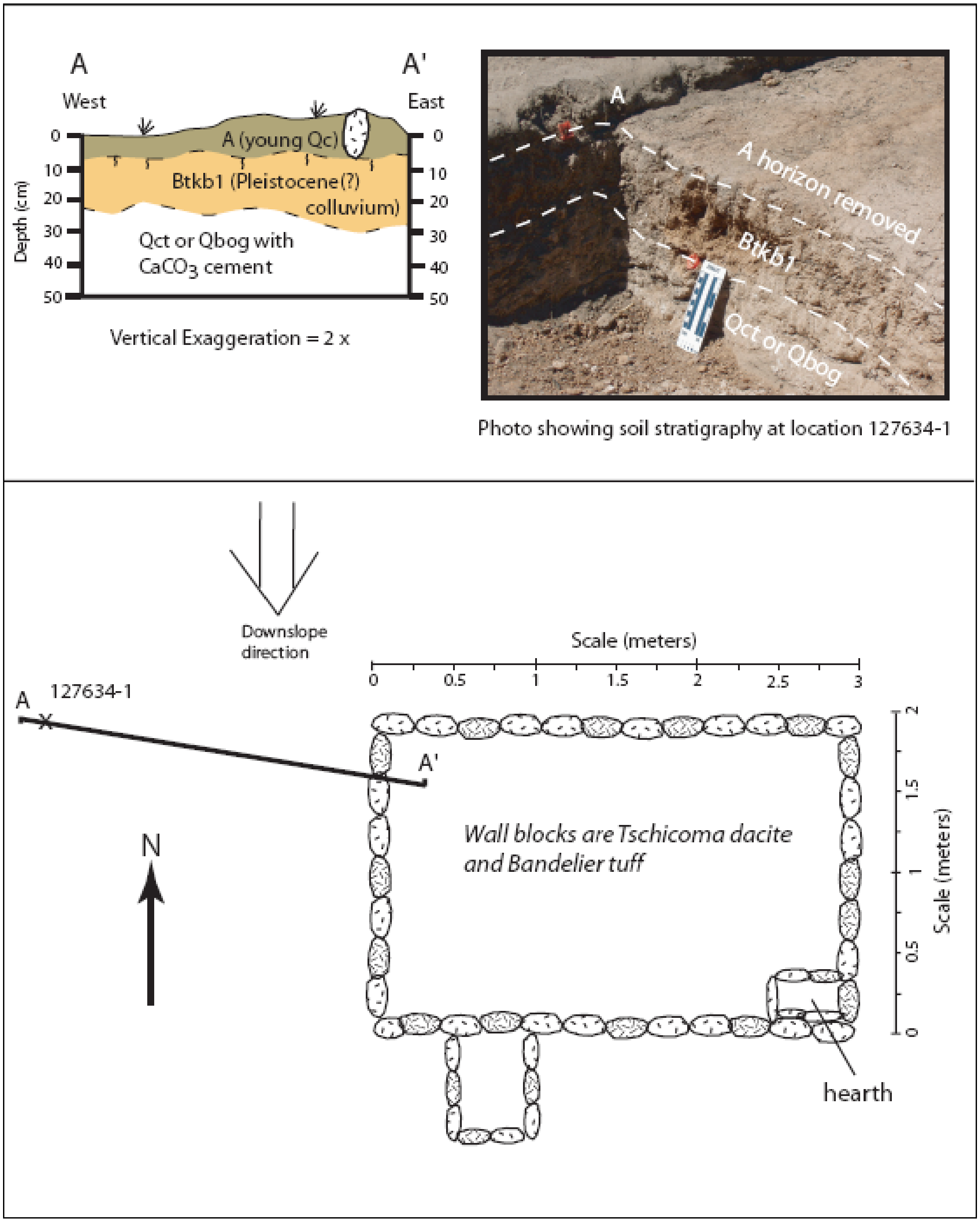


Figure 57.66. Schematic site map (bottom) and cross-section (top) from LA 127634.

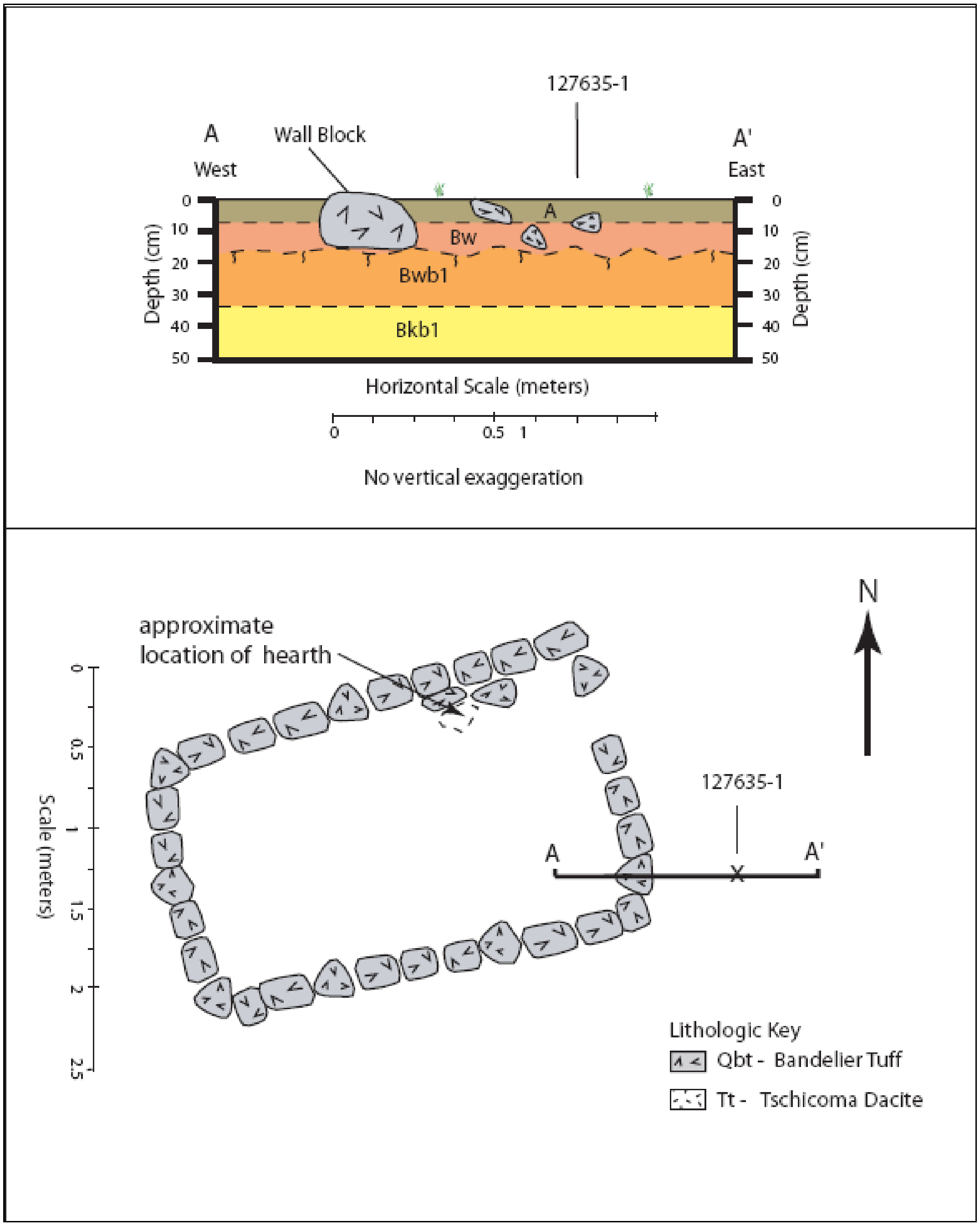


Figure 57.67. Schematic site map and cross-section from LA 127635.

The fieldhouse was constructed from Bandelier tuff blocks. The occupation surface at the site is the top of the Bwb1 horizon (Figure 57.67). LA 127635 is buried by a weakly developed, though relatively thick, colluvial soil with an A-Bw profile that includes wallfall in the deposit. Post-occupation colluvial deposits are 19 cm thick at the described profile near the east wall. The soils data and related stratigraphy are suggestive of a Coalition period or Classic period age for LA 127635. Two samples of maize, collected from fill in the lower and upper part of the hearth, yielded radiocarbon ages of 800±40 BP (Beta-215558) and 760±40 BP (Beta-215559). The dates are statistically indistinguishable, allowing summing of probabilities and a refined age estimate of 780±28 BP and a date of cal AD 1247 with a two-sigma date range of cal AD 1215–1278 (Table M.2), therefore indicating a Coalition period age for LA 127634. The walls are well preserved and colluvial deposition has aided site preservation and the site is likely in good archaeological context.

LA 135291 (Fieldhouse)

LA 135291 is a fieldhouse site situated on a north-facing slope below the top of the Qt2 terrace (see Figure 57.30). The structure measures approximately 2.8 m east-west by 1.7 m north-south (inside dimensions), or 3.3 m east-west by 2.3 m north-south (outside dimensions). A possible feature is located in the northeast corner of the structure. Soils were described in one test pit at the site, located 1.6 m east of the east side of the fieldhouse. Site stratigraphy consists of an A-Bw soil overlying a buried Pleistocene Btb1 soil (Figure 57.68; Table L.5).

The fieldhouse was constructed predominantly from Tschicoma dacite blocks, with a few Bandelier tuff blocks set on top of the Btb1 horizon. The occupation surface at the site is the top of the Btb1 horizon (Figure 57.68). LA 135291 is buried by slopewash colluvium and/or an eolian deposit, measuring 11 cm thick where described. This deposit has a weakly developed soil with an A-Bw profile with artifacts including biscuitware ceramics. The soils data and related stratigraphy are consistent with a Classic period age for LA 135291. With the exception of a few blocks scattered across the surface, the walls are well preserved, and the site is in moderate to good archaeological context.

LA 135292 (Fieldhouse)

LA 135292 is a fieldhouse site situated on the gently northeast-sloping Qt2 terrace surface (see Figure 57.30). The two remaining wall segments of the partially intact structure measure approximately 1.8 m north-south by 1.8 m east-west (Figure 57.69). The structure appears to have been partially disturbed by machinery. Soils were described in two test pits at the site; profile 135292-1 was described 1.3 m west of the west wall of the fieldhouse and profile 135292-2 was described inside the structure (Figure 57.69; Table L.5). Site stratigraphy consists of a relatively thick A-Bw1-Bw2 soil overlying a buried Pleistocene Btb1-Bkb1 soil (Figure 57.69). The upper soil is formed in eolian and reworked eolian silty loam mixed with slopewash colluvium and is 44 cm thick where described.

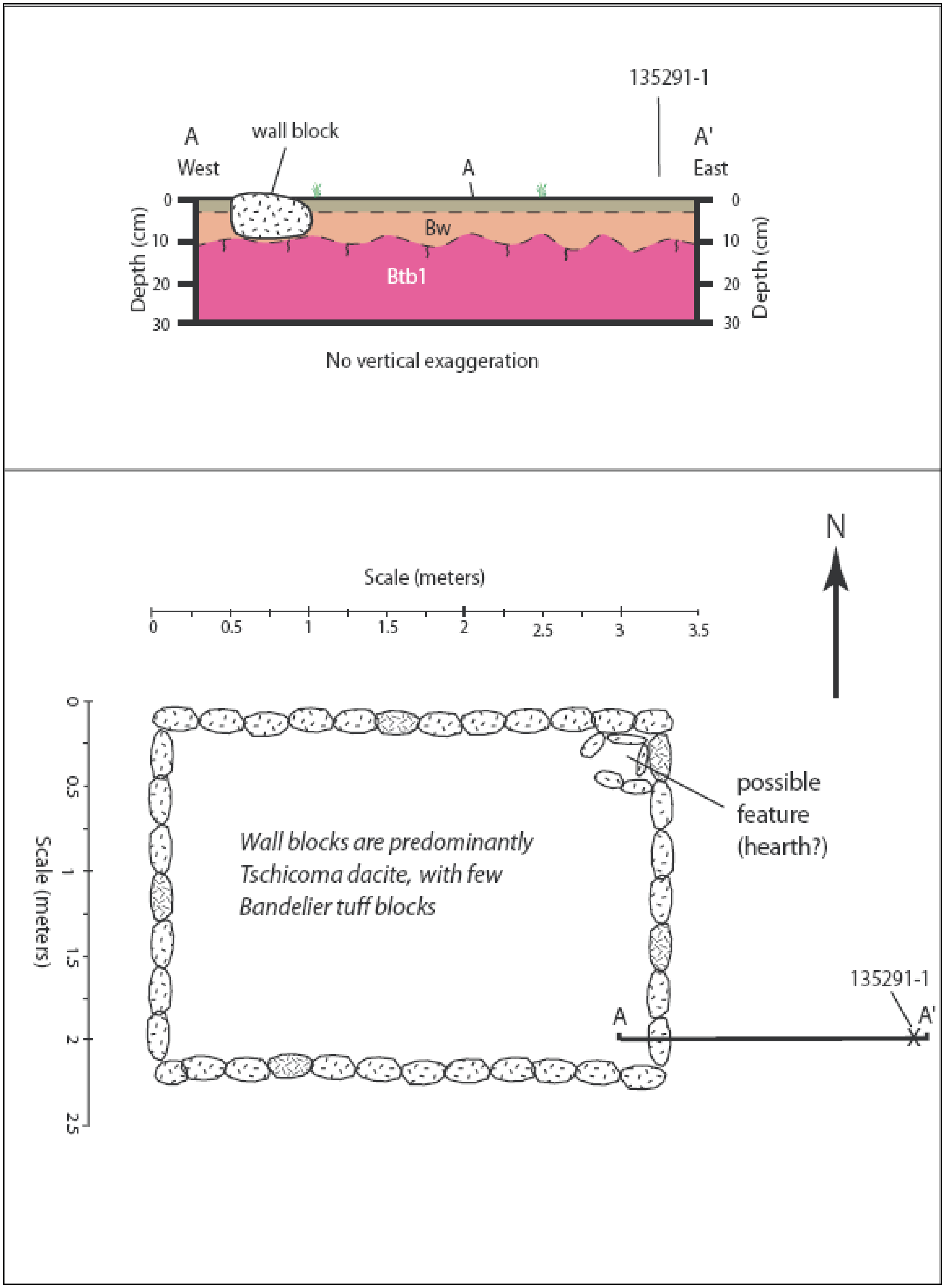


Figure 57.68. Schematic site map and cross-section from LA 135291.

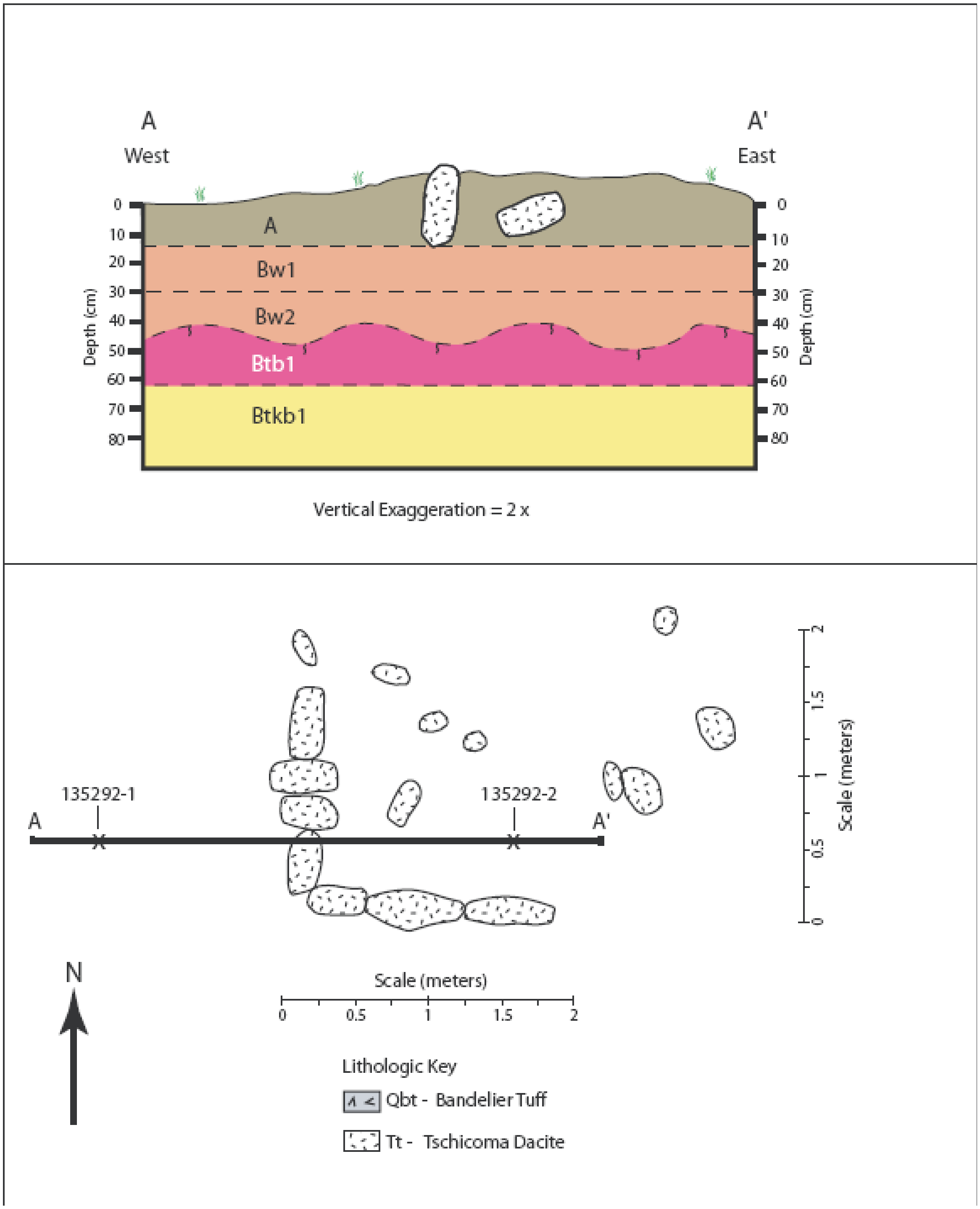


Figure 57.69. Schematic site map (plan view, bottom) and cross-section (top) at LA 135292.

The fieldhouse was constructed from dacite blocks that appear to have been set on top of the Bw1 horizon (Figure 57.69). The top of the Bw1 horizon, which is similar to the post-Coalition deposits observed at the Airport and White Rock tract sites (Drakos and Reneau 2003, 2004), is the likely occupation surface. The site is buried by the A horizon deposit that is mounded inside the structure and is 14 cm thick where described (Figure 57.69; Table L.5). The soils and related stratigraphy are consistent with a Classic period age for LA 135292. Due to apparent disturbance of the north and east walls of the site, LA 135292 is in moderate to poor archaeological context.

Rendija Tract Summary

Sites investigated within the Rendija Tract include three Archaic or multi-component sites on hillslopes and ridge top settings with generally thin colluvium and eolian deposits overlying Qct or Qbog pumice or Qct gravel Twenty-one fieldhouse sites were investigated; nine sites were located on fluvial terraces, eight sites were located on colluvial slopes, three sites were located on ridge crests, and one fieldhouse site was located on a Qct knob (Table 57.1). Two tipi ring sites were investigated, one on a ridge top and one in a valley bottom setting.

Surficial stratigraphy includes thin late Holocene colluvial and eolian deposits less than 25 cm thick (typically 10 to 20 cm thick) overlying late Pleistocene colluvial and eolian deposits or middle Holocene (6.8 to 7.4 ka) to late Holocene (1 to 2 ka) swale fill deposits less than 1.5 m thick (Figure 57.70). Late Pleistocene soils are truncated, indicating erosion some time during the Holocene, before deposition of the late Holocene colluvium. The development of shallow drainages and their subsequent filling is recorded by the ca 1 to 2 ka and ca 6 to 7 ka swale fill deposits (Figures 57.32 and 57.70). Valley bottoms preserve 1.5- to 2-m-thick middle to late Holocene colluvial deposits and an unknown thickness of underlying early Holocene and/or late Pleistocene deposits (see Figure 57.50). The Holocene and Pleistocene sections exposed in gullies have excellent potential for preservation of Archaic or older sites, although no buried sites were observed in this setting during mapping or stratigraphic descriptions for this investigation. Valley-bottom sediments partially bury the Apache tipi ring site LA 85864, and, therefore, the deep gully incision in the area apparently post-dates occupation, occurring sometime after the middle to late 1800s. The ridge top tipi ring site LA 85869 has experienced 0 to 4 cm of eolian deposition since occupation in the middle to late 1800s.

All twenty-one fieldhouse sites excavated within the Rendija Tract during this investigation have experienced some deposition of eolian sediment and/or colluvium since abandonment, which has aided site preservation. The evidence for net deposition at these sites is consistent with evidence from most other Coalition and Classic period sites examined within the land transfer tracts. Although there is also evidence for erosion at some sites, particularly on the steeper slopes, the apparent predominance of deposition has created conditions of relatively good site preservation.

The fieldhouses were constructed utilizing Tschicoma dacite blocks likely obtained from the terrace deposits and Bandelier Tuff blocks and slabs likely obtained from nearby colluvial deposits or outcrops, or possibly taken from surrounding mesas. Some dacite slabs may have been quarried from nearby outcrops. In individual fieldhouses, some were constructed predominantly or solely utilizing one lithology of building materials, whereas other fieldhouses utilized a mixture of lithologies (Table 57.1). Clear relationships between type of building material, relative site age, and/or geomorphic position were not observed.

Table 57.1. Fieldhouse site summaries and relative age estimates for Rendija Canyon land transfer sites.

Site	Buried by (soil horizons and type of deposit overlying site)	Occupation surface and type of deposit	Depth of burial inside structure (cm)	Depth of burial outside structure (cm) and distance from wall (m)	Geomorphic setting/ comments	Estimated relative site age based on soils: 1 = youngest, 2 = intermediate, 3 = oldest	Notes on relative age estimates
LA 15116	A-Bw soil; Qc includes wall fall	Btb; Qc	7	20 cm, 1 m W	North-facing slope below Qt2 surface	2	intermediate age inferred based on A-Bw profile
LA 70025	A-Bw1-Bw2 soil; Qc	Btjb1; Qc	8	29 cm, 2 m W	On dissected Qc slope over Qt ridge (?); Cabra Canyon	3? (2?) (1?)	relatively old age based on relatively thick post-occupation soil and A-Bw1-Bw2 profile outside; but thin eroded soil inside
LA 85403	A horizon only or A-Bw soil; Qe + Qc lag(?)	Bw or Bwb1; Qe	31	9 cm or 22 cm, 1.4 m W	On Qt2 surface	1	young age inferred if Bw horizon is occupation surface
LA 85404	A-Bw soil outside; A-Bw1-Bw2 soil inside; Qc	Btb1;Qtg	32	12 cm, 1.5 m W	East-facing edge of Qt1	1? (2?)	young age inferred based on relatively thin Bw profile outside structure, but possibly old age based on thicker A-Bw1-Bw2 profile inside
LA 85408	A horizon only; Qc	Qct soil	20 to 25	9 cm, 2 m W	Qct ridge spur	1	young age inferred based on thin and very weak post-occupation soil (A horizon)

Site	Buried by (soil horizons and type of deposit overlying site)	Occupation surface and type of deposit	Depth of burial inside structure (cm)	Depth of burial outside structure (cm) and distance from wall (m)	Geomorphic setting/ comments	Estimated relative site age based on soils: 1 = youngest, 2 = intermediate, 3 = oldest	Notes on relative age estimates
LA 85411	A-Bw soil; Qc	Bwb1 or Btjb1; thin Qc over Qct	20	14 cm, 2.3 m E	NE-sloping side of Qct ridge	2	intermediate age inferred based on A-Bw profile
LA 85413	A horizon only; Qc	Bw; Qct	18	7 cm, 3 m SE	North-facing slope at Qc/Qct contact	1	young age inferred based on thin and very weak post-occupation soil (A horizon)
LA 85414	A horizon only; Qc	Bw or Bwb1; thin Qc over Qct	n.a.	8 cm, 1.5 m E	East-facing Qct bench	1	young age inferred based on thin and very weak post-occupation soil (A horizon)
LA 85417	A horizon only; Qe + Qc lag	Bw or Bt b1; thin Qc over Qct	<10	6 cm, 2 m W	Qct knob	1	young age inferred based on thin and very weak post-occupation soil (A horizon)
LA 85861	A-Bw soil; Qc	Bwb1; thin Qc over Qct	31	15 cm, 4 m E	East-sloping Qct ridge	2	intermediate age inferred based on A-Bw profile
LA 85867	A horizon only; Qc	Bw1; Qct	5	n.a.	South-facing Qc slope below Qct ridge	1	young age inferred based on thin and very weak post-occupation soil (A horizon)
LA 86605 *first occupation*	A-Bw soil outside, A-Bw1-Bw2 soil inside; Qc (+ Qe?)	Btb1 (outside), Btkb1 (inside); Qc?	45	19 cm, 1.1m W	On east-sloping shoulder of Qt2; good evidence for two	3? (2?)	relatively old age inferred based on reddened color and relatively hard dry consistence of

Site	Buried by (soil horizons and type of deposit overlying site)	Occupation surface and type of deposit	Depth of burial inside structure (cm)	Depth of burial outside structure (cm) and distance from wall (m)	Geomorphic setting/ comments	Estimated relative site age based on soils: 1 = youngest, 2 = intermediate, 3 = oldest	Notes on relative age estimates
					occupations; Includes Qbt slabs		Bw horizon, possibly intermediate age based on A-Bw profile outside structure
LA 86605 *second occupation*	A horizon outside, A-Bw1 soil inside; Qc (+ Qe?)	Bw (outside), Bw2 (inside); Qc	38	7 cm, 1.1m W		1	relatively young age inferred based on trench for slab apparently cutting Bw horizon(?); thin overlying A horizon
LA 86606	A-Bw1 soil; Qc	Bw2; Qc	n.a.	22 cm, 1 m. W	East-sloping Cabra Canyon Qt overlain by Qc	2? (1?)	intermediate age inferred based on A-Bw profile
LA 86607	A horizon only; Qc	Btb1; Qtg or Qct	10 to 12	4 cm, 1.5 m W	Qct ridge spur or Qt remnant	1?	young age inferred based on thin and very weak post-occupation soil (A horizon); possibly influenced by location in erosional setting
LA 87430	A-Bw soil; Qc	Btb1; Qtg	23	18 cm, 1.8 m E	On north-edge of Qt5 above Rendija Canyon drainage	1? (2?)	young age inferred base on weakly developed colluvial soil; intermediate age inferred based on A-Bw profile

Site	Buried by (soil horizons and type of deposit overlying site)	Occupation surface and type of deposit	Depth of burial inside structure (cm)	Depth of burial outside structure (cm) and distance from wall (m)	Geomorphic setting/ comments	Estimated relative site age based on soils: 1 = youngest, 2 = intermediate, 3 = oldest	Notes on relative age estimates
LA 127627	A-Bw soil; Qc	Bt1b1; Qtg	13	21 cm, approx. 0.5 m E	On north-facing slope below Qt2	2?	intermediate age inferred based on A-Bw profile
LA 127633	A - BC soil; Qc slopewash	IIC; Qc	31	57 cm, hillslope profile SW of site	On relatively steep SE-facing slope; Qc overlying Qct? (storage bin)	1	young age inferred based on weak A-BC soil profile
LA 127634	A horizon; Qc slopewash	Btkb1; Qc	10	6 cm, 2 m W	On Qct or Qbog slopewash Qc	1	young age inferred based on thin and very weak post-occupation soil (A horizon)
LA 127635	A-Bw soil; Qc + wall fall	Bwb1; Qc	29	19 cm, 0.5 m E	On Qc wedge on back side of pre-Qt6 terrace	2? (3?)	intermediate age inferred based on A-Bw profile; possibility of relatively old age suggested by slightly hard dry consistence of Bw horizon, thick soil
LA 135291	A-Bw soil; Qc+Qe	Btb1;Qtg	17	11 cm, 1.6 m E	North-facing slope below/on edge of Qt2 surface	2? (1?)	intermediate age inferred based on A-Bw profile; possibility of relatively young age suggested by thin post-occupation soil on gentle terrace

Site	Buried by (soil horizons and type of deposit overlying site)	Occupation surface and type of deposit	Depth of burial inside structure (cm)	Depth of burial outside structure (cm) and distance from wall (m)	Geomorphic setting/ comments	Estimated relative site age based on soils: 1 = youngest, 2 = intermediate, 3 = oldest	Notes on relative age estimates
							top
LA 135292	A horizon; Qc slopewash	Bw1; Qc over Qtg	28	14 cm, 1.3 m W	On flat Qt2 surface overlain by slopewash Qc	1	young age inferred based on weak post-occupation soil profile (A horizon)

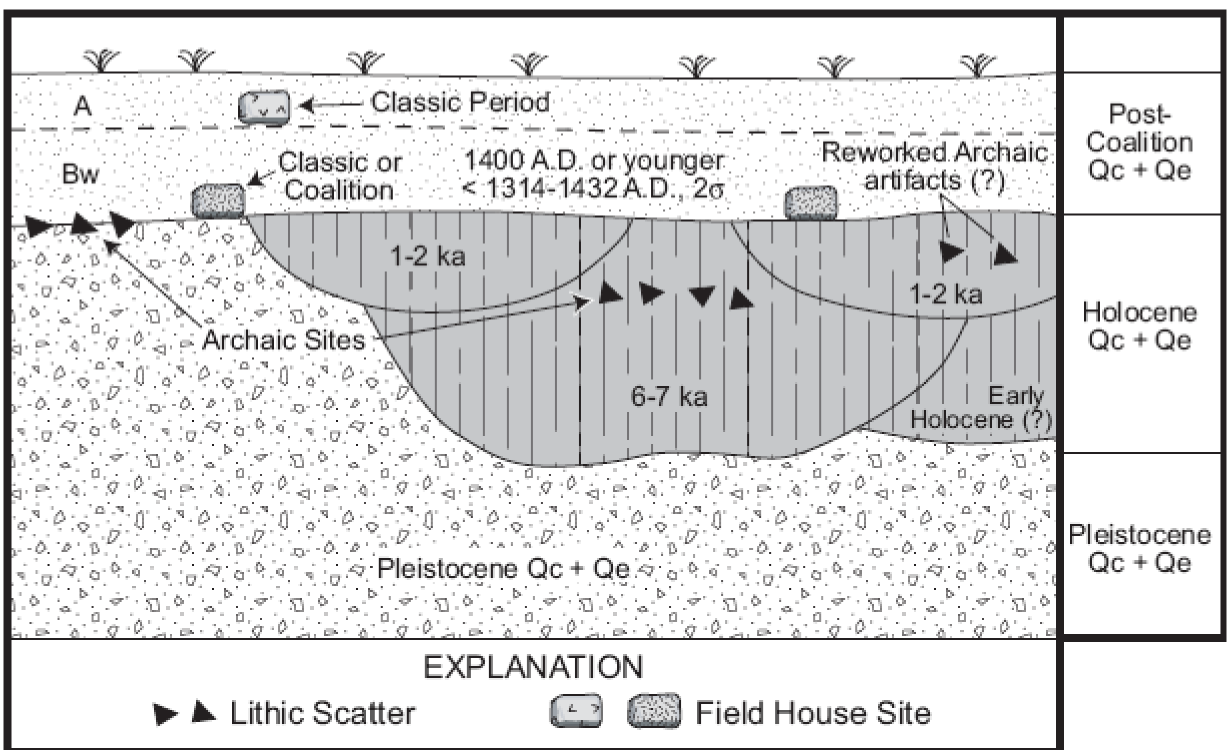


Figure 57.70. Composite soil stratigraphic correlation chart for Rendija Canyon colluvial and eolian deposits.

Based on soil stratigraphy of deposits burying the sites and comparison with soils described at Coalition and Classic period sites in the Airport and White Rock tracts (Drakos and Reneau 2003, 2004), the fieldhouses in the Rendija Tract may have been constructed from Coalition through Classic period time. An attempt was made to provide relative age estimates of fieldhouse sites based on soil characteristics and depth of burial (Table 57.1). Sites overlain by thin soils with only an A horizon or A-BC horizon development, appear to be the youngest sites investigated (relative age = 1 in Table 57.1) and based on soil characteristics are Classic period sites. Sites overlain by slightly thicker soils, typically with A-Bw horizon development, appear to be intermediate in age (relative age = 2 in Table 57.1) of the sites investigated. The intermediate-age sites may be older Classic period sites, or are sites located in a depositional setting. Sites overlain by thicker soils with A-Bw1-Bw2 profiles, or A-Bw profiles with reddened or hardened Bw horizons, are inferred to be the oldest sites investigated (relative age = 3 in Table 57.1). Soil characteristics suggest that the "oldest"-age sites may be Coalition period sites, although soils data do not preclude a Classic period age. However, radiometric ages and evidence provided by dated cultural materials demonstrate that most of the fieldhouses are Classic period sites and in some cases are inconsistent with relative ages inferred from the soils data. These discrepancies could be due to more colluvial-versus-eolian origin for sediments burying Rendija Canyon Ancestral Puebloan sites and may indicate that the main pulse of colluvial deposition has occurred later than the AD 1250–1325 eolian event, likely after AD 1500.

The orientation of fieldhouse structures can be related to geomorphic position. Where building sites are relatively flat, expansive surfaces, structures are oriented with walls aligned along north-south and east-west axes and, if openings are present, have east-facing doorways (Table 57.2). These sites include LA 85403, LA 85417, LA 86605, LA 86606, LA 135291, LA135292, and possibly LA 85404. Where building sites are located on hillslopes, the structure is typically oriented perpendicular to the hillslope (Table 57.2). Doorways, if present, generally face downslope. Structures built on hillslopes with walls shifted off of a north-south/east-west axis include LA 85411, LA 85413, LA 127627, and LA 127633. Structures built on north- or south-facing hillslopes with walls aligned on a north-south/east-west axis include LA 15116, LA 85867, and LA 127634. Structures built on east-facing hillslopes with walls also aligned approximately north-south/east-west include LA 85404, LA 85861, and LA 86607. In other cases, structures are built to fit on small terrace remnants or ridge spurs and are rotated off of a north-south/east-west axis. These fieldhouses include LA 70025, LA 85408, LA 87430, and LA 127635 (Table 57.2).

Table 57.2. Geomorphic position, slope, and fieldhouse orientations, Rendija Tract sites.

Site	Lithology of Blocks	Geomorphic setting/slope	Orientation of Structure	Comments
LA 15116	Tt dacite dominates; minor Qbt tuff	North-facing gentle slope below Qt2 surface	N-S by E-W	possible opening in E wall; structure oriented perpendicular to slope
LA 70025	Qbt tuff+ Tt dacite	On dissected Qc slope over Qt ridge (?); Cabra Canyon	N20°W	Structure oriented to fit small ridge top
LA	Tt dacite	On broad, flat Qt2	N-S by E-W	East-facing doorway

Site	Lithology of Blocks	Geomorphic setting/slope	Orientation of Structure	Comments
85403		surface		
LA 85404	Tt dacite	East-facing gently-sloping edge of Qt1	N-S by E-W	Non-rectangular structure; no obvious doorway
LA 85408	Tt dacite, minor tuff, Qct sandstone?	Qct ridge spur	N48°E	Southwest-facing opening
LA 85411	Tt dacite	NE-sloping side of Qct ridge	NW	Structure oriented perpendicular to slope; two-room fieldhouse
LA 85413	Tt dacite predominates; minor Qbt tuff	N-facing slope at Qc/Qct contact	N75°E	Structure oriented perpendicular to slope (?); NW-facing opening
LA 85414	Tt dacite	East-facing Qct bench	N20°E	Structure oriented to utilize large Tt boulders in place on slope?
LA 85417	Tt dacite	Qct knob	N-S by E-W	East-facing doorway
LA 85861	Tt dacite	Broad, gently east-sloping Qct ridge crest	N10°W	Openings in east and south walls
LA 85867	Tt dacite	South-facing Qc slope	N-S by E-W	North wall disturbed; no other openings in walls
LA 86605	Qbt tuff+ Tt dacite	On broad, gently-sloping east-sloping Qt2 surface	N-S by E-W	East-facing doorway
LA 86606	Tt dacite predominates; minor Qbt tuff	East-sloping Qt overlain by Qc	N-S by E-W	No obvious doorway
LA 86607	Tt dacite predominates; minor Qbt tuff	East-sloping Qct or Qtg ridge spur	approx. N-S by E-W	Non-rectangular structure; opening to east
LA 87430	Tt dacite + Qbt tuff	On north-edge of Qt5 above Rendija Canyon drainage	N20°E	Structure oriented to fit small terrace remnant; SSE-facing doorway
LA 127627	Tt dacite	On northwest-facing slope below Qt2	N40°W	Structure oriented perpendicular to slope; door in NE corner
LA 127633	Tt dacite slabs + Qbt tuff blocks	On relatively steep (25°) SE-facing slope	N77°E	Structure oriented perpendicular to slope
LA 127634	Tt dacite + Qbt tuff	On south-facing Qct or Qbog slope	N-S by E-W	Structure oriented perpendicular to slope; south-facing entryway
LA 127635	Qbt tuff	On Qc wedge on back side of pre-Qt6 terrace	N75°E	Structure oriented to fit small terrace remnant; NNE-facing doorway
LA 135291	Tt dacite dominates; minor Qbt tuff	N-facing slope below/ on narrow top of Qt2 surface	N-S by E-W	No obvious doorway

Site	Lithology of Blocks	Geomorphic setting/slope	Orientation of Structure	Comments
LA 135292	Tt dacite	On flat Qt2 surface overlain by slopewash Qc	N-S by E-W	Structure not intact; doorway unknown

TA-74 SOUTH TRACT

Surficial Geologic Units

The TA-74 South land transfer parcel is located in a relatively broad part of lower Pueblo Canyon. A generalized geologic map of the western and central part of the parcel is shown in Figure 57.71. Surficial geologic units within the parcel include the active stream channel and adjacent floodplains of Pueblo Canyon (unit Qal), higher stream terraces of Holocene and Pleistocene age (unit Qt), and areas of colluvium and alluvial fans on the side slopes and along tributary drainages (unit Qc). Bedrock units within the parcel include Pliocene fanglomerates of the Puye Formation (unit Tpf) and non-welded tuff and pumice beds of the Otowi Member of the Bandelier Tuff (unit Qbo). The latter includes the Guaje pumice bed (unit Qbog). The Tshirege Member of the Bandelier Tuff (unit Qbt) is exposed along the margins of the canyon but is not exposed within the parcel, although erosion of this unit is a major source for colluvium within the parcel. Geologic maps of this area have been prepared by Griggs (1964) and Rogers (1995), and detailed geomorphic maps of parts of the canyon bottom are presented in Reneau et al. (2002) and Tardiff et al. (2002). Except for a strip of young sediment along the main stream channel, the surficial geologic units in the parcel have not been studied in detail, although their characteristics and history are probably similar to units in other parts of the Pajarito Plateau such as the White Rock and Rendija Canyon parcels.

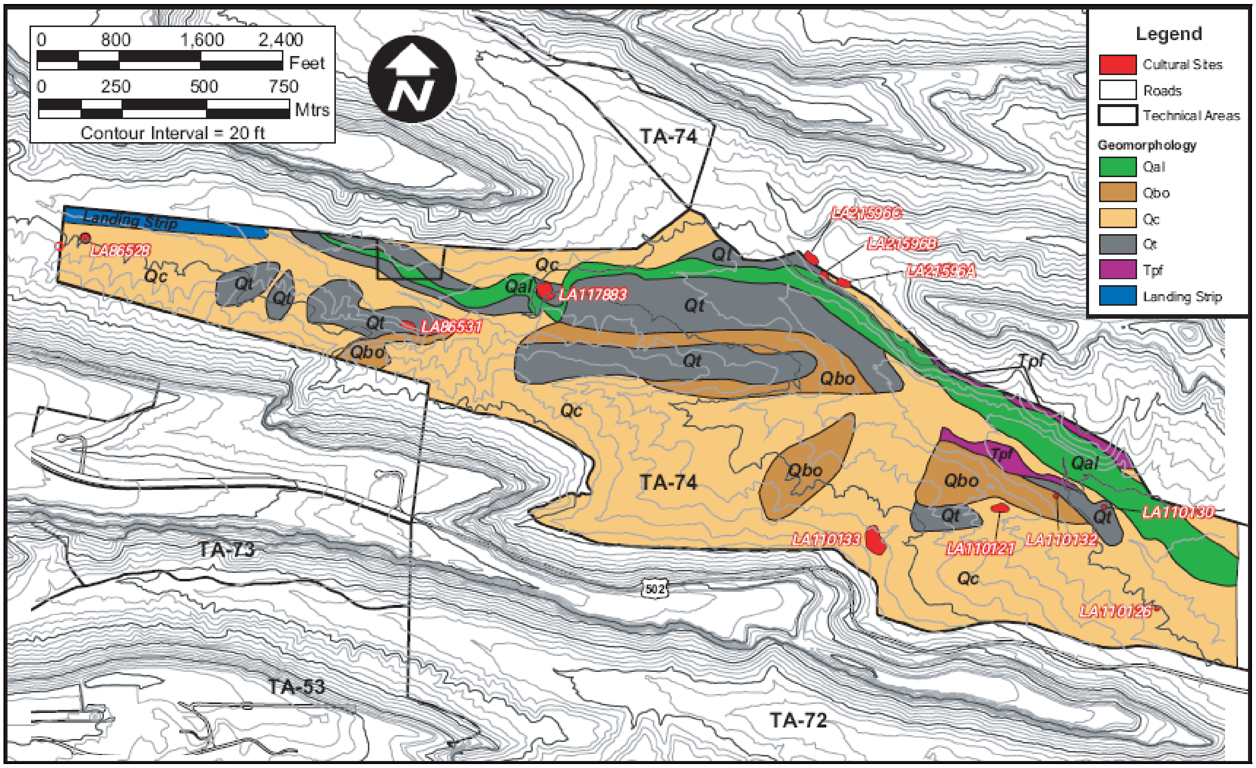


Figure 57.71. TA-74 South Tract (Pueblo Canyon) geomorphology.

Otowi Grid Gardens

The Otowi grid gardens (LA 21592) are located near LA 21596. A description from the Otowi grid gardens is included here for completeness.

LA 21592 (Grid Gardens)

LA 21592 consists of grid gardens on a colluvial slope above the bottom of Bayo Canyon, on the north side of the channel and northwest of the Otowi ruins. The grid gardens are outlined by rock alignments made of locally derived clasts. The upper 8 cm of sediment inside the grid garden has a silt loam texture and exhibits an absence of soil development, indicating a young eolian and/or slopewash layer. The underlying Cbwb1 horizon, 8 to 20 cm deep, is sandier and contains clasts and ceramics and likely represents soil that was present during use of the grid garden. Alternatively, the Cbwb1 horizon could represent a post-occupational deposit, although this interpretation is considered to be less likely.

LA 21596 (Grid Gardens)

LA 21596 consists of grid gardens at the base of a colluvial slope adjoining floodplains or fluvial terraces in the bottom of Pueblo Canyon, below the Otowi ruins. The grid gardens are outlined by rock alignments made of locally derived clasts. Excavations through the grid gardens indicate that ceramics and lithics are present to depths of at least 50 cm and that relatively little sediment has been deposited since construction of the rock alignments. Artifacts are abundant from 0 to 30 cm; artifacts are present but less abundant from 30 to 50 cm. Rocks forming the grid gardens are set on the Bw1 horizons in profiles 21596-1, 21596-2, and 21596-3 and are buried by only 4 to 6 cm of sediment (Table L.8). These observations suggest that the grid gardens were created during a relatively late stage of occupation of Otowi Pueblo and that a significant amount of colluvial deposition occurred at this location concurrent with Puebloan occupation. Based on profile 21596-4, described on the colluvial slope outside the grid garden, the thickness of young colluvium is greater than 34 cm. It is possible that human traffic or other disturbances on the steep slope between the grid gardens and the Otowi ruins accelerated the rate of colluvial transport and deposition at this location.

LA 86528 (Possible Rockshelter)

LA 86528 consists of a possible rockshelter site situated next to and under a large boulder on a north-facing colluvial slope, downslope from the base of a Bandelier Tuff cliff (see Figure 57.71). The site is on the upslope side of the boulder and extends from the colluvial slope to beneath the overhanging lip of the boulder. Three soil profiles were described within, near the edge of, and outside the overhang. Profiles 86528-1 and 86528-3 each have a thin (3 to 5 cm) AC or C horizon formed in young (less than 500 years old, possibly less than 100 years old) colluvium that buries older soil horizons (Table L.8). Profiles described next to and beneath the overhang have late Holocene (possibly Puebloan-age) Bwb1 horizons 10 to 15 cm thick overlying Pleistocene colluvial soils. Profile 86528-2, described on the colluvial slope outside the overhang, exhibits only young (less than 500 years old) thin (10 cm thick) colluvium overlying Pleistocene soil. Profile 86528-1, in Test Pit #1, at the edge of the overhang, included a charcoal stain at the base of the AC horizon and a Bwb1 horizon formed in late Holocene colluvium (Table L.8). The abrupt, irregular boundary between the Bwb1 and underlying Pleistocene Btb2 horizon can be interpreted as due to either cultural or non-cultural processes. One explanation is that a pit or similar excavation was dug into the Pleistocene soil, during the time the overhang was used as a rock shelter. A differing explanation, consistent with the interpretation that the overhang was not used as a rock shelter, is that the irregular boundary between the Bwb1 and underlying Bwb2 horizon was caused by erosion on the fairly steep slope projecting beneath the overhang, with an opening at the downslope end. In this scenario, subsequent partial plugging of the escape hole facilitated colluvial deposition, which was followed by a non-cultural fire.

The profiles described in the vicinity of LA 86528 are indicative of a stripped, Pleistocene colluvial hillslope overlain by thin (10 to 20 cm thick) late Holocene to historic age colluvium. Overall, the geomorphic evidence is ambiguous with respect to whether or not the overhang was used as a rockshelter. The charcoal stain at the base of the AC horizon may be of relatively recent origin, post-dating the Puebloan occupation, in which case there may be very little evidence that the overhang was used as a rockshelter.

LA 86531 (Lithic/Ceramic Scatter)

LA 86531 is a lithic and ceramic scatter situated on top of a Pleistocene fluvial fill terrace located approximately 30 m above the canyon floor (see Figure 57.71). The deposit underlying the terrace comprises multiple fluvial sequences, capped by a coarsening upward deposit with imbricated boulders (Figure 57.72).

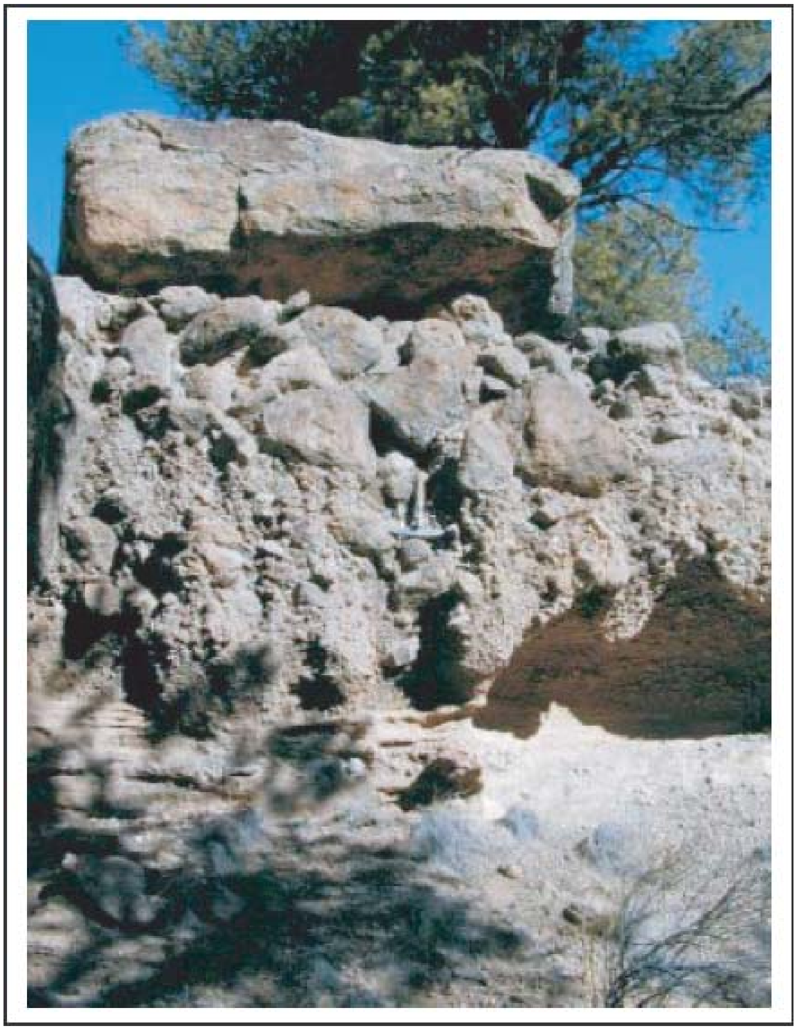


Figure 57.72. Coarsening-upward gravel underlying Pleistocene fluvial terrace at LA 86531.

Gravels include abundant Bandelier Tuff and Tschicoma dacite clasts. The gravel overlies fine-grained fluvial deposits and the Otowi Member of the Bandelier Tuff. The top of the terrace appears to be a stripped surface that is capped by thin (less than 20 cm thick) young soils overlying stripped Pleistocene soils or bedrock (Table L.8, profiles 86531-1 and 86531-2). Based on the relatively well-developed stripped Bt horizon observed in profile 86531-1 and the height of the terrace above the canyon floor, the terrace is inferred to be mid-Pleistocene in age.

Soil descriptions completed at LA 86531 are indicative of young (less than 100 years?) slopewash from 0 to 3 cm overlying a thin (7 to 11 cm thick) late Holocene/post-Puebloan (?) deposit (Table L.8). Charcoal (a fire stain) was observed in Test Pit #2 (profile 86531-2). Test Pit #2 was therefore expanded northward into Test Pit #3, which revealed a Pleistocene compacted silt horizon, likely an eolian unit (profile 86531-2). The fire stain was inset into the Pleistocene soil, suggesting that the fire stain was a root burn, rather than a cultural feature.

The likely cultural horizon (the Ab1 horizon) observed in profiles 86531-1 and 86531-2 is thin. However, the presence of a surficial artifact scatter on an eroded ridge top with thin soils is consistent with the interpretation that the LA 86531 artifact scatter represents erosion of a site situated on the Pleistocene terrace. Artifacts may represent a surface lag and may have only been transported a short distance. The presence of a carved boulder (zig zag patterns carved on the north side of a boulder) directly below the artifact scatter on the north side of the terrace shows the presence of other cultural elements at this location.

LA 110121 (Lithic/Ceramic Scatter)

LA 110121 is a lithic and ceramic scatter situated on the eroding slope of a low ridge that is part of a dissected Guaje pumice landscape (Figure 57.71). The Guaje pumice bed is the base of the Otowi Member of the Bandelier Tuff and overlies the Puye Formation. The thickness of post-Guaje sediment is minimal (11 cm) at this location (Table L.8, profile 110121-1; Figure 57.73). The artifact scatter is apparently part of the thin colluvium overlying the Guaje pumice and is therefore not in archaeological context.

LA 110126 (Fieldhouse)

LA 110126 is a fieldhouse situated on a heavily eroded north-facing colluvial slope (see Figure 57.71). Due to the extensive erosion, there is minimal potential for a preserved archaeological record outside of the structure. Excavation inside the fieldhouse revealed 29 cm of post-Puebloan soil that probably constitutes eolian sediment and/or colluvial sediment mixed with tuff clasts derived from wall collapse (Table L.8, profile 110126-1). An older (Pleistocene) buried Bt soil horizon is present beneath the structure.

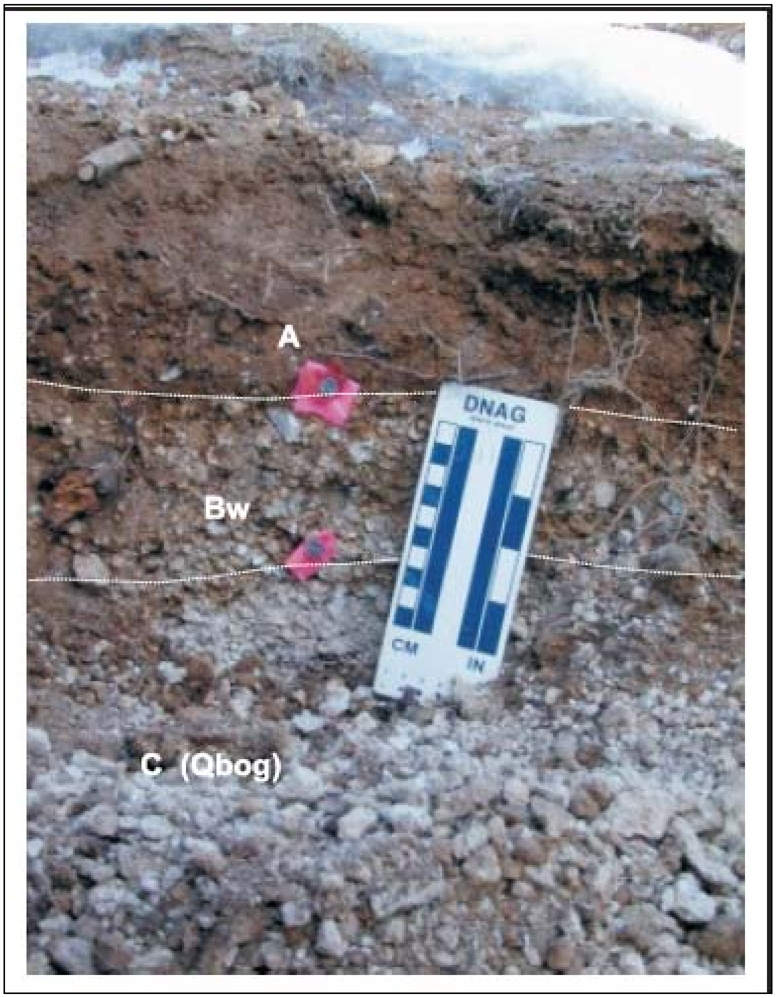


Figure 57.73. Soil formed in Guaje pumice at LA 110121.

LA 110130 (Fieldhouse)

LA 110130 includes rock alignments, sherds, and minor lithics, situated on the north edge of an eroded, gently east-sloping fluvial terrace above the Pueblo Canyon floodplain (see Figure 57.71). Excavation through the rock alignments revealed 17 cm of sediment overlying a buried Bt horizon interpreted to represent a stripped or eroded late (?) Pleistocene soil (Table L.8, profile 110130-1). The rock alignments include large (approximately 10- to 30-cm diameter) rocks set into or on top of the Btb1 horizon (Figure 57.74). The rock alignments are not clearly walls, but may represent the foundation of a structure. Alternatively, the rock alignments may represent a grid garden. Some smaller rocks were observed within the Bw horizon, but the smaller rocks do not appear to be part of the rock alignments.

Classic period sherds were observed in the post-Pleistocene soil horizons and were present in greatest abundance in the Bw horizon. The A and Bw horizons likely represent slopewash colluvium that includes reworked older soil in the Bw horizon and has partially buried the rock alignments. The artifacts observed within the A and Bw horizons are likely part of the slopewash colluvium although their presence does suggest an association with the alignments, and a Classic age for the site. The artifacts may represent locally bioturbated material that is in reasonably good archaeological context.

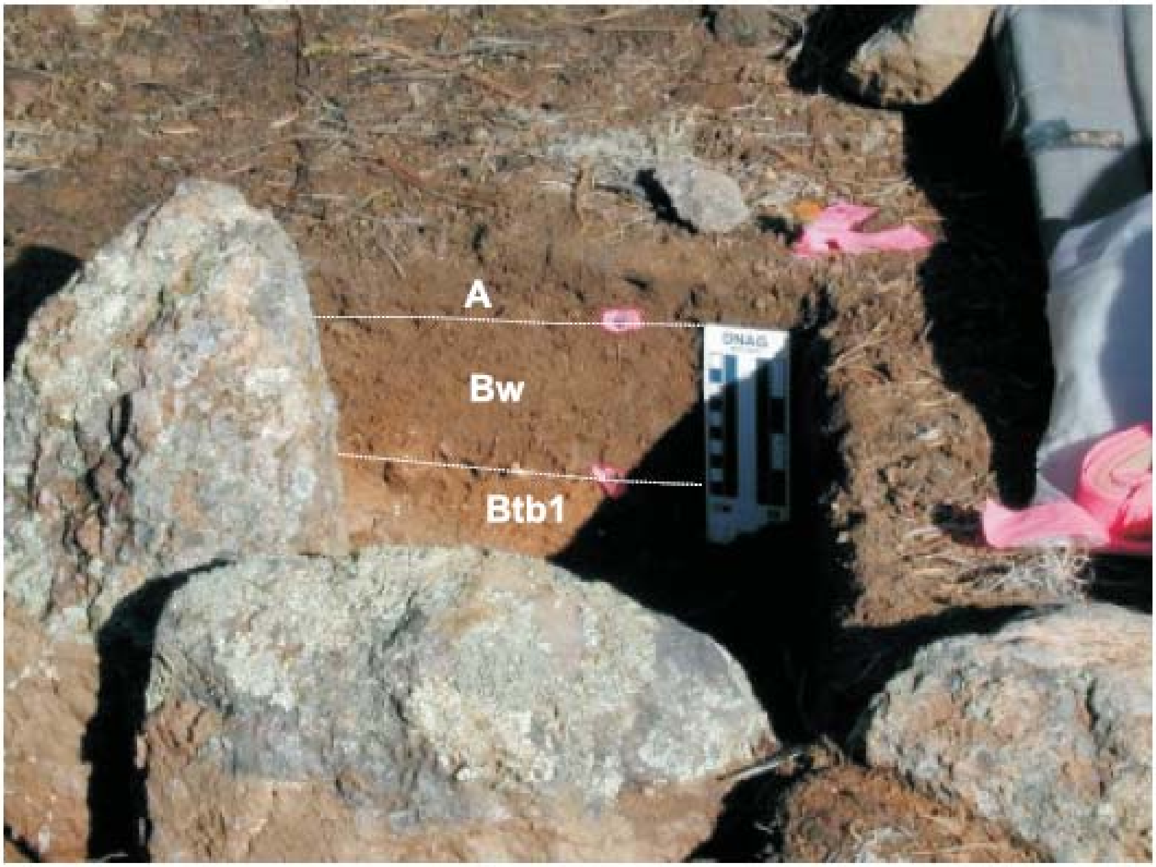


Figure 57.74. Soil stratigraphy at LA 110130; rock alignment set into/on Btb1 horizon.

LA 110132 (Possible Fieldhouse)

LA 110132 consists of a possible rock alignment and surficial artifact scatter in thin, bouldery colluvium overlying the Guaje pumice bed (see Figure 57.71). The colluvium includes reworked terrace gravels with boulders. An examination of the possible rock alignment indicated that it is probably a natural occurrence of large cobbles that are reworked terrace gravels that are part of the colluvium, and not of cultural origin.

LA 110133 (Lithic/Ceramic Scatter)

LA 110133 consists of a light scatter of lithics and ceramics situated on a north-facing colluvial slope on the south side of Pueblo Canyon (see Figure 57.71). LA 110133 is situated where colluvial slopes begin to steepen to the south below the Bandelier Tuff cliffs that form the canyon walls. Two profiles were examined at LA 110133. In profile 110133-1 (Test Pit #1), artifacts were observed at depths of around 30 cm and from 50 to 60 cm. In profile 110133-2 (Test Pit #2), sparse concentrations of artifacts were observed on the surface and from 0 to 10 cm. Both profiles include AC horizons overlying BC or CB horizons with very weak soil development (Table L.8). Profiles 110133-1 and 110133-2 exhibit 16 to 19 cm of very young (likely less than 100 years old) colluvium overlying post-Puebloan age colluvium to a depth of 70 cm or greater (Table L.8). These profiles indicate that LA 110133 is located on a very active colluvial slope with greater than 70 cm of colluvial deposition in post-Puebloan time. The artifacts observed at this location appear to be part of the colluvium and are not in archaeological context.

LA 117883 (Archaic Site)

LA 117883 is an archaic site comprising a lithic scatter on a colluvial slope that overlies a stream terrace or pair of terraces (see Figure 57.71). Two profiles were described at LA 117883. Profile 117883-1 (Test Pit #1) was located on a terrace 20 m north of the Pueblo Canyon channel, and profile 117883-2 (Test Pit #2) was located approximately 32 m north of the Pueblo Canyon channel and upslope from 117883-1. Both soil profiles exhibit an AC-C-Bwb1 or AC-C-BCb1 horizon sequence suggesting two colluvial depositional events, with older colluvium (less than 1000 to 2000 years) overlain by young colluvium (less than 500 years) (Table L.8). The presence of artifacts through the entire thickness of the colluvial layer in profile 117883-1 suggests that the artifacts have been transported from upslope and are not in place. Thickness of colluvium overlying the terrace gravels thins downslope, from 101 cm at profile 117883-2 to 55 cm at profile 117883-1 (Table L.8).

The buried soil developed in the buried terrace gravels at profile 17883-2 includes a Stage I+ carbonate suggesting a late Pleistocene to early Holocene age for the terrace. In contrast, the soil formed in buried terrace gravels at profile 17883-1 lacks carbonate, soil structure, or other indicators of soil development. Soil characteristics of the horizons described in the terrace gravels at the two locations therefore suggest that the buried terrace at 117883-2 is late Pleistocene to early Holocene in age, whereas the buried terrace at 117883-1 is late Holocene in age, based on comparison with the Qt8 soil described by McDonald et al. (1996). These data suggest that two terraces of different age are buried beneath the colluvium, with the profile 117883-1 terrace inset into the profile 117883-2 terrace.

TA-74 Tract Summary

Sites investigated in the TA-74 South Tract include two grid garden sites, three lithic/ceramic scatters, two fieldhouse sites, one possible rock shelter, and one Archaic lithic scatter. Six of the sites in TA-74 are located on active colluvial slopes, two sites are located on Pleistocene terraces, and one site is located on a colluvial slope overlying a late Pleistocene to early Holocene and a late Holocene (?) fluvial terrace (Figures 57.71 and 57.75).

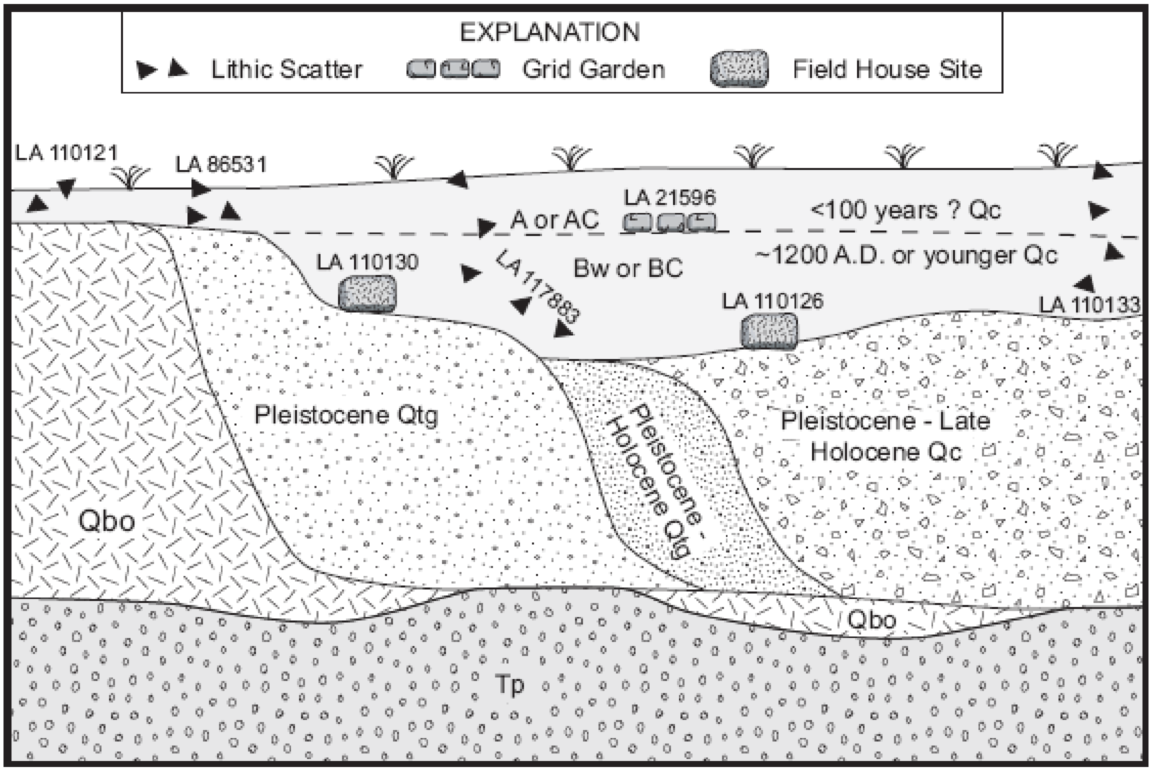


Figure 57.75. Pueblo Canyon schematic stratigraphic correlations chart showing context of archaeological sites.

Recent (less than 750 years old), relatively thick (greater than 50 cm) colluvial deposits were observed at LA 21596b and LA 21596c (Classic period grid garden site), LA 110133 (Coalition/Classic period lithic/ceramic scatter), and LA 117883 (Archaic lithic scatter). Sites LA 110133 and LA 117883 are artifact scatters where the artifacts are part of the colluvium and lack archaeological context (Figure 57.75). LA 21596 includes a series of grid gardens that were a relatively late-stage feature relative to the occupation of Otowi Pueblo, built on top of Puebloan-age colluvium (Figure 57.75). Three sites, LA 110126 (Classic period fieldhouse), LA 86528 (possible Classic/Historic period rock shelter), and LA 110121 (Coalition period lithic/ceramic scatter) are situated on eroded colluvial slopes. At LA 110121, thin (10 cm thick) late Holocene colluvial deposits overlie the Guaje pumice bed (Figure 57.75). The LA 110121 artifact scatter is part of the colluvium and lacks archaeological context. At LA 86528, thin (11 cm thick) late Holocene colluvial deposits overlie Pleistocene colluvium. LA 110130 (fieldhouse) and LA 86531 (lithic scatter) are located on the surface of somewhat dissected Pleistocene fluvial terraces (Figure 57.75). Both sites have artifacts present in the upper 20 cm that are part of slopewash colluvium or are a surface lag, but are likely to have been transported a relatively short distance from their original locations, and therefore may be in moderate to good archaeological context.

Stratigraphy of surficial units includes thin late Holocene colluvial deposits overlying late Pleistocene colluvial deposits or Pleistocene and Holocene fluvial terrace deposits (Figure 57.75). Late Pleistocene soils are truncated, indicating erosion some time during the Holocene, before deposition of the late Holocene colluvium. Soil stratigraphic relationships and artifact context at many of the sites in the TA-74 South Tract are indicative of one colluvial deposit with an age of less than 800 years and a second colluvial deposit that has an estimated age of 100 years or less. Before Coalition period time, large areas of the Pueblo Canyon landscape were characterized by stripped, erosional surfaces. In contrast, most of the landscape in the TA-74 South Tract has experienced net deposition since Coalition period time. With the exception of Holocene terrace deposits, the pre-Coalition period Holocene record in this part of Pueblo Canyon is apparently very poorly preserved. In this geomorphic setting, colluvial processes have reworked many of the artifacts across low-gradient colluvial slopes. Low fluvial terraces buried by young colluvium may have the best potential for preserving an intact archaeological record.

WHITE ROCK Y TRACT

Surficial Geologic Units

Surficial geologic units within the parcel include young alluvium in the main stream channel and tributary drainages of Los Alamos Canyon (unit Qal), higher stream terraces of Holocene and Pleistocene age (units Qt3, Qt2, and Qt1)), and areas of colluvium on side slopes (unit Qc). The White Rock Y parcel includes the channel of Los Alamos Canyon, incised into basalt bedrock (unit Tb), and an adjacent stream terrace, Qt3, that is overlain by colluvium derived from a higher, Pleistocene-age terrace, Qt1 (Figure 57.76).

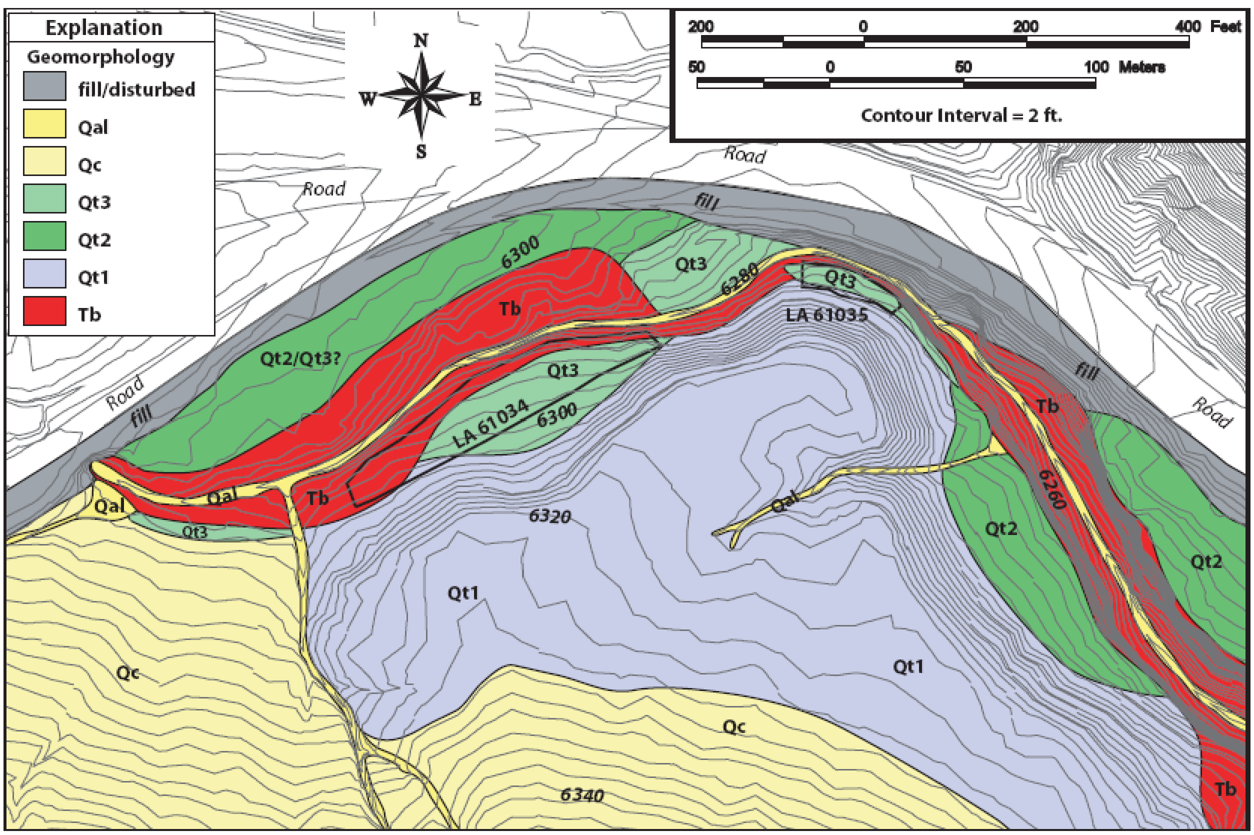


Figure 57.76. Geomorphic map of White Rock Y Tract.

An intermediate, inferred Pleistocene-age terrace, Qt2, is also present above the basalt cliffs in the bottom of the canyon. Terrace gravels exposed on the edge of the Qt3 terrace, below the elevation of the bottom of archaeological test pits, have Stage I calcium carbonate coatings on the undersides of clasts, suggesting an early to middle Holocene deposit (Figure 57.77). The inferred Holocene terrace is 3 to 4 m above the modern stream channel, and the higher Pleistocene terrace is 12 to 13 m above the modern channel (Figure 57.77). Qt1 is bordered on the south by colluvial slopes that lead up to a Bandelier Tuff-capped mesa south of the tract. In the western end of the tract, the Qc slope is continuous from the Bandelier Tuff-capped mesa to basalt bedrock (Figure 57.76).

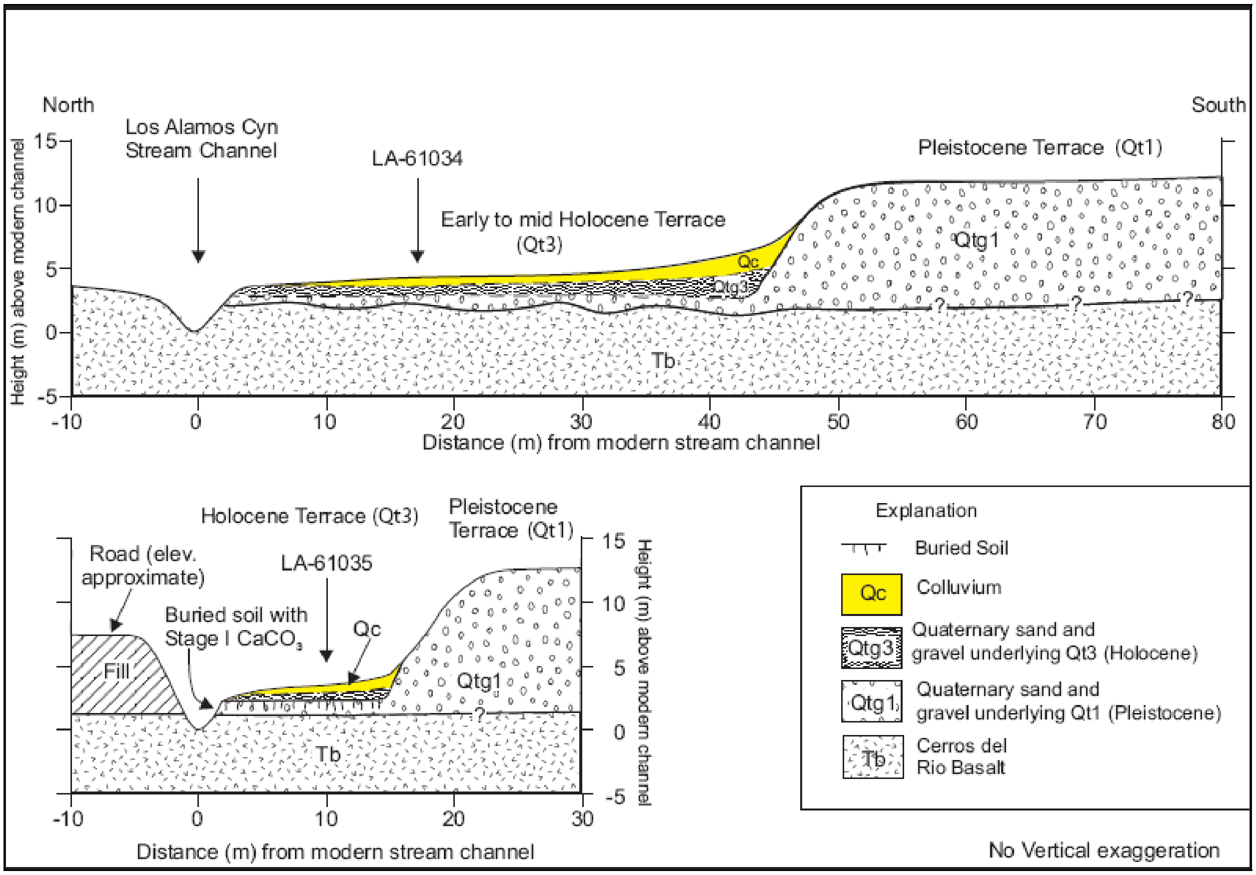


Figure 57.77. Cross-sections through archaeological sites at White Rock Y Tract.

LA 61034 (Lithic/Ceramic Scatter)

LA 61034 consists of lithic and ceramic scatter on a colluvial slope that overlies a stream terrace. The presence of artifacts through the entire thickness of the colluvial layer is consistent with the interpretation that the artifacts have been transported from upslope and are not in place. The horizon sequence, consisting of an A-Bw-Btj1(b1?)-Btj2(b1?)-IIBCb2 profile, is suggestive of Puebloan or post-Puebloan colluvium (the A-Bw horizons) overlying Archaic colluvium (the Btj1(b1?)-Btj2(b1?) horizons), burying Holocene terrace gravel (the IIBCb2 horizon). This interpretation is supported by the distribution of artifacts throughout the colluvial profile. Ceramics and lithics were found in excavation depths corresponding to the A and Bw horizons, whereas lithics only were found in excavation depths corresponding to the Btj1(b1?) and Btj2(b1?) horizons (Table L.9). Total thickness of colluvium at LA 61034 is 40 cm.

LA 61035 (Lithic/Ceramic Scatter)

LA 61035 consists of a lithic and ceramic scatter on a colluvial slope that overlies a stream terrace. The presence of artifacts through the entire thickness of the colluvial layer is consistent with the interpretation that the artifacts have been transported from upslope and are not in place. The presence of ceramics in the upper 30 to 40 cm indicates significant colluvial deposition since Puebloan occupation of this area. Total thickness of colluvium at LA 61035 exceeds 140 cm. The presence of an underlying section of colluvium with obsidian flakes but without ceramics is interpreted to indicate that colluvial deposition here began before Puebloan occupation, likely during Archaic time, and that the obsidian flakes were derived from erosion of an Archaic site upslope. The section of colluvium observed at LA 61035 has a greater thickness than the colluvial section at LA 61034. This is a result of their relative positions on the terrace; with LA 61035 located much closer to the back edge of the terrace than is LA 61034 (Figure 57.77).

White Rock Y Tract Summary

Two sites were investigated in the White Rock Y Tract. LA 61034 and LA 61035 are both lithic/ceramic scatters located on a Los Alamos Canyon stream terrace (Qt3) of probable Holocene age overlain by colluvium derived from an adjacent, higher Pleistocene terrace (Qt1). Artifacts occur in colluvial deposits that overlie the terrace gravel and are not in archaeological context, having been transported here from upslope. Two episodes of colluvial deposition are inferred, with a total thickness of colluvium ranging from 40 cm at LA 61034 to greater than 140 cm at LA 61035. The upper colluvial layer includes both ceramic and lithic artifacts, was deposited during Puebloan time or later, and ranges in thickness from 14 to 45 cm at the two sites. The lower colluvial layer contains only lithic artifacts, was likely deposited during Archaic time, and ranges in thickness from16 to greater than 95 cm at the two sites.

CONCLUSIONS

Archaeological sites examined during this investigation are located on mesa top, colluvial slope, fluvial terrace, valley bottom, and ridge top settings. The record of eolian and colluvial deposition on mesa tops and within canyons indicates periods of widespread deposition during the latest Holocene (generally <1 ka deposits) and during the late Pleistocene to early Holocene. middle Holocene (approximately 6 to 8 ka) and late Holocene (approximately 1 to 2 ka) colluvial deposits are less extensively preserved. Similarly, early Holocene (9 to 10 ka), middle Holocene (approximately 4 to 6 ka), and late Holocene (approximately 2 to 3 ka) eolian deposits are less extensively preserved than late Pleistocene and latest Holocene deposits. Of a total of 59 archaeological sites and stratigraphic profile locations described during this investigation for which pre-Puebloan information is available, 32 (54%) have only latest Holocene and Pleistocene deposits, 23 (39%) have latest Holocene and middle or early Holocene deposits, and 4 (7%) have latest Holocene and late Pleistocene to early Holocene deposits. The net aggradation recorded by nearly all locations with young (post-Coalition period) deposits demonstrates recent aggradation across the Pajarito Plateau landscape following a period dominated by erosion during the middle to late Holocene. This sequence of surficial processes has resulted in good preservation of many Ancestral Puebloan sites in a variety of geomorphic settings, but has resulted in the preservation of relatively few Archaic sites in the land transfer parcels.

Preliminary regional correlation of eolian stratigraphic units have been developed during investigation of sites located on mesa top settings in the Airport Tract and White Rock Tract and, by comparison, with the stratigraphic record exposed in paleoseismic trenches on Pajarito Mesa. A post-Puebloan age eolian deposit is present in each of the mesa top locations; therefore, Ancestral Puebloan sites are typically buried and are generally in good archaeological context. It is inferred that 15 to 20 cm of eolian deposition occurred sometime after the middle Coalition period but before the Classic period (i.e., ca AD 1250–1325), and in many cases Coalition and Classic period sites can be differentiated based on soil stratigraphic relationships. The timing of this eolian event corresponds to "The Great Drought" of AD 1276–1299 and a locally drier period from AD 1250–1255, inferred from tree ring data, and a major regional event associated with the abandonment of Mesa Verde (Rose et al. 1981).

A second, more recent eolian event occurred after abandonment of the Early Classic (?) period sites, resulting in deposition of an additional 5 to 10 cm of fine-grained sediment in mesa top settings since approximately AD 1500. Up to 4 cm of eolian deposition has occurred since the middle to late 1800s at one site. Post-Middle Coalition period deposits are typically underlain by 0 to 1.5 m of Pleistocene and Holocene deposits overlying the 1.22 Ma Bandelier Tuff, recording a sequence of discontinuous, truncated late Pleistocene through middle to late Holocene soils that represent episodic eolian deposition and soil formation followed by erosion. The Airport Tract b1 soil is likely correlative with either the 2 to 3 ka Pajarito Mesa deposit, or is a mid-Holocene deposit not observed during the Pajarito Mesa investigation. The Airport Tract b2 soil may be correlative with pre-El Cajete Pajarito Mesa unit 3b, or could be correlative with a unit 2a Pleistocene or early Holocene deposit. The local early Holocene b2 deposit at EG&G gully may correlate with the Pajarito Mesa unit 2a 9 to 10 ka deposit. The Airport Tract b3 soil and Pajarito Mesa unit 3e deposit are both characterized by well-developed stripped soils with 5YR to 7.5YR hue formed in part in Bandelier Tuff rubble and preserved in bedrock pockets in the undulating tuff surface and appear to be correlative with one another. The presence of late Pleistocene to early Holocene eolian deposits in mesa top settings preserves a record of Paleoindian occupation on the Pajarito Plateau, as shown by the three Paleoindian sites exposed on Pajarito Mesa.

In canyon settings, early to middle Holocene deposits are less extensively preserved, except in some canyon bottoms, recording net erosion during the Holocene across most of the landscape. Late Pleistocene soils are truncated, indicating erosion some time during the Holocene, before deposition of the late Holocene colluvium. In Rendija Canyon, the development of shallow hillslope drainages and their subsequent filling is recorded by the ca 1 to 2 ka and ca 6 to 7 ka swale fill deposits. Valley bottoms preserve 1.5 to 2 m thick middle to late Holocene colluvial deposits and an unknown thickness of underlying early Holocene and/or late Pleistocene deposits. Pre-Coalition period colluvial deposits are apparently preserved over a larger part of the Cañada del Buey landscape, but are apparently very poorly preserved in Pueblo Canyon within the TA-74 South Tract. Use of soil stratigraphic characteristics to differentiate between Coalition and Classic period sites in hillslope settings has not been as reliable as has been found for mesa top sites. This may indicate that the main pulse of recent colluvial deposition has occurred later than the AD 1250–1325 eolian event, likely after AD 1500.

Use of soils to correlate between colluvial and eolian deposits is complicated by variable rates of soil development in different geomorphic settings. This proved problematic in the case of site LA 85859, where a 6.7 to 7.4 ka soil had properties typically observed in late Pleistocene soils found on the Pajarito Plateau. The unusually rapid soil formation observed at LA 85859 is likely due to site-specific geomorphic factors including erosion of older, clay-rich soils upslope, and deposition of clay-rich colluvium in a hillslope depression. Caution should be used when making relative age estimates based on soil properties in variable geomorphic settings.

Pleistocene-age colluvial deposits are not differentiated in the Rendija and TA-74 South tracts; however, two Pleistocene-age colluvial deposits are described in the White Rock Tract. A younger, greater than 50 to 60 ka (pre-El Cajete) colluvial deposit is preserved throughout the tract, and an older, greater than 100 to 200 ka deposit is discontinuously preserved. At one location in the south-central area of the White Rock Tract, a piece of fossilized bone of *Bison antiquus* was found at a depth of about 20 to 30 cm eroding out of a gully wall in the younger Pleistocene Qc deposit, stratigraphically below the ca 50 to 60 ka El Cajete pumice. This is apparently the first recorded Pleistocene fossil from Los Alamos County and is also one of very few bison records in New Mexico with dates older than about 20 ka.

The episodes of eolian deposition provide a significant source of sediment for the colluvial deposits, and eolian deposits are commonly reworked downslope. Several Holocene periods of widespread eolian and colluvial deposition are roughly coincident, with a short lag time between eolian and colluvial deposition, including the latest Holocene (<1 ka deposits), the late Holocene (approximately 1 to 2 ka colluvial deposits and approximately 2 to 3 ka eolian deposits, and the early to middle Holocene (approximately 6 to 8 ka colluvial deposits and 9 to 10 ka eolian deposits). Although most of the Pleistocene record is likely not preserved, late Pleistocene (post-El Cajete) eolian deposits are preserved on Pajarito Mesa, in Rendija Canyon, and possibly in the Airport Tract. Some colluvial deposits are likely also of a similar age. Pre-El Cajete, late Pleistocene eolian and colluvial deposits are preserved on Pajarito Mesa, the Airport Tract, in Cañada del Buey, and likely in Pueblo and/or Rendija canyons. Older, greater than 100 to 200 ka eolian and colluvial deposits are apparently preserved in all areas visited during this investigation. In between eolian events, erosional processes dominate and much of the sediment is stripped from hillslopes and mesa tops and deposited in valley bottoms, including deposition on fluvial terraces.

As a result of widespread eolian and colluvial deposition during the latest Holocene, Ancestral Puebloan sites are well preserved in a variety of settings including mesa tops, hillslopes, fluvial terraces, and ridgetops. Although older Holocene colluvial and eolian deposits are not extensively preserved, Archaic site LA 85869 is located within and on top of colluvium deposited during a period of aggradation from ca 6.7 to 7.4 ka that apparently included site occupation. Other Archaic sites were in poor archaeological context, and lithics were generally present as part of a younger colluvial package or as a surface lag. Although not extensively preserved, future investigations could target middle and early Holocene deposits on fluvial terraces and in other settings in valley bottoms, along gullies and, when possible, during excavations on mesa top settings, to further investigate the Archaic and Paleoindian record on the Pajarito Plateau. The Pajarito Mesa paleoseismic trenching investigation demonstrated that such sites are present, although they have been relatively poorly investigated to date.

CHAPTER 58
CERAMIC ANALYSIS FOR THE LAND CONVEYANCE AND TRANSFER PROJECT, LOS ALAMOS NATIONAL LABORATORY

C. Dean Wilson

INTRODUCTION

This chapter presents the results of the analysis of 22,618 ceramic artifacts recovered during the Land Conveyance and Transfer (C&T) Project archaeological excavations. This analysis was conducted under the supervision of Dean Wilson, with the assistance Candace Lewis, Rick Montoya, Marlene Owens, and Carol Price of the Office of Archaeological Studies, Museum of New Mexico in Santa Fe. The artifacts were recovered from archaeological sites excavated in the White Rock, Airport, and Rendija tracts, as well as test excavations conducted in the Technical Area (TA) 74 and White Rock Y tracts (Table 58.1). The chapter contains information on the ceramic attributes and types recorded during the analysis and the long-term temporal trends reflected in changing ceramic types, production and exchange patterns, and vessel function.

Table 58.1. Site ceramic sample sizes by tract.

Tract	Site	Sample
White Rock	LA 12587	10,363
	LA 86637	110
	LA 127625	28
	LA 127631	12
	LA 128804	262
	LA 128805	199
	IOs	192
Airport	LA 86534	3,925
	LA 135290	4,021
	LA 139418	26
	LA 141505	29
Rendija	LA 15116	85
	LA 70025	185
	LA 85403	7
	LA 85404	199
	LA 85414	35
	LA 85417	129
	LA 84859	2
	LA 85961	439
	LA 85864	2
	LA 85867	68
	LA 86605	105
	LA 86606	143

Tract	Site	Sample
	LA 86607	9
	LA 87430	487
	LA 99396	85
	LA 99397	3
	LA 127627	82
	LA 127633	1
	LA 127634	149
	LA 127635	371
	LA 135291	82
	LA 135292	89
TA-74	LA 21596B	257
	LA 21596C	382
	LA 86531	1
	LA 110126	11
	LA 110130	24
	LA 110133	6
	LA 117883	1
White Rock Y	LA 61034	1
	LA 61035	11
Total		22,618

Several sites were included in the analysis that were not part of the project excavations, but provided additional information. A total of 10,070 sherds were included from LA 4618, 1056 sherds from LA 4619, and 360 sherds from LA 82601. LA 4618 and LA 4619 are Late Coalition period roomblocks while LA 82601 is a Coalition period fieldhouse and all are located on Mesita del Buey near the White Rock Tract (Wilson 2006, 2007). A limited number of sherds were also analyzed from excavations conducted in the 1950s at the Airport 1 (n = 19) and Airport 2 (n = 129) sites located in the Airport Tract (Steen 1977; Chapter 27, Volume 2). Both of these sites appear to be Coalition period roomblocks. Given the lack of information on the Developmental period, a total of 168 sherds were also analyzed from a Late Developmental site (LA 82601) situated on the mesa overlooking the Rio Grande valley in TA-70 (Acklen 1993).

All of the aforementioned data will be included in the discussions provided in this chapter. The chapter will first discuss analysis strategies, procedures, and typological categories employed during the analysis of the ceramics. Data documented during this study is then used to examine various trends and issues relating to prehistoric occupations on the Pajarito Plateau. These data will then be used to address some of the research issues raised by Vierra et al. (2002) in the project data recovery plan. An initial set of questions relates to chronology and site occupation span. Other issues involve the examination of the nature and organization of subsistence activities, local and regional exchange networks, and the influence of various local conditions, stresses, and pressures on various networks and activities as well as on the eventual abandonment of various sites and locations on the Pajarito Plateau.

Many issues can be examined by using ceramic distributions to determine the time of occupation indicated by assemblages from various sites and contexts as well as the documentation of ceramic distributions relating to the production, area of origin, decoration, and use of ceramic vessels. In order to examine various trends, a range of ceramic traits was recorded in the form of both attribute classes and ceramic type categories.

CERAMIC ATTRIBUTES

Sherds exhibiting a unique combination of traits were separated by group, provenience, and site during the ceramic analysis. Information about the characteristics of a combination of sherds from a particular grouping was recorded on distinct data lines. Each data line from a particular provenience was assigned to consecutive catalog numbers. Sherds assigned to a particular grouping were placed into a separate bag along with a small slip of paper recording the site, field specimen (FS) number, and catalog number. Information recorded during ceramic analysis included associated provenience (or FS) and catalog number, typological assignment, descriptive attribute code, quantity of sherds, and total weight. These procedures allow for the matching of sherds with data lines recorded during ceramic analysis, necessary for locating items for data editing and more detailed analyses.

Ceramics from various sites and proveniences were also assigned to a "segment" category, which refers to the stage or year of analysis, the tract where a site was located, and the type of recovery or sampling of ceramics from a particular context. The recording of this information as a separate category allows for the separation and manipulation of ceramic data from distinct tracts or analysis sets.

Attribute classes recorded during the present study include temper, paint type, surface manipulation, modification, and vessel form. In addition, more detailed studies, such as refiring analysis, petrographic characterization, and stylistic analysis were conducted on small samples of pottery.

Temper

Temper category refers to characteristics of added or naturally occurring aplastic particles. Temper analysis involved examining freshly broken sherd surfaces through a binocular microscope. Such characterizations are limited, although broad temper categories can be recognized based on combinations of color, shape, fracture, and sheen of tempering particles.

‘Indeterminate temper’ refers to cases where temper was examined, but the type of material could not be determined. ‘Self-tempered’ refers to examples where distinct added aplastic inclusions were not present in the clay paste, and inclusions are limited to tiny naturally occurring silt grains. ‘Vitrified’ refers to examples where the temper could not be identified because the particles in the paste had been melted due to exposure to very high temperatures.

The majority of the analyzed ceramics appear to have been tempered with volcanic rock commonly used by potters on the Pajarito Plateau. ‘Fine tuff or ash’ refers to fine volcanic fragments common in whiteware forms made over much of the Rio Grande region. Temper assigned to this category consists of small, clear to light, or dark vitreous, angular to rod-shaped particles with light-colored dull pumice particles. The presence of such particles may reflect either the use of self-tempered clays weathered from ash deposits or the intentional addition of crushed or weathered tuff or ash to the clay. Similar categories were recognized based on the presence of associated sand or mica fragments and were classified as 'fine tuff and sand,' 'mica and tuff,' and 'tuff, mica, and sand.' A few examples displayed large fragments and were coded as large tuff fragments or vitric tuff.

The form of temper usually dominating grayware types at sites on the Pajarito Plateau is referred to here as 'tuff and phenocrysts (anthill sand).' These grains are often transparent or crystalline in structure, and occur in a non-micaceous paste. This temper appears to be common in grayware pottery found over much of the Pajarito Plateau and is represented by fairly rounded quartz phenocrysts along with smaller tuff particles. Such sources are most common on anthills and assorted streambeds in the Pajarito Plateau (Vint 1999). Other examples, with a small but still significant amount of phenocrysts, were assigned to a 'mostly tuff with some phenocryst' category. Another form of this temper is dominated by large tuff fragments and was classified as 'large tuff with anthill sand.'

'Granite with mica' refers to the dominant temper type in grayware forms derived from areas in the northern Rio Grande region, although this temper does not appear to have been available to, nor used by, potters residing on the Pajarito Plateau. This category reflects the use of various combinations of local alluvial clays with rock fragments and crushed igneous river cobbles that may have been derived from porphyries common in mountains and drainages scattered over much of the northern Rio Grande region. Even without microscopic examination, sherds with this temper are usually easy to recognize by the presence of numerous mica fragments that visibly glitter on the vessel surface. Temper fragments are relatively large and sub-angular to sub-rounded. These particles are usually white but are occasionally clear, light gray, or pink. Rock fragments may also contain mica and very occasionally black inclusions. Sherds with similar temper were separated into different categories based on the absence or presence of higher amounts of mica fragments. Sherds with similar temper without mica were assigned to the 'granite without abundant mica' category. Pastes where mica represents the dominant material were assigned to a 'highly micaceous (residual) paste' category. Another granitic temper occurs in late grayware types such as Sapawe micaceous, is distinguished by fine crystalline and dense small mica particles, and was recorded as 'Sapawe micaceous temper.'

Sand refers to rounded or sub-rounded, well-sorted sand grains. These grains are translucent, or white to gray. This category is distinguished from sandstone temper by the presence of large even-sized quartz grains and the absence of a matrix. A few sherds containing sand and mica or dark igneous fragments were separated into other categories. Examples of similar sand with other particles were assigned to the 'sherd and sand' or 'sand and mica' category. Examples consisting of extremely fine sand particles were classified as 'very fine sand (silt).' 'Fine sandstone' exhibits rounded sand grains along with angular matrix fragments. Grains derived from sandstone are usually smaller than those found in sand temper.

Sherd refers to the use of crushed potsherds as temper. Crushed sherd fragments may be white, buff, gray, or orange in color. These fragments are often distinguished from crushed rock tempers by their dull non-reflective appearance. Fragments of tuff, however, may be similar in appearance. Small reflective rock particles may be included inside or outside the sherd fragments.

Temper consisting of similar sand along with rounded white to dull gray fragments, assumed to represent natural inclusions in the clay with sand, was assigned to an 'oblate shale and sand' category. Pastes with shale fragments without other lithic fragments were assigned to a 'shale' category. Others containing similar shale and small tuff categories were classified as 'oblate shale and tuff.'

Gray crystalline basalt refers to the presence of homogenous greenish-, gray-, or black-colored angular rock fragments representing crushed basalt. This temper is mainly associated with glazeware types from the Zia, Cochiti, and Albuquerque areas. Similar material with sand particles was assigned to the 'basalt and sand' category. Scoria refers to similar basalt with red- or orange-colored particles.

Another crushed rock type associated with glazeware types is latite. This temper is characterized by dull buff, light gray, to dark colored dull tuff particles and shiny black and white quartz particles.

'Andesite or diorite' refers to fragments from either crushed andesites or diorites grains. This category represents a temper used by potters in most of the northern San Juan or Mesa Verde region of the Four Corners Ancestral Pueblo (Wilson and Blinman 1995a). Examples of this temper noted during the present study were associated with other materials and thus assigned to either an 'andesite or diorite and sherd' or 'andesite or diorite and sand and sherd' category.

'Mogollon volcanics' or 'sand and Mogollon volcanics' refer to the presence of natural inclusions common in clay sources from the Mogollon Highlands in southwest New Mexico. Previous studies of Mogollon pottery indicate that these reflect the use of pedogenic sources ultimately derived from local volcanic outcrops and volcanic-clastic sandstone in the Mogollon Highlands (Wilson 2000). These clay sources usually contain numerous natural igneous and sandstone inclusions, and in most cases the addition of separate tempering material would have been unnecessary.

Other temper categories represent combinations of sherd and distinct crushed rock associated with Chupadero Black-on-white produced in the northern Mogollon region. These temper types include 'dark igneous,' 'dark igneous and sherd,' 'dark igneous and sand,' and 'sherd and calcium carbonate.'

Pigment Type

Pigment categories were identified based on the presence, surface characteristics, and color of painted surface decorations. Most pigments were divided into organic (or carbon) and mineral pigment groups based on previously described characteristics (Shepard 1963).

The presence, type, and color of paint pigments were recorded for all sherds examined. Sherds without evidence of painted decorations were simply placed into a 'none' category. Those, for which the paint type could not be determined, were classified as 'indeterminate and indeterminate burned out.'

Mineral paint refers to ground minerals such as iron oxides used as pigments. These decorations are applied as powdered compounds, usually along with an organic binder. Mineral pigment represents a distinct physical layer and rests on the vessel surface. Such pigments are usually thick enough to exhibit visible relief. Mineral pigments usually obscure surface polish and irregularities. The firing atmospheres to which mineral pigments were exposed affects color. Mineral pigment categories identified during the present study include 'mineral black,' 'mineral brown,' and 'mineral red.'

Organic paint refers to the use of vegetal pigment only. Organic paint is soaked into rather than deposited on the vessel surface. Thus, streaks and polish are often visible through the paint. The painted surface is generally lustrous, depending on the degree of surface polishing. The pigment may be gray, black, bluish, and occasionally orange in color. The edges of the painted designs are often fuzzy. Sherds with the light remnants of organic paint that had been mostly fired off were classified as 'organic diffuse.'

Glaze paint refers to the use of lead as a fluxing agent to produce vitreous decorations. Glaze pigments are often very thick and runny, and bubbles may protrude through the surface. The glaze may weather off, leaving a thin organic layer. Pigment color ranges from brown, black, and orange to green.

Surface Manipulation

Attributes relating to surface manipulations reflect the presence and type of surface texture, polish, and slip treatments. Surface manipulation categories were recorded for both interior and exterior vessel surfaces. Categories identified during the present study include 'plain unpolished,' 'plain polished,' 'polished white slip,' 'polished red slip,' 'polished smudged,' 'plain striated,' 'micaceous slip,' 'surface missing,' 'narrow coil,' 'wide coil,' 'narrow coil,' 'clapboard,' 'indented corrugated,' 'indented plain corrugated,' smeared-indented corrugated,' 'smeared plain corrugated,' 'wide wiped undulated,' 'wide banded incised indented alternating wide fillet-indented corrugated,' 'unpolished white slip,' 'polished thin white slip,' 'basket impressed,' 'polished cream-red slip,' 'polished cream slip,' 'unpolished red slip,' 'parallel incised,' 'fingernail incised,' 'neck corrugated indented,' 'alternating plain indented corrugated,' 'smeared plain corrugated with mica slip,' and 'incised with mica slip.'

Vessel Form

Observations about sherd shape and surface manipulation provide clues concerning the use of the vessels from which they derived. Vessel form classification is usually dependant on sherd size, manipulation, and vessel portion. It is usually possible to assign rim sherds to more specific categories than body sherds. Categories identified during the present study include ’indeterminate,’ ‘bowl rim,’ ‘bowl body,’ ‘seed jar,’ ‘olla rim,’ ‘jar neck,’ ‘jar rim,’ ‘jar body,’ ‘jar body with strap or coil handle,’ ‘jar body with lug handle,’ ‘dipper with handle,’ ‘gourd dipper,’ ‘dipper rim,’ ‘indeterminate coil strap handle,’ ‘canteen rim,’ ‘miniature jar,’ ‘miniature pinch pot rim,’ ‘miniature pinch pot body,’ ‘jar rim with strap handle,’ ‘cloud blower,’ ‘appliqué,’ ‘jar rim with lug handle,’ ‘effigy,’ ‘fired coil,’ ‘body sherd polished interior-exterior,’ ‘body sherd unpolished,’ ‘body sherd polished interior unpolished exterior,’ ‘indeterminate rim,’ ‘dipper handle,’ ‘plate or tray,’ ‘flared bowl rim,’ and ‘indeterminate lug handle.’

Modification

Modification refers to evidence of post-firing alteration including abrasion, drilling, chipping, or spalling. Data concerning such treatments provide information about use, repair, and shaping of sherds and vessels. Modification categories combine information concerning the size, shape, and associated wear patterns of a modified sherd. Modification categories recorded during the present study include ‘none,’ ‘drill hole complete,’ ‘ceramic scraper,’ ‘beveled edge,’ ‘punched hole,’ ‘interior worn from cooking,’ ‘interior spall erosion,’ ‘abraded surface exterior,’ ‘drill hole incomplete,’ ‘interior surface partially worn,’ ‘abraded surface interior,’ ‘exterior firing shall,’ ‘rim wear,’ ‘interior-exterior erosion,’ ‘sooted interior-exterior,’ ‘sooted interior,’ ‘exterior partially exfoliated erosion,’ ‘sooted exterior,’ ‘shaped all sides,’ ‘reshaped rim,’ ‘pendant,’ ‘pigment residue,’ ‘interior chipping,’ ‘intentional chipping,’ ‘unknown residue,’ and ‘single groove incised.’

Stylistic Analysis

While information relating to surface texture and design style were documented through typological categories, a range of stylistic attributes was recorded for a subset of grayware and whiteware rim sherds. Stylistic attributes recorded for painted whiteware types include ‘rim thickness,’ ‘design orientation from the rim,’ ‘design motifs,’ ‘number of motifs,’ ‘rim decoration,’ ‘rim shape,’ and ‘degree of surface polish.’ Attributes recorded for grayware types include ‘evidence of type of finish,’ ‘presence and thickness of top rim fillet,’ and ‘interior finish.’ These attributes provide additional information concerning the characteristics of Rio Grande types. Information relating to the distribution of various attributes from dated types may be compared to studies from other areas to better determine the nature of temporal changes and regional influences.

Refired Color

Refiring analysis provides data for paste comparisons based on mineral impurities in clay and ceramic pastes. This technique involved firing samples in oxidizing conditions to temperatures of 950°C. Such firings standardize the oxidation of iron compounds in clays and fire out organic material. This allows for the common comparison of color of samples and reflects types and amounts of mineral impurities (particularly iron). Sample color was recorded using the Munsell color categories. During the present study, sherds exhibiting hues of 2.5YR were described as red, those exhibiting hues of 5Y as yellow red, hues of 7.5YR as pink, and hues of 10YR, 2.5Y, and 5Y as buff.

Petrographic Analysis

In order to further examine issues relating to local production and exchange, a small sample of sherds were selected for petrographic analysis. The detailed results of the petrographic analysis are presented by Miksa (Chapter 59, this volume). These data will be used to discuss issues pertaining to ceramic production and exchange on the Pajarito Plateau.

CERAMIC TYPE DESCRIPTIONS

Ceramics examined from the project sites were assigned to typological categories based on combinations of traits with spatial, functional, and temporal implications. Ceramics were assigned to different type categories based on a series of decisions that involved the recognition of associated ceramic tradition, ware, and defined pottery types. The determination of associated ceramic tradition involved the separation of ceramics into broad groups indicative of postulated area of origin or "cultural" association. Ceramics were placed into ceramic traditions defined for the northern Rio Grande and surrounding regions based on characteristics of temper, paste, and paint of pottery known to have been produced in various regions. Sherds were then assigned to ware groups based on technological attributes and surface manipulation. Finally, sherds were assigned to ceramic types based on temporally sensitive painted decorations or textured treatments.

Indeterminate Tradition Types

Types assigned to an 'indeterminate tradition' refer to sherds that could not be placed into previously defined regional traditions. The 'indeterminate tradition' category was seldom used and was limited to rare situations where sherds were tempered with material or inclusions not attributed to specific traditions. 'Indeterminate utilityware' refers to grayware pottery of indeterminate tradition or origin. Whiteware pottery was assigned to two types within this tradition including 'unpainted undifferentiated white' and 'indeterminate painted ware.' 'Indeterminate blackware' refers to pottery of unknown origin that is sooted or smudged over a polished surface.

Northern Rio Grande Pottery Tradition

The majority of the ceramics analyzed from the C&T Project sites exhibited styles, technologies, and temper indicative of pottery produced on the Pajarito Plateau or in surrounding areas of the northern Rio Grande region. Both grayware and whiteware ceramics that exhibited these characteristics were assigned to northern Rio Grande tradition types, although low frequencies of intrusive prehistoric types were also identified. Many of the types defined for the northern Rio Grande pottery were first named and described by Kidder or Mera based on excavations in the early 20th century (Kidder 1915; Kidder and Amsden 1931; Kidder and Shepard 1936; Mera 1933, 1934, 1935). The various Rio Grande pottery types defined and described during these investigations were first compiled by Hawley (1936), and these categories have long been used as the basis for the description and examination of pottery data from sites in the northern Rio Grande region (Habicht-Mauche 1993; Honea 1968; Lambert 1954; Lang 1997; Powell 2002; Stubbs and Stallings 1953; Vint 1999; Warren 1976).

Northern Rio Grande Graywares

Northern Rio Grande Grayware refers to the dominant gray or grayware found over wide areas of the Rio Grande region (Habicht-Mauche 1993; Wendorf 1953). Two basic paste groups with strong area implications commonly occur in northern Rio Grande grayware pottery. The majority of grayware forms examined contained temper previously described as "anthill sand" in non-micaceous pastes. This temper appears to reflect tuff sources with unusually high frequencies of quartz phenocryst particles in tuff. The abundance of these particles appears to have resulted from sorting action reflected in both anthills and streambeds found on the Pajarito Plateau. The other paste commonly noted in grayware pottery from sites in the northern Rio Grande region is represented by pottery with numerous mica fragments (Warren 1979). The earliest "micaceous" types appear to reflect the use of crushed local mica-bearing granite cobbles as temper along the Rio Grande and associated drainages (Warren 1979). This temper does not appear to have been commonly used by potters on the Pajarito Plateau, and its presence is assumed to reflect the exchange of vessels produced in other areas such as along the Rio Grande Valley where micaceous granite sources were common.

A range of exterior surface manipulations has been noted on pottery exhibiting both paste groups and resulted in the identification of a number of different prehistoric grayware types. Similar criteria were used to assign northern Rio Grande grayware pottery to types based on exterior surface texture. While formal types have been defined for various surface treatments (for example Tesuque Smeared Corrugated), the definition of many of these types is somewhat vague and confusing, and the types commonly defined often do not cover the full range of manipulation encountered within these assemblages. Thus, the strategy employed here involved the utilization of descriptive types associated with a range of surface textures (Bice 1997).

Plain grayware vessels with completely smoothed surfaces occur at Rio Grande sites dating to all ceramic periods, although their relative frequency within ceramic assemblages changed significantly through time. Plain gray body sherds may be derived from plain surface vessels or from the lower portion of neck banded or corrugated vessels. Rim sherds that appear to have derived from completely smoothed vessels were classified as ‘plain gray rim’ (Figures 58.1 and 58.2). Rim sherds that were too small to indicate the surface texture of the vessel were classified as ‘unknown gray rim.’ Smoothed body sherds that could have originated from plain vessels or smoothed portions of neck banded or corrugated vessels were classified as ‘plain gray body.’ Grayware types assigned to other pottery forms not exhibiting distinct coils include ‘polished gray,' 'basket impressed gray' (Figure 58.3), 'plain incised,' 'wiped scored gray,' and 'mudware' (Figure 58.4).

Figure 58.1. Plain gray rim sherd from LA 86534 (FS 958-1).

Figure 58.2. Plain gray olla rim from LA 4618 (FS 171.1).

Figure 58.3. Basket impressed sherds from LA 86534 (left, FS 1555-1 and FS 1593-1) and LA 12587 (right, FS 4183-1).

Figure 58.4. Mudware vessel from the Pajarito Plateau.

Other grayware sherds display textures created by incompletely obliterated coil junctures along the exterior of vessel necks. Given the absence of sites dating before the Coalition period in the present sample, neck banded sherds are very rare. ‘Wide neckbanded’ refers to sherds with wide coils or fillets. These coils are clearly separated by distinct junctures that rest vertically to each other and usually do not overlap. ‘Wide neckbanded smeared’ is similar to the previously described type except the juncture between the coils has been partially obliterated. The area between these coils is visible but reflected by an undulating or ribbed surface. Similar forms with rounded coils were assigned to a ‘coiled necked’ category. Those with overlapping coils were classified as ‘clapboard neck.’

Other grayware sherds displayed corrugated textures resulting from incompletely obliterated coil junctures on exterior surfaces. Corrugated grayware vessels have thin overlapping coils, which often have regularly spaced indentations. These coils usually cover the entire exterior surface, although corrugated treatments are sometimes limited to the vessel neck. In some cases, corrugated types were further distinguished by other temporally sensitive attributes such as the type and pronouncement of coiled treatment.

‘Indented corrugated’ (Figures 58.5 through 58.7) includes grayware sherds with narrow coils, regularly spaced indentations, and moderate to high contrast between coils. This represents the dominant corrugated type during the Late Developmental period and the very early part of the Classic period.

Figure 58.5. Indented corrugated sherd from LA 12587 (FS 3908-38).

Figure 58.6. Indented corrugated sherd from LA 12587 (FS 4092-16).

Figure 58.7. Indented corrugated jar sherd from LA 135290 (FS 2106-2).

Grayware sherds with similar textures, but with distinct incised decorations, were classified as 'incised corrugated' (Figure 58.8). 'Plain corrugated' refers to grayware forms with similar coil treatment and relief described for indented corrugated but without regularly spaced indentations. Sherds with both rows of indented and coiled treatments were classified as 'alternating corrugated.' 'Patterned corrugated' refers to combinations of corrugated and coiled treatments that form distinct patterns or designs on the vessel. 'Neck corrugated' refers to indented corrugated limited to the neck area. Sherds assigned to this category usually exhibit corrugations with high relief as well as a plain lower area.

Figure 58.8. Incised corrugated sherd from LA 12587 (FS 3110-8).

'Smeared-indented corrugated' and 'smeared-plain corrugated' (Figures 58.9 through 58.12) display indented corrugations that have subsequently been smeared, resulting in the partial obliteration of indentations and coil junctures. Rio Grande grayware types exhibiting these treatments have been previously classified as 'Tesuque Smeared' (Mera 1935). In the Rio Grande region, smeared-indented corrugated was the most common grayware form during most of the Coalition period as well as the very early part of the Classic period.

Figure 58.9. Smeared-indented corrugated sherds from LA 4618 (left, FS 684-8) and LA 12587 (right, FS 1265-4).

Figure 58.10. Smeared-indented corrugated vessel from LA 4712.

Figure 58.11. Smeared-indented corrugated rim sherd from LA 86534 (FS 1248-1).

Figure 58.12. Smeared-indented corrugated rim sherds from LA 135290 (FS 1328-3, FS 1003-3, FS 1254-18b, and FS 2106-3).

'Sapawe micaceous washboard' represents the dominant grayware type at some Classic period sites in the northern Rio Grande region (Figures 58.13 and 58.14). 'Sapawe micaceous washboard' is commonly associated with other Classic period sites such as biscuitware types (Gauthier 1987a). Surfaces may be covered with a micaceous slip and are tan to dark brown to gray in color. Paste cross-section is dark gray, black, to dark brown. Pastes tend to be silty in appearance and are often vitrified. Sherds tend to be hard and dense. This type is almost always represented by jar forms, which tend to be thin. 'Sapawe micaceous washboard' is tempered with micaceous schist or granite that is most likely a natural constituent in the clay (Gauthier 1987a). Slightly obliterated coils are evident on the exterior surface. This creates a series of parallel ridges without distinct junctures between the coils. Other sherds with similar pastes and temper as described for 'Sapawe micaceous' but with plain surfaces were classified as 'mica utility undifferentiated' and 'unpolished micaceous.' A few very thin sherds with characteristics of late occupations were assigned to the 'thin plain non-micaceous' category.

Figure 58.13. Sapawe micaceous sherds from LA 128804 (left, FS 148-1) and LA 21596C (right, FS 11-16).

Figure 58.14. Two Sapawe micaceous vessels excavated from sites on the Pajarito Plateau.

Another type, which contains combinations of attributes noted in Classic period Rio Grande whiteware and plain grayware types, is Potsuwi'i Incised (Mera 1932). This type is represented by jars with very smoothed or polished exterior surfaces (Figures 58.15 and 58.16). Vessels tend to be thin and exterior surfaces are sometimes covered with a micaceous slip. Exterior surfaces are dull and gray. Pastes tend to be cream or tan and contain a fine tuff or ash similar to that noted in biscuitware types. A thin layer of mica was sometimes applied to the surface. Sherds are often thin and are almost always represented by jars. Decorations consist of fine incised lines. Designs are variable but often consist of combinations of parallel horizontal and vertical lines. Punctated decorations are sometimes represented.

The only other grayware pottery assigned to the prehistoric Rio Grande tradition was represented by a few brown-colored, polished sherds classified as 'local brownware.'

Northern Rio Grande Whiteware

Most of the decorated types are represented by black-on-white pottery with distinct pastes and temper indicative of northern Rio Grande whiteware types. The sequence of types assigned here to the northern Rio Grande tradition is similar to that attributed to the Tewa series as defined for areas of the northern Rio Grande (Gauthier 1987a; Harlow 1973; Wendorf 1953). Part of the sequence is also reflected in the Pajarito series as employed during the Arroyo Hondo Project (Habicht-Mauche 1993). This tradition reflects a long sequence of production of black-on-white vessels using distinct resources employed over wide areas of the northern Rio Grande Valley. The production of distinctive Rio Grande tradition pottery began with Pueblo II mineral-painted pottery in areas of the northern Rio Grande during the 10^{th} century and continued with a long sequence of changes that persists with pottery produced by Tewa Pueblo potters today.

Figure 58.15. Potsuwi'i incised sherds from LA 21596C (FS 9-1, left, and FS 11-2, right).

Figure 58.16. Potsuwi'i incised vessel from LA 170 (Tsirege).

Rio Grande whiteware types on the Pajarito Plateau are mainly represented by types associated with the Coalition and Classic periods. Unpainted whiteware sherds with temper indicative of the Rio Grande tradition were placed into an ‘unpainted undifferentiated’ category. This category generally refers to white exhibiting characteristics common in forms produced before the Classic period, as it is often possible to distinguish earlier (Late Developmental and Coalition period) unpainted whiteware sherds from those derived from biscuitware types and other later forms.

The earliest Rio Grande or Tewa series whiteware types identified during the present study is Kwahe'e Black-on-white, which dominates sites occupied during the last part of the Late Developmental period. This type reflects the first use of clays from volcanic ash or alluvial deposits common in areas of the Rio Grande Valley. Temper fragments in Kwahe'e Black-on-white usually consist of fine volcanic rock such as tuff or fine silt. The fineness of these tempers contrasts with that noted for pottery from areas of the Colorado Plateau to the west.

Kwahe'e Black-on-white displays a range of surface characteristics and design styles. Some sherds assigned to this type display surfaces that are not slipped that range from green to gray. Other examples display thin streaky thin white slip applied over a gray paste. Painted surfaces range from poorly to moderately polished, while well-polished examples are rare.

Kwahe'e Black-on-white is always decorated with iron oxide pigment. Pigments are usually black, although brown and red examples are common and may result from a poorly controlled firing atmosphere. Examples of this type are commonly decorated with designs similar to those found in pottery produced at contemporaneous sites in the Colorado Plateau. Execution, however, is sometimes poorer on Kwahe'e Black-on-white, although well-executed examples are occasionally encountered. Rims are usually tapered and may be either unpainted or painted with a solid line.

Most of the pottery assigned to Kwahe'e Black-on-white exhibited painted styles roughly equivalent to various Pueblo II types produced in the Cibola region to the west such as Gallup Black-on-white and Escavada Black-on-white. Sherds were also placed into distinctive stylistic groups defined for Kwahe'e Black-on-white based on the presence of different design styles. Early painted sherds without distinct styles were assigned to the ‘mineral paint undifferentiated’ category. Stylistic groups into which local mineral-painted whiteware sherds were placed include Kwahe'e Black-on-white.

Pottery produced during the Coalition period occupation is in many ways very similar to earlier Rio Grande whiteware types but is easily distinguished from these by decorations in organic rather than mineral paint. Some organic-painted pottery without distinct styles or forms was assigned to an ‘indeterminate organic paint’ category. One sherd with manipulations and paste similar to that noted on Coalition period pottery such as Santa Fe Black-on-white but with red slip was classified as ‘organic paint slipped red.’

Santa Fe Black-on-white represents the earliest organic-painted type described for the northern Rio Grande tradition and dominates most Coalition period assemblages (Figures 58.17 to 58.23).

Figure 58.17. Santa Fe Black-on-white ladle from LA 86534 (FS 1872-1).

Figure 58.18. Santa Fe Black-on-white sherds from LA 135290 (FS 2570-1, FS 1313-1, 1290-1, and 1349-1).

Figure 58.19. Santa Fe Black-on-white sherd from LA 4618 (FS 354-2).

Figure 58.20. Santa Fe Black-on-white sherd from LA 12587 (FS 1693-1).

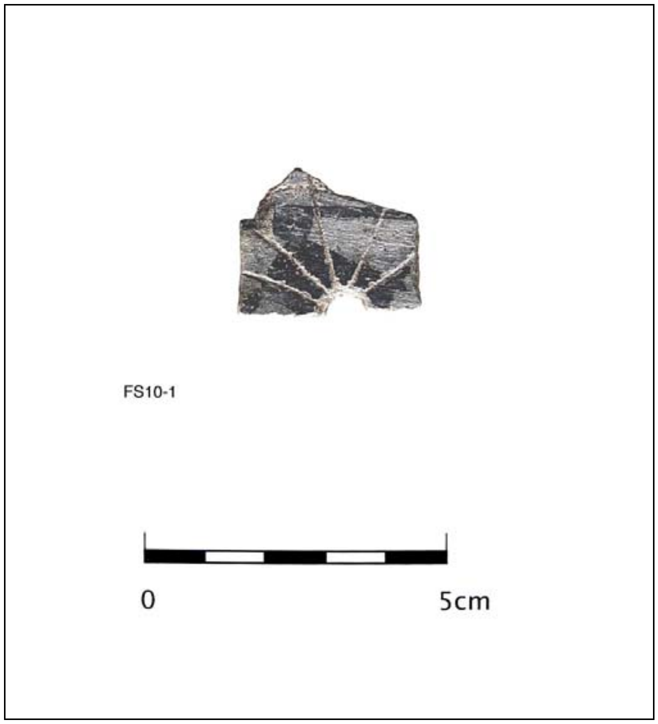


Figure 58.21. Santa Fe Black-on-white spindle whorl fragment from LA 127635 (FS 10-1).

Figure 58.22. Santa Fe Black-on-white bowl sherd from LA 135290 (FS 1254-6).

Figure 58.23. Santa Fe Black-on-white bowl from LA 4634.

Painted decorations on Santa Fe Black-on-white reflect a widespread shift to Pueblo III design styles decorated in organic paint (Lambert 1954; Lang 1982; Mera 1935; Stubbs and Stallings 1953; Sundt 1984). Some of the varieties such as Pindi and Pogi variety of Santa Fe Black-on-white, which are recognized based on temper variation (Habicht-Mauche 1993; Stubbs and Stallings 1953), were not used during the present study. In retrospect, the presence of low frequencies of Santa Fe Black-on-white containing vitric tuff temper indicates the presence of Pindi Black-on-white variety.

Vessel walls of Santa Fe Black-on-white are relatively thin and straight and are similar in shape and thickness to Kwahe'e Black-on-white. Pastes are often fairly dense and hard and can be vitreous. Pastes are usually very fine in texture and fracture along an even plain. Paste color is usually light gray to blue gray. Decorated surfaces are usually polished and often slipped. Surfaces are moderately to well-polished and often slipped. Surfaces range from white, light gray, and greenish to tan. Bowls are by far the dominant vessel form in this type. Undecorated exterior bowl surfaces are often unslipped and unpolished and may occasionally display unobliterated coils, striations, or basket impressions. Tempering materials include fine sand or finely crushed volcanic rock temper, fine sand, and, in some cases, sherd (Habicht-Mauche 1993; Stubbs and Stallings 1953).

Painted decorations are executed in organic pigment, which is sometimes faded and translucent. Paint color ranges from dark-gray, blueish-black to black. Rims are usually tapered and undecorated, while ticked rims, similar to those noted in contemporaneous pottery from regions on the Colorado Plateau are extremely rare. In bowls, decoration is oriented in a band on the interior surfaces. Decoration consists of banded panels on bowl interiors and the upper portions of jars. These banded panels are often framed by a pair of single lines that is separated by very short spaces between the line and top and bottom of the panels. Similar lines are also commonly directly incorporated into the top and bottom edges of the panels. These designs are occasionally framed by a series of similar-sized parallel lines or a combination of thick and thin lines. Santa Fe Black-on-white was first produced during the middle to late AD 1100s and continued to dominate assemblages until the middle AD 1300s and may occur as late as the early AD 1400s (Habicht-Mauche 1993; Stubbs and Stallings 1953; Sundt 1987).

Pottery exhibiting designs executed in organic paint, characteristic of Rio Grande whiteware types but with distinct pastes, were assigned to Galisteo Black-on-white. During the present study, Galisteo Black-on-white was differentiated from Santa Fe Black-on-white by the presence of a coarser white paste with added sherd and/or sand temper (Lambert 1954; Stubbs and Stallings 1953). The classification of Galisteo Black-on-white using previously defined criteria presents several dilemmas. Galisteo Black-on-white has been previously defined anywhere from a type reflecting a very distinct technology derived from Mesa Verde Black-on-white from the San Juan region (Stubbs and Stallings 1953) to an areal variation of Santa Fe produced in areas where low-iron geological clays were available (Wilson 1999).

Definitions of Galisteo Black-on-white as employed in some studies imply strong technological and stylistic similarities and relationships between Galisteo Black-on-white and Mesa Verde Black-on-white from the San Juan region (Habicht-Mauche 1993; Stubbs and Stallings 1953). Similarities include the use of sherd and volcanic rock temper, thick crazed slips, square rims, and similar designs (Abel 1955; Stubbs and Stallings 1953). Galisteo Black-on-white appears to have been the dominant decorated type in some areas south of Santa Fe after AD 1300 and is postulated to have reached its widest distribution in the late 14^{th} century (Habicht-Mauche 1993). The most commonly noted form of Galisteo Black-on-white is characterized by white pastes that contrast markedly with the darker and finer Santa Fe pastes. Temper is generally described as a crushed sherd that appears as coarse gray to black angular fragments, although a wide variety of lithic and mineral inclusions may be present (Habicht-Mauche 1993). Surfaces are covered by a well-polished slip that sometimes displays fine crackling. Organic-painted designs can appear on both interior and exterior surfaces.

Designs are usually organized in paneled bands of oblique and horizontal solids, oriented from multiple or single framing lines. Design elements are usually solid, as hatched elements are uncommon. In some assemblages squared rims are present. Rims are sometimes ticked and may be rounded or tapered. Design styles on Galisteo Black-on-white are sometimes characterized as having derived from McElmo and Mesa Verde Black-on-white types (Mera 1935; Lang 1982), although there are definite differences in the range of styles and treatments occurring in these regional types. Sherds exhibiting pastes similar to those described for Galisteo black-on-white but lacking painted decorations were classified as ‘unpainted Galisteo paste.’

Wiyo Black-on-white appears to have developed directly out of Santa Fe Black-on-white (Figures 58.24 through 58.27). (Note: Reconstructible vessel analyses are presented in Appendix P.) Wiyo Black-on-white was originally referred to as "biscuitoid" to indicate pottery with pastes and treatments thought to be transitional between Santa Fe Black-on-white and the biscuitware types (Kidder and Amsden 1931; Mera 1935; Stubbs and Stallings 1953). Wiyo Black-on-white exhibits organic-painted designs similar to Santa Fe Black-on white, but often has softer pastes that are tan, buff, orange, or greenish (Hibben 1937; Stubbs and Stallings 1953). Wiyo Black-on-white is consistently tempered with finely crushed volcanic rock. Forms are usually represented by bowls, although jars, dippers, and other forms have been noted. Interior bowl surfaces are usually well-polished and are evenly smoothed with thin slips that are often tan or brown. Bowl exteriors tend to be unslipped and unpolished and may exhibit a series of small striations. Vessel walls of Wiyo Black-on-white tend to be slightly thicker and more porous than those noted in Santa Fe Black-on-white.

Figure 58.24. Wiyo Black-on-white bowl sherds from LA 12587.

Figure 58.25. Wiyo Black-on-white bowl sherd from LA 4618 (FS 417-4).

Figure 58.26. Wiyo Black-on-white bowl rim sherd from LA 86534 (FS 1206-1).

Figure 58.27. Wiyo Black-on-white vessel from LA 169 (Otowi).

Pigments in Wiyo Black-on-white tend to be darker and denser than those noted in earlier pottery types. Design styles are similar to those described for Santa Fe Black-on-white, although they are sometimes described as heavier (Stubbs and Stallings 1953). Solid designs tend to be more common and lines are thicker. Panel designs are also common on Wiyo Black-on-white.

The temporal range of Wiyo Black-on-white overlaps that for Santa Fe Black-on-white, and the two types occur together in some assemblages in the northern Rio Grande region. Wiyo Black-on-white may date from AD 1250 to 1400, but tends to be most common in assemblages dating between AD 1300 and 1350 (Breternitz 1966; Smiley et al. 1953; Sundt 1987) and is most common at about AD 1300 (Habicht-Mauche 1993). The relative frequency of Wiyo Black-on-white in Coalition period assemblages decreases with distance from the Tewa Basin and Pajarito Plateau, and it is rare at sites south of Santa Fe.

Biscuitware forms are the dominant decorated pottery at Classic period sites in the Tewa Basin, Chama Valley, and Pajarito Plateau (Mera 1934). Biscuitware types refer to the distinctive whiteware pottery produced in areas of the northern Rio Grande during the Classic period. Pastes of biscuitware types reflect the use of bentonite clays and vitric tuff temper (Kidder and Amsden 1931). Vessels have a soft gray to yellow paste, with finely crushed tuff or pumice. Biscuitware forms are distinguished from other organic-painted Rio Grande whiteware types by their porous textures. Surfaces are often white, light gray, tan, or buff. Vessel walls tend to be very thick, particularly when compared to earlier Rio Grande whiteware types. Vessels also tend to be extremely lightweight compared to their overall size because of the porous paste texture. Bowl rims often exhibit a distinct flare or eversion, and thickness may vary considerably from the rim.

Biscuitware types are decorated with sharp, clear, and black organic paint. Plain bowl rims are generally ticked, and standing rims are often embellished with repeating dashes or zigzag lines on the interior below the lip (Gauthier 1987a). Painted designs are often organized in banded patterns with panels of repeating hatched or solid geometrical elements. These include ticked edges, parallel or rectilinear lines, and stylized Awanyu motifs.

Descriptions of some of the biscuitware forms discussed here have been presented in terms of both descriptive names, which include the term biscuitware, and sometimes a type name as well. For example, early forms of biscuitwares that could be assigned to a specific type can be described as either Biscuit A or Abiquiu Black-on-gray. While previous descriptions often employ the term Abiquiu Black-on-gray or Bandelier Black-on-gray (McKenna and Miles 1991), I chose to describe this pottery as Black-on-white. This decision stems from the observation that many of the surface colors noted in the biscuitware types also occur in earlier Rio Grande whiteware types. Since biscuitware forms are definitely part of the continuum associated with the Rio Grande whiteware pottery tradition, the implication that they might be more closely related to grayware could be misleading. Thus, I have chosen to use the terms Abiquiu Black-on-white or Bandelier Black-on-white in the present report as well as other reports where I have described similar forms. It should be noted that the pottery described here in these terms is identical to that described in other studies as Black-on-gray types.

Biscuit A (Abiquiu Black-on-white) is distinguished only for bowl forms and is defined by the presence of slipped or painted manipulations on interior surfaces only (Figures 58.28 through 58.30). Biscuit B (Bandelier Black-on-white) is distinguished from Biscuit A by the presence of slipped surfaces usually with painted decorations on both the exterior and interiors of bowls (Figures 58.31 through 58.37). An additional distinction made for rim sherds otherwise exhibiting characteristics described for Biscuit B was Biscuit C (Cuyamunge Black-on-tan). This type was defined to differentiate later high rimmed tan colored biscuitware bowls (Harlow 1973).

Figure 58.28. Biscuit A bowl sherd from LA 86534 (FS 1748-1).

Figure 58.29. Biscuit A bowl sherd from LA 86637 (FS 176-1).

Figure 58.30. Biscuit A bowl rim sherd from LA 12587 (FS 4034-1).

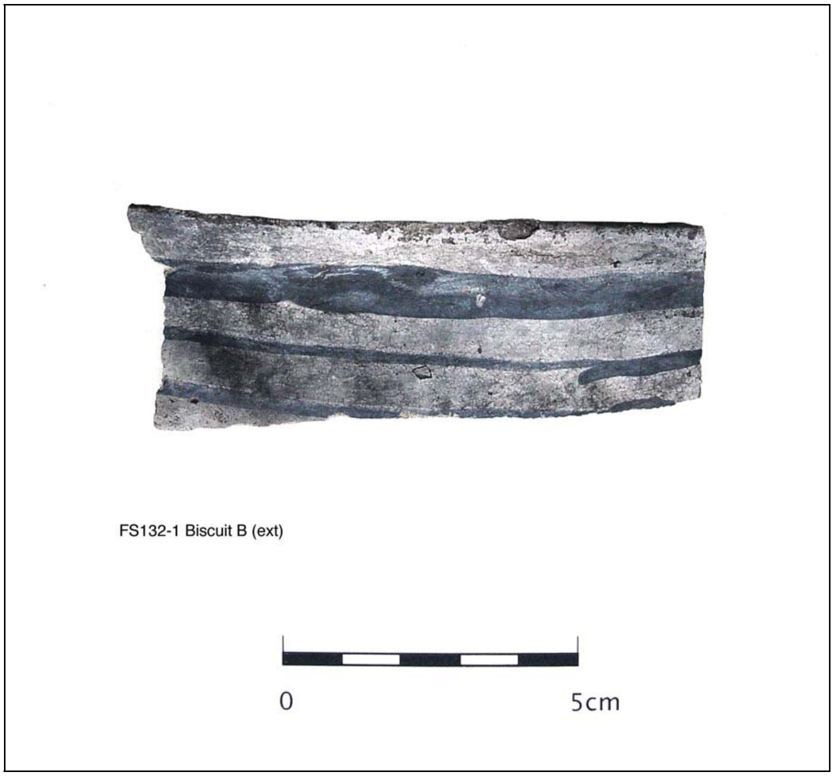


Figure 58.31. Biscuit B sherd from LA 87430 (FS 132-1).

Figure 58.32. Biscuit B sherd from LA 21596C (FS 4-14).

Figure 58.33. Biscuit B sherd from LA 86637 (FS 153-1).

Figure 58.34. Biscuit B sherd from LA 128804 (FS 41-1).

Figure 58.35. Biscuit B interior sherd from LA 87430 (FS 132-1).

Figure 58.36. Biscuit B bowl (Vessel 3) from LA 170 (Tsirege).

Figure 58.37. Biscuit B bowl (Vessel 4) from LA 170 (Tsirege).

In some cases, it was not possible to assign a specific type to pottery exhibiting characteristics clearly indicative of biscuitware types. Unpainted sherds exhibiting pastes, shapes, and thickness characteristic of biscuitware types were assigned to several categories based on evidence of slipping including ‘biscuitware unpainted slipped both sides,’ ‘unpainted biscuitware slipped one side,’ and ‘biscuitware slip, and paint absent.’ All painted jars as well as some bowls where it was not possible to determine the nature of decoration on different sides were assigned to a ‘biscuitware unspecified painted’ category (Figures 58.38 and 58.39).

Figure 58.38. Biscuitware jar sherd from LA 86637 (FS 82-1).

Figure 58.39. Biscuitware jar sherd from LA 128804 (FS 93-3).

While biscuitware forms are found over an area that includes the Tewa Basin, Pajarito Plateau, and Chama Valley (Mera 1934), this area is much smaller than that over which Santa Fe Black-on-white is the dominant decorated type. The temporal range for Biscuit A is estimated from about AD 1375 to 1450, while that for Biscuit B lasted from about AD 1400 to 1550 (Breternitz 1966; Gauthier 1987a; Wendorf 1953).

Sankawi Black-on-cream is very similar to biscuitware types, but exhibits pastes and surface characteristics that may be transitional to later historic forms including Tewa Polychrome types (Figures 58.40 through 58.43). Pastes are often pink to orange and indicate a higher degree of oxidation than biscuitware types. Surfaces tend to be more consistently light cream or tan in color and are often crackled or streaky. Vessel walls tend to be thinner, denser, and harder than biscuitware types. Another change is reflected in Sankawi Black-on-cream jar forms with longer necks. Designs are executed in bands similar to those noted in biscuitware types although execution is simpler and uses less line work. Design motifs include thin parallel and zig-zag lines with pendant dots, solid or hatchured triangles, narrow checkerboards, and awanyus.

Figure 58.40. Sankawi Black-on-cream sherd from LA 128805 (FS 83-1).

Jemez (Vallecitos variety) Black-on-white represents a regional variant of organic-painted whiteware types produced along the Jemez drainage. This type is characterized by a dark paste with fine ash and thick, flat, pearly white slip (Reither 1938). The use of similar clay and manipulations by potters along the Jemez drainage spans the Coalition to Historic periods (about

AD 1300 to 1750). Designs on earlier forms resemble those noted on Santa Fe Black-on-white. Those on later forms appear to have been derived from late glaze vessels and exhibit ticked lips, wide lines, and solid dots. Both jars and bowls were slipped and painted on both sides.

Figure 58.41. Sankawi Black-on-cream vessel from LA 170 (Tsirege).

Figure 58.42. Sankawi Black-on-cream vessel from LA 170 (Tsirege).

Figure 58.43. Sankawi Black-on-cream vessel from LA 170 (Tsirege).

Gallina Black-on-white was assigned to sherds exhibiting design styles, manipulations, and pastes characteristic of pottery produced in the Gallina region and, as defined here, is identical to Gallina Black-on-gray as defined by others (Hibben 1949; Mera 1935; Seaman 1976). Gallina Black-on-white appears to have been produced in the Gallina region between AD 1000 and 1300. Gallina Black-on-white is usually smoothed, may be unpolished or slightly polished, and is never slipped. The surface of Gallina Black-on-white vessels is often bumpy and sometimes striated. Decorations are executed in organic paint and are often faded and gray in color. Designs are usually simple and poorly executed, particularly when compared to Pueblo III types found in other regions. Motifs may be oriented in simple banded or all-over patterns. The simplicity of the execution and patterns is often reminiscent of earlier types in this area such as Rosa Black-on-white. The most common design motifs include parallel and intersecting lines, although triangle, hourglass, checkered, and hatchured patterns may be present. Rims are usually rounded or tapered and undecorated. Pastes are white to gray in color and may contain a distinct core.

Glazeware Types

Glazeware types reflect a distinct pottery class known to have been produced in areas of the middle and southern Rio Grande region. Glazeware types refer to pottery exhibiting painted decorations either with glaze or to unpainted sherds assumed to have been derived from vessels decorated with glaze paint. Glazeware types are defined by the use of lead glaze paint or paste reflecting pottery produced in the middle Rio Grande from about AD 1325 to the early 1700s (Franklin 1997; Kidder and Shepard 1936; Mera 1933; Snow 1982, 1997).

The basic system of classification of glaze rim sherds presented by Mera (1933) is still utilized. This classification system, however, is only applicable to rim sherds. Thus, body sherds that could not be assigned to a specific type were assigned to types based on surface treatments using similar conventions as used in other recent studies in the Middle Rio Grande (Franklin 1997). Unpainted body sherds exhibiting combinations of temper, paste, and surface characteristics indicate probable derivation from glazed painted vessels and were assigned to descriptive type categories based on the presence or type of slip and painted decorations. Categories employed during the present study include 'glaze red body unpainted' and 'glaze yellow body unpainted.' Painted body sherds were also assigned to a series of descriptive glazeware types based on slip and paint characteristics and include 'glaze unslipped body,' 'glaze red body' (Figures 58.44 and 58.45), 'glaze yellow body,' glaze polychrome body,' and 'glaze unslipped body.'

Figure 58.44. Glaze-on-red sherd from LA 128804 (FS 135-3).

Figure 58.45. Glaze-on-red sherd from LA 128804 (FS 88-1).

Bowl rim forms with straight even walls were assigned to Glaze A types (Mera 1933). Pottery exhibiting characteristics of these types appears to be similar to early glazeware pottery recovered over a wide area (Franklin 1997; Habicht-Mauche 1993; Kidder and Shepard 1936). A single Glaze A rim bowl with a well-polished red slip was assigned to Agua Fria Red-on-glaze. Painted decoration associated with Agua Fria Glaze-on-red is usually black paint with limited evidence of vitrification to a distinct glaze. Applications of the paint pigment tend to be well-executed as compared to later glaze forms and often resemble earlier matte pigment. In addition, designs are usually even and well-executed as compared to later glaze forms. Another sherd with similar characteristics as those described for Agua Fria Glaze-on-red with the addition of white clay paint was assigned to Los Padillas Glaze Polychrome.

Cieneguilla Glaze-on-yellow is similar to Agua Fria Glaze-on-red in form and style, but exhibits a light-slipped background. Cieneguilla Glaze-Polychrome is also the first Rio Grande glazeware to incorporate red matte paint into the design field.

Largo Glaze-on-yellow is differentiated from Cieneguilla Glaze-on-yellow by thickened rim forms that developed out of the straight Glaze A rim forms. Largo glaze forms are estimated to have been produced from AD 1400 to 1450 and appear to represent a short-lived form transitional between Glaze A Yellow and Glaze C (Espinosa Glaze Polychrome). Rim forms vary slightly with some rims showing a prominent change in thickness while others have a more gradual thickening.

Puaray Polychrome is characterized by light or red-slipped backgrounds with dark glaze designs, sometimes with red matte interiors. Rim forms are also highly variable. Puaray glaze types are distinguishable by an elongated rim form with some thickening above the base and a shift back to lighter slips. The rim is clearly differentiated from the bowl walls by a curve in the angle of the rim (Mera 1933).

Cibola Types

Pottery exhibiting combinations of white paste and sand or sherd temper indicative of that produced over a wide area to the west were assigned to types of the Cibola tradition (Windes 1977). Grayware assigned to this tradition includes sherds assigned to 'smeared-plain corrugated' and 'polished gray.'

Unpainted sherds exhibiting Cibola Pastes were assigned to 'unpainted white undifferentiated.' Those with similar pastes with indistinct decorations in mineral paint were assigned to 'mineral paint undifferentiated.' Sherds with pastes and manipulation typical of Pueblo II Cibola whiteware with hatchured designs decorated in mineral paint were assigned to Gallup Black-on-white. Those with manipulations, pastes, and solid or hatchured designs typical of Pueblo III forms produced in the southern Cibola region were assigned to Tularosa Black-on-white (Figure 58.46).

Figure 58.46. Tularosa Black-on-white sherds from LA 12587 (FS 3140-1 and 3736-2).

White Mountain Redware

White Mountain redware refers to a specialized pottery that was produced within a fairly limited area in west-central New Mexico and east-central Arizona, but was also widely traded throughout much of the southwest (Carlson 1970). Pottery assigned to this tradition is characterized by white, gray to orange paste, sherd temper, and a dark red slip. Surfaces are well-polished and painted decorations are usually executed in a black mineral or organic paint. A polychrome effect was sometimes achieved through the additional use of white clay paint.

'White Mountain redware unpainted' refers to White Mountain redware pottery not displaying painted decorations, while 'White Mountain red painted undifferentiated' refers to those with indistinct painted decorations. Wingate Black-on-red contains dark red to bright red slips (Figure 58.47). Designs consist primarily of hatchured elements sometimes with opposed solid elements. Painted sherds with a lighter orange paste characteristic of pottery produced during the 13th century were classified as St Johns Black-on-red. Pottery exhibiting similar characteristics but with decorations in white clay paint were classified as St Johns Polychrome.

Figure 58.47. Wingate Black-on-red sherd from LA 128805 (FS 57-1).

San Juan Whiteware

San Juan Whiteware refers to the very small number of sherds exhibiting light pastes and andesite/diorite temper indicating origin within the San Juan or Mesa Verde region of the Four Corners area (Breternitz et al. 1973; Wilson and Blinman 1995a). The number of sherds placed into San Juan types during the present was surprisingly low given modeled widespread migrations from the San Juan region to the Pajarito Plateau. Whiteware types not exhibiting designs of a specific type were assigned to 'unpainted whiteware undifferentiated' or 'indeterminate organic San Juan white.'

Mesa Verde Black-on-white was the last whiteware type produced in the Mesa Verde region and dates from about AD 1180 to 1300 (Wilson and Blinman 1995a). Mesa Verde Black-on-white vessels are usually well-polished, and slipped vessels are common, usually with a pearly white surface. Vessel walls, especially bowls, are thick and bowl rims are flat and are usually decorated with ticks, dots, or lines. Designs are usually complex and well-executed and include banded and all-over forms. Banded designs are commonly bracketed by framing lines both above and below. Single framing lines are usually thick and, if more than one framing line is present, are usually of different thicknesses. Design elements include straight hatchured, triangles, stepped triangles, dots, diamonds, and ticked lines, but elements are often smaller and combinations are more complex. Exterior designs on bowls are common both as isolated elements and as bands, usually without framing lines.

Jornada Mogollon Whiteware

A very small number of whiteware sherds identified during the present study represent Chupadero Black-on-white (Figure 58.48) produced in the Northern Mogollon region (Farwell et al. 1992; Hayes et al. 1981; Kelley 1984; Mera 1931; G. Vivian 1964). Chupadero Black-on-white was first manufactured circa AD 1050 to 1100 and continued to have been produced until about 1550. Chupadero Black-on-white found over a wide area exhibits similar characteristics. Chupadero Black-on-white sherds usually have dense light gray to white pastes reflecting the use of low iron clay firing to buff colors and a low-oxidizing or neutral atmosphere. The undecorated surfaces of Chupadero Black-on-white are often unpolished with striated or scored treatments resulting from scraping. Most Chupadero sherds are tempered with dark igneous rock and sherd, although a wide variety of tempers are represented and may indicate Chupadero vessels were derived from a number of sources.

Painted designs on Chupadero Black-on-white vessels often consist of combinations of hatchured and solid motifs. Designs were executed in a series of panels where the basic design was repeated every one or two sections. At least four, and as many as eight panels, may be represented. During the present study, sherds thought to have derived from Chupadero Black-on-white were assigned to a series of categories based on the presence or style of painted decoration (Figure 58.48). Categories of this type recognized during the present study include 'unpainted Chupadero Black-on-white,' 'Chupadero Black-on-white, solid design,' and 'Chupadero Black-on-white indeterminate design.'

Figure 58.48. Chupadero Black-on-white sherd from LA 86534 (FS 1686-1).

Socorro Black-on-white refers to whiteware forms produced in an area that appears to have been roughly bounded by the roads that today connect Socorro, Albuquerque, Grants, and Quemado, New Mexico. Socorro Black-on-white is distinguished from other whiteware types by distinctive paste, surface characteristics, and painted designs (Mera 1935; Sundt 1979). Surfaces are unslipped and gray in color. Pastes are gray, hard, and often vitrified. Paint is usually black and is often dense and vitrified. The result of these high-fired mineral pigments often contains a sub-glaze appearance. Temper usually consists of a dark igneous rock that may occur along with crushed sherd. The petrographic analysis indicates these dark fragments reflect basalt and rhyolitic tuff. Designs include fine lines, hatchured, dots, lines appended with dots, checkered squares with and without dots, and triangles. Hatched lines are closely spaced. Motifs tend toward opposed solid and hatched combinations. Design layout consists of paneled bands for bowls and wide bands or all-over patterns on jars.

Mogollon Brownware

A very small number of sherds examined displayed pastes, temper, and surface characteristics indicative of utility brownware types produced in the Mogollon Highlands to the west and southwest of the plateau (Wilson 1999). Temper consists of volcanic-clastic rock sometimes with sand and reflects the use of self tempered clays weathered from surrounding volcanic rocks.

Pastes tend to be dark gray, brown, or yellow-red. Brownware sherds were assigned to types based on combinations of smudged interiors and exterior textures. Those with plain exteriors and smudged interiors were classified as 'Reserve smudged.' Those exhibiting exterior corrugations were classified as either 'Reserve indented corrugated' or 'Reserve plain corrugated smudged.'

Historic Pottery Types

A very small number of sherds examined during the present study represent types thought to have been manufactured by Tewa Pueblo potters. This pottery is associated with Hispanic or Anglo homesteads dating from the late 19th to early 20th century and probably reflects trade with nearby Pueblos such as San Ildefonso and Santa Clara. Identified historic Tewa types include 'Tewa Polychrome,' 'San Juan Red-on-tan,' 'Tewa buff undifferentiated,' 'Tewa polished gray,' 'buffware with mica slip,' and 'unpolished mica slip.'

TEMPORAL TRENDS

The first step in the documentation of various trends reflected by ceramic distributions involves the assignment of temporal dates to pottery assemblages from various contexts and sites, based on observations about the distribution of ceramic types and attributes. Many of the assigned dating periods used are based on observations from context in the northern Rio Grande region that have been dated by tree-ring samples or techniques (Creamer 2000; Franklin 1997; Habicht-Mauche 1993; Harlow 1973; Honea 1968; Hubbell and Traylor 1982; Lang 1982, 1993, 1997; McKenna and Miles 1991; Mera 1935; Powell 2002; Smiley et al. 1953; Sundt 1987; Vint 1999; Warren 1976). Information regarding the dating of various contexts has often been organized in terms of periods or phases that are recognized based on the presence, combination, and frequency of different ceramic types.

The Pecos Classification system represented the first systematic attempt to define and document temporal periods across the Southwest (Kidder 1927). Subsequent investigations resulted in the utilization of a classification and phase system distinct to the northern Rio Grande region (Wendorf 1954; Wendorf and Reed 1955). These periods were defined by changes in pottery technology and architecture and include Developmental (AD 600 to 1200), Coalition (AD 1200 to 1325), Classic (AD 1325 to 1600), and Historic (AD 1600 to present) (Wendorf 1954; Wendorf and Reed 1955).

Occupations on the Pajarito Plateau are usually described as beginning during the Early Coalition period and placed circa AD 1150 to 1200 (Kohler 2004; Orcutt 1999), although there is some evidence for an extremely small occupation in this area dating to the Late Developmental period. The Late Developmental period was originally defined as dating from AD 900 to 1200 (Wendorf 1954; Wendorf and Reed 1955) and reflects a time span and material culture roughly equivalent to that noted for the Pueblo II to early Pueblo III period occupations on the Colorado Plateau (Cordell 1978). While Late Developmental sites are not well-documented on the Pajarito Plateau, they are more common and better described for areas in the Tewa Basin to the east, where they may date from about AD 900 to 1200 (McNutt 1969; Mera 1935; Wendorf 1954; Wiseman 1989). Pan-regional stylistic trends have been used to assign Late Developmental components into two distinct phases (McNutt 1969; Wendorf 1954). Assemblages dating to the Red Mesa phase are identified by the presence of Red Mesa Black-on-white as the dominant whiteware type, and grayware assemblages dominated by plain gray and neck banded sherds, and occasionally contain extremely low frequencies of corrugated pottery. Assemblages dating to the later Kwahe'e phase are identified by the presence of local (Kwahe'e Black-on-white) and intrusive black-on-white pottery mostly assigned to Gallup Black-on-white and Escavada Black-on-white. These whiteware types are easily distinguished from those associated with the later Coalition period by decorations in mineral rather than organic pigments (Lang 1982; McKenna and Miles 1995; McNutt 1969). Grayware pottery from Kwahe'e phase assemblages also display a wide range of treatments including neckbanded and corrugated textures, although plain forms often dominate these assemblages.

Almost all the prehistoric ceramic-period occupations on the Pajarito Plateau date to the Coalition or Classic periods (Orcutt 1999). The assignment of dates to assemblages based on ceramic distributions from Coalition and Classic period components is based on pottery distributions from a series of tree-ring-dated contexts from sites in a number of areas, including those east of the Pajarito Plateau such as Pindi Pueblo (Stubbs and Stallings 1953), Arroyo Hondo Pueblo (Habicht-Mauche 1993; Lang 1993), and Pecos Pueblo (Kidder and Amsden 1931; Kidder and Shepard 1936; Powell and Benedict 2002). Assemblages from these and other sites have been used to document changes in the frequency of various pottery types, but are often based on the dominant decorated types noted.

Several studies also provide information relating to various trends from Coalition period sites on the Pajarito Plateau based on comparisons of pottery from sites at or near the Los Alamos area (Curewitz and Harmon 2002; Gray 1990, 1992; Gray and Albaugh 1992; Hendron 1940; Hubbell and Traylor 1982; Kohler 1989, 2004; Larson n.d; Snow 1974; Worman 1967; Worman and Steen 1978). Ceramic seriation studies conducted by Orcutt (1999) as part of the Bandelier Archaeological Survey reviewed data relating to pottery from tree-ring-dated contexts in an area defined by Santa Clara Canyon on the north, Cochiti Pueblo on the south, the Rio Grande on the east, and the Jemez Mountains on the west. The prehistoric occupation was divided into 13 periods, including six defined for the Coalition period and seven for the Classic period (Orcutt 1999). It is, however, difficult to determine how each period was defined from the report, although it is possible to deduce certain changes from this and other studies of sites in the area (Kohler 2004).

The initial occupation of the Pajarito Plateau noted by Orcutt (1999) dates to the earliest part of the Coalition period and is represented by ceramic assemblages in which Santa Fe Black-on-white is the dominant whiteware type, but also contains significant amounts of Kwahe'e Black-on-white, which can make up almost half of the decorated pottery (Hubbell and Traylor 1982; Kohler 2004; Snow 1974; Worman 1967). Grayware types are dominated by indented corrugated sherds. Combinations of these types reflect assemblages dating to the second half of the 12th century (Kohler 2004; Orcutt 1999).

By the early 13th century Kwahe'e Black-on-white may be present but is very rare, and whiteware forms are overwhelmingly dominated by Santa Fe Black-on-white (Bussey 1968a, 1968b; Curewitz and Harmon 2002; Gray 1992; Hubbell and Traylor 1982; Kohler 2004). Decorated types from most sites dating to the 13th century are overwhelmingly represented by sherds derived from Santa Fe Black-on-white vessels, and other decorated types are limited to extremely low frequencies of intrusive pottery, including White Mountain redwares, Cibola whitewares, San Juan whitewares, Chupadero Black-on-white, and Socorro Black-on-white. During the 13th century, grayware assemblages became increasingly dominated by smeared corrugated types.

In the early 14th century, Santa Fe black-on-white is still the dominant decorated type but the overall frequency of this type gradually declines as other types become more common. By AD 1325, Wiyo Black-on-white becomes much more common in the northern Pajarito Plateau, representing a major type occurring along with Santa Fe Black-on-white. The presence of significant frequencies of Wiyo without Biscuit A is a good indicator of occupations dating to the very late part of the Coalition period during the middle of the 14th century. The appearance and increase in Wiyo Black-on-white in the Pajarito Plateau is part of regional trend in the appearance of regionally distinct whiteware types (Habicht-Mauche 1993). At about the same time, Rio Grande glazeware types appear to have been first produced in areas to the south in the middle Rio Grande region (Vint 1999). Changes occurring in the northern Pajarito Plateau and Chama Valley during the Late Coalition are primarily reflected by a gradual increase in Wiyo Black-on-white sherds. Wiyo Black-on-white appears to have developed directly out of, and was closely related to, Santa Fe Black-on-white. This is reflected by the large proportion of Santa Fe Black-on-white sherds with characteristics such as high polish and wide lines, which seem to be transitional between this type and Wiyo Black-on-white (Kohler 2004). Components dating to the entire span of the Coalition period in the Pajarito Plateau are dominated by similar grayware types, which appear to consist of about 80 percent of the total pottery tempered with anthill sand. The only change so far noted in the grayware appears to be an increase in the overall frequency of smeared corrugated as compared to other grayware forms and a decrease in plain and more indented forms (Curewitz and Harmon 2002; Gray 1990, 1992; Stubbs and Stallings 1953).

Biscuit A appears to have replaced Wiyo Black-on-white around AD 1375 at about the same time that Wiyo Black-on-white was no longer produced and the frequency of Santa Fe Black-on-white dramatically diminished. Sites dating to the Early Classic period are identified by the appearance of Biscuit A (Abiquiu Black-on-white) and early glazeware types that were common by the middle of the 14th century (Creamer 2000; Lang 1997). Decorated ceramics at some sites in the southern portions of the Pajarito Plateau are dominated by early glazeware types (Kohler 2004; Vint 1999). During the late 14th century, smeared corrugated appears to have been replaced by plain gray as the dominant utilityware form.

The end date for Biscuit A is some time around AD 1450 and 1500. Biscuit B (Bandelier Black-on-white) may have first been produced at about AD 1400 and lasted until AD 1550 (Lang 1997). This type appears to have been most abundant at sites dating between AD 1500 and 1550. During the last part of the Classic period, a gradual change in firing technology and vessel shape resulted in the appearance of Cuyamunge Black-on-tan (Biscuit C) and Sankawi Black-on cream. Non-local whiteware types are almost completely absent at Classic period sites in the northern Pajarito Plateau, and nonlocal pottery is limited to glazeware types that appear to dominate and may have even been produced in areas of the southern Pajarito Plateau. During the Late Classic period, there was a shift from the total dominance of utilityware forms tempered solely with anthill sand to the additional presence of those containing micaceous granite of schist temper (Vint 1999). This also corresponds with the occurrence of mica-slipped types with smeared-indented corrugated exteriors that include Sapawe Utility and micaceous types with smoothed exteriors. Potsuwi'i Incised also appears during the later part of the Classic period.

Changes noted in glazeware pottery produced at sites in the southern Pajarito Plateau and elsewhere may also provide clues concerning the dating of Classic period sites (Warren 1976). The Glaze-on-red period (AD 1315 to 1425, Group A) was defined by the predominance of glaze-on-red and Glaze A forms. Next in this sequence is the Glaze-on-yellow period (AD 1325 to 1450). Before the end of the 14th century, glaze painted vessels with white, cream, yellow, or pink slips and Glaze B rims are common. The Intermediate Glaze period (AD 1450 to 1600) is characterized by the presence of Glaze C, D, and early E forms and a mixture of slips. The Kotyiti period (AD 1600 to 1750) is characterized by the dominance of Glaze E and F forms.

Another approach that may provide for finer temporal resolution is stylistic analysis. Attempts to subdivide the very long-lived type Santa Fe Black-on-white have so far not been very successful in defining shorter periods within the Coalition period (Ruscavage-Barz 2002), although stylistic analyses from two sites excavated during the Bandelier Archaeological Project indicate a shift from hatchured to solid designs and an increase in the degree of polishing (Gray and Albaugh 1992).

Ceramic Trends for the C&T Project Sites

All sites examined during the present study were assigned to ceramic dating periods based on the combinations and frequencies of pottery types (Table 58.2). Most of the discussions presented here focus on data from sites that were assigned to a dated period, particularly those assigned to the Coalition period, which dominated this analysis. These examinations focus first on using ceramic data to assign sites and components to a particular occupational period or temporal span. Following these evaluations, ceramic data from these dated contexts are used to examine trends relating to the origin, exchange, and uses of this pottery.

Sites of Unknown Age

Assemblages from 10 sites could not be assigned to a particular temporal component based on ceramic distributions (Tables 58.3 and 58.4). Sites not assigned to a particular period based on ceramics include LA 21550, LA 61034, LA 85403, LA 85859, LA 86531, LA 99397, LA 110130, LA 110133, LA 117883, and LA 127633. Because of the small sample size and lack of diagnostic pottery, other trends will not be discussed for these sites.

Table 58.2. Distribution of sites by assigned Ceramic period.

Site #	Indeterminate	Indeterminate Coalition	Middle Coalition	Middle Coalition with some Late Coalition	Late Coalition	Coalition and Classic Mixed	Indeterminate Classic	Early Classic	Middle Classic	Late Classic	Coalition w/some Late Classic	Late Coalition/Early Classic Transition	IOs* mostly from Classic	Late Classic w/some Historic	Coalition Prehistoric and Historic	Group Total
4618					10,070											10,070
4619												1056				1056
12587				10,363												10,363
15116										85						85
21150	61															61
21596B						257										257
21596C						382										382
61034	4															4
61035		11														11
70025									185							185
85403	7															7
85404						199										199
85407														193		193
85408										80						80
85411									320							320
85413								494								494
85414							35									35
85417															130	130

Site #	Indeterminate	Indeterminate Coalition	Middle Coalition	Middle Coalition with some Late Coalition	Late Coalition	Coalition and Classic Mixed	Indeterminate Classic	Early Classic	Middle Classic	Late Classic	Coalition w/some Late Classic	Late Coalition/Early Classic Transition	IOs* mostly from Classic	Late Classic w/some Historic	Coalition Prehistoric and Historic	Group Total
85859	2															2
85861											439					439
85864		2														2
85867								68								68
86531	1															1
86533		14														14
86534			3925													3925
86605										105						105
86606						143										143
86607		9														9
86637									110							110
87430										487						487
99396		85														85
99397	3															3
110126										11						11
110130	24															24
110133	6															6
117883	1															1
127625							28									28
127627							82									82

Site #	Indeterminate	Indeterminate Coalition	Middle Coalition	Middle Coalition with some Late Coalition	Late Coalition	Coalition and Classic Mixed	Indeterminate Classic	Early Classic	Middle Classic	Late Classic	Coalition w/some Late Classic	Late Coalition/Early Classic Transition	IOs* mostly from Classic	Late Classic w/some Historic	Coalition Prehistoric and Historic	Group Total
127631						12										12
127633	1															1
127634										149						149
127635						371										371
128804										262						262
128805										199						199
135290			4021													4021
135291								82								82
135292										89						89.4
139418							26									26
141505						29										29
White Rock IOs													192			192
Total	110	121	7946	10,363	10,070	1393	171	644	615	1467	439	1056	192	193	130	34,911

* Isolated occurrences

Table 58.3. Distribution (count/percent) of ceramic types at sites of unknown age.

Ceramic Type	LA 21150	LA 61034	LA 85403	LA 85859	LA 86531	LA 99397	LA 110130	LA 110133	LA 117883	LA 127633	Total
Northern Rio Grande Whiteware											
Unpainted undifferentiated	1 (1.6)		1 (14.3)					1 (16.7)			3 (2.7)
Wiyo Black-on-white							1 (4.2)				1 (0.9)
Biscuitware painted unspecified		1 (25.0)									1 (0.9)
Unpainted biscuitware slipped one side									1 (100)		1 (0.9)
Northern Rio Grande Grayware											
Plain gray body			1 (14.3)				2 (8.3)	3 (50.0)		1 (100)	7 (6.4)
Indented corrugated	3 (4.9)		1 (14.3)								4 (3.6)
Smeared-indented corrugated	57 (93.4)	3 (75.0)	4 (57.1)	2 (100)	1 (100)	3 (100)	2 (8.3)	2 (33.3)			74 (67.3)
Sapawe micaceous							19 (79.2)				19 (17.3)
Total	61 (100)	4 (100)	7 (100)	2 (100)	1 (100)	3 (100)	24 (100)	6 (100)	1 (100)	1 (100)	110 (100)

Table 58.4. Distribution of ware group at sites of unknown age.

Ware	LA 21150	LA 61034	LA 85403	LA 85859	LA 86531	LA 99397	LA 110130	LA 110133	LA 117883	LA 127633	Total
Gray	60 (98.4)	3 (75.0)	6 (85.7)	2 (100)	1 (100)	3 (100)	4 (16.7)	5 (83.3)		1 (100)	85 (77.3)
White	1 (1.6)	1 (25.0)	1 (14.3)				1 (4.2)	1 (16.7)	1 (100)		6 (5.5)
Micaceous							19 (79.2)				19 (17.3)
Total	61 (100)	4 (100)	7 (100)	2 (100)	1 (100)	3 (100)	24 (100)	6 (100)	1 (100)	1 (100)	110 (100)

Late Developmental Period Sites

LA 82601 may contribute extremely important information relating to the timing and nature of what appears to be the earliest ceramic-period settlements on the Pajarito Plateau. This site was excavated in the 1990s by the Ojo Line Extension Project. While this site was not excavated as part of the C&T Project, it is located in TA-70 near White Rock and was analyzed because of the early and distinct nature of the associated pottery (Tables 58.5 and 58.6).

Table 58.5. Distribution of ceramic types from LA 82601, a Late Developmental period site on the plateau.

Ceramic Type	Frequency	Percent
Northern Rio Grande Whiteware		
Unpainted undifferentiated	30	8.3
Mineral paint undifferentiated	1	0.3
Kwahe'e Black-on-white solid designs	4	1.1
Kwahe'e Black-on-white thin parallel line	2	0.6
Kwahe'e Black-on-white hatchured designs	1	0.3
Kwahe'e Black-on-white other design	7	1.9
Santa Fe Black-on-white	4	1.1
Northern Rio Grande Grayware		
Plain gray rim	1	0.3
Unknown gray rim	6	1.7
Plain gray body	127	35.3
Wide neckbanded	2	0.6
Indented corrugated	91	25.3
Plain corrugated	4	1.1
Smeared-indented corrugated	63	17.5
Plain incised	1	0.3
Sand-Tempered Grayware		
Plain gray body	2	0.6
Indented corrugated	3	0.8
Cibola Whiteware		
Unpainted, polished whiteware	5	1.4
Mineral paint undifferentiated	4	1.1
Escavada Black-on-white solid designs	1	0.3
San Juan Whiteware		
Unpainted whiteware undifferentiated	1	0.3
Total	**360**	**100.0**

Table 58.6. Distribution of ware groups from LA 82601, a Late Developmental period site.

Ware	Count	Percent
Gray	300	83.3
White	60	16.7
Total	360	100.0

The overall proportion of whiteware pottery was high (16.7%) when compared to Late Developmental period sites in the Tewa Basin where types assigned to whiteware types only comprised about 5 percent of the total pottery (Wilson 2006). The majority of the painted pottery from this site exhibits local pastes and decorations in mineral paint and therefore were assigned to Kwahe'e Black-on-white. Other sherds decorated with mineral paint were assigned to Cibola whiteware types based on the presence of sand temper and light pastes. Styles associated with both local and nonlocal whiteware types are similar to those noted in pottery throughout the Southwest dating to the 11th and early 12th centuries. A very small number of sherds were assigned to Santa Fe Black-on-white based on decorations in organic paint, but were otherwise similar to pottery assigned to Kwahe'e Black-on-white. Grayware types consist of a roughly even mixture of plain and corrugated forms. The proportion of corrugated pottery is higher than that noted at Late Developmental period sites in the Tewa Basin (Wilson 2006).

While the combination of pottery types at LA 82601 is similar to that noted at Late Developmental period sites in the Tewa Basin, several observations indicate that this site probably dates to the very end of this period, with a date in the middle of the 12th century being most likely. This site may reflect the initial movement of ceramic-producing groups onto the Pajarito Plateau from areas to the east such as the Tewa Basin some time during the end of the Late Developmental period, and may date just before the occupation of sites previously assigned to the very early span of the Coalition period.

Coalition Period Sites

Assemblages from at least 19 of the sites examined during the present study display some combination of ceramic types indicative of occupations during the Coalition period. These include eight sites from the Rendija Tract, three from the White Rock Tract, four from the Airport Tract, two from the TA-74 Tract, and two from Mesita del Buey. Most of the pottery examined during the present study was recovered from four Coalition period roomblocks and one dating to the Late Coalition/Early Classic period transition. The large ceramic samples from these sites allow for the assignment of fairly specific dating spans to these sites. Distributions noted at these sites will form the basis for discussions of ceramic trends associated with the Coalition period.

Less-specific information is provided in the form of smaller assemblages from four sites, which resulted in their assignment to an Indeterminate Coalition period based on the presence of Santa Fe Black-on-white and smeared corrugated and the absence of later types (Tables 58.7 and 58.8). The small size of these assemblages does not allow for the determination of the specific span of occupation during the Coalition period. Sites assigned to the Indeterminate Coalition period based on ceramic distributions include LA 61035 (n = 11), LA 85864 (n = 2), LA 86607 (n = 9), and LA 99396 (*n* = 85). The small size of these assemblages also makes the determination of other trends difficult to impossible.

Table 58.7. Distribution (count/percent) of ceramics from indeterminate Coalition period sites.

Ceramic Type	61035	85864	86533	86607	99396	Total
Northern Rio Grande Whiteware						
Indeterminate painted ware			2 (14.3)			2 (1.7)
Unpainted undifferentiated	2 (18.2)		1 (7.1)		12 (14.1)	15 (12.4)
Indeterminate organic paint			1 (7.1)			1 (0.8)
Indeterminate organic Coalition period	1 (9.1)			2 (22.2)		3 (2.5)
Santa Fe Black-on-white	1 (9.1)	1 (50)	3 (21.4)	4 (44.4)	9 (10.6)	18 (14.9)
Jemez Santa Fe Vallecitos			2 (14.3)			2 (1.7)
Northern Rio Grande Grayware						
Plain gray rim					2 (2.4)	2 (1.7)
Plain gray body	1 (9.1)				9 (10.6)	10 (8.3)
Indented corrugated					1 (1.2)	1 (0.8)
Incised corrugated					1 (1.2)	1 (0.8)
Smeared-indented corrugated	6 (54.5)	1 (50)	5 (35.7)	3 (33.3)	51 (60)	66 (54.5)
Total	11 (100)	2 (100)	14 (100)	9 (100)	85 (100)	121 (100)

Table 58.8. Distribution of ware groups (count/percent) at indeterminate Coalition period sites.

Ware	LA 61035	LA 85864	LA 86533	LA 86607	LA 99396	Total
Gray	7 (63.6)	1 (50.0)	5 (35.7)	3 (33.3)	64 (75.3)	80 (66.1)
White	4 (36.4)	1 (50.0)	9 (64.3)	6 (66.7)	21 (24.7)	41 (33.9)
Total	**11 (100)**	**2 (100)**	**14 (100)**	**9 (100)**	**85 (100)**	**121 (100)**

In addition, the occurrence of Santa Fe Black-on-white and associated grayware types from assemblages at eight sites indicate the presence of Coalition period components as well as ceramics indicating later components dating to the Classic period (Tables 58.9 and 58.10). Sites with assemblages indicating components dating to the Coalition and Classic period include LA 21596B (*n* = 257), LA 21596C (*n* = 382), LA 85404 (*n* = 199), LA 85861 (*n* = 439), LA 86606 (*n* = 143), LA 127631 (*n* = 12), LA 127635 (*n* = 371), and LA 141505 (*n* = 29). In addition, ceramic distributions from another site (LA 85417) indicate pottery derived from both Coalition and Historic period components (Tables 58.11 and 58.12).

Ceramic distributions associated with large assemblages recovered from four roomblock may be used to assign dates to specific spans within the Coalition period, and one within a Coalition/Classic transition period. No sites examined during the present study appear to date to the earliest phase of the Coalition period as defined during the Bandelier Project (Orcutt 1999). A good example of a site representing this phase is located near the sites discussed here, and the phase designation is reflected by distributions from assemblages excavated from Casa del Rito in Bandelier National Monument. Examinations of ceramics from this site indicate that Santa Fe Black-on-white only slightly outnumbers Kwahe'e Black-on-white (Kohler 2004). LA 3852 (Casa del Rito) reflects an occupation dating to the Early Coalition period and probably dates some time between the middle 12th and very early 13th century. The majority of the utilityware is represented by indented corrugated and plain corrugated types. Smeared corrugated is present in very low frequencies and may indicate that this site was abandoned just as smeared corrugated was starting to be produced (Gray 1992).

The next span of occupation is indicated by distributions of pottery types from two sites including LA 86534 (*n* = 3925) and 135290 (*n* = 4921), which are both located in the Airport Tract (Tables 58.13 and 58.14). Examinations of distributions from the large assemblages at these sites provided a good opportunity to examine trends associated with sites dating to the early 12th century or early part of the Middle Coalition period (see Tables 58.13 and 58.14). The majority of pottery from both sites was assigned to grayware types (approximately 80%), with most of the whiteware pottery being derived from Santa Fe Black-on-white vessels. The majority of grayware types represent corrugated and smeared corrugated types that were tempered with anthill sand. Kwahe'e Black-on-white, Wiyo Black-on-white, Galisteo Black-on-white, and White Mountain Redware types are present at both sites in extremely low frequencies. A very small number of sherds from these two sites as reflected by biscuitware and a single glazeware sherd from LA 135290 may reflect a very limited amount of contamination from Classic period components.

Santa Fe Black-on-white is the dominant decorated type at both sites, representing 8 percent of the pottery recorded at LA 86534 and 9 percent from LA 135290. The majority of the pottery from Coalition period sites is represented by grayware forms including combinations of plain, corrugated, and smeared corrugated textures with similar high iron pastes with anthill sand. The dominant grayware pottery at both sites is smeared plain corrugated representing 61.4 percent of the pottery from LA 86534 and 69.7 percent from LA 135290.

Table 58.9. Distribution of ceramic types (count/percent) from mixed Coalition and Classic period sites.

Ceramic Type	21596B	21596C	85404	85861	86606	127631	127635	141505	Total
Indeterminate Utilityware									
Indeterminate utilityware	1 (0.4)	1 (0.3)							2 (0.1)
Northern Rio Grande Whiteware									
Unpainted undifferentiated	31 (12.1)	31 (8.1)	13 (6.5)	28 (6.4)	2 (1.4)		18 (4.9)	5 (17.2)	128 (7.0)
Mineral paint undifferentiated								2 (6.9)	2 (0.1)
Kwahe'e Black-on-white thin parallel line								1 (3.4)	1 (0.1)
Indeterminate organic paint	13 (5.1)	10 (2.6)		11 (2.5)		1 (8.3)	1 (0.3)		36 (2.0)
Santa Fe Black-on-white	13 (5.1)	18 (4.7)	17 (8.5)	40 (9.1)	6 (4.2)	2 (16.7)	11 (3.0)	4 (13.8)	111 (6.1)
Wiyo Black-on-white	5 (1.9)	8 (2.1)		2 (0.5)			7 (1.9)		22 (1.2)
Biscuitware unpainted slipped both sides	2 (0.8)	5 (1.3)		2 (0.5)			2 (0.5		11 (0.6)
Biscuitware painted unspecified	9 (3.5)	39 (10.2)							48 (2.6)
Biscuitware slip and paint absent			4 (2.0)						4 (0.2)
Unpainted biscuitware slipped one side	5 (1.9)	16 (4.2)		3 (0.7)					24 (1.3)
Biscuit A (Abiquiu Black-on-white)	11 (4.3)	40 (10.5)	8 (4.0)		1 (0.7)	1 (8.3)	15 (4.0)		76 (4.1)
Biscuit B rim	2 (0.7)	2 (0.5)		1 (0.2)	1 (0.7)				6 (0.3)
Biscuit B/C body	19 (7.4)	27 (7.1)	1 (0.5)	2 (0.5)	5 (3.5)		3 (0.8)		57 (3.1
Biscuit C rim		1 (0.3)			2 (1.4)				3 (0.2)
Galisteo Black-on-white							1 (0.3)		1 (0.1)
Unpainted Galisteo paste							1 (0.3)		1 (0.1)
Jemez Santa Fe Vallecitos				1 (0.2)					1 (0.1)
Northern Rio Grande Grayware									
Plain gray rim					3 (2.1)		1 (0.3)		4 (0.2)
Plain gray body	6 (2.3)	24 (6.3)	6 (3.0)	2 (0.5)	5 (3.5	1 (8.3)	20 (5.4)	2 (6.9)	66 (3.6)

Ceramic Type	21596B	21596C	85404	85861	86606	127631	127635	141505	Total
Clapboard neck				1 (0.2)					1 (0.1)
Indented corrugated	5 (1.9)	1 (0.3)	1 (0.5)				1 (0.3)		8 (0.4)
Plain corrugated						1 (8.3)			1 (0.1)
Smeared plain corrugated				270 (61.5)	66 (46.2)	4 (33.3)			340 (18.6)
Alternating corrugated				1 (0.2)	1 (0.7)				2 (0.1)
Smeared-indented corrugated	70 (27.2)	45 (11.8)	106 (53.3)	71 (16.2)	50 (35.0)		262 (70.6)	12 (41.4)	616 (33.6)
Mica utility undifferentiated							4 (1.1)		4 (0.2)
Sapawe micaceous	53 (20.6)	32 (8.4)	9 (4.5)	3 (0.7)		1 (8.3)	24 (6.5)	2 (6.9)	124 (6.8)
Potsuwi'i incised	2 (0.8)	2 (0.5)							4 (0.2)
Thin, plain, non-micaceous Classic period	8 (3.1)	68 (17.8)							76 (4.1)
Cibola Whiteware									
Unpainted white undifferentiated				1 (0.2)					1 (0.1)
White Mountain Redware									
Wingate Black-on-red					1 (0.7)				1 (0.1)
White Mountain Red unpainted, undifferentiated	1 (0.4)								1 (0.1)
Middle Rio Grande Glazeware									
Glaze red body unpainted		1 (0.3)	30 (15.1)			1 (8.3)			32 (1.7)
Glaze yellow body unpainted			2 (1.0)						2 (0.1)
Glaze unslipped body			1 (0.5)					1 (3.4)	2 (0.1)
Glaze polychrome body undifferentiated	1 (0.4)	3 (0.8)							4 (0.2)
Glaze red body undifferentiated		3 (0.8)							3 (0.2)
Glaze yellow body undifferentiated		1 (0.3)	1 (0.5						2 (0.1)
Glaze unslipped body		2 (0.5)							2 (0.1)
Mogollon Brownware									

Ceramic Type	21596B	21596C	85404	85861	86606	127631	127635	141505	Total
Reserve indented corrugated		1 (0.3)							1 (0.1)
Reserve plain corrugated smudged		1 (0.3)							1 (0.1)
Total	**257 (100)**	**382 (100)**	**199 (100)**	**439 (100)**	**143 (100)**	**12 (100)**	**371 (100)**	**29 (100)**	**1832 (100)**

Table 58.10. Distribution of ware groups (count/percent) from the mixed Coalition and Classic period.

Ware	21596B	21596C	85404	85861	86606	127631	127635	141505	Total
Gray	92 (35.8)	141 (36.9)	122 (61.3)	348 (79.3)	125 (87.4)	6 (50.0)	312 (84.1)	16 (55.2)	1162 (63.4)
White	110 (42.8)	197 (51.6)	43 (21.6)	91 (20.7)	17 (11.9)	4 (33.3)	59 (15.9)	12 (41.4)	533 (29.1)
Red	1 (0.4)				1 (0.7)				2 (0.1)
Brown		2 (0.5)							2 (0.1)
Glaze	1 (0.4)	10 (2.6)	34 (17.1)			1 (8.3)		1 (3.4)	47 (2.6)
Micaceous	53 (20.6)	32 (8.4)							85 (4.6)
Historic						1 (8.3)			1 (0.1)
Total	**257 (100)**	**382 (100)**	**199 (100)**	**439 (100)**	**143 (100)**	**12 (100)**	**371 (100)**	**29 (100)**	**1832 (100)**

Table 58.11. Distribution of ceramic types (count/percent) from LA 85417, an indeterminate Coalition and Historic period site.

Ceramic Type	Total	
Indeterminate Utilityware		
Indeterminate Utilityware	4 (3.1)	
Northern Rio Grande Whiteware		
Santa Fe Black-on-white	1 (0.8)	
Northern Rio Grande Grayware		
Plain gray body	2 (1.6)	
Smeared plain corrugated	88 (68.2)	
Smeared-indented corrugated	8 (6.2)	
Sand-Tempered Grayware		
Smeared plain corrugated	2 (1.6)	
Historic Tewa Plainware		
Buffware with mica slip	24 (18.6)	
Total	**129**	**100.0**

Table 58.12. Distribution of ware groups (count/percent) from LA 85417, an indeterminate Coalition and Historic period site.

Ware	Total
Gray	104 (80.6)
White	1 (0.8)
Historic Tewa Plain	24 (18.6)
Total	129 (100)

Table 58.13. Distribution of ceramic types (count/percent) at Middle Coalition period sites.

Ceramic Type	LA 86534	LA 135290	Total
Indeterminate Whiteware			
Indeterminate Blackware	1 (0.0)		1 (0.0)
Northern Rio Grande Whiteware			
Unpainted undifferentiated	277 (7.1)	271 (6.7)	548 (6.9)
Mineral paint undifferentiated	1 (0.0)	1 (0.0)	2 (0.0)
Kwahe'e Black-on-white solid designs		2 (0.0)	2 (0.0)
Kwahe'e Black-on-white thick parallel lines	1 (0.0)		1 (0.0)
Kwahe'e Black-on-white hatchured designs		9 (0.2)	9 (0.1)
Indeterminate organic paint	4 (0.1)		4 (0.1)
Indeterminate organic Coalition period	3 (0.1)		3 (0.0)
Santa Fe Black-on-white	315 (8.0)	362 (9.0)	677 (8.5)
Wiyo Black-on-white	8 (0.2)	3 (0.1)	11 (0.1)
Biscuit A (Abiquiu Black-on-white)	1 (0.0)		1 (0.0)
Biscuit B/C body		2 (0.0)	2 (0.0)
Biscuit B/C rim	1 (0.0)		1 (0.0)

Ceramic Type	LA 86534	LA 135290	Total
Galisteo Black-on-white	3 (0.1)	2 (0.0)	5 (0.1)
Organic slipped red	1 (0.0)		1 (0.0)
Northern Rio Grande Grayware			
Plain gray rim	17 (0.4)	14 (0.3)	31 (0.4)
Unknown gray rim	2 (0.1)	1 (0.0)	3 (0.0)
Plain gray body	174 (4.4)	64 (1.6)	238 (3.0)
Wide neckbanded	1 (0.0)		1 (0.0)
Coiled necked	5 (0.1)		5 (0.1)
Wiped scored gray		4 (0.1)	4 (0.1
Basket impressed gray	8 (0.2)	1 (0.0)	9 (0.1)
Indented corrugated	621 (15.8)	465 (11.6)	1086 (13.7)
Incised corrugated	30 (0.8)	3 (0.1)	33 (0.4)
Plain corrugated	17 (0.4)	4 (0.1	21 (0.3)
Smeared plain corrugated		2 (0.0)	2 (0.0)
Smeared-indented corrugated	2408 (61.4)	2802 (69.7)	5210 (65.6)
Patterned corrugated		1 (0.0)	1 (0.0)
Polished gray	6 (0.2)		6 (0.1)
Neck corrugated	1 (0.0)		1 (0.0)
Plain incised	1 (0.0)	1 (0.0)	2 (0.0)
Mudware	4 (0.1)	3 (0.1)	7 (0.1)
Cibola Whiteware			
Unpainted white undifferentiated	3 (0.1)	1 (0.0)	4 (0.1)
Mineral paint undifferentiated	1 (0.0)	1 (0.0)	2 (0.0)
Gallup Black-on-white	1 (0.0)		1 (0.0)
White Mountain Redware			
White Mountain Red painted, undifferentiated		1 (0.0)	1 (0.0)
White Mountain Red unpainted, undifferentiated	1 (0.0)		1 (0.0)
Middle Rio Grande Glazeware			
Glaze yellow body unpainted	1 (0.0)		1 (0.0)
Northern Mogollon Whiteware			
Unpainted with Chupadero paste	1 (0.0)		1 (0.0)
Chupadero Black-on-white indeterminate design	5 (0.1)		5 (0.1
Chupadero Black-on-white solid design	1 (0.0)		1 (0.0
Eastern Mogollon Whiteware			
Socorro Black-on-white		1 (0.0)	1 (0.0)
Total	**3925 (100)**	**4021 (100)**	**7946 (100)**

Table 58.14. Distribution of ware groups (count/percent) at Middle Coalition period sites.

Ware	LA 86534	LA 135290	Total
Gray	3295 (83.9)	3365 (83.7)	6660 (83.8)
White	627 (16.0)	655 (16.3)	1282 (16.1)
Red	1 (0.0)	1 (0.0)	2 (0.0)
Brown	1 (0.0)		1 (0.0)

Ware	LA 86534	LA 135290	Total
Glaze	1 (0.0)		1 (0.0
Total	**3925 (100)**	**4021 (100)**	**7946 (100)**

Attributes noted for whiteware bowl sherds can also be compared in order to determine their temporal significance. One attribute compared was the frequency of painted and unpainted bowl sherds (Table 58.15). The total frequency of whiteware bowls exhibiting painted decorations are similar at LA 86534 (69.3% of all whiteware bowls) and LA 135290 (69.1%). These frequencies are similar to each other and lower than those noted in later Coalition period assemblages. While the majority of whiteware bowl sherds from both sites exhibit unpolished exteriors, the frequency of Santa Fe Black-on-white sherds with polished exteriors was higher at LA 86534. The frequency of bowl sherds exhibiting plain versus polished exteriors was also compared (Table 58.16). The majority of whiteware bowls from LA 135290 (73.4%) exhibit unpolished and unslipped exteriors, while those from LA 86534 exhibit unpolished exteriors. Frequencies noted on LA 135290 are more similar to those noted for whiteware pottery from other Coalition period sites.

Table 58.15. Frequency of paint on whitewares (count/percent) from Coalition period sites.

LA 4618	LA 12587	LA 86534	LA 135290	Total
230 (16.3)	330 (20.3)	143 (30.7)	146 (30.9)	849 (21.4)
	3 (0.2)	3 (0.6)		6 (0.2)
	4 (0.2)	3 (0.6)	5 (1.1)	12 (0.3)
		1 (0.2)	1 (0.2)	2 (0.1)
		3 (0.6)		3 (0.1
1181 (83.7)	1289 (79.3)	312 (67.0)	321 (67.9)	3103 (78.0)
		1 (0.2)		1 (0.0
1411 (100)	1626 (100)	466 (100)	473 (100)	3976 (100)

Table 58.16. Whiteware exterior treatment (count/percent) from Coalition period sites.

Exterior Manipulation	LA 4618	LA 12587	LA 86534	LA 135290	Total
Not applicable		1 (0.1)			1 (0.0)
Plain unpolished	1178 (83.5)	1178 (72.4)	243 (52.1)	347 (73.4)	2946 (74.1)
Plain polished	107 (7.6)	196 (12.1)	133 (28.5)	60 (12.7)	496 (12.5)
Polished white slip	56 (4.0)	107 (6.6)	25 (5.4)	49 (10.4)	237 (6.0)
Polished red slip		8 (0.5)			8 (0.2)
Plain striated	1 (0.1)	29 (1.8)		1 (0.2)	31 (0.8)
Surface missing	64 (4.5)	88 (5.4)	51 (10.9)	14 (3.0)	217 (5.5)
Smeared-indented corrugated	3 (0.2)	3 (0.2)			6 (0.2)
Basket impressed	2 (0.1)	13 (0.8	14 (3.0)	2 (0.4)	31 (0.8)
Polished cream slip		3 (0.2)			3 (0.1)
Total	**1411 (100)**	**1626 (100)**	**466 (100)**	**473 (100)**	**3976 (100)**

Stylistic analysis of a sample of Santa Fe black-on-white rim sherds indicated a similar range of decorations and manipulations from the Coalition period sites (Tables 58.17 through 58.23). The majority of rim sherds are unpainted and tapered. While other attributes seem to be similar, the small sample size from LA 135290 limits such comparisons.

Table 58.17. Distribution of rim shape (count/percent) by site for Santa Fe Black-on-white sherds.

Rim Shape	LA 4618	LA 12587	LA 21596B	LA 86534	LA 135290	Total
Rounded		5 (10.2)		1 (8.3)		6 (4.0)
Flat		2 (4.1)		2 (16.7)	1 (5.3)	5 (3.3)
Tapered	67 (97.1)	36 (73.5)	1 (100)	9 (75.0)	18 (94.7)	131 (87.3)
Angled		4 (8.2)				4 (2.7)
Flared	2 (2.9)	2 (4.1)				4 (2.7)
Total	**69 (100)**	**49 (100)**	**1 (100)**	**12 (100)**	**19 (100)**	**150 (100)**

Table 58.18. Distribution of rim shape (count/percent) for Santa Fe and Wiyo Black-on-white types.

Rim Decoration	LA 4618	LA 12587	LA 21596B	LA 86534	LA 135290	Total
Indeterminate	1 (1.4)					1 (0.7)
None	66 (95.7)	43 (87.8)	1 (100)	13 (100)	19 (100)	142 (94.0)
Solid		2 (4.1)				2 (1.3)
Ticked with vertical lines	1 (1.4)					1 (0.7)
Ticked with dots and squares	1 (1.4)	4 (8.2)				5 (3.3)
Total	**69 (100)**	**49 (100)**	**1 (100)**	**13 (100)**	**19 (100)**	**151 (100)**

Table 58.19. Distribution of rim orientation (count/percent) for Santa Fe and Wiyo Black-on-white types.

Rim Orientation	4618	12587	21596B	86534	135290	Total
Single thin framing line	9 (13.0)	14 (29.2)	1 (100)		3 (15.8	27 (18.0)
Single thick framing line	19 (27.5)	10 (20.8)		2 (15.4)	7 (36.8)	38 (25.3)
Multiple thin framing lines	10 (14.5)			2 (15.4)	1 (5.3)	13 (8.7)
Multiple size framing lines large top				1 (7.7)		1 (0.7)
Incorporated framing line	21 (30.4)	16 (33.3)		7 (53.8)	2 (10.5)	46 (30.7)
Thin top, incorporated lower		4 (8.3)			4 (21.1)	8 (5.3)

Rim Orientation	4618	12587	21596B	86534	135290	Total
Solid		3 (6.3)		1 (7.7)		4 (2.7)
No framing lines	9 (13.0)	1 (2.1)			2 (10.5)	12 (8.0)
Thick top/thin bottom lines	1 (1.4)					1 (0.7)
Total	**69 (100)**	**48 (100)**	**1 (100)**	**13 (100)**	**19 (100)**	**150 (100)**

Table 58.20. Distribution of rim thickness (count/percent) for Santa Fe and Wiyo Black-on-white types.

Wall Thickness	4618	12587	21596B	86534	135290	Total
4 or less	2 (2.8)	3 (6.3)	1 (100)	1 (7.7)	1 (5.3)	8 (5.3)
4 to 5	6 (8.7)	11 (22.9)	`	5 (38.5)	6 (31.6)	28 (18.7)
5 to 6	38 (55.1)	27 (56.3)		6 (45.2)	11 (57.1)	82 (54.7)
6 or more	23 (33.3)	7 (14.6)		1 (7.7)	1 (5.3)	32 (21.3)
Total	**69 (100)**	**48 (100)**	**1 (100)**	**13 (100)**	**19 (100)**	**150 (100)**

Table 58.21. Distribution of interior surface polish (count/percent) for Santa Fe and Wiyo Black-on-white types.

Polish	4618	12587	21596B	86534	135290	Total
Unpolished				1 (7.7)		1 (0.7)
Lightly polished	15 (21.7)	5 (10.4)	1 (100)	5 (38.5)	7 (36.8)	33 (22.0)
Moderately polished	22 (31.9)	33 (68.8)		7 (53.8)	10 (52.6)	72 (48.0)
Heavily polished	32 (46.4)	10 (20.8)			2 (10.5)	44 (29.3)
Total	**69 (100)**	**48 (100)**	**1 (100)**	**13 (100)**	**19 (100)**	**150 (100)**

Table 58.22. Number of motifs (count/percent) noted for Santa Fe and Wiyo Black-on-white types.

# of Motifs	4618	12587	21596B	86534	135290	Total
0	1 (1.4)	1 (2.0)				2 (1.3)
1	38 (54.3)	35 (71.4)	1 (100)	12 (92.3)	14 (73.7)	100 (65.8)
2	25 (35.7)	12 (24.5)		1 (7.7)	3 (15.8)	41 (27.0)
3	5 (7.1)	1 (2.0)			2 (10.5)	8 (5.3)
4	1 (1.4)					1 (0.7)
Total	**70 (100)**	**49 (100)**	**1 (100)**	**13 (100)**	**19 (100)**	**152 (100)**

Table 58.23. Distribution of primary design motifs (count/percent) for Santa Fe Black-on-white and Wiyo Black-on-white.

Design Motif	4618	12587	21596B	86534	135290	Total
Solid indeterminate	6 (8.7)	7 (14.3)			2 (11.1)	15 (10.0)
Solid triangle	21 (30.4)	4 (8.2)			10 (55.6)	35 (23.3
Solid and lined				1 (7.7)		1 (0.7)

Design Motif	4618	12587	21596B	86534	135290	Total
Thin parallel lines	11 (15.9)			5 (38.5)		16 (10.7)
Thick parallel lines	6 (8.7)	3 (6.1)				9 (6.0)
Hatchured	9 (13.0)	20 (40.8)	1 (100)	1 (7.7)	4 (22.2)	35 (23.3)
Hatchured ribbon	4 (5.8)	2 (4.1)		1 (7.7)		7 (4.7)
Ticked lines		1 (2.0)				1 (0.7)
Chevron parallel lines		1 (2.0)		1 (7.7)		2 (1.3)
Checkerboard	5 (7.2)	1 (2.0)				6 (4.0)
Open triangle		4 (8.2)		1 (7.7)		5 (3.3)
Hatchured triangle		1 (2.0)				1 (0.7)
Checkerboard triangle		1 (2.0)		1 (7.7)	1 (5.6)	3 (2.0)
Thick and thin parallel lines				1 (7.7)		1 (0.7)
Intersecting lines				1 (7.7)		1 (0.7)
Dotted lines		2 (4.1)				2 (1.3)
Straight line hatchured		2 (4.1)				2 (1.3)
Stepped triangles	2 (2.9)					2 (1.3)
Single thick line	4 (5.8)					4 (2.7)
Single thin line	1 (1.4)					1 (0.7)
Dots					1 (5.6)	1 (0.7)
Total	**69 (100)**	**49 (100)**	**1 (100)**	**13 (100)**	**18 (100)**	**150 (100)**

The dominance of Santa Fe Black-on-white along with low frequencies of Kwahe'e Black-on-white indicates occupations associated with the early part of the Middle Coalition period at both sites. Data from other sites on the Pajarito Plateau indicate a decrease in the frequency of smeared corrugated relative to other grayware forms some time during the early to middle part of the Coalition period (Curewitz and Harmon 2002). The most likely interpretation is that LA 86534 and LA 135290 were both occupied during the early to middle 13th century. This interpretation is supported by archaeomagnetic dates from LA 86534, which support an occupation during the first half of the 13th century.

Further clues concerning occupations during the Middle Coalition period in this area are provided by data from 2985 sherds examined from LA 4624, a site excavated by Los Alamos National Laboratory (LANL) personnel in the early 1990s and analyzed by Curewitz and Harmon (2002). The majority of the pottery at LA 4624 is represented by Santa Fe Black-on-white although Kwahe'e is represented in a low but significant frequency. Wiyo Black-on-white was absent from the assemblage. Nonlocal sherds were limited to Wingate Black-on-red. The majority of all whiteware sherds were painted. Grayware types represent 77.7 percent of all the identified pottery and the assemblage was dominated by smeared-indented corrugated. A small but significant frequency of grayware sherds exhibited plain and indented corrugated exteriors. The presence of Kwahe'e Black-on-white and higher frequencies of grayware forms is similar to trends noted at LA 86534 and LA 135290, although the frequency of Kwahe'e Black-on-white and grayware types other than smeared corrugated is slightly higher at LA 4624. This may indicate an occupation dating slightly earlier than that noted at LA 86534 and LA 135390 (Curewitz and Harmon 2002), and a date in the early 13th century is likely.

A large number of sherds were recovered from LA 12587 (*n* = 10,363) (Tables 58.24 and 58.25). This represents a selected sample, as not all sherds recovered from this site were analyzed. A smaller sub-sample of ceramics includes material from burials as well as special objects selected for analysis. Many aspects of assemblage are similar to those noted for the two Middle Coalition sites just discussed. These include similar frequencies of ware groups, with just over 80 percent representing bowls. Another similarity is that the majority of whiteware sherds are derived from Santa Fe Black-on-white, which represents over 12 percent of all pottery. In addition, as is the case for the other Middle Coalition assemblages, most of the sherds are from smeared corrugated vessels. Frequencies of ware groups are similar to those noted for earlier Coalition period sites with grayware types representing just over 80 percent of the total pottery (Table 58.25).

Table 58.24. Distribution of ceramic types (count/percent) at LA 12587.

Ceramic Type	Total
Indeterminate Whiteware	
Unpainted undifferentiated white	1 (0.0)
Indeterminate painted ware	1 (0.0)
Northern Rio Grande Whiteware	
Unpainted undifferentiated	426 (4.1)
Mineral paint undifferentiated	1 (0.0)
Kwahe'e Black-on-white solid designs	1 (0.0)
Indeterminate organic paint	41 (0.4)
Indeterminate organic Coalition period	3 (0.0)
Santa Fe Black-on-white	1267 (12.2)
Wiyo Black-on-white	40 (0.4)
Biscuitware painted unspecified	1 (0.0)
Biscuit A (Abiquiu Black-on-white)	10 (0.1)
Biscuit B/C Body	7 (0.1)
Sankawi Black-on-cream	1 (0.0)
Unpainted biscuitware slipped one side	2 (0.0)
Galisteo Black-on-white	22 (0.2)
Unpainted Galisteo paste	4 (0.0)
Jemez Santa Fe Vallecitos	1 (0.0)
Gallina Black-on-white	1 (0.0)
Northern Rio Grande Grayware	
Plain gray rim	31 (0.3)
Unknown gray rim	202 (1.9)
Plain gray body	525 (5.1)
Basket impressed gray	2 (0.0)
Indented corrugated	481 (4.6)
Incised corrugated	2 (0.0)
Plain corrugated	37 (0.4)

Ceramic Type	Total
Smeared plain corrugated	1032 (10.0)
Alternating corrugated	1 (0.0)
Smeared-indented corrugated	6175 (59.6)
Polished gray	4 (0.0)
Plain incised	1 (0.0)
Mudware	5 (0.0)
Unpolished mica slip	1 (0.0)
Local brown ware	8 (0.1)
Polished gray	1 (0.0)
Tularosa Black-on-white	2 (0.0)
Cibola Whiteware	
White Mountain Red painted undifferentiated	2 (0.0)
St. Johns Black-on-red	1 (0.0)
White Mountain Red unpainted undifferentiated	5 (0.0)
Middle Rio Grande Glazeware	
Glaze yellow body unpainted	3 (0.0)
Glaze red body undifferentiated	1 (0.0)
Agua Fria Glaze-on-red	1 (0.0)
Northern San Juan Whiteware	
Unpainted whiteware undifferentiated	2 (0.0)
Mesa Verde Black-on-white	3 (0.0)
Indeterminate organic San Juan whiteware	1 (0.0)
Northern Jornada Mogollon Whiteware	
Chupadero Black-on-white indeterminate design	1 (0.0)
Northern Mogollon Brownware	
Reserve smudged	3 (0.0)
Total	**10,363 (100)**

Table 58.25. Distribution of ware groups (count/percent) at LA 12587.

Ware	Total
Gray	8500 (82.0)
White	1839 (17.7)
Red	8 (0.1)
Brown	11 (0.1)
Glaze	5 (0.0)
Total	**10,363 (100)**

Some differences were noted in ceramic distributions from LA 12587 and those from the other Middle Coalition period sites just discussed. For example, the frequency of Wiyo Black-on-white and Galisteo Black-on-white is slightly higher at LA 12587. The overall frequency of grayware sherds exhibiting smeared corrugated exteriors is also higher at LA 12587. In addition, the total frequency of whiteware sherds exhibiting painted decorations was higher at LA 12587 (79.6% of all whiteware vessels) than at either LA 86534 or LA 135290. This may reflect a broader field of decorations for Santa Fe Black-on-white produced during later periods. The frequency of whiteware bowls from LA 12587 with unpolished exteriors was higher than that noted for LA 86534 and similar to that noted at LA 135290. Stylistic analyses indicate similar trends at the two earlier Coalition period sites including the dominance of unpainted, tapered rims. Differences may include slightly thicker vessel walls, higher polish, and higher frequency of hatchured designs.

The occurrence of Galisteo Black-on-white, St Johns Black-on-red, and higher frequencies of smeared corrugated at LA 12587 (see Tables 58.24 and 58.25) may indicate a slightly later or longer occupation at this site (Curewitz and Harmon 2002; McKenna and Miles 1999). Data from other sites on the Pajarito Plateau indicate a decrease in the frequency of smeared corrugated relative to other grayware forms some time during the early to middle part of the Coalition period (Curewitz and Harmon 2002; Kohler 2004). The most likely interpretation is that while the early part of the occupation of LA 12587 may have overlapped with the previously discussed Coalition period sites, it extended later in time. The later part of the occupation of LA 12587 may have dated from the early to middle 13th century to the beginning of the 14th century. Low frequencies of biscuitware and glazeware types are presumably associated with the later site components (fieldhouse and agricultural features).

The next stage in the ceramic sequence on the Pajarito Plateau for the Coalition period is reflected by ceramic distributions associated with the 10,070 sherds from LA 4618. Almost all the pottery from LA 4618 represents types produced during the Coalition period (Tables 58.26 and 58.27). The only exception was a single San Juan Red-on-tan sherd dating to the Historic period and two glazeware sherds. The majority (84.0%) of the pottery from this site represented gray utilityware types while 15.9 percent represented whiteware types, and 1 percent consisted of redware types (see Table 58.27). Most of the whiteware sherds that could be assigned to a type were classified as Santa Fe Black-on-white, which consisted of 10.9 percent of all pottery. Wiyo Black-on-white was represented in lower frequencies and consisted of 1.3 percent of all pottery. Whiteware types present in very low frequencies include Galisteo Black-on-white and Kwahe'e Black-on-white. Grayware assemblages were dominated by smeared-indented corrugated sherds, which represent 80.6 percent of all pottery. Other sherds, comprising, 1.2 percent of all pottery, were assigned to various corrugated types based on variation in exterior surface treatment or plainware forms exhibiting no exterior surface treatments.

Table 58.26. Distribution of ceramic types (count/percent) at LA 4618.

Ceramic Type	Total
Indeterminate Whiteware	
Unpainted undifferentiated whiteware	1 (0.0)
Northern Rio Grande Whiteware	
Unpainted undifferentiated	338 (3.4)
Kwahe'e Black-on-white hatchured designs	1 (0.0)
Kwahe'e Black-on-white checkerboard	4 (0.0)
Santa Fe Black-on-white	1094 (10.9)
Wiyo Black-on-white	128 (1.3)
Galisteo Black-on-white	17 (0.2)

Ceramic Type	Total
Unpainted Galisteo paste	6 (0.1)
Northern Rio Grande Grayware	
Plain gray rim	7 (0.1)
Unknown gray rim	6 (0.1)
Plain gray body	99 (1.0)
Wide neckbanded	5 (0.0)
Wide neckbanded smeared	1 (0.0)
Clapboard neck	1 (0.0)
Indented corrugated	42 (0.4)
Incised corrugated	1 (0.0)
Plain corrugated	101 (1.0)
Smeared plain corrugated	76 (0.8)
Smeared-indented corrugated	8112 (80.6)
Plain incised	4 (0.0)
Sand-Tempered Grayware	
Plain gray body	1 (0.0)
Cibola Whiteware	
Unpainted white undifferentiated	7 (0.1)
White Mountain Redware	
White Mountain Red painted undifferentiated	1 (0.0)
St. Johns Black-on-red	1 (0.0)
St. Johns Polychrome	2 (0.0)
White Mountain Red unpainted undifferentiated	2 (0.0)
Middle Rio Grande Glazeware	
Glaze Polychrome body undifferentiated	1 (0.0)
Puaray Polychrome	1 (0.0)
Northern San Juan Whiteware	
Unpainted whiteware undifferentiated	2 (0.0)
Mesa Verde Black-on-white	1 (0.0)
Historic Tewa Polychrome	
Tewa Polychrome type	4 (0.0)
Historic Tewa Plainware	
Red-tan buff unpainted	1 (0.0)
San Juan Red-on-tan	1 (0.0)
Tewa buff undifferentiated	1 (0.0)
Total	**10,070 (100)**

Table 58.27. Distribution of ceramic ware groups (count/percent) at LA 4618.

Ware	Total
Gray	8456 (84.0)
White	1599 (15.9)
Red	7 (0.1)
Glaze	2 (0.0)

Ware	Total
Historic plain	2 (0.0)
Polychrome	4 (0.0)
Total	**10,070 (100)**

A comparison of the pottery from LA 4618 and the Middle Coalition period sites discussed previously indicate Late Coalition period occupation. A Late Coalition period occupation is not only indicated by the higher frequencies of Wiyo Black-on-white but also by the distinctive range of characteristics noted in Santa Fe Back-on-white from this site, which appear to reflect gradual changes in the technology and decoration of whiteware vessels. This is reflected by a higher degree of polishing on painted whiteware vessels on both Santa Fe Black-on-white and Wiyo Black-on-white sherds at LA 4618. These differences indicate gradational changes associated with the development of Santa Fe Black-on-white into Wiyo Black-on-white. The total frequency of whiteware sherds exhibiting painted decoration is fairly high at LA 4618, with 83.7 percent of all Rio Grande whiteware sherds exhibiting paint. This is slightly higher than the overall frequency noted at other Coalition period sites. The differences in these distributions may reflect broader field of decorations for Santa Fe Black-on-white produced during later periods. The degree of polish appears to be higher for the interior of whiteware bowls as indicated during stylistic analyses. The majority of the whiteware ceramics (83.5%) exhibit a plain, unpolished exterior.

Stylistic analyses indicate similarities in rims noted in painted whiteware sherds from other Coalition period sites. Sherds from this site tend to display wider vessel walls and higher interior polish and reflect the continuation of trends discussed for the previous sites. Hatchured designs appear to be rarer than noted for the previous period.

Distribution of pottery types is somewhat similar to those noted at LA 12587, although the higher frequency of Wiyo Black-on-white reflects a later date. This combination of pottery indicates an occupation dating to some time from the very end of the 13th century to the first part of the 14th century.

Pottery distributions from LA 4618 seem to conform fairly close to pottery described from Area Two of Burned Mesa Pueblo, excavated as part of the Bandelier Project (Gray 1992). Ceramic assemblages from this context were characterized by the dominance of smeared corrugated with Santa Fe Black-on-white and transitional Wiyo Black-on-white. This ceramic assemblage was interpreted as representing an occupation dating some time between AD 1270 and 1335 (Gray 1992).

Pottery distributions associated with the 1056 sherds from LA 4619 are very similar to those noted at LA 4618. As is the case with other Coalition period sites, just over 80 percent of the pottery represents grayware types, with almost all the remaining types representing whiteware forms (Tables 58.28 and 58.29).

Table 58.28. Distribution of ceramic types (count/percent) at LA 4619.

Ceramic Type	LA 4619
Northern Rio Grande Whiteware	
Unpainted undifferentiated	87 (8.2)
Indeterminate organic paint	42 (4.0)
Santa Fe Black-on-white	51 (4.8)
Wiyo Black-on-white	16 (1.5)
Biscuitware painted unspecified	1 (0.1)
Biscuit A (Abiquiu Black-on-white)	3 (0.3)
Biscuit B rim	1 (0.1)
Galisteo Black-on-white	1 (0.1)
Unpainted Galisteo paste	2 (0.2)
Northern Rio Grande Grayware	
Plain gray rim	2 (0.2)
Unknown gray rim	27 (2.6)
Plain gray body	264 (25.0)
Plain corrugated	38 (3.7)
Smeared plain corrugated	385 (36.4)
Smeared-indented corrugated	132 (12.5)
Cibola Whiteware	
Unpainted white undifferentiated	2 (0.2)
White Mountain Redware	
White Mountain red unpainted undifferentiated	2 (0.2)
Total	**1056 (100)**

Table 58.29. Distribution of ceramic ware groups (count/percent) at LA 4619.

Ware	LA 4619
Gray	848 (80.3)
White	206 (19.5)
Red	2 (0.2)
Total	**1056 (100)**

Slight differences may indicate a somewhat later occupation and the effects of small sherd size on the assignment of pottery types. Similarities include the dominance of Santa Fe Black-on-white along with low but significant frequencies of Wiyo Black-on-white. Biscuitwares also occur in low frequencies. Several of the sherds assigned to biscuitware types as well as those assigned to Wiyo Black-on-white appear to exhibit characteristics transitional between these types. In addition, many of the Santa Fe Black-on-white sherds exhibit pastes that also seemed to be transitional to either Wiyo Black-on-white or biscuitware types. The transitional nature of these whitewares was also noted in many of the sherds from LA 4618, but appears to be even more transitional than noted at LA 4619. The paste of whitewares from LA 4619 tends to be very light (almost white in color) with dense, small tuff particles that are very similar to that noted in biscuitware. Surfaces tend to be highly polished. Almost all the sherds were too small to be included in stylistic analysis. Glazeware types were not present. Intrusive types were limited to very low frequencies of sherds assigned to Cibola Whiteware and White Mountain Redware types.

Utilitywares at the Late Coalition period sites are dominated by smeared corrugated. The main differences are the much higher frequency of sherds assigned to the plain gray body type. This may in part reflect a trend toward increased obliteration of the surface, but may also be a reflection of the much smaller sizes of sherds from LA 4619. The smaller size of many of these sherds may have made it more difficult to identify corrugated treatments, and thus resulted in a higher proportion of sherds being assigned to plain grayware categories.

It is likely that LA 4619 dates to either the same time or to just after the occupational period of LA 4618, with an occupation around the middle of the 14th century. The ceramics from this site exhibit more characteristics described for Coalition period sites and thus are included in the discussion with these sites, although they also exhibit characteristics that are also transitional to those noted in Classic period assemblages.

As part of the present study, ceramics from two sites excavated by LANL personnel during the 1950s were also analyzed. These sites were not given Laboratory of Anthropology (LA) numbers, but consist of the Airport Ruin 1 (n = 19) and Airport Ruin 2 (n = 129) (Tables 58.30 and 58.31). The high frequency of whiteware sherds assigned to specific types may largely be a result of the collection strategy rather than actual behavioral patterns. While Santa Fe Black-on-white is the most common type at both sites, frequencies of Wiyo Black-on-white are also represented higher than noted at other sites examined during the present study. Grayware assemblages are mainly represented by smeared corrugated sherds. Glazeware sherds were noted at Airport Ruin 2. While the number of sherds examined from both sites was small, ceramic distributions appear to most closely resemble those documented from LA 4618 and LA 4619, dating some time during the middle of the 14th century.

Table 58.30. Distributions of ceramic types (count/percent) from non-C&T Project Late Coalition period sites.

Ceramic Type	Airport Ruin 1	Airport Ruin 2	Total
Northern Rio Grande Whiteware			
Mineral paint undifferentiated		2 (1.6)	2 (1.4)
Indeterminate organic Coalition period	3 (15.8)		3 (2.0)
Santa Fe Black-on-white	6 (31.6)	45 (34.9)	51 (34.5)
Wiyo Black-on-white	5 (26.3)	15 (11.6)	20 (13.5)
Galisteo Black-on-white		1 (0.8)	1 (0.7)
Northern Rio Grande Grayware			
Wide neckbanded smeared		1 (0.8)	1 (0.7)
Indented corrugated		3 (2.3)	3 (2.0)
Smeared plain corrugated		2 (1.6)	2 (1.4)
Alternating corrugated	1 (5.3)		1 (0.7)
Smeared-indented corrugated	4 (21.1)	56 (43.4)	60 (40.5)
Patterned corrugated		1 (0.8)	1 (0.7)

Middle Rio Grande Glazeware			
Glaze Red Body Unpainted		3 (2.3)	3 (2.0)
Total	**19 (100)**	**129 (100)**	**148 (100)**

Table 58.31. Distribution of ware groups (count/percent) from non-C&T Project Late Coalition period sites.

Ware	**Airport Ruin 1**	**Airport Ruin 2**	**Total**
Gray	5 (26.3)	63 (48.8)	68 (45.9)
White	14 (73.7)	63 (48.8)	77 (52.0)
Glaze		3 (2.3)	3 (2.0)
Total	**19 (100)**	**129 (100)**	**148 (100)**

The excavation of Burnt Mesa Pueblo resulted in the examination of ceramics dating to several occupations, most of which dated to the later part of the Coalition period (Gray 1992). Area 2 appears to date to approximately AD 1230 to 1275 and is characterized by the dominance of Santa Fe Black-on-white with relatively few pieces of Wiyo Black-on-white. Dates from the main part of Area 2 indicate an occupation around AD 1270 to 1335. The main occupation was dominated by Santa Fe Black-on-white and transitional or early Wiyo Back-on-white with smeared-indented corrugated. The ceramics characterizing the lower kiva fill is distinct from other areas of the site and is characterized by a high ratio of Wiyo black-on-white to Santa Fe Black-on-white, Galisteo black-on-white, and Biscuit A (Abiquiu Black-on-white) and may indicate an occupation from approximately AD 1350 to 1375.

Thus, while the ceramic distributions from Coalition period sites so far discussed are similar, it is possible to order these sites into a sequence that reflects the gradual nature of change from the Late Developmental period into the Classic period. An analysis of ceramics recovered from LA 82601 indicates that ceramic producing groups had already begun to settle the Pajarito Plateau during the Late Developmental period around the middle of the 12th century. Such sites have rarely been documented on the plateau and are probably limited to extremely sparse habitation and limited activity sites. Sites dating to the next period, which has sometimes been characterized as the earliest phase of the Early Coalition period (Orcutt 1999), are not represented by the LANL assemblages that were examined, although such assemblages are expected to be similar to those described from LA 3852 (Casa del Rito), which was excavated during the Bandelier Archaeological Project (Gray 1992.). The earliest occupation so far examined at LANL is LA 4624 (Curewitz and Harmon 2002), followed by LA 86534 and LA 135290, which exhibit ceramic distributions similar to those noted at Area 2 from Burnt Mesa Pueblo and appear to date to the middle of the 13th century. Later dates are represented by assemblages from LA 12587 and LA 4618, and finally LA 4619, which are similar to those described from Area 1 of Burnt Mesa Pueblo. These occupations appear to reflect occupations dating to the second half of the 13th to the middle of the 14th century. Small ceramic assemblages from two sites (Airport 1 and Airport 2, Steen 1977) also appear to date to the very end of the Coalition period. Thus, ceramic evidence from the C&T Project sites and the surrounding areas dating to the Coalition period reflect continual occupation spanning most of the 13th century into the middle of the 14th century, and may represent a span of about a 150 years.

Dating of Classic Period Sites

Ceramic assemblages were primarily assigned to the Classic period based on the presence of biscuitwares, glazewares, and Sapawe micaceous sherds. Another feature of Classic period ceramic assemblages is the rarity of Santa Fe Black-on-white ceramics as compared to its frequency in Coalition period assemblages. However, it should be pointed out that sherds assigned to the Santa Fe Black-on-white type are hardly ever completely absent in assemblages dating to the Classic period. Assemblages from at least 29 of the sites examined during the present study display a combination of ceramic types indicative of at least some discard of these ceramics during the Classic period. These include 19 sites located in the Rendija Tract, three in the TA-74 Tract, five from the White Rock Tract, and two from the Airport Tract.

Assemblages were usually assigned to different spans within the Classic period based on the relative frequency of different biscuitware types. Of particular importance was the presence of more Biscuit A relative to Biscuit B ceramics at Early Classic period components, and the dominance of Biscuit B in recognizing Late Classic period occupations. The presence of low frequencies of Biscuit C and Sankawi Black-on-cream also played a role in recognizing components associated with the very end of the Classic period.

Five sites were assigned to an indeterminate Classic period based on the dominance of biscuitwares and other late ceramic types, but could not be assigned to specific temporal spans within this period. This inability resulted from difficulties in assigning dates to assemblages with small numbers of ceramics where it was not possible to determine the relative frequencies of Biscuit A and Biscuit B and other important diagnostic types (Table 58.32 and 58.33). Sites assigned to an indeterminate Classic period include LA 85414 (*n* = 35), LA 127625 (*n* = 28), LA 127627 (*n* = 82), and LA 139418 (*n* = 26). Most whiteware sherds from sites assigned to this period were classified to general biscuitware types with the exception of one Biscuit A sherd from LA 85414 and one Biscuit B sherd from LA 127627. The overall frequency of different wares was extremely variable with varying ware groups dominating the assemblages from the sites. Grayware types common at sites assigned to this period include smeared corrugated, Sapawe micaceous, and plain corrugated forms. This variation may reflect both the small size and nature of vessel use at Classic period sites. Despite the small sample size, glazeware types were represented at all of these sites.

Table 58.32. Distribution of ceramic types (count/percent) from indeterminate Classic period sites.

Ceramic Type	85414	127625	127627	139418	Total
Northern Rio Grande Whiteware					
Unpainted undifferentiated	3 (8.6)	3 (10.7)			6 (3.5)
Indeterminate organic paint		2 (7.1)			2 (1.2)
Santa Fe Black-on-white			1 (1.2)	1 (3.8)	2 (1.2)
Wiyo Black-on-white				2 (7.7)	2 (1.2)
Biscuitware unpainted slipped both sides		2 (7.1)			2 (1.2)

Ceramic Type	85414	127625	127627	139418	Total
Biscuitware slip and paint absent			10 (12.2)		10 (5.8)
Biscuitware painted unspecified		3 (10.7)		2 (7.7)	5 (2.9)
Biscuit A (Abiquiu Black-on-white)	1 (2.9)				1 (0.6)
Biscuit B rim			1 (1.2)		
Biscuit B/C body		1 (3.6)	1 (1.2)		3 (1.8)
Unpainted biscuitware slipped one side	1 (2.9)	1 (3.6)	4 (4.9)		6 (3.5)
Northern Rio Grande Grayware					
Plain gray rim			1 (1.2)		1 (0.6)
Plain gray body		8 (28.6)	26 (31.7)		34 (19.9)
Indented corrugated		1 (3.6)			1 (0.6)
Smeared plain corrugated	3 (8.6)	6 (21.4)			9 (5.3)
Smeared-indented corrugated			19 (23.2)		19 (11.1)
Sapawe micaceous	24 (68.6)		16 (19.5)		40 (23.4)
Middle Rio Grande Glazeware					
Glaze red body unpainted	1 (2.9)	1 (3.6)	3 (3.7)	17 (65.4)	22 (12.9)
Glaze yellow body unpainted	1 (2.9)				1 (0.6)
Glaze unslipped body				1 (3.8)	1 (0.6)
Glaze red body undifferentiated				2 (7.7)	2 (1.2)
Glaze yellow body undifferentiated	1 (2.9)				1 (0.6)
Glaze unslipped body				1 (3.8)	1 (0.6)
Total	**35 (100)**	**28 (100)**	**82 (100)**	**26 (100)**	**171 (100)**

Table 58.33. Distribution of ware groups (count/percent) at indeterminate Classic period sites.

Ware	85414	127625	127627	139418	Total
Gray	27 (77.1)	15 (53.6)	62 (75.6)		104 (60.8)
White	5 (14.3)	12 (42.9)	17 (20.7)	5 (19.2)	39 (22.8)
Glaze	3 (8.6)	1 (3.6)	3 (3.7)	21 (80.8)	28 (16.4)
Total	**35 (100)**	**28 (100)**	**82 (100)**	**26 (100)**	**171 (100)**

Three sites were assigned to the Early Classic period based on the dominance of Biscuit A in the whiteware assemblages (Tables 58.34 and 58.35). These include LA 85413 (*n* = 494), LA 85867 (*n* = 68), and LA 135291 (*n* = 82). Biscuit B ceramics are absent from these sites. All three sites are dominated by ceramics assigned to grayware types ranging from 64.6 percent at LA 135291 to 85.8 percent LA 85413. The only site assigned to this group from which glazeware sherds were noted is LA 85413, which included one Cieneguilla Glaze-on-yellow sherd.

Table 58.34. Distribution of ceramic types (count/percent) from Early Classic period sites.

Ceramic Type	85413	85867	135291	Total
Northern Rio Grande Whiteware				
Santa Fe Black-on-white	3 (0.6)			3 (0.5)
Biscuitware painted unspecified	1 (0.2)			1 (0.2)
Biscuit A (Abiquiu Black-on-white)	50 (10.1)	12 (17.6)	12 (14.6)	74 (11.5)
Unpainted biscuitware slipped one side	1 (0.2)	2 (2.9)	3 (3.7)	6 (0.9)
Biscuitware slip and paint absent			14 (17.1)	14 (2.2)
Northern Rio Grande Grayware				
Plain gray rim			3 (3.7)	3 (0.5)
Plain gray body		4 (5.9)	13 (15.9)	17 (2.6)
Smeared plain corrugated	2 (0.4)			2 (0.3)
Smeared-indented corrugated	1 (0.2)		37 (45.1)	38 (5.9)
Mica utilityware undifferentiated	26 (5.3)			26 (4.0)
Sapawe micaceous	395 (80.0)	50 (73.5)		445 (69.1)
Middle Rio Grande Glazeware				
Glaze red body unpainted	7 (1.4)			7 (1.1)
Glaze red body undifferentiated	6 (1.2)			6 (0.9)
Glaze yellow body undifferentiated	1 (0.2)			1 (0.2)
Cieneguilla Glaze-on-yellow	1 (0.2)			1 (0.2)
Total	**494 (100)**	**68 (100)**	**82 (100)**	**644 (100)**

Table 58.35. Distribution of ware groups (count/percent) at Early Classic period sites.

Ware	85413	85867	135291	Total
Gray	424 (85.8)	54 (79.4)	53 (64.6)	531 (82.5)
White	56 (11.3)	14 (20.6)	29 (35.4)	99 (15.4)
Glaze	14 (2.8)			14 (2.2)
Total	**494 (100)**	**68 (100)**	**82 (100)**	**644 (100)**

Three sites were assigned to a mixed Classic period based on the presence of both Biscuit A and Biscuit B (Tables 58.36 and 58.37). These sites include LA 70025 (n = 185), LA 85411 (n = 320), and LA 86637 (n = 110). Whiteware types from all these assemblages are dominated by biscuitware ceramics but also contain low frequencies of Santa Fe Black-on-white. It is possible these represent a late form of this type rather than a multi-component context. Assemblages from two sites (LA 70025 and LA 85411) are dominated by grayware types (over 70% of the pottery), which is primarily represented by Sapawe micaceous. In contrast, the majority of sherds from LA 86637 are represented by whiteware types. Three glazeware sherds were also recovered from LA 86637.

Table 58.36. Distribution of ceramic types (count/percent) from mixed Classic period sites.

Ceramic Type	70025	85411	86637	Total
Northern Rio Grande Whiteware				
Unpainted undifferentiated	2 (1.1)	8 (2.5)	22 (20.0)	32 (5.2)
Indeterminate organic paint		9 (2.8)	1 (0.9)	10 (1.6)
Santa Fe Black-on-white	2 (1.1)	2 (0.6)	5 (4.5)	9 (1.5)
Biscuitware unpainted slipped both sides	9 (4.9)	2 (0.6)		11 (1.8)
Biscuitware painted unspecified		2 (0.6)	29 (26.4)	31 (5.0)
Biscuit A (Abiquiu Black-on-white)	8 (4.3)	43 (13.4)	3 (2.7)	54 (8.8)
Biscuit B (Bandelier Black-on-white)	5 (2.7)	18 (5.6)	4 (3.6)	27 (4.4)
Unpainted biscuitware slipped one side	5 (2.7)	3 (0.9)	14 (12.7)	22 (3.6)
Biscuitware slip and paint absent	7 (3.8)	1 (0.3)		8 (1.3
Northern Rio Grande Grayware				
Unknown gray rim			2 (1.8)	2 (0.3)
Plain gray body	3 (1.6)	1 (0.3)	11 (10.0)	15 (2.4)
Indented corrugated	4 (2.2)		5 (4.5)	9 (1.5)
Plain corrugated			1 (0.9)	1 (0.2)
Smeared plain corrugated		14 (4.4)	3 (2.7)	17 (2.8)
Smeared-indented corrugated	15 (8.1)		7 (6.4)	22 (3.6)
Sapawe micaceous	125 (67.6	202 (63.1)		327 (53.2)
Sand-Tempered Grayware				
Plain gray body		13 (4.1)		13 (2.1)
Smeared plain corrugated		2 (0.6)		2 (0.3)
Middle Rio Grande Glazeware				
Glaze red body unpainted			2 (1.8)	2 (0.3)
Los Padillas glaze polychrome			1 (0.9)	1 (0.2)
Total	**185 (100)**	**320 (100)**	**110 (100)**	**615 (100)**

Table 58.37. Distribution of ware groups (count/percent) from mixed Classic period sites.

Ware	70025	85411	86637	Total
Gray	147 (79.5)	232 (72.5)	29 (26.4)	408 (66.3)
White	38 (20.5)	88 (27.5)	78 (70.9)	204 (33.2)
Glaze			3 (2.7)	3 (0.5)
Total	**185 (100.0)**	**320 (100)**	**110 (100)**	**615 (100)**

Nine sites were assigned to the Late Classic period based on the dominance of Biscuit B (Tables 58.38 and 58.39). Some of these sites also contain Biscuit C and Sankawi Black-on-cream and may reflect occupations that continued late into the Classic period. This, in conjunction with the small numbers of Biscuit C, influenced the decision to include these types together into a single Late Classic period group. Sites assigned to the Late Classic period based on ceramic assemblages include LA 15116 (*n* = 85), LA 85408 (*n* = 80), LA 86605 (*n* = 105), LA 87430 (*n* = 487), LA 110126 (*n* = 11), LA 127634 (*n* = 149), LA 128804 (*n* = 262), LA 128805 (*n* = 199), and LA 135292 (*n* = 89). While the majority of whiteware types from all these sites are Biscuit B, Biscuit B/C, and Biscuit C or Sankawi Black-on-cream, extremely low frequencies of Santa Fe Black-on-white were also noted at four sites (LA 87430, LA 128804, LA 128805, and LA 135292). While it is possible that some of the pottery assigned to this type could be from earlier Coalition period sites, it is quite likely that at least some are associated with the Classic period. A clue of such association is the unique characteristics of some of the Santa Fe Black-on-white sherds in Classic period sites, including a distinct and highly vitrified paste. While some of the examples of Santa Fe Black-on-white could be from earlier heirloom vessels, it is also possible that some of these represent a very late form of Santa Fe Black-on-white that may have continued to have been produced in certain localities during the Classic period. Such a possibility has previously been suggested for ceramic assemblages from the Arroyo Hondo site (Lang 1993), and it is my experience that low frequencies of Santa Fe Black-on-white continue to occur in northern Rio Grande ceramic assemblages that otherwise seem to date to the Classic period. In addition, some of the pottery assigned to Santa Fe Black-on-white may represent varieties of this type, such as Pindi Black-on-white, which continued to be produced at some localities into the Classic period.

The possibility of components dating to the end of the Classic period at sites with assemblages dominated by Biscuit B is reflected by the additional presence of Sankawi Black-on-cream at three sites (LA 85408, LA 127634, and LA 135292) and the presence of Biscuit C and Sankawi Black-on-cream at two sites (LA 86605 and LA 128805). Sapawe micaceous was present at most sites assigned to this period and the common occurrence of plain corrugated at some of these sites reflects a shift in technology toward fewer manipulations on the surface exterior. Smeared corrugated is present at some Late Classic period sites, but tends to be rarer than in earlier periods. Assemblages from Late Classic period assemblages with glazeware types include those from LA 15116, LA 85408, LA 127634, LA 128804, and LA 128805. Specific types to which glazeware bowl rim sherds from later Classic period sites were assigned include Agua Fria Glaze-on-red and Largo Glaze-on-yellow.

The previous three ceramic groups are the same as defined by Harmon and Vierra in their chronometric chapter (Chapter 69, this volume). That is, Classic 1 is the same as my Early Classic period, Classic 2 is the same as my mixed Classic period, and Classic 3 equals my Late Classic period. Harmon and Vierra's study, therefore, provides independent support for my temporal classification. However, it should also be noted that other chapters in this report series separate the Classic period into Early, Middle, and Late based on ceramics and chronometric dates (e.g., Chapter 1, Volume 1). In this case, Early Classic includes Biscuit A and/or primarily dates to the 14th century, Middle Classic includes Biscuit B and/or primarily dates to the 15th century, and Late Classic includes Biscuit C and Sankawi Black-on-cream and/or primarily dates to the 16th century (also see Orcutt 1999:115). However, mixed Biscuit A/B assemblages were designated as Early-Middle Classic and body sherds lacking rims, but with painted interior and exterior designs, were designated as Biscuit B/C and would have been given a Middle-Late Classic period designation. Therefore, this Middle-Late Classic period designation would simply be lumped together within my Late Classic period group.

Table 58.38. Distribution of ceramic types (count/percent) from Late Classic period sites.

Ceramic Type	15116	85408	86605	87430	110126	127634	128804	128805	135292	Total
Northern Rio Grande Whiteware										
Unpainted undifferentiated	2 (2.4)	11 (13.8)	3 (2.9)	5 (1.0)			5 (1.9)	3 (1.5)	2 (2.2)	31 (2.1)
Mineral paint undifferentiated		1 (1.3)								1 (0.1
Indeterminate organic paint		9 (11.3)					2 (0.8)	7 (3.5)		18 (1.2)
Indeterminate organic Coalition period				1 (0.2)						1 (0.1)
Santa Fe Black-on-white				1 (0.2)			4 (1.5)	1 (0.5)	2 (2.2)	8 (0.5)
Wiyo Black-on-white				1 (0.2)			1 (0.4)			2 (0.1)
Biscuitware unpainted slipped both sides	1 (1.2)	2 (2.5)	1 (1.0)	6 (1.2)		4 (2.7)	3 (1.1)	2 (1.0)	4 (4.5)	23 (1.6)
Biscuitware painted unspecified	21 (24.7)		8 (7.6)	2 (0.4)			9 (3.4)	6 (3.0)	2 (2.2)	48 (3.3)
Biscuitware slip and paint absent	3 (3.5)		2 (1.9)	1 (0.2)		9 (6.0)			4 (4.5)	19 (1.3)
Biscuit A (Abiquiu Black-on-white)		6 (7.5)		2 (0.4)		5 (3.4)	2 (0.8)	3 (1.5)	3 (3.4)	21 (1.4)
Biscuit B (Bandelier Black-on-white)	32 (37.6)	29 (36.3)	37 (35.2)	58 (11.9)	7 (63.6	58 (38.9)	8 (3.1)	10 (5.0)	14 (15.7)	253 (17.2)
Biscuit C Black-on-tan rim			2 (1.9)					1 (0.5)		3 (0.2)
Sankawi Black-on-cream		4 (5.0)	1 (1.0)			2 (1.3)		2 (1.0)	2 (2.2)	11 (0.7)
Unpainted biscuitware slipped one side	4 (4.7)		37 (35.2)	1 (0.2)	2 (18.2)	6 (4.0)	3 (1.1)	14 (7.0)	2 (2.2)	69 (4.7)
Jemez Santa Fe Vallecitos		1 (1.3)								1 (0.1)
Northern Rio Grande Grayware										
Plain gray rim				6 (1.2)			2 (0.8)	10 (5.0)		18 (1.2)
Unknown gray rim								1 (0.5)	1 (1.1)	2 (0.1)
Plain gray body	2 (2.4)			50 (10.3)		3 (2.0)	21 (8.0)	52 (26.1)	3 (3.4)	131 (8.9)
Indented corrugated							18 (6.9)	6 (3.0)		24 (1.6)
Plain corrugated							3 (1.1)	6 (3.0)		9 (0.6)
Smeared plain corrugated							22 (8.4)	19 (9.5)		41 (2.8)
Smeared-indented corrugated	4 (4.7)			10 (2.1)			133 (50.8)	32 (16.1)	50 (56.4)	229.4 (15.6)
Utility undifferentiated			5 (4.8)	16 (3.3)						21 (1.4)
Sapawe micaceous	13 (15.3)	6 (7.5)	9 (8.6)	327 (67.1)	2 (18.2)	50 (33.6)	4 (1.5)	5 (2.5)		416 (28.3)

Ceramic Type	15116	85408	86605	87430	110126	127634	128804	128805	135292	Total
San Tempered Grayware										
Plain gray body		7 (8.8)				1 (0.7)				8 (0.5)
White Mountain Redware										
Wingate Black-on-red								1 (0.5)		1 (0.1)
Middle Rio Grande Grayware										
Plain grayware						5 (3.4)				5 (0.3)
Middle Rio Grande Glazeware										
Glaze red body unpainted	2 (2.4)					3 (2.0)	6 (2.3)	4 (2.0)		15 (1.0)
Glaze yellow body unpainted	1 (1.2)					1 (0.7)		2 (1.0)		4 (0.3)
Glaze unslipped body							10 (3.8)	7 (3.5)		17 (1.2)
Glaze polychrome body undifferentiated								2 (1.0)		2 (0.1)
Glaze red body undifferentiated		2 (2.5)					4 (1.5)	2 (1.0)		8 (0.5)
Glaze yellow body undifferentiated						1 (0.7)	2 (0.8)	1 (0.5)		4 (0.3)
Glaze unslipped body						1 (0.7)				1 (0.1)
Agua Fria Glaze-on-red		1 (1.3)								1 (0.1)
Largo glaze yellow		1 (1.3)								1 (0.1)
Total	**85 (100)**	**80 (100)**	**105 (100)**	**487 (100)**	**11 (100)**	**149 (100)**	**262 (100)**	**199 (100)**	**89 (100)**	**1467 (100)**

Table 58.39. Distribution of ware groups (count/percent) from Late Classic period sites.

White	15116	85408	86605	87430	110126	127634	128804	128805	135292	Total
Gray	19 (22.4)	13 (16.3)	14 (13.3)	409 (84.0)		58 (38.9)	199 (76.0)	126 (63.3)	54.4 (60.9)	892.4 (60.8)
White	63 (74.1)	63 (78.8)	91 (86.7)	78 (16.0)	9 (81.8)	85 (57.0)	37 (14.1)	49 (24.6)	35 (39.1)	510 (34.8)
Red								1 (0.5)		1 (0.1)
Glaze	3 (3.5)	4 (5.0)				6 (4.0)	22 (8.4)	18 (9.0)		53 (3.6)
Micaceous					2 (18.2)		4 (1.5)	5 (2.5)		11 (0.7)
Total	**85 (100)**	**80 (100)**	**105 (100)**	**487 (100)**	**11 (100)**	**149 (100)**	**262 (100)**	**199 (100)**	**89.4 (100)**	**1467.4 (100)**

The frequency of types assigned to different ware groups is extremely variable in assemblages from sites assigned to the later Classic period. Sites from which the assemblages examined are dominated by grayware types include LA 87430, LA 128804, LA 128805, and LA 135292. Those dominated by whiteware types include LA 15116, LA 85408, LA 86605, LA 110126, and LA 127634. While some of these differences may reflect small sample size, these distributions seem to indicate more variation in the activities for which vessels were used than during earlier periods.

Ceramic distributions from LA 85407 (*n* = 193; the Serna Homestead) indicate the presence of a few sherds dating to the Late Classic period in an assemblage that is otherwise dominated by native historic pottery types (Table 58.40). The prehistoric component was assigned to the Classic period based on the occurrence of Biscuit B and Sapawe micaceous.

Table 58.40. Distribution of ceramic types (count/percent) from LA 85407, the Serna Homestead.

Ceramic Type	Total
Rio Grande Whiteware	
Unpainted undifferentiated	1 (0.5)
Biscuit B (Bandelier Black-on-white)	5 (2.6)
Unpainted biscuitware slipped one side	2 (1.0)
Rio Grande Grayware	
Sapawe micaceous	3 (1.6)
Historic Tewa Plainware	
Tewa buff undifferentiated	2 (1.0)
Tewa polished gray	2 (1.0)
Historic Athabaskan Utilityware	
Unpolished mica slip	2 (1.0)
Athabaskan plain unpolished	176 (91.2)
Total	**193 (100)**

In addition, the frequency of Santa Fe Black-on-white and associated grayware types from assemblages at eight sites indicate the presence of Coalition period components as well as ceramics indicating later Classic period components (see Tables 58.9 and 58.10). Sites with assemblages indicating components dating to the Coalition and Classic period include LA 21596B (*n* = 257), LA 21596C (*n* = 382), LA 85404 (*n* = 199), LA 85861 (*n* = 439), LA 86606 (*n* = 143), LA 127631 (*n* = 12), LA 127635 (*n* = 371), and LA 141505 (*n* = 29). Sites with very small numbers of Late Classic period ceramics but with very few or no distinct biscuitware types include LA 127631 and LA 141505. Thus, the later components from these sites could only be assigned to an indeterminate Classic period group. Biscuitwares from LA 84504 and LA 127635 were dominated by Biscuit A. The later component at these sites appears to date to the Early Classic period. Assemblages from both LA 21596B and LA 21596C exhibit a mixture of Biscuit A and Biscuit B. In addition, the presence of Potsuwi'i Incised at both sites and Biscuit C at LA 21596 indicate some occupation during the Late Classic period, and it is therefore likely that these sites were occupied during both the Early and Late Classic periods. Biscuitwares from LA

85861 and LA 86606 are dominated by Biscuit B, which reflects a later Classic period component at these sites.

Decorated pottery collected in isolated scatters from the White Rock Tract are mainly represented by biscuitware and glazeware types associated with the Classic period, although the frequency of Santa Fe Black-on-white is high enough to indicate the presence of some sherds associated with the Coalition period (Tables 58.41 and 58.42). The dominance of Biscuit B and the presence of Sankawi Black-on-cream also indicate that most of this pottery was deposited during the Late Classic period.

Table 58.41. Distribution of ceramic types (count/percent) for isolated occurrences in the White Rock Tract.

Ceramic Type	Total
Northern Rio Grande Whiteware	
Unpainted undifferentiated	17 (8.9)
Indeterminate organic paint	1 (0.5)
Indeterminate organic Coalition period	3 (1.6)
Santa Fe Black-on-white	8 (4.2)
Biscuitware unpainted slipped both sides	3 (1.6)
Biscuitware painted unspecified	5 (2.6)
Biscuit A (Abiquiu Black-on-white)	7 (3.6)
Biscuit B (Bandelier Black-on-white)	19 (9.9)
Sankawi Black-on-cream	2 (1.0)
Unpainted biscuitware slipped one side	1 (0.5)
Northern Rio Grande Grayware	
Plain gray body	4 (2.1)
Indented corrugated	9 (4.7)
Smeared-indented corrugated	99 (51.6)
Polished gray	1 (0.5)
Potsuwi'i Incised	1 (0.5)
Middle Rio Grande Glazeware	
Glaze red body unpainted	4 (2.1)
Glaze yellow body unpainted	2 (1.0)
Glaze unslipped body	2 (1.0)
Glaze polychrome body undifferentiated	2 (1.0)
Glaze yellow body undifferentiated	2 (1.0)
Total	**192 (100)**

Table 58.42. Distribution of ware groups (count/percent) for isolated occurrences in the White Rock Tract.

Ware	Total
Gray	114 (59.4)
White	66 (34.4)

Ware	Total
Glaze	12 (6.3)
Total	**192 (100)**

ORGINS AND INFLUENCES OF CERAMICS ON THE PAJARITO PLATEAU

Pottery distributions from these sites may provide information concerning the time and areal origin of ceramic-producing groups on the Pajarito Plateau. Evidence for the presence of a Kwahe'e phase occupation and the gradual and distinctive nature of stylistic development observed during the Coalition period seem to indicate an initial movement of ceramic-producing groups from areas of the northern Rio Grande just to the east. These occupations are followed by a sequence of gradual ceramic changes similar to that occurring in other areas of the northern Rio Grande region. The apparent sudden appearance of populations entering the plateau and other areas of the northern Rio Grande region during the 13th and 14th centuries have sometimes been attributed to the long-distance migration of groups from the San Juan (or Mesa Verde) region in the Four Corners area.

Stylistic analysis indicates that the styles and manipulations noted in Santa Fe Black-on-white are similar to contemporary whitewares from sites in other areas of the Rio Grande region including the Albuquerque area, Santa Domingo Basin, Rio Puerco Valley, Pecos Valley, Santa Fe Valley, Tewa Basin, Chama Valley, and Galisteo Basin. Also of interest is the strong contrast in the nature of decoration and construction of Santa Fe Black-on-white and Mesa Verde Black-on-white from the San Juan region. While certain traits such as the use of organic paint and bold banded styles may reflect influences from the Mesa Verde region, broad stylistic patterns noted in pottery from this region are very different from those noted in Coalition period sites described during the present study (Wilson 1996; Tables 58.17 through 58.23). For example, the majority of the sherds exhibit unpainted, tapered rims in contrast to the flat ticked rims common in Mesa Verde Black-on-white (Breternitz et al. 1974; Wilson 1996; Wilson and Blinman 1995a). In addition, bowl exteriors are usually unpolished and unslipped, and vessel forms other than bowls are extremely rare. This also contrasts with traits noted in Mesa Verde Black-on-white and other 13th century San Juan whiteware types (Breternitz et al. 1974; Wilson and Blinman 1995a). The overall design organization and motifs noted in these Santa Fe Black-on-white sherds also tend to be slightly earlier looking than that from a 13th century site in the San Juan region (Wilson 1996). Thus, a scenario of a full-scale migration of groups to the Pajarito Plateau from the Mesa Verde region seems unlikely.

Instead, the various combinations of traits suggest a local development out of Kwahe'e Black-on-white in areas that were occupied during the Late Developmental period such as the Tewa Basin, along with influences from areas to the west. Characteristics of pottery from the previously discussed Late Developmental site (LA 82601) seem to indicate that the earliest ceramic occupations on the Pajarito Plateau were the result of short-distance migrations from areas such as the Tewa Basin. Recent research also indicates that contemporaneous populations in the Tewa Basin were large enough to have been the source of immigrants onto the Pajarito Plateau (Lakatos 2003). Characteristics described for Early Coalition sites such as LA 3852 (Casa del Rito) investigated during the Bandelier Project indicate a slow and gradual transition from Late

Developmental to Coalition period ceramic forms. Such changes may have resulted from a combination of both local change and continuing migration from areas such as the Tewa Basin. Characteristics described for other Coalition period sites indicate a very gradual transition that was unique to, and occurred over, large areas of the northern Rio Grande region. It has been suggested that population migration onto the Pajarito Plateau from the Mesa Verde region occurred in the form of a series of small population drifts. If this was the case, these individuals had very little influence on ceramic technology and decorative conventions as well as other aspects of the material culture of the regions into which they migrated.

THE TEMPORAL DISTRIBUTION OF SITES BY TRACT

The examination of distributions of sites assigned to different temporal periods within the separate tracts may also provide clues concerning the nature and history of occupations of these various localities of the central Pajarito Plateau. It should be noted, however, that these represent relatively small and not necessarily representative samples of sites dating to the different time periods for these tracts, and characterization of such patterns should be supplemented by data from surveys of these tracts (e.g., see Hoagland et al. 2000).

The majority of the ceramics analyzed from seven sites in the White Rock Tract were recovered from the Late Coalition period roomblock at LA 12587. The extremely small sample of pottery from the fieldhouse at LA 127631 reflects an occupation dating to the Late Coalition and Early Classic periods. Pottery from the other five sites represents Classic period occupations. The artifact scatter at LA 127625 was assigned to an indeterminate span of the Classic period. Ceramics from the artifact scatter at LA 86637 indicate a Middle Classic period occupation. Sites with ceramics dating to the Late Classic period include the check dam at LA 128804 and the fieldhouse at LA 128805.

The majority of ceramics from the five sites excavated in the Airport Tract was recovered from the Middle Coalition period roomblocks at LA 86534 and LA 135290. The very small sample of pottery from the artifact scatter at LA 86533 indicated an occupation during an indeterminate span of the Coalition period. Pottery from the fieldhouse at LA 141505 reflects a Late Coalition and Early Classic period occupation. Pottery from the grid garden and surrounding artifact scatter at LA 139418 suggest a Classic period occupation.

All the 26 ceramic sites examined from the Rendija Tract represent small sites from which relatively few ceramics were recovered. Very small assemblages from the fieldhouses at LA 85403 and LA 127634, the tipi ring at LA 85864, and the artifact scatters at LA 85859 and LA 99397 could not be assigned to a specific time period. Pottery from the artifact scatter and structure at LA 99396 and the fieldhouse at LA 86607 indicate an occupation in an indeterminate span of the Coalition period. Pottery distributions from fieldhouses at LA 85404, LA 85861, LA 86606, and LA 127635 reflects occupations during both the Coalition and Classic periods. Pottery distributions from fieldhouses at LA 85414 and LA 127627 reflect occupations during an indeterminate span of the Classic period. Pottery from the fieldhouses at LA 85413, LA 85869, and LA 135291 reflects an occupation dating to the early part of the Classic period. Pottery from the fieldhouse at LA 85411 indicates possible occupations during the early and late spans of the

Classic period. Pottery from fieldhouses at LA 15116, LA 70025, LA 85408, LA 86605, LA 87430, and LA 135292 indicate occupations dating to the later portion of the Classic period. Distributions of native pottery types from a homestead at LA 85407 indicate an occupation primarily dating to the Historic period, as well as the Classic period. Ceramics recovered in the fieldhouse at LA 85417 suggest both historic and prehistoric occupations of the site area.

All seven of the ceramic assemblages from the TA-74 sites yielded small assemblages. Very small assemblages from fieldhouses at LA 110121, LA 110130, and LA 110133 and the lithic scatter at LA 117883 could not be assigned to a specific time period. Pottery distributions from a grid garden at LA 21596B and a fieldhouse at LA 21596C indicate occupations during both the Coalition and Classic periods. Ceramics recovered from the fieldhouse at LA 110126 indicate an occupation during the later Classic period. Very small ceramic samples from artifact scatters at two sites in the White Rock Y Tract were not assigned to a specific period.

Large ceramic assemblages were recovered from two sites excavated in the early 1990s on Mesita del Buey. Ceramic assemblages from the roomblocks at LA 4618 and LA 4619 indicate occupations dating toward the end of the Coalition period, with those from LA 4619 possibly being slightly later.

A review of dates assigned to sites located in different tracts indicates occupations covering much of the Coalition and Classic periods. The majority of the analyzed pottery was recovered from a small number of Coalition period roomblocks located in the White Rock and Airport tracts. While some seasonal sites (e.g., artifact scatters and fieldhouses) date to the Coalition period, these are relatively rare compared to the Classic period fieldhouse sites. The ceramic assemblages recovered from the Rendija Tract fieldhouses indicate that they date primarily to the Classic period. All the Classic period sites and components identified during this study likely reflect seasonal uses by the occupants of the major Classic period towns in this area of the Pajarito Plateau (e.g., Otowi and Tsirege).

POTTERY TRENDS

The assignment of sites to different time periods based on distributions of ceramic attributes provides evidence for long-term changes in pottery production, exchange, and use of vessels. Many of the spatial and temporal patterns of ceramic distributions previously noted reflect changing factors influencing the production, decoration, exchange, and use of ceramic vessels. Aspects of pottery production, exchange, and function may often represent closely interrelated components of larger economic, technological, and social systems. Thus, the changing characteristics and the range of one aspect of ceramic containers must be considered along with the affect on and influences from others (Blinman 1988; Pool 1992). For example, the characteristics and qualities of clay resources available to potters in a particular area may prevent or encourage the production of certain pottery forms in different regions. This in turn could have facilitated the exchange of specialized pottery forms between areas in which different ceramic resources were available. The types and roles of activities for which pottery containers produced in different areas might have been used would have further influenced the classes and forms of pottery produced. Attempts to produce vessels that would have been desirable or acceptable to groups in various areas would have influenced the decoration and technology of these vessels, as well as contributing to potentially important ties and relationships between groups in separated areas.

This chapter follows recent studies in the northern Rio Grande that have described changing regional systems in the production, distribution, and form of pottery vessels during the Coalition and Classic periods in terms of models of tribalization (Habicht-Mauche 1993; Powell 2002; Vint 1999). While many areas of the northern Rio Grande were first occupied during the Late Developmental period, the Coalition period has often been treated as the starting point in studies of regional trends in relating to settlement, interaction, and exchange in the northern Rio Grande region. In many of these studies, trends noted for Coalition period components are contrasted with those documented for the later Classic period (Habicht-Mauche 1993; Powell 2002; Vint 1999).

Studies framed in terms of tribalization models have largely concentrated on determining how many of the larger communities first appeared in different localities throughout the northern Rio Grande region during the Coalition period, and these were initially organized and integrated into a regional network. These studies have examined evidence relating to the type and nature of social and economic networks between separated communities (Habicht-Mauche 1993; Powell 2002; Vint 1999). During the Coalition period, the widespread sharing of information by separated communities appears to be reflected by the distribution of similar decorative styles and manipulations in pottery found over a very wide area of the northern and middle Rio Grande region (Habicht-Mauche 1993). The high degree of stylistic similarity of Santa Fe Black-on-white produced in the Pajarito Plateau and surrounding areas contrasts with the evidence for paste differences at sites located at a close distance to each other and indicates that vessels produced over a wide area were decorated in a very similar manner (Habicht-Mauche 1993; Kohler et al. 2004; Powell 2002; Ruscavage-Barz 2002; Vint 1999). Other evidence of specialization in the production of whiteware vessels during the Coalition period is reflected by the identification of pit kilns near Santa Fe that were used to produce Santa Fe Black-on-white, but were situated at some distance from village communities (Post and Lakatos 1995). The amount of nonlocal pottery that was clearly produced in regions outside of the northern Rio Grande tends to be very low in Coalition period assemblages.

The widespread homogeneity of locally produced Santa Fe Black-on-white and smeared corrugated at Early Coalition period sites over much of the Rio Grande region has been interpreted as reflecting broad, open, and widespread economic and social networks (Habicht-Mauche 1993). The resulting openness may represent an alternative to the widespread exchange of goods that could have allowed groups in neighboring territories access to information about the availability and distribution of food resources (Habicht-Mauche 1993). This may have represented a strategy that developed to compensate for spatial, seasonality, and annual variability in resources over a wide area.

In contrast, pottery distributions from Classic period components indicate a shift towards a more diverse range of widely exchanged pottery types within restricted production zones (Vint 1999). Regional changes that had begun by the Early Classic period have been interpreted as indicating the emergence, consolidation, and competition between distinct regional alliances (Habicht-

Mauche 1993; Powell 2002). These are thought to reflect alliances supported by formalized reciprocal transactions (Habicht-Mauche 1993). These patterns of economic specialization and regional integration appear to be reflected in the increased differentiation of pottery vessels produced in different areas of the Rio Grande region that began during the late part of the Coalition period. This initial differentiation is represented by the divergence of whiteware types into spatially distinct varieties such as Galisteo Black-on-white in the Galisteo Basin and Wiyo Black-on-white in the Pajarito Plateau, Chama Valley, and Tewa Basin (Habicht-Mauche 1993).

In areas such as the Pajarito Plateau, Chama Valley, and Tewa Basin, the tradition of organic-painted pottery represented in Santa Fe Black-on-white and Wiyo black-on-white types continued with the production of biscuitware types during the Classic period. Distinct glazeware technology was introduced into the southern part of the Pajarito Plateau that replaced earlier organic-painted whitewares (Vint 1999). The technology associated with the production of glazeware pottery did not develop locally in the Rio Grande area region but was introduced by Keres-speaking groups from the Zuni and Little Colorado regions. This new glazeware technology was characterized by a range of styles and techniques indicative of experimentation with this new technology (Snow 1982). By the middle of the 14th century, glazeware pottery had become quite standardized and appears to reflect a level of craftsmanship that surpassed any of preceding decorated pottery forms (Habicht-Mauche 1993). Temper data from sites over a wide area of the northern and middle Rio Grande region indicate that most of the glazeware production occurred at a few production sites in the Rio Grande region (Habicht-Mauche 1993; Kidder and Shepard 1936; Morales 1997; Shepard 1942; 1965; Vint 1999; Warren 1969).

Geology and Resources

Factors resulting in the formation of land forms in the Pajarito Plateau have resulted in the distinct characteristics of clays and tempers available to the potters living in the area. LANL is situated on the central part of the Pajarito Plateau, an east-sloping, dissected tableland bounded by the Jemez Mountains to the west and White Rock Canyon on the east. The geology of this area is the result of a combination of volcanic activity in the Jemez Mountains and surrounding areas and stresses from the Rio Grande rift (see Chapter 2, Volume 1). The Rio Grande rift represents a series of north-south-trending fault troughs spanning from southern Colorado to southern New Mexico. The Pajarito Plateau is located on the southeastern edge of the Jemez Mountains, which represents a huge volcanic landmass that was built over the last 13 million years. The Pajarito Plateau is covered by the gently east-sloping Bandelier tuffaceous materials, which are exposed to depths of several hundred feet. From west to east, canyons are cut progressively deep into the Bandelier tuff, and near the Rio Grande deep canyons expose older igneous and sedimentary rock formations. The Bandelier tuff consists of pyroclastic flows from two extremely large eruptions from the Jemez Mountains, which underwent major eruptions just over a million years ago. These include the Tshierge Member (1.22 million years) and the Otowi Member (1.61 million years). These deposits reflect eruptions that deposited ash and tuff over 300 m thick and that cover much of the Pajarito Plateau (Burton 1982; Woodward 1974). A variety of older formations are exposed in some areas. These include Basalt rocks of the Cerros del Rio Volcanic field and coarse alluvial deposits of the Puye formation including a fanglomerate facies, axial facies, and a lacustrine facies. In some areas this underlies alluvial deposits of the Santa Fe group, as well as igneous bedrock.

Subsequent erosion of these deposits has resulted in land forms dominated by deep canyons that are separated by long narrow mesas that form the Pajarito Plateau. These mostly drain into the eastern mountains as well as the Pajarito Plateau and join the Rio Grande in White Rock Canyon. Recent erosion has resulted in patches of pumiceous soils, which are prominent on surfaces in areas of the Pajarito Plateau. Some of the exposed areas of the Bandelier formation have also eroded into usable clays.

Among the best potential source of clays for pottery are the lacustrine facies of the Puye formation, which include the Culebra Lake deposit in Los Alamos Canyon (see Chapter 2, Volume 1; Lakatos 1995; Warren 1977). This formation consists of extremely light-gray to greenish clays in varied deposits. These clays appear to have accumulated in small lakes formed by the ancient damming of White Rock Canyon (Galusha and Blick 1971). These clays are highly homogeneous and very plastic. These clays contain fine silt fragments and plastic accessory minerals (Lakatos 1995). Clay from the Culebra Lake formation represents a very likely source for at least some of the Santa Fe Black-on-white vessels including those manufactured in locations fairly far from this formation as indicated by paste characteristics of Santa Fe Black-on-white recovered from kilns in the Las Campanas area near Santa Fe (Lakatos 1995).

Tempering material is primarily represented by sources derived from local tuffs (see Chapter 59, this volume). These may represent inclusions that occur naturally in, or material added into, the clay. The very fine size of most of the tuff fragments would be suitable for whiteware vessels. It would have been necessary to add larger particles to grayware pastes. Natural sorting action from alluvial sources and anthills would have resulted in the common occurrence of coarser quartz particles of sufficient size to have been suitable for use in grayware pottery. Such material has been described during this analysis as anthill sand.

Several clay and potential temper sources were collected from the project area (Chapter 59, this volume). Most collected clays appear to represent alluvial formations presumably from the Puye formation including Culebra Lake deposit or pedogenic or alluvial clays near the surface. One of these clays may reflect material weathered from the Bandelier formation. Attempts by Eric Blinman to replicate pottery from these clays were mixed.

Late Developmental Period and the Origins of the Rio Grande System

Evidence from LA 82601, the single Late Developmental period or Kwahe'e phase site included in this analysis, may provide clues concerning factors that influenced the manufacture, distribution, decoration, and use of pottery produced during this period. It may also provide clues to the initial movement of groups into new areas of the Rio Grande region and changing interactions between groups situated in various areas. These changing relationships may have ultimately given rise to the better known regional networks described for the Coalition and Classic periods. While Kwahe'e phase occupations in other areas to the east (e.g., the Tewa

Basin and Santa Fe Valley) appear to have developed directly out of the earlier Red Mesa phase, it is likely that the Pajarito Plateau was unoccupied by ceramic-producing peoples until the very end of the Late Developmental period. Population on the Pajarito Plateau during the Late Developmental period appears to have been extremely small and dispersed and may mainly reflect seasonal use. The Late Developmental period occupation on Pajarito Plateau has gone largely undetected, as the Early Coalition period is still commonly described as the earliest ceramic occupation in this area (Orcutt 1999).

While ceramic assemblages from LA 82601 and other contemporaneous sites in the area exhibit traits and styles similar to those occurring on the Colorado Plateau, they are more similar to those from Late Developmental period complexes occurring in areas along the Rio Grande Valley to the east, with larger population and longer sequences of site occupation. The westward movement of groups to the Pajarito Plateau during the Kwahe'e phase reflects larger trends of movement of people during the very Late Developmental and Early Coalition periods, which also occurred in the Chama Valley, Galisteo Basin, and Pecos Valley. Another interesting aspect of Late Developmental period ceramic assemblages in the northern Rio Grande area is the common occurrence of nonlocal pottery types defined for regions to the west, and is reflected by the occurrence of Cibola and northern San Juan whitewares at LA 82601. A possible area of origin for much of the Cibola pottery is the middle Rio Puerco Valley. Pueblo II period sites in the Rio Puerco Valley contain both Kwahe'e Black-on-white and locally produced Cibola whiteware types and exhibit similar pastes and temper as those occurring on Cibola whiteware types from LA 82601 and other Late Developmental period sites.

In the Rio Puerco Valley, the Kwahe'e period follows a long series of occupational periods dominated by pottery types of the Cibola Ancestral Pueblo tradition. Traits reflecting influences or contacts with areas to the west have sometimes been described in terms of this area being located on the very eastern edge of the vast Chacoan system centered in the San Juan Basin in the Four Corners country (Riley 1995). Contemporary developments in the Four Corners areas, however, are probably best viewed as a distinct regional development that represents responses to pan-regional pressures occurring during the 11^{th} and 12^{th} century. The movement of groups into the northern Rio Grande is followed by the local development of a material culture and interaction system that appears to have represented a distinct regional system in its own right. I have referred to this early network as the Kwahe'e system and it is defined by the widespread production and distribution of similar pottery over wide areas of the northern Rio Grande region (Wilson n.d.). This system is associated with scattered settlements that cover much of the Rio Grande Valley including the middle Rio Grande Valley, Santo Domingo Basin, Rio Puerco Valley, Santa Fe Valley, Tewa Basin, Pecos Valley, and possibly the Taos Valley. Most of the population appears to be concentrated in areas near lower sections of the Rio Grande Valley and adjacent river drainages where Pueblo groups resided historically. Assemblages from most of these locations are dominated by grayware types reflecting a wide range of treatments including plain, incised, neckbanded, and corrugated exteriors and are usually tempered with micaceous granite. Locally produced whiteware forms are decorated with similar designs executed with mineral paint over a lightly slipped surface and are tempered with fine tuff. Characterizations of ceramic assemblages from different areas of the northern Rio Grande do indicate some spatial differences, particularly in the overall frequency of textured treatments on the exterior surface of grayware types.

The boundaries of the Kwahe'e system may reflect both a common ethnicity as well as geographically caused resource constraints on potters participating in this regional economic network. As was the case for contemporaneous Pueblo II regional networks documented elsewhere in the upland Southwest, long-term social and economic ties between separated areas would have provided for the movement of food or other necessary resources between communities in various areas during times of shortages. In addition, the movement of pottery from other regions may have been an important part of this system. Movements onto the Pajarito Plateau may represent the extension of northern Rio Grande groups into new environmental zones as a result of population or climatic pressure.

Characteristics of ceramics at LA 82601 are similar to those noted in Kwahe'e assemblages in areas to the west, although some distinct characteristics may foreshadow traits noted in Early Coalition period ceramic assemblages (see Tables 58.5, 58.6, 58.43, and 58.44). While Cibola whiteware types are present at LA 82601, they tend to occur in lower frequencies than at Kwahe'e period sites in the Tewa Basin, as most of the whiteware types from LA 82601 are tempered with some form of tuff. The frequency of whiteware types at this site at 16.7 percent is also higher than most Kwahe'e period sites, which average about 5 percent. This may indicate the local production of whiteware vessels at or near this site. Grayware types are reflected by a mixture of forms with corrugated types representing a slight majority. While most of the grayware pottery is tempered with a form of micaceous granite, some of which seems to be distinct from that found in grayware pottery produced in areas to the east, a low but significant frequency (23%) is tempered with anthill sand. This may reflect a gradual shift to locally available temper sources. Thus, while characteristic ceramics from this site are certainly within the range noted in Kwahe'e phase sites, some distinct characteristics may already reflect changes in technologies associated with the earliest Coalition period occupation.

Table 58.43. Distribution of ceramic tradition by ware (count/percent) at LA 82601.

Tradition	Gray	White	Total
Northern Rio Grande	295 (98.3)	49 (81.7)	344 (95.6)
Cibola	5 (1.7)	10 (16.7)	15 (4.2)
Upper San Juan		1 (1.7)	1 (0.3)
Total	**300 (100)**	**60 (100)**	**360 (100)**

Table 58.44. Distribution of wares by temper (count/percent) at LA 82601.

Temper	Gray	White	Total
Sand	5 (1.7)	5 (8.3)	10 (2.8)
Granite with mica	191 (63.7)		191 (53.1)
Granite without abundant mica	1 (0.3)		1 (0.3)
Sherd and sand		2 (3.3)	2 (0.6)
Fine tuff or ash		15 (25.0)	15 (4.2)
Large tuff (Vitric) fragments		1 (1.7)	1 (0.3)
Fine tuff and sand		18 (30.0)	18 (5.0)
Fine sandstone		1 (1.7)	1 (0.3)

Temper	Gray	White	Total
Crushed andesite or diorite		1 (1.7)	1 (0.3)
Dark igneous and sand		2 (3.3)	2 (0.6)
Tuff and phenocrysts (anthill sand)	69 (23.0)		69 (19.2)
Mica, tuff, and sand	11 (3.7)	4 (6.7)	15 (4.2)
Mostly tuff with some phenocrysts	19 (6.3)	10 (16.7)	29 (8.1)
Oblate shale and tuff		1 (1.7)	1 (0.3)
Large tuff predominate with anthill sand	4 (1.3)		4 (1.1)
Total	**300 (100)**	**60 (100)**	**360 (100)**

Evidence of Coalition Period Production and Exchange Patterns

Trends relating to the production and exchange of Coalition period pottery largely conform to patterns noted during previous studies and seem to support the previously discussed models of tribalization. The majority of grayware and whiteware pottery was assigned to northern Rio Grande tradition types based on the presence of pastes and tempers characteristic of pottery known to have been produced for a long time on the Pajarito Plateau. The majority of whiteware pottery was assigned to Santa Fe Black-on-white based on design styles executed in organic paint, surface manipulations, and fine pastes with tuff temper characteristic of this type. Almost all the grayware pottery from Coalition period sites are tempered with similar anthill sand and exhibit pastes firing to yellow-red color.

The widespread distributions of organic-painted whitewares with "Santa Fe" designs with pastes and temper indicative of different areas of production have resulted in the proliferation of a number of similar types or varieties exhibiting decorations and manipulations similar to that described for Santa Fe Black-on-white (Habicht-Mauche 1993). An example of such variation is reflected in Warren's identification of 35 temper varieties for this type of pottery recovered at sites in the Cochiti Lake area (Snow 1976).

Recent studies have attempted to document local patterns in the distribution of ceramic paste and decorated styles of Santa Fe Black-on-white from sites on the Pajarito Plateau dating to different spans of the Coalition period (Kohler et al. 2004; Ruscavage-Barz 2002; Vint 1999). Compositional analysis of decorated pottery by Vint (1999) included Santa Fe Black-on-white types. Two techniques were used in the compositional analysis including inductively coupled plasma spectroscopy in order to determine paste composition and temper identifications using a binocular microscope. Variation in the chemical makeup of paste was used to evaluate the diversity of production score. Chemically similar ceramics were placed into groups that aid in identifying their area or origin or at least their differences. Santa Fe Black-on-white sherds were selected from 17 sites within Bandelier National Monument, which were grouped together by Early Coalition or Late Coalition period. Four distinct compositional groups were defined for Santa Fe Black-on-white sherds, with two groups indicating a point of origin in the Bandelier area. Bandelier Group 2 corresponds to moderate to abundant tuff with angular quartz inclusions. Group 1 contains lesser amounts of temper as well as samples with a higher frequency of quartz inclusions. Sites assigned to the Late Coalition period have more Santa Fe

Black-on-white with Group 2 temper than at Early Coalition period components, and may indicate increased technological variation (Vint 1999).

Ruscavage-Barz (2002) also examined variability in Santa Fe Black-on-white between earlier single roomblocks and later plaza pueblo sites dating to the Coalition period from Bandelier National Monument. Comparisons of design diversity values for ceramics from single roomblock and plaza pueblos were used to determine whether the range of design elements changed. Petrographic analysis was used to determine possible changes in patterns of production associated with Santa Fe Black-on-white. Temper analysis indicates a great deal of variability in Santa Fe Black-on-white ceramics. The temper variants local to the Pajarito Plateau include mixtures of fine sand and glassy pumice with occasional tuff. Most of the ceramics fall into one or two categories; more sand than glassy pumice or more glassy pumice than sand.

Petrographic analyses indicated a heterogeneous distribution of temper types as well possible shifts through time. This is indicated by a higher frequency of Santa Fe Black-on-white sherds with more sand at Early Coalition period assemblages, versus higher amounts of added pumice or tuff in Late Coalition period assemblages. Stylistic comparisons of pottery from the two site types also indicate no differences in the variety or manipulation design styles in the two groups. This indicates an increase in design diversity did not occur. The lack of differences in the range of stylistic diversity between single roomblock and plaza pueblos suggests design styles were not being used to differentiate plaza pueblos from other community settlements (Ruscavage-Barz 2002).

Coalition Period Production and Exchange at the C&T Project Sites

Ceramic distributions noted for assemblages from sites assigned to the Coalition period appear to support previously discussed models and observations. The majority of the whiteware sherds from almost all the Coalition period assemblages exhibit decorations executed in organic paint, surface manipulations, and pastes indicating they originated from Santa Fe Black-on-white vessels. The majority of grayware vessels from Coalition period sites exhibited smeared corrugated indentations and a relatively coarse temper described here as anthill sand (also see Chapter 59, this volume and Chapter 75, Volume 4).

Examinations of Santa Fe Black-on-white temper from different assemblages indicates some interesting differences in the sources employed in whiteware vessel production at different sites at sites located close to each other (Tables 58.45 through 58.50). Refiring analyses indicate that the whiteware sherds tend to be fired in a similar manner and are pink to yellow-red in color. These characteristics indicate the use of clays with some iron content. Visual characterizations of ceramic tempers were used to assign temper for the majority of Coalition period whiteware types to a fine tuff category. Sites in which this temper category dominated the whiteware ceramics include LA 99396 (Table 58.45), LA 86534 (Table 58.46), LA 12587 (Table 58.48), LA 4619 (Table 58.49), and LA 4618 (Table 58.50).

Table 58.45. Distribution of temper by ware (count/percent) at LA 99396.

Temper	Gray	White	Total
Fine tuff or ash	2 (3.1)	19 (90.5)	21 (24.7)
Tuff and phenocrysts (anthill sand)	62 (96.9)		62 (72.9)
Oblate shale and tuff		2 (9.5)	2 (2.4)
Total	**64 (100)**	**21 (100)**	**85 (100)**

Table 58.46. Distribution of temper by ware (count/percent) at LA 86534.

Temper	Gray	White	Red	Brown	Glaze	Total
Indeterminate	26 (0.8)					26 (0.7)
Sand	4 (0.1)	2 (0.3)				6 (0.2)
Granite with mica	3 (0.1)	1 (0.2)				4 (0.1)
Sherd		6 (1.0)	1 (100)			7 (0.2)
Sherd and sand		3 (0.5)				3 (0.1)
Fine tuff or ash	31 (0.9)	474 (75.6)				505 (12.9)
Fine tuff and sand		17 (2.7)		1 (100)	1 (100)	19 (0.5)
Sand and mica	1 (0.0)					1 (0.0)
Dark igneous and sherd Chupadero		5 (0.8)				5 (0.1)
Tuff and phenocrysts (anthill sand)	3227 (97.9)	2 (0.3)				3229 (82.3)
Sherd and calcium carbonate		1 (0.2)				1 (0.0)
Oblate shale and sand	1 (0.0)	4 (0.6)				5 (0.1)
Fine tuff, mica, and sand	1 (0.0)					1 (0.0)
Mostly tuff with some phenocrysts	1 (0.0)	112 (17.9)				113 (2.9)
Total	**3295 (100)**	**627 (100)**	**1 (100)**	**1 (100)**	**1 (100)**	**3925 (100)**

Table 58.47. Distribution of temper by ware (count/percent) at LA 135290.

Temper	Gray	White	Red	Total
Indeterminate	1 (0.0)			1 (0.0)
Granite with mica	23 (0.7)			23 (0.6)
Highly micaceous (residual) paste	1 (0.0)			1 (0.0)
Sherd		3 (0.5)	1 (100)	4 (0.1)
Sherd and sand	1 (0.0)	2 (0.3)		3 (0.1)
Fine tuff or ash	6 (0.2)	285 (43.4)		291 (7.2)
Large vitric tuff fragments		2 (0.3)		2 (0.0)
Fine tuff and sand	2 (0.1)	12 (1.8)		14 (0.3)

Temper	Gray	White	Red	Total
Fine sandstone	1 (0.0)			1 (0.0)
Tuff and phenocrysts (anthill sand)	1261 (37.5)	1 (0.2)		1262 (31.4)
Fine Jornada sherd	2 (0.1)			2 (0.0)
Mica and tuff		2 (0.3)		2 (0.0)
Mostly tuff with some phenocrysts	2065 (61.4)	6 (1.1)		2071 (51.5)
Oblate shale and tuff	2 (0.1)	341 (52.0)		343 (8.5)
Large tuff predominate with anthill sand		1 (0.2)		1 (0.0)
Total	**3365 (100)**	**655 (100)**	**1 (100)**	**4021 (100)**

Table 58.48. Distribution of ware by temper (count/percent) at LA 12587.

Temper	Gray	White	Red	Brown	Glaze	Total
Indeterminate		1 (0.1)				1 (0.0)
Sand	4 (0.0)					4 (0.0)
Granite with mica	18 (0.2)					18 (0.2)
Granite without abundant mica	7 (0.1)	1 (0.1)				8 (0.1)
Highly micaceous (residual) paste	1 (0.0)					1 (0.0)
Sherd		5 (0.3)	6 (75)			11 (0.1)
Sherd and sand		12 (0.7)	2 (25)			14 (0.1)
Fine tuff or ash	20 (0.2)	1556 (84.6)			4 (80)	1580 (15.2)
Fine tuff and sand	4 (0.0)	115 (6.3)				119 (1.1)
Fine sandstone	1 (0.0)	2 (0.1)				3 (0.0)
Andesite or diorite and sherd		2 (0.1)				2 (0.0)
Andesite or diorite, sand and sherd		1 (0.1)				1 (0.0)
Self tempered	2 (0.0)					2 (0.0)
Mogollon volcanics				2 (18.2)		2 (0.0)
Latite Keres area					1 (20)	1 (0.0)
Tuff and phenocrysts (anthill sand)	8440 (99.3)	5 (0.3)		8 (72.7)		8453 (81.6)
Shale, sand, and sherd		3 (0.2)				3 (0.0)
Dark igneous southern origin		1 (0.1)				1 (0.0)
Sand and Mogollon volcanics				1 (9.1)		1 (0.0)
Oblate shale and sand		22 (1.2)				22 (0.2)
Fine tuff, mica, and sand		1 (0.1)				1 (0.0)
Mica and tuff		3 (0.2)				3 (0.0)
Shale		7 (0.4)				7 (0.1)
Very fine sand silt		1 (0.1)				1 (0.0)

Temper	Gray	White	Red	Brown	Glaze	Total
Mostly tuff with some phenocrysts	3 (0.0)	101 (5.5)				104 (1.0)
Total	**8500 (100)**	**1839 (100)**	**8 (100)**	**11 (100)**	**5 (100)**	**10,363 (100)**

Table 58.49. Distribution of ware by temper (count/percent) at LA 4619.

Temper	Gray	White	Red	Total
Granite with mica	1 (0.1)			1 (0.1)
Sherd			2 (100)	2 (0.2)
Sherd and sand		4 (1.9)		4 (0.4)
Fine tuff or ash		13 (6.3)		13 (1.2)
Large vitric tuff fragments		1 (0.5)		1 (0.1)
Fine tuff and sand	4 (0.5)	183 (88.8)		187 (17.7)
Tuff and phenocrysts (anthill sand)	840 (99.1)	3 (1.5)		843 (79.8)
Mostly tuff with some phenocrysts	3 (0.4)	1 (0.5)		4 (0.4)
Oblate shale and tuff		1 (0.5)		1 (0.1)
Total	**848 (100)**	**206 (100)**	**2 (100)**	**1056 (100)**

A notable exception to this observation was the dominance of visually distinct temper described as oblate shale and tuff at LA 135290. The majority (52%) of the whiteware sherds from LA 135290 contained oblate shale and tuff temper. Petrographic analyses indicate that sherds assigned to this category exhibited a distinct paste that was characterized by the additional presence of numerous rounded clay fragments. Very fine and sparse tuff fragments were also present. This temper was present in Coalition period whitewares at most other sites, but in very low frequencies. A relatively high frequency (43.4%) of pottery from this site was tempered with a fine tuff that is visually similar to that noted at other sites.

While the majority of whiteware sherds from other sites were tempered with fine tuff, the petrographic characterization of selected Santa Fe Black-on-white sherds indicate that several distinct local sources may have been employed in whiteware production by the different communities. Temper from Santa Fe Black-on-white sherds with some form of tuff temper may be characterized as an extremely variable group and suggests multiple production areas. Petrographic analyses indicate that pottery assigned to the fine tuff category could be placed into two distinct groups; one that was described as Tuff 1 temper (unmodified volcanic tuff) and the other as Tuff 2 temper (modified volcanic tuff). While mineral components in Tuff 1 temper (unmodified) and Tuff 2 temper (modified volcanic tuff) exhibit similarities to each other as well as to tempers common in grayware pottery described as anthill sand, the proportion of lithic grains and the general grain morphology is quite different.

Table 58.50. Distribution of ware by temper (count/percent) at LA 4618.

Temper	Gray	White	Red	Glaze	Historic Plain	Polychrome	Total
Indeterminate		1 (0.1)					1 (0.0)
Sand	1 (0.0)	2 (0.1)					3 (0.01)
Granite with mica	89 (1.1)						89 (0.9)
Granite without abundant mica			1 (14.3)				1 (0.0)
Sherd		8 (0.5)	4 (57.1)				12 (0.09)
Sherd and sand		5 (0.3)					5 (0.03)
Fine tuff or ash	64 (0.8)	1420 (88.8)	2 (28.6)		2 (100)		1488 (14.8)
Large vitric tuff fragments		2 (0.1)					2 (0.0)
Fine tuff and sand		30 (1.9)				4 (100)	34 (0.3)
Fine sandstone	1 (0.0)	1 (0.1)					2 (0.0)
Andesite or diorite and sherd		1 (0.1)					1 (0.0)
Andesite or diorite, sand and sherd		2 (0.1)					2 (0.0)
Latite Keres area				2 (100)			2 (0.0)
Tuff and phenocrysts (anthill sand)	8301 (98.2)	7 (0.4)					8308 (82.5)
Oblate shale and sand		3 (0.2)					3 (0.01)
Shale		13 (0.8					13 (0.1)
Mostly tuff with some phenocrysts		101 (6.3)					101 ((1.0)
Oblate shale and tuff		3 (0.2)					3 (0.01)
Total	**8456 (100)**	**1599 (100)**	**7 (100)**	**2 (100)**	**2 (100)**	**4 (100)**	**10,070 (100)**

Tuff 1 temper (unmodified volcanic tuff) is characterized by angular to very angular temper grains of low sphericity with a range of grain sizes from fine to very coarse sand. Vitric felsite is the predominant component, along with either quartz or sanidine. Tuff 2 temper (modified volcanic tuff) was defined as representing a mixture of volcanic tuff with some other tempering material, sufficiently distinguishable by either its composition or its morphology to be considered a purposeful addition. Main modifying components observed are anthill sand and incompletely wetted clay lumps. Morphologically, some Tuff 2 (modified volcanic tuff) tempers can be similar to anthill sand, although observed mixtures are variable in composition and morphological characteristics.

While LA 86534 is located in the Airport Tract near LA 135290, the majority of whiteware pottery was tempered with some form of fine tuff, and clay fragments were very rare. At LA 86534, four of the seven whiteware sherds subjected to petrographic analysis contained Tuff 2 (modified tuff) temper. The remaining sherds are tempered with Tuff 1 temper (unmodified volcanic tuff; n = 2) and anthill sand (n = 1). Seven of the nine whiteware sherds from LA 12587 have Tuff 2 (modified volcanic tuff) temper while one is tempered with anthill sand with clay lumps and another has Tuff 1 (unmodified volcanic tuff) temper. The primary differences in temper from Santa Fe Black-on-white sherds from LA 86534 and LA 12587 is a slightly higher frequency of sherds with numerous fine silt particles at LA 86534. A reexamination of a sample of Santa Fe Black-on-white sherds from the two sites indicates a slightly higher frequency of sherds with a silty paste at LA 86534. It is possible that the higher frequency of Tuff 1 (unmodified) temper noted at LA 86534 along with the distinct tempers noted at LA 135290 may reflect variations in clays from the Culebra Lake deposits that were being used during the Early and Middle Coalition period (Lakatos 1995).

Petrographic analysis indicates strong differences in the whiteware from LA 4618 (Wilson 2006). Six of the nine whiteware sherds (including Santa Fe and Wiyo Black-on-white) are tempered with Tuff 1 temper (unmodified volcanic tuff). Visual characteristics of temper in whitewares from LA 4618 indicate that the majority of sherds from this site were tempered with similar material. Biscuitware pottery is consistently tempered with Tuff 1 temper (unmodified volcanic tuff). Both compositionally and morphologically, the Tuff 1 (unmodified tuff) tempers in whiteware pottery from this site are generally similar to those of other sites studied. As a result, a shift to the use of crushed tuff temper, common during the Classic period, may have first occurred during the Late Coalition period. Three of the Santa Fe Black-on-white sherds from this site, however, are tempered with granitic sand. This temper type is considered to be non-local to the Pajarito Plateau and only occurs in a few grayware samples from sites also dating to the Classic period. This further suggests some shared characteristics in the use of specific tempers used by the inhabitants of LA 4618 and later Classic period sites. Later changes in whiteware pottery may reflect either the use of natural clay sources with higher amounts of tuff temper or the actual addition of fine tuff or ash to the clay.

Some of these differences were not readily detected during the binocular examination of temper, during which roughly equal amounts of tuff and tuff and sand were recorded. Most of the Santa Fe Black-on-white sherds are characterized by combinations of a variety of very small particles in varying proportions. These include small, rounded, white to tan silt grains, small angular white laminated ‘pumice’ particles, small linear black to glassy ‘ash,’ and larger rounded clear quartz phenocrysts. Examples of temper with numerous larger quartz fragments were assigned to the anthill sand or tuff with phenocrysts category. Examples with distinct sand grains were assigned to a tuff and sand category. Examples dominated by larger tuff grains were assigned to a larger vitric tuff category. The differences in combinations and frequencies of most particles, as examined through a binocular microscope, tended to be gradational; in most cases, it was not possible to differentiate temper. This resulted in the classification of most examples with very fine particles size as fine tuff.

Later changes, which are first reflected by pastes from LA 12587 and then more dramatically by those from LA 4618, may indicate a shift toward the use of self-tempered clay sources. These sources have higher amounts of tuff temper or the actual addition of fine tuff or ash to the clay and appear to correspond with observations from other studies. The shift from Santa Fe Black-on-white ceramics produced with local tempers to types with added temper is not only represented by transitions resulting in the production of biscuitwares on the Pajarito Plateau and Chama Valley, but is also reflected by the appearance of various other types with added tempers produced in various areas of the Rio Grande during the latter part of the Coalition period. Examples of such types include Pindi Black-on-white with large crushed pumice temper, Galisteo Black-on-white with sherd temper, and Poge Black-on-white with sand temper.

The majority of grayware ceramics from Coalition period sites are tempered with a similar material consisting of a very-coarse-grained angular sand of mixed sphericity. This material is characterized here as anthill sand and appears to have been consistently used in grayware vessels to provide a fairly coarse material suitable for utilitarian functions such as repeated exposure to heat during cooking. Comparisons with collected alluvial sands from two local drainages, Pueblo and Los Alamos canyons, and anthill sands allowed discrimination among the coarse sand tempers on the basis of morphological characteristics (see Chapter 59, this volume). Anthill sand dominates in grayware pottery from all the Coalition period sites examined here and can be readily distinguished from alluvial sand both in terms of morphology and composition. Anthill sand is characterized by angular to subangular sand of mixed sphericity with a bimodal grain size distribution. Composition in the study area is dominated by sanidine and quartz, but plagioclase feldspar is also present. Later grayware forms, which are associated with Classic period occupations, were occasionally tempered with granite.

All of the nine thin-sectioned grayware sherds from LA 135290 were tempered with anthill sand. There was one exception that contained sanidine and quartz as the dominant particles (see Chapter 59, this volume). Of the eight grayware sherds from LA 86534, five were tempered with anthill sand. All of these contained sanidine and quartz as the two most common particles. Three were tempered with Tuff 1 (unmodified tuff) temper. Under the petrographic microscope, the samples from LA 86534 appear to have a very homogeneous temper composition that is characterized primarily by sanidine and quartz, with lesser amounts of sanidine-bearing felsite and minor plagioclase. Samples from LA 135290, while also characterized primarily by sanidine and quartz, show much more varied secondary and minor temper components including sanidine felsite and minor plagioclase, tuff and vitric felsites, intermediate volcanics, and K-feldspar. Quantitatively, the proportion of plagioclase is lower and is more variable in the samples from LA 135290 relative to those samples from LA 86534. All 10 of the grayware sherds were tempered with anthill sand. This temper is generally similar in both composition and morphology to anthill sand tempers from the other sites.

While similar tempers were noted in Santa Fe Black-on-white ceramics occurring at sites throughout much of the Rio Grande region, it is likely most of the Santa Fe Black-on-white sherds were produced on the Pajarito Plateau. Styles and manipulations noted in these sherds are similar to those noted in Santa Fe Black-on-white ceramics from other areas of the Rio Grande, but are distinct from those noted in other regions of the Southwest.

The examination of pastes and manipulations associated with grayware pottery from the Coalition period may also provide clues concerning the production and exchange of utility forms during this period. Grayware ceramics from the C&T Project Coalition period sites tend to be fairly consistent in terms of pastes and surface characteristics. Vessel forms are almost exclusively represented by wide mouth jars with dark gray to black sooted exteriors. Exteriors surfaces on grayware types exhibit similar smeared corrugated treatments and interiors are completely unpolished with temper grains showing through the surface. Grayware ceramics consistently fire to similar red colors in a controlled oxidation atmosphere, which indicates the use of high-iron clays.

Grayware ceramics from all the C&T Project Coalition period sites examined consistently exhibit anthill sand temper. This temper is characterized visually by the presence of significant amounts of clear sand-like quartz phenocryst particles that are relatively large as compared to other particles and surrounded by tuff particles of various sizes. The basis for the separation of this temper from other "local" tuff categories was the presence of quartz phenocryst particles of large size. While variability was noted in the density and characteristics of these particles, they could not readily be separated into distinct categories. Almost all the indented corrugated and smeared corrugated sherds that contained anthill sand were subjected to petrographic analysis and contained mineralic temper. Comparisons with reference samples of anthill sand allowed for the recognition of this bimodal distribution as the result of a mixture between a very coarse mineral sand or the anthill sand component and the much finer sand contained in the clay. Petrographic analysis indicates possible differences in the anthill sand from the two Coalition period sites. Those from LA 86534, which is located in the Airport Tract, were characterized as almost exclusively of felsic volcanic origin either of a vitric or tuffaceous matrix. In contrast, most of the samples from LA 12587 in the White Rock Tract included plagioclase-rich, trachytic felsic, or indeterminate volcanic. This lithology appears to be absent within the Bandelier Tuff volcanic sequence that characterizes the Pajarito Plateau and likely corresponds to the more mafic composition of the Cerros del Rio volcanic field, which is located east of LANL. These attributes could indicate some specialization and short-distant exchange of this pottery.

Temper assigned to this category appears to have first been used during the Coalition period and reflects the common utilization of sorted tuff sources by potters on the Pajarito Plateau. The recognition of this temper as compared to micaceous granites and other materials utilized outside the Pajarito Plateau may provide the opportunity to examine broader patterns in production and exchange ties not possible through the visual examination of whiteware temper where tuff temper was used over a wide area.

During the Late Developmental period, when settlements in the northern Rio Grande region were mainly distributed along the drainages of the Rio Grande Valley (e.g., the Tewa and Santo Domingo basins), almost all grayware pottery was tempered with crushed micaceous granite common in this area (Wilson, n.d.). It is interesting to note that the majority of utilitywares from LA 82601, the only Late Developmental site examined during this study, are tempered with granite with mica although a significant number are also tempered with anthill sand (Table 58.51). As settlements became established at sites on the Pajarito Plateau and in other areas where micaceous granite sources were not readily available, material for potential temper may have been largely limited to local tuff or ash sources. The need for temper suitable for using in gray cooking jars was met through the use of material from sorted tuff deposits where larger quartz grains would have been present.

The majority of the grayware pottery from Coalition period sites in the Santo Domingo Basin is also tempered with anthill sand temper where it replaces the micaceous granite temper present in graywares produced during the Late Developmental period. Petrographic analyses conducted during the Peña Blanca Project indicate that grayware sherds tempered with anthill sand recovered from Coalition period sites from the Cochiti area were not locally produced but may represent pottery produced on the Pajarito Plateau. This may indicate the specialization and short-distant movement of grayware pottery somewhere on the Pajarito Plateau to the Cochiti area, and may reflect trends similar to those seen in the petrographic analyses of the C&T Project sites.

Micaceous granite temper that appears to be identical to that used during the Late Developmental period (Wilson, n.d.) continued to be used at settlements in the Tewa Basin during the Coalition period. At the Tesuque Valley Ruin, a Coalition period site near Tesuque Pueblo, almost all the grayware types were tempered with similar micaceous granite. These differences indicate very little exchange of utilitywares between the Tewa Basin and Pajarito Plateau sites. While grayware from Coalition period assemblages in the Santa Fe Valley are dominated by micaceous granite temper, about one-fifth of the graywares are tempered with anthill sand. It is possible these settlements were more closely linked to the Cochiti area and the Pajarito Plateau through routes along the Santa Fe River than those in the Tewa Basin.

Other distinct characteristics were noted in grayware pottery from the Coalition period C&T Project sites when compared to contemporary pottery produced in other regions of the Southwest. The most obvious trait is the dominance of smeared corrugated manipulations. Another distinct characteristic relates to the rarity of distinct rim fillets, which are present on the majority of contemporary grayware vessels produced in most Southwestern regions. Over 70 percent of the corrugated grayware pottery for which this attribute was recorded has no rim fillet. The interior of this grayware pottery is very smoothed, particularly when compared to contemporary micaceous grayware pottery from Coalition period sites in the Tewa Basin.

Table 58.51. Distribution of ware groups and ceramic traditions at Coalition period sites.

Ware	Tradition	4618	12587	61035	85864	86534	86607	99396	135290	Total
Gray	Indeterminate							1 (1.2)		1 (0.0)
	Northern Rio Grande	8455 (84.0)	8499 (82.0)	7 (63.6)	1 (50.0)	3295 (84.0)	3 (33.3)	63 (74.1)	3365 (83.7)	23,687 (83.2)
	Cibola	1 (0.0)	1 (0.0)							2 (0.0)
White	Indeterminate	1 (0.0)	2 (0.0)							3 (0.0)
	Northern Rio Grande	1588 (15.8)	1828 (17.6)	4 (36.4)	1 (50.0)	615 (15.7)	6 (66.7)	21 (24.7)	652 (16.2)	4715 (16.6)
	Cibola	7 (0.1)	2 (0.0)			5 (0.1)			2 (0.0)	16 (0.1)
	Northern San Juan	3 (0.0)	6 (0.1)							9 (0.0)
	Northern Jornada Mogollon		1 (0.0)			7 (0.2)				8 (0.0)
	Eastern Mogollon								1 (0.0)	1 (0.0
Red	Cibola	6 (0.1)	8 (0.1)			1 (0.0)			1 (0.0)	16 (0.1)
Brown	Northern Rio Grande		8 (0.1)							8 (0.0)
	Mogollon Highlands		3 (0.0)							3 (0.0)
Glaze	Middle Rio Grande	2 (0.0)	5 (0.0)			1 (0.0)				8 (0.0)
Histor-ic Plain	Historic Tewa	3 (0.0)								2 (0.0)

Ware	Tradition	4618	12587	61035	85864	86534	86607	99396	135290	Total
Histor-ic Poly-chrome	Historic Tewa	4 (0.0)								4 (0.0)
Total		**10,070 (100)**	**10,363 (100)**	**11 (100)**	**2 (100)**	**3925 (100)**	**9 (100)**	**85 (100)**	**4021 (100)**	**28,486 (100)**

The dominance of grayware sherds with anthill sand, red-yellow firing pastes, and similar surface characteristics indicates the utilization of very distinct resources and technologies characteristic of the Pajarito Plateau. The rarity of pottery tempered with micaceous granite that would have originated in the valleys to the west indicates the absence of exchange of grayware pottery between these areas and seems to indicate these areas were not closely linked in an exchange network involving the movement of grayware vessels. This trend contrasts with the dominance of anthill sand, which appears to have been locally unavailable in grayware vessels in Coalition period sites in the Cochiti area and a small significant frequency of grayware containing this temper in Coalition period sites in the Santa Fe Valley.

In summary, paste characteristics noted for both decorated whiteware and grayware pottery seem to reflect the utilization of tuff from formations or other sources on the Pajarito Plateau, with distinct variations selected for the different ware groups. Petrographic analyses indicate the possible utilization of distinct sources in the production of both whiteware and grayware pottery at different sites. However, these distinctions have thus far been difficult to distinguish through visual analysis, although future studies may try to extend distinctions made during petrographic analysis to visual distinctions. There is some evidence of spatial specialization of production and short-distant movement of grayware vessels. Evidence of local production also contrasts with the strong similarities in design styles of whiteware and grayware textures and support previous models indicating the local production of similarly constructed and decorated pottery over an extremely wide area of the Rio Grande region.

Almost all the pottery from Coalition period sites was assigned to pottery types of the northern Rio Grande region (Table 58.51). The use of extremely distinct paste technologies and decorative conventions by potters outside the northern Rio Grande region provide for a relatively easy identification of pottery produced in a number of different regions. Pottery assigned to the Rio Grande whiteware tradition includes single examples of Jemez Black-on-white and Gallina Black-on-white from areas to the west. Other nonlocal ceramic traditions reflected by types from Coalition period sites include Cibola Whiteware, Northern Jornada Mogollon (Chupadero) Whitewares, White Mountain Redware, San Juan Whiteware, and Mogollon Brownware types. The presence of this pottery indicates a pattern of very limited exchange with groups over a very wide area. However, this exchange network does not appear to have been concentrated in a particular area or even direction, but seems to reflect sporadic contacts or ties with groups scattered throughout the highlands of the Southwest.

Evidence of Classic Period Exchange and Production Patterns

Distributions associated with the small amount of pottery from Classic period components also seem to support patterns of economic specialization and regional integration discussed in models of tribalization (Habicht-Mauche 1993). The widespread exchange of specialized pottery forms produced in different areas of the Rio Grande region would have ultimately linked multiple pueblos into distinct "tribal" networks (Habicht-Mauche 1993; Vint 1999). In the northernmost areas of the Rio Grande region, which includes much of the Pajarito Plateau, Chama Valley, and Tewa Basin, the tradition of organic-painted whiteware forms reflected earlier in Santa Fe Black-on-white continued with the production of biscuitware types throughout the Classic period. In much of the southern part of this region where Santa Fe Black-on-white was also produced during the Coalition period, this earlier decorated black-on-white technology was replaced by a glazeware technology that first developed in areas to the west. Early in the Classic period, distinct forms of glazeware with distinct tempers were produced over a wide area. The north/south distributions of biscuitware versus glazeware types appear to roughly correspond with historical boundaries of Tewa- versus Keres-speaking Pueblo groups (Vint 1999). Both Keres and Tewa Pueblo groups claim the area between Frijoles and Ancho canyons, which is north of the Cochiti area and functions as the temporal dividing line between these groups (Mera 1935). Sourcing and petrographic studies conducted on Rio Grande glazeware pottery indicate the specialization and wide distribution of glazeware forms produced in specific areas where distinct temper resources were available and used (Shepard 1942, 1965; Warren 1969).

Most of the ceramics from Classic period sites are represented by types in the northern Rio Grande tradition, although glazeware types are represented in low frequencies. Characteristics of temper and clay noted for grayware and whiteware include some material sources similar to those noted for earlier Coalition period sites, but overall distributions are very different.

The majority of the grayware pottery from Classic period sites exhibited a combination of pastes and surface treatment. Most of the graywares from Classic period assemblages exhibited yellow-red firing pastes and smeared corrugated treatments similar to that noted in grayware types from the Coalition period sites. Some of the pottery from Classic period sites tempered with anthill sand also exhibited micaceous slips and treatments common in Sapawe utilityware.

Petrographic analysis of grayware pottery associated with the Classic period sites contained sherds tempered with anthill sand that indicate they were tempered with plagioclase trachytic felsic volcanic rock (Chapter 59, this volume). This temper is similar to that noted in Coalition period utilitywares and indicates the continual use of similar sources probably derived with the Bandelier tuff sequence. Grayware that have either granite with mica or Sapawe Igneous temper were distinguished from the local anthill sand temper by the presence of visible minerals, and they have mineralic tempers derived from a granitic or metagranitic temper source. Temper assigned to both categories was described during the petrographic analyses as crushed granitic rock with mica. In contrast to anthill sand, sources for micaceous granitic rock temper would not have been readily available to potters on the Pajarito Plateau. The similarity of temper and other characteristics of Sapawe Gray with pottery tempered with micaceous granitic rock from the nearby Tewa Basin indicate that this pottery may have originated in this area where the micaceous temper is locally available.

Distributions of grayware temper indicate a great deal of variation in temper type from Classic period sites (Tables 58.52 through 58.74). Sites where grayware sherds were examined are largely dominated (75% or more) by anthill sand temper and are represented at LA 21596B, LA 85404, LA 85606, LA 85861, LA 135291, LA 128804, LA 128805, and LA 135292; whereas those sites where the majority of grayware sherds were largely dominated by some form of micaceous granitic rock temper consist of LA 85867, LA 70025, LA 15116, LA 86605, and LA 127634. Sites in which relatively even mixtures of the two temper groups were represented in grayware sherds consist of LA 21596C, LA 127627, LA 85413, LA 86637, and LA 85408. At one other site (LA 85411), the most common temper category was large vitric tuff. This temper probably originated from local tuff sources, but appears to represent a distinct source distinguished from those used at other Classic period sites in the area. Distributions of temper classes appear to be variable through time and across spaces and a wide distribution of temper groups was noted within and between tracts as well as in different temporal spans within the Classic period.

Most of the decorated pottery from Classic period sites includes whiteware forms with similar paste and surface characteristics resulting in their assignment to biscuitware types or Sankawi Black-on-cream. This pottery consistently has a similar fine tuff temper and red firing paste. The dominance of these whiteware types in decorated assemblages and the presence of locally available resources indicate they were probably locally produced. Much of this pottery is well made and exhibits similar buff to tan surfaces, painted decorations, and rim profiles. It is likely these whiteware types represent specialized forms produced at or near their site of recovery, although similar pottery appears to have been widely exchanged into other areas of the Rio Grande region. Petrographic analysis of the biscuitwares indicates a homogenous group, particularly when compared to Coalition period whiteware pottery composed primarily of lithic volcanic tempers, which appear to be derived from vitric felsite (Chapter 59, this volume). The biscuitware types have tempers that are characterized by their uniform volcanic composition, angular to very angular morphology, low sphericity, and high frequency of vitric felsites as the predominant component. Biscuitware types appear to be consistently tempered with Tuff 1 temper (unmodified volcanic tuff), and a shift to the use of crushed tuff temper common during the Classic period may have first occurred during the late part of the Coalition period. Although distributions of temper in biscuitware types seem to suggest the utilization of fewer sources and thus greater specialization than represented in Santa Fe Black-on-white, the distribution of feldspar types in the biscuitware types displays some site variability that may suggest local production.

Almost none of the pottery associated with the Classic period was assigned to types other than those associated with the middle or northern Rio Grande tradition. The few grayware sherds assigned to the Cibola tradition on the basis of sand temper still could have been produced in the northern Rio Grande region. The strongest evidence of pottery produced in other areas of the Pajarito Plateau is represented by the presence of glazeware and micaceous utilityware types. As previously indicated, the glazeware types may represent specialized forms from several different production areas. Petrographic analyses indicate that the similarities in biscuitware temper from different sites contrast with the differences in earlier Santa Fe Black-on-white from the different sites examined during the present study. These differences indicate that the areas of production of biscuitware types may have been more limited and specialized than for earlier Santa Fe Black-on-white.

The presence of grayware forms with micaceous temper may reflect increasing interaction with other groups in the Tewa or Santo Domingo basins as well as other areas where this temper was more commonly used (e.g., see Chapter 76, Volume 4). The increase in exchange of micaceous grayware vessels may also represent the movement of increasingly specialized cooking forms. Such specialization may be reflected in the thinness of this pottery and the application of distinct micaceous slips on the exterior surface.

Table 58.52. Distribution of ware groups and ceramic tradition (count/percent) at Classic period sites.

Ware	Tradition	15116	70025	85408	85411	85413	85414	85867	86605	86637	87430
Gray	Indeterminate										1 (0.2)
	Rio Grande (Prehistoric)	19 (22.4)	147 (79.5)	6 (7.5)	217 (67.8)	424 (85.8)	27 (77.1)	54 (79.4)	14 (13.3)	29 (26.4)	408 (83.8)
	Cibola			7 (8.8)	15 (4.7						
White	Rio Grande (Prehistoric)	63 (74.1)	38 (20.5)	63 (78.8)	88 (27.5)	55 (11.1)	5 (14.3)	14 (20.6)	91 (86.7)	78 (70.9)	78 (16.0)
Red	Cibola										
Glaze	Northern Rio Grande	3 (3.5)		4 (5.0)		14 (2.8)	3 (8.6)			3 (2.7)	
Micaceous	Northern Rio Grande										
Total		**85 (100)**	**185 (100)**	**80 (100)**	**320 (100)**	**494 (100)**	**35 (100)**	**68 (100)**	**105 (100)**	**110 (100)**	**487 (100)**

Table 58.52 (continued). Distribution of ware groups and ceramic tradition (count/percent) at Classic period sites.

Ware	Tradition	110126	127625	127627	127634	128804	128805	135291	135292	139418	Total
Gray	Indeterminate										1 (0.0)
	Rio Grande (Prehistoric)		15 (53.6)	62 (75.6)	57 (38.3)	199 (76.0)	126 (63.3)	53 (64.6)	54.4 (60.9)		1911 (66.0)
	Cibola				1 (0.7)						23 (0.8)
White	Rio Grande (Prehistoric)	9 (81.8)	12 (42.9)	17 (20.7)	85 (57.0)	37 (14.1)	49 (24.6)	29 (35.4)	35 (39.1)	5 (19.2)	851 (29.4)
Red	Cibola						1 (0.5)				1 (0.0)

Ware	Tradition	110126	127625	127627	127634	128804	128805	135291	135292	139418	Total
Glaze	Northern Rio Grande		1 (3.6)	3 (3.7)	6 (4.0)	22 (8.4)	18 (9.0)			21 (80.8)	98 (3.4)
Micaceous	Northern Rio Grande	2 (18.2)				4 (1.5)	5 (2.5)				11 (0.4)
Total		**11 (100)**	**28 (100)**	**82 (100)**	**149 (100)**	**262 (100)**	**199 (100)**	**82 (100)**	**89 (100)**	**26 (100)**	**3383 (100)**

Table 58.53. Distribution of ware by temper (count/percent) at LA 21596B.

Temper	Gray	White	Red	Glaze	Micaceous	Total
Granite with mica	11 (12.0)				46 (86.8)	57 (22.2)
Highly micaceous paste	8 (8.7)				1 (1.9)	9 (3.5)
Fine tuff or ash		78 (70.9)		1 (100)		79 (30.7)
Fine tuff and sand		1 (0.9)			1 (1.9)	2 (0.8)
Sand and mica		2 (1.8)				2 (0.8)
Tuff and phenocrysts (anthill sand)	69 (75.0)	2 (1.8)			5 (9.4)	76 (29.6)
Basalt and sand			1 (100)			1 (0.4)
Tuff, mica, and sand	2 (2.2)	15 (13.6)				17 (6.6)
Mica and tuff	2 (2.2					2 (0.8)
Mica, tuff, and sand		1 (0.9)				1 (0.4)
Mostly tuff with some phenocrysts		11 (10.0)				11 (4.3)
Total	**92 (100)**	**110 (100)**	**1 (100)**	**1 (100)**	**53 (100)**	**257 (100)**

Table 58.54. Distribution of ware by temper (count/percent) at LA 21596C.

Temper	Gray	White	Brown	Glaze	Micaceous	Total
Sand	2 (1.4)	1 (0.5)			1 (3.1)	4 (1.0)
Granite with mica	68 (48.2)				29 (90.6)	97 (25.4)
Highly micaceous (residual) paste	21 (14.9)					21 (5.5)
Fine tuff or ash	3 (2.1)	74 (37.6)		1 (10)		78 (20.4)
Fine tuff and sand		4 (2.0)				4 (1.0)
Mogollon volcanics			1 (50)			1 (0.3)
Tuff and phenocrysts (anthill sand)	45 (31.9)	3 (1.5)			2 (6.3)	50 (13.1)
Sand and Mogollon volcanics			1 (50)			1 (0.3)
Basalt and sand				9 (90)		9 (2.4)
Tuff, mica, and sand	2 (1.4)	47 (23.9)				49 (12.8)
Mica and tuff		25 (12.7)				25 (6.5)
Mostly tuff with some phenocrysts		43 (21.8)				43 (11.3)
Total	**141 (100)**	**197 (100)**	**2 (100)**	**10 (100)**	**32 (100)**	**382 (100)**

Table 58.55. Distribution of ware by temper (count/percent) at LA 85404.

Temper	Gray	White	Glaze	Total
Fine tuff or ash		39 (90.7)		39 (19.6)
Fine tuff and sand		2 (4.7)		2 (1.0)
Tuff and phenocrysts (anthill sand)	113 (92.6)			113 (56.8)
Tuff, mica, and sand		1 (2.3)		1 (0.5)
Mica and tuff		1 (2.3)		1 (0.5)
Basalt			34 (100)	34 (17.1)
Sapawe micaecous temper	9 (7.4)			9 (4.5)
Total	**122 (100)**	**43 (100)**	**34 (100)**	**199 (100)**

Table 58.56. Distribution of ware by temper (count/percent) at LA 85861.

Temper	Gray	White	Total
Sherd and sand		1 (1.1)	1 (0.2)
Fine tuff or ash		10 (11.0)	10 (2.3)
Fine tuff and sand		78 (85.7)	78 (17.8)
Tuff and phenocrysts (anthill sand)	345 (99.1)		345 (78.6)
Oblate shale and tuff		2 (2.2)	2 (0.5)
Sapawe micaecous temper	3 (0.9)		3 (0.7)
Total	**348 (100)**	**91 (100)**	**439 (100)**

Table 58.57. Distribution of ware by temper (count/percent) at LA 86606.

Temper	Gray	White	Red	Total
Granite with mica	1 (0.8)			1 (0.7)
Sherd and sand			1 (100)	1 (0.7)
Fine tuff or ash		8 (47.1)		8 (5.6)
Fine tuff and sand		7 (41.2)		7 (4.9)
Tuff and phenocrysts (anthill sand)	119 (95.2)			119 (83.2)
Mostly tuff with some phenocrysts	5 (4.0)			5 (3.5)
Oblate shale and tuff		2 (11.8)		2 (1.4)
Total	**125 (100)**	**17 (100)**	**1 (100)**	**143 (100)**

Table 58.58. Distribution of ware by temper (count/percent) at LA 127635.

Temper	Gray	White	Total
Indeterminate	3 (1.0)		3 (0.8)
Granite with mica	12 (3.8)		12 (3.2)
Sherd		2 (3.4)	2 (0.5)
Fine tuff or ash	8 (2.6)	37 (62.7)	45 (12.1)
Fine tuff and sand		11 (18.6)	11 (3.0)
Tuff and phenocrysts (anthill sand)	266 (85.3)	5 (8.5)	271 (73.0)

Temper	Gray	White	Total
Oblate shale and tuff		4 (6.8)	4 (1.1)
Sapawe micaecous temper	23 (7.4)		23 (6.2)
Total	**312 (100)**	**59 (100)**	**371 (100)**

Table 58.59. Distribution of ware by temper (count/percent) at LA 127627.

Temper	Gray	White	Glaze	Total
Granite with mica	21 (33.9)	2 (11.8)		23 (28.0)
Fine tuff or ash	1 (1.6)	13 (76.5)		14 (17.1)
Fine tuff and sand		1 (5.9)		1 (1.2)
Latite Keres area	2 (3.2)			2 (2.4)
Tuff and phenocrysts (anthill sand)	32 (51.6)	1 (5.9)		33 (40.2)
Basalt			3 (100)	3 (3.7)
Sapawe micaecous temper	6 (9.7)			6 (7.3)
Total	**62 (100)**	**17 (100)**	**3 (100)**	**82 (100)**

Table 58.60. Distribution of ware by temper (count/percent) at LA 85413.

Temper	Gray	White	Glaze	Total
Granite with mica	1 (0.2)			1 (0.2)
Highly micaceous (residual) paste	1 (0.2)			1 (0.2)
Fine tuff or ash		6 (10.7)		6 (1.2)
Fine tuff and sand		49 (87.5)		49 (9.9)
Latite Keres area		1 (1.8)	11 (78.6)	12 (2.4)
Tuff and phenocrysts (anthill sand)	3 (0.7)			3 (0.6)
Galisteo igneous latite			3 (21.4)	3 (0.6)
Mostly tuff with some phenocrysts	173 (40.8)			173 (35.0)
Sapawe micaecous temper	246 (58.0)			246 (49.8)
Total	**424 (100)**	**56 (100)**	**14 (100)**	**494 (100)**

Table 58.61. Distribution of ware by temper (count/percent) at LA 85867.

Temper	Gray	White	Total
Large vitric tuff fragments	3 (5.6)		3 (4.4)
Fine tuff and sand		14 (100)	14 (20.6)
Mostly tuff with some phenocrysts	2 (3.7)		2 2.9)
Sapawe micaecous temper	49 (90.7)		49 (72.1)
Total	**54 (100)**	**14 (100)**	**68 (100)**

Table 58.62. Distribution of ware by temper (count/percent) at LA 135291.

Temper	Gray	White	Total
Granite without abundant mica	13 (24.5)		13 (15.9)
Fine tuff or ash		26 (89.7)	26 (31.7)

Temper	Gray	White	Total
Tuff and phenocrysts (anthill sand)	40 (75.5)	3 (10.3)	43 (52.4)
Total	**53 (100)**	**29 (100)**	**82 (100)**

Table 58.63. Distribution of ware by temper (count/percent) at LA 70025.

Temper	Gray	White	Total
Fine tuff or ash		34 (89.5)	34 (18.4)
Large vitric tuff fragments		2 (5.3)	2 (1.1)
Fine tuff and sand		1 (2.6)	1 (0.5)
Tuff and phenocrysts (anthill sand)	22 (15.0)		22 (11.9)
Oblate shale and tuff		1 (2.6)	1 (0.5)
Sapawe micaecous temper	125 (85.0)		125 (67.6)
Total	**147 (100)**	**38 (100)**	**185 100)**

Table 58.64. Distribution of ware by temper (count/percent) at LA 85411.

Temper	Gray	White	Total
Sand	16 (6.9)		16 (5.0)
Fine tuff or ash		2 (2.3)	2 (0.6)
Large vitric tuff fragments	109 (47.0)		109 (34.1)
Fine tuff and sand		84 (95.5)	84 (26.3)
Tuff and phenocrysts (anthill sand)	2 (0.9)		2 (0.6)
Mostly tuff with some phenocrysts	5 (2.2)		5 (1.6)
Oblate shale and tuff		2 (2.3)	2 0.6
Large tuff predominate with anthill sand	28 (12.1)		28 (8.8)
Sapawe micaecous temper	72 (31.0)		72 (22.5)
Total	**232 (100)**	**88 (100)**	**320 (100)**

Table 58.65. Distribution of ware by temper (count/percent) at LA 86637.

Temper	Gray	White	Glaze	Total
Indeterminate	1 (3.4)			1 (0.9)
Granite with mica	12 (41.4)	1 (1.3)		13 (11.8)
Fine tuff or ash		68 (87.2)		68 (61.8)
Gray crystalline basalt			3 (100)	3 (2.7)
Tuff and phenocrysts (anthill sand)	16 (55.2)			16 (14.5)
Mica and tuff		2 (2.6)		2 (1.8)
Mostly tuff with some phenocrysts		7 (9.0)		7 (6.4)
Total	**29 (100)**	**78 (100)**	**3 (100)**	**110 100)**

Table 58.66. Distribution of ware by temper (count/percent) at LA 15116.

Temper	Gray	White	Glaze	Total
Granite with mica	1 (5.3)			1 (1.2)
Fine tuff or ash		62 (98.4)		62 (72.9)
Tuff and phenocrysts (anthill sand)	3 (15.8)	1 (1.6)		4 (4.7)
Basalt			3 (100)	3 (3.5)
Sapawe micaecous temper	15 (78.9)			15 (17.6)
Total	**19 (100)**	**63 (100)**	**3 (100)**	**85 (100)**

Table 58.67. Distribution of ware by temper (count/percent) at LA 85408.

Temper	Gray	White	Glaze	Total
Sand	7 (53.8)			7 (8.8)
Fine tuff or ash		2 (3.2)		2 (2.5)
Large vitric tuff fragments	1 (7.7)			1 (1.3)
Fine tuff and sand		57 (90.5)		57 (71.3)
Latite Keres area			1 (25)	1 (1.3)
Tuff and phenocrysts (anthill sand)		1 (1.6)		1 (1.3)
Vitrified		3 (4.8)		3 (3.8)
Scoria			3 (75)	3 (3.8)
Sapawe micaecous temper	5 (38.5)			5 (6.3)
Total	**13 (100)**	**63 (100)**	**4 (100)**	**80 (100)**

Table 58.68. Distribution of ware by temper (count/percent) at LA 86605.

Temper	Gray	White	Total
Granite with mica	14 (100)		14 (13.3)
Sherd and sand		1 (1.1)	1 (1.0)
Fine tuff or ash		89 (97.8)	89 (84.8)
Fine tuff and sand		1 (1.1)	1 (1.0)
Total	**14 (100)**	**91 (100)**	**105 (100)**

Table 58.69. Distribution of ware by temper (count/percent) at LA 87430.

Temper	Gray	White	Total
Granite with mica	67 (16.4)		67 (13.8)
Sherd and sand	5 (1.2)	3 (3.8)	8 (1.6)
Fine tuff or ash		73 (93.6)	73 (15.0)
Fine tuff and sand		2 (2.6)	2 (0.4)
Tuff and phenocrysts (anthill sand)	20 (4.9)		20 (4.1)
Sapawe micaecous temper	317 (77.5)		317 (65.1)
Total	**409 (100)**	**78 (100)**	**487 (100)**

Table 58.70. Distribution of ware by temper (count/percent) at LA 127634.

Temper	Gray	White	Glaze	Total
Sand		1 (1.2)		1 (0.7)
Granite with mica	1 (1.7)	1 (1.2)		2 (1.3)
Highly micaceous (residual) paste	5 (8.6)			5 (3.4)
Fine tuff or ash	1 (1.7)	67 (78.8)		68 (45.6)
Fine tuff and sand		15 (17.6)		15 (10.1)
Fine sandstone	1 (1.7)			1 (0.7)
Tuff and phenocrysts (anthill sand)	2 (3.4)			2 (1.3)
Basalt	5 (8.6)		6 (100)	11 (7.4)
Sapawe micaecous temper	43 (74.1)	1 (1.2)		44 (29.5)
Total	**58 (100)**	**85 (100)**	**6 (100)**	**149 (100)**

Table 58.71. Distribution of ware by temper (count/percent) at LA 128804.

Temper	Gray	White	Glaze	Micaceous	Total
Sand				2 (50)	2 (0.8)
Granite with mica	14 (7.0)			2 (50)	16 (6.1)
Fine tuff or ash	1 (0.5)	23 (62.2)			24 (9.2)
Fine tuff and sand		6 (16.2)			6 (2.3)
Gray crystalline basalt			8 (36.4)		8 (3.1)
Latite	2 (1.0)		14 (63.6)		16 (6.1)
Dark igneous and sand	1 (0.5)				1 (0.4)
Tuff and phenocrysts (anthill sand)	181 (91.0)	3 (8.1)			184 (70.2)
Mostly tuff with some phenocrysts		5 (13.5)			5 (1.9)
Total	**199 (100)**	**37 (100)**	**22 (100)**	**4 (100)**	**262 (100)**

Table 58.72. Distribution of ware by temper (count/percent) at LA 128805.

Temper	Gray	White	Red	Glaze	Mica-ceous	Total
Sand	3 (2.4)				3 (60)	6 (3.0)
Granite with mica	21 (16.7)					21 (10.6)
Highly micaceous (residual) paste					2 (40)	2 (1.0)
Sherd and sand	1 (0.8)		1 (100)			2 (1.0)
Fine tuff or ash		47 (95.9)		1 (5.6)		48 (24.1)
Gray crystalline basalt				8 (44.4)		8 (4.0)
Latite				9 (50.0)		9 (4.5)
Tuff and phenocrysts (anthill sand)	101 (80.2)					101 (50.8)

Temper	Gray	White	Red	Glaze	Mica-ceous	Total
Mostly tuff with some phenocrysts		2 (4.1)				2 (1.0)
Total	**126 (100)**	**49 (100)**	**1 (100)**	**18 (100)**	**5 (100)**	**199 (100)**

Table 58.73. Distribution of ware by temper (count/percent) at LA 135292.

Temper	Gray	White	Red	Glaze	Micaceous	Total
Sand	3 (2.4)				3 (60)	6 (3.0)
Granite with mica	21 (16.7)					21 (10.6)
Highly micaceous (residual) paste					2 (40)	2 (1.0)
Sherd and sand	1 (0.8)		1 (100)			2 (1.0)
Fine tuff or ash		47 (95.9)		1 (5.6)		48 (24.1)
Gray crystalline basalt				8 (44.4)		8 (4.0)
Latite				9 (50.0)		9 (4.5)
Tuff and phenocrysts (anthill sand)	101 (80.2)					101 (50.8)
Mostly tuff with some phenocrysts		2 (4.1)				2 (1.0)
Total	**126 (100)**	**49 (100)**	**1 (100)**	**18 (100)**	**5 (100)**	**199 (100)**

Glazeware types were consistently present in low frequencies at Classic period sites. About 3 to 8 percent of the pottery recovered from the Classic period sites are represented by glazewares. As previously indicated, this pottery was not produced at sites on the central Pajarito Plateau, but originated at communities to the south including areas of the southern Pajarito Plateau where glazeware types dominate decorated pottery (Goff 2005; Mera 1933; Shepard 1942, 1965; Vint 1999). Glazeware types were noted at 11 of the sites with larger assemblages resulting in components assigned to the Classic period. Temper types recorded for these glazeware sherds included various forms of fine tuff, basalt, and latite (Table 58.75). Glazeware sherds from three sites were tempered with fine tuff, those from eight sites were tempered with basalt, and those from four sites had latite temper. Despite the small sample of glazeware pottery noted, this variation in glazeware temper is consistent with observations noted for other sites on the Pajarito Plateau (Goff 2005). The distribution of these tempers indicates that the glazeware ceramics examined during this project could have been produced in a number of areas to the south including areas of the southern Pajarito Plateau, Galisteo Basin, and northern Santo Domingo Basin.

Table 58.74. Distribution of broad temper groups of graywares (count/percent) from Classic period sites.

Temper Group	21596B	21596C	85404	85861	86606	127635	127627	85413	85867	135291
Micaceous igneous	19 (20.7)	70 (49.6)	9 (7.4)	3 (0.9)	1 (0.8)	35 (11.2)	27 (43.5)	248 (58.5)	49 (90.7)	13 (24.5)
Anthill sand	69 (75)	45 (31.9)	113 (92.6)	345 (99.1)	124 (98.2)	266 (85.3)	32 (51.6)	176 (41.5)	2 (3.7)	40 (75.5)
Other	4 (4.3)	26 (18.5)				11 (3.5)	3 (4.8)		3 (5.8)	
Large vitric tuff										
Total	**92 (100)**	**141 (100)**	**122 (100)**	**348 (100)**	**125 (100)**	**312 (100)**	**62 (100)**	**424 (100)**	**54 (100)**	**53 (100)**

Table 58.74 (continued). Distribution of broad temper groups of graywares (count/percent) from Classic period sites.

Temper Group	70025	85411	86637	15116	85408	86605	87430	127634	128804	128805
Micaceous igneous	125 (85)	72 (31)	12 (41.4)	16 (84.2)	5 (38.5)	14 (100)	384 (83.9)	49 (84.5)	14 (7)	21 (16.7)
Anthill sand	22 (15)	35 (15.9)	16 (55.2)	3 (15.8)			20 (4.9)	7 (12.1)	181 (91)	101 (80.2)
Other		16 (6.9)	1 (3.4)		7 (53.8)		5 (1.2))	2 (3.4)	4 (2.1)	4 (3.1)
Large vitric tuff		109 (47)			1 (7.7)					
Total	**147 (100)**	**232 (100)**	**29 (100)**	**19 (100)**	**13 (100)**	**14 (100)**	**409 (100)**	**58 (100)**	**199 (100)**	**125 (100)**

Table 58.75. Distribution of broad temper groups of glazewares (count/percent) from Classic period sites.

Temper	21596B	21596C	85404	127627	85413	86637	15116	85408	127634	128804	128805
Fine Tuff	1 (100)	1 (10)									1 (6.6)
Basalt		9 (90)	34 (100)	3 (100		3 (100)	3 (100)	9 (90)		8 (38.4)	8 (44.4)
Latite					14 (100)			1 (10)	6 (100)	14 (63.6)	9 (50)
Total	**1 (100)**	**10 (100)**	**34 100**	**3 (100)**	**14 (100)**	**3 (100)**	**3 (100)**	**10 (100)**	**6 (100)**	**22 (100)**	**18 (100)**

VESSEL USE

Pottery traits indicative of vessel use are reflected in ceramic ware group distinctions and vessel form categories. Distributions of attributes associated with these categories may indicate differences in the kind and range of activities for which ceramic vessels were used. Comparisons of functionally related traits at contemporaneous contexts may provide clues concerning the organization of activities and tasks in which pottery was used. Changes in distributions of such traits in assemblages assigned to different periods may provide insights concerning changes in the use of pottery in organization of various tasks that may reflect broader economic changes.

Functional Distributions at Coalition Period Components

Overall distributions of ware group and form categories are very similar at most Coalition period sites. For larger assemblages (over 100 sherds), grayware types from sites dating to all spans of the Coalition period make up just over 80 percent of the total pottery (Tables 58.14, 58.25, and 58.27). Grayware types from all of these sites are almost exclusively represented by wide mouth cooking jars. The majority of these jars exhibit coarse pastes, fairly wide rim diameters relative to size, dark-sooted exteriors, and smeared corrugated exteriors. The homogenous nature of this pottery appears to reflect pottery produced primarily for use in cooking. While the number of grayware jar rim sherds for which rim radius could be recorded was very small, a very wide range of sizes was indicated. The next most dominant form is represented by grayware forms, which could not be assigned to a particular category because of one or more missing surfaces. It is likely, however, that most of the sherds assigned to this category were derived from jars. An extremely low frequency of grayware pottery appears to have been derived from bowls. Other forms noted in extremely low frequencies in grayware pottery from Coalition period sites include jar body with lug handle, indeterminate coil or strap handle, miniature jar, miniature pinch pot, cloud blower, effigy, and appliqué.

Sherds assigned to whiteware types consisted of just over 15 percent of the pottery from these Coalition period sites. Whiteware pottery from Coalition period sites appears to represent a very homogenous group, resulting in the classification of most decorated pottery from Coalition period sites as Santa Fe Black-on-white. The majority of whiteware sherds from sites dating to this period are derived from bowls (Tables 58.76 through 58.82). These bowls tend to be slipped on the interior surface and unpolished on the exterior surface, exhibit fine tuff temper, and are fairly thin and well-fired. A wide range in vessel size is represented. The next most dominant category is represented by sherds that could not be assigned to a specific form because at least one surface was missing. Many of the sherds assigned to this category are assumed to have derived from bowls. Another whiteware category consists of jars that tend to make up about 5 percent of the whiteware sherds from Coalition period sites. Many of the jar forms are from pottery types associated with nonlocal traditions such as Chupadero Black-on-white. Other forms represented by extremely low frequencies of whiteware sherds include gourd dipper, bowl dipper, indeterminate coil or strap handle, and canteen rim.

Table 58.76. Distribution of ware by form (count/percent) at LA 82601.

Form	Gray	White	Total
Indeterminate	3 (1.0)	13 (21.7)	16 (4.4)
Bowl rim		7 (11.7)	7 1.9)
Bowl body		22 (36.7)	22 (6.1)
Jar neck	12 (4.0)	1 (1.7)	13 (3.6)
Jar rim	8 (2.7)	1 (1.7)	9 (2.5)
Jar body	277 (92.3)	11 (18.3)	288 (80.0)
Canteen rim		2 (3.3)	2 (0.6)
Indeterminate rim		3 (5.0)	3 (0.8)
Total	**300 (100)**	**60 (100)**	**360 (100)**

Table 58.77. Distribution of ware by form (count/percent) at LA 99396.

Form	Gray	White	Total
Bowl rim	1 (1.6)		1 (1.2)
Bowl body		20 (95.2)	20 (23.5)
Jar neck	2 (3.1)		2 (2.4)
Jar rim	4 (6.3)		4 (4.7)
Jar body	52 (81.3)	1 (4.8)	53 (62.4)
Indeterminate coil, strap handle	3 (4.7)		3 (3.5)
Miniature pinch pot rim	1 (1.6)		1 (1.2)
Miniature pinch pot body	1 (1.6)		1 (1.2)
Total	**64 (100)**	**21 (100)**	**85 (100)**

Table 58.78. Distribution of ware by form (count/percent) at LA 86534.

Form	Gray	White	Red	Brown	Glaze	Total
Indeterminate	316 (9.6)	111 (17.7)	1 (100)			428 (10.9)
Bowl rim	10 (0.3)	54 (8.6)				64 (1.6)
Bowl body	10 (0.3)	412 (65.7)		1 (100)	1 (100)	424 (10.8)
Olla rim	13 (0.4)					13 (0.3)
Jar neck	339 (10.3)	1 (0.2)				340 (8.7)
Jar rim	86 (2.6)	1 0.2)				87 (2.2)
Jar body	2492 (75.6)	43 (6.9)				2535 (64.6)
Jar body with lug handle	2 (0.1)					2 0.1)
Dipper with handle		1 (0.2)				1 (0.0)
Gourd dipper	10 (0.3)					10 (0.3)
Indeterminate coil, strap handle	2 (0.1)					2 (0.1)
Miniature jar	2 (0.1)					2 (0.1)
Miniature pinch pot	3 0.1)					3 0.1)

Form	Gray	White	Red	Brown	Glaze	Total
rim						
Miniature pinch pot body	1 (0.0)					1 (0.0)
Cloud blower	5 (0.2)					5 (0.1)
Appliqué	1 0.0)	1 (0.2)				2 (0.1)
Jar rim with lug handle	3 0.1)					3 (0.1)
Effigy		1 0.2)				1 (0.0)
Dipper handle		2 (0.3)				2 0.1)
Total	**3295 (100)**	**627 (100)**	**1 100)**	**1 (100)**	**1 (100)**	**3925 (100)**

Table 58.79. Distribution of ware by form (count/percent) at LA 135290.

Form	Gray	White	Red	Total
Indeterminate	35 (1.0)	120 (18.3)		155 (3.9)
Bowl rim	19 (0.6)	75 (11.5)		94 (2.3)
Bowl body	15 (0.4)	398 (60.8)		413 (10.3)
Jar neck	350 (10.4)	2 0.3)		352 (8.8)
Jar rim	88 (2.6)			88 (2.2)
Jar body	2848 (84.6)	54 (8.2)	1 (100)	2903 (72.2)
Jar body with strap or coil handle		1 (0.2)		1 (0.0)
Jar body with lug handle	2 (0.1)	1 (0.2)		3 (0.1)
Indeterminate coil, strap handle	8 (0.2)			8 (0.2)
Canteen rim		1 (0.2)		1 (0.0)
Miniature jar		1 (0.2)		1 (0.0)
Seed jar rim		2 0.3)		2 (0.0)
Total	**3365 (100)**	**655 (100)**	**1 (100)**	**4021 (100)**

Table 58.80. Distribution of ware by form (count/percent) at LA 12587.

Vessel form	Gray	White	Red	Brown	Glaze	Total
Indeterminate	203 (2.4)	114 (6.2)	2 (25)	6 (54.5)		325 (3.1)
Bowl rim	2 (0.0)	219 (11.9)	1 12.5)		4 (80)	226 (2.2)
Bowl body	10 (0.1)	1407 (76.5)	5 (62.5)	3 (27.3)		1425 (13.8)
Olla rim		3 (0.2)				3 (0.0)
Jar neck	984 (11.6)	6 (0.3)		1 (9.1)		991 (9.6)
Jar rim	445 (5.2)	1 (0.1)		1 (9.1)	1 (20)	448 (4.3)
Jar body	6829 (80.3)	77 (4.2)				6906 (66.6)
Jar body with lug handle	2 (0.0)	1 (0.1)				3 (0.0
Dipper rim		4 (0.2)				4 (0.0)
Indeterminate coil, strap	1 (0.0	2 (0.1)				3 (0.0)

Vessel form	Gray	White	Red	Brown	Glaze	Total
handle						
Canteen rim		2 (0.1)				2 (0.0)
Miniature jar	1 (0.0)					1 (0.0)
Miniature pinch pot rim	3 (0.0)					3 (0.0)
Cloud blower	10 (0.1)					10 (0.1)
Effigy	1 (0.0)	1 0.1				2 (0.0)
Body sherd unpolished	3 (0.0)					3 (0.0)
Indeterminate rim	5 (0.1)	1 0.1				6 (0.1)
Indeterminate lug handle	1 (0.0	1 0.1				2 (0.0)
Total	**8500 (100)**	**1839 (100)**	**8 (100)**	**11 (100)**	**5 (100)**	**10,363 (100)**

Table 58.81. Distribution of ware by form (count/percent) at LA 4618.

Vessel Form	Gray	White	Red	Glaze	Historic Plain	Poly-chrome	Total
Indeterminate	29 (0.3)	117 (7.3)			2 (100)		148 (1.5)
Bowl rim	20 (0.2)	201 (12.6)	1 (14.3)	1 (50)		3 (75)	226 (2.2)
Bowl body	5 (0.1)	1210 (75.7)	5 (71.4)	1 (50)		1 (25)	1222 (12.1)
Seed jar		1 0.1)					1 (0.0)
Jar neck	610 (7.2)	2 (0.1)					612 (6.1)
Jar rim	347 (4.1)	2 (0.1)					349 (3.5)
Jar body	7321 (86.6)	66 (4.1)					7387 (73.4)
Jar body with strap or coil handle	4 (0.0)						4 (0.0)
Jar body with lug handle	1 0.0)						1 (0.0)
Indeterminate coil, strap handle	90 (1.1)						90 (0.9)
Miniature jar	11 (0.1)						11 (0.1)
Miniature pinch pot rim	2 0.0)						2 (0.0)
Miniature pinch pot body	5 (0.1)						5 (0.0)
Cloud blower	6 (0.1)						6 (0.1)
Appliqué	1 (0.0)						1 (0.0)
Effigy	1 (0.0)						1 0.0)
Fired coil	1 (0.0)						1 (0.0)
Body sherd polished int-ext			1 (14.3)				1 0.0)

Vessel Form	Gray	White	Red	Glaze	Historic Plain	Poly-chrome	Total
Plate tray	1 (0.0)						1 (0.0)
Indet. lug handle	1 (0.0)						1 (0.0)
Total	**8456 (100)**	**1599 100)**	**7 (100)**	**2 (100)**	**2 (100)**	**4 (100)**	**10,070 (100)**

Table 58.82. Distribution of ware by form (count/percent) at LA 4619.

Vessel Form	Gray	White	Red	Total
Indeterminate	9 (1.1)	32 (15.5)		41 (3.9)
Bowl rim		17 (8.3)		17 (1.6)
Bowl body		144 (69.9)		144 (13.6)
Jar neck	33 (3.9)	5 (2.4)		38 (3.6)
Jar rim	8 (0.9)			8 (0.8)
Jar body	770 (90.8)	8 (3.9)	2 (100)	780 (73.9)
Jar body with lug handle	1 (0.1)			1 (0.1)
Indeterminate rim	27 (3.2)			27 (2.6)
Total	**848 (100)**	**206 (100)**	**2 (100)**	**1056 (100)**

Thus, the overwhelming majority of pottery recovered from Coalition period sites are represented by two fairly standardized functional groups and include smeared corrugated jars and whiteware bowls (also see Vierra 2000). While pottery assemblages associated with occupational sequences scattered over much of the northern Southwest are commonly dominated by similar grayware jar and whiteware bowl forms (Wilson and Blinman 1995b), the homogeneity of these forms is particularly notable at Coalition period sites in the northern Rio Grande; whereas, in Late Developmental site assemblages, grayware jar sherds exhibit a much higher range of exterior-textured treatments and whiteware pottery is represented by a wider range of forms including a higher frequency of jars (Wilson, n.d.).

It is likely that the patterns noted for Coalition period pottery in the northern Rio Grande reflect both widespread consensus concerning the appropriate way to produce and decorate utility- and whiteware vessels discussed earlier, as well as their intended use in very specific and similar ranges of tasks in most contexts. The dominance of smeared corrugated vessels, which consistently represent about 70 percent of the sherds at Coalition period sites, reflect the importance and the specialized nature of tasks relating to the cooking and storage of food. Whiteware vessels also appear to have been intended for use in distinct tasks associated with the serving and preparation of food. This may indicate that tasks relating to food preparation and serving were organized in similar and standardized fashions during the Coalition period in the northern Rio Grande.

Functional Distributions at Classic Period Components

Distributions of ceramic traits noted for Classic period components identified during the C&T Project analysis indicate a higher degree of variation in functionally related traits than noted in

Coalition period components (Tables 58.83 through 58.104). For example, a considerable amount of variability was noted in the frequency of ware groups, with some sites dominated by grayware and others by whiteware types. Sites in which the majority of pottery is represented by grayware sherds consist of LA 85404, LA 85861, LA 86606, LA 127635, LA 141505, LA 85414, LA 127625, LA 85413, LA 85867, LA 135291, LA 70025, LA 85411, LA 87430, LA 128804, LA 128805, and LA 135292. Distributions at sites dominated by grayware are also quite variable, with grayware at some of these sites representing just over 50 percent and over 85 percent at others. Ceramic assemblages from Classic period sites that were dominated by whiteware sherds consist of LA 21596B, LA 21566C, LA 86637, LA 15116, LA 85408, LA 86605, LA 110126, and LA 127634.

Table 58.83. Distribution of ware by form (count/percent) at LA 21596B.

Form	Gray	White	Red	Glaze	Micaceous	Total
Indeterminate	1 (1.1)	19 (17.3)				20 (7.8)
Bowl rim		4 (3.6)				4 (1.6)
Bowl body		56 (50.9)	1 (100)			57 (22.2)
Olla rim	5 (5.4)					5 (1.9)
Jar neck	3 (3.3)	5 (4.5)			5 (9.4)	13 (5.1)
Jar rim	2 (2.2)	4 (3.6)			1 (1.9)	7 (2.7)
Jar body	81 (88.0)	21 (19.1)		1 (100)	47 (88.7)	150 (58.4)
Miniature pinch pot rim		1 (0.9)				1 (0.4)
Total	**92 (100)**	**110 (100)**	**1 (100)**	**1 (100)**	**53 (100)**	**257 (100)**

Table 58.84. Distribution of ware by form (count/percent) at LA 21596C.

Form	Gray	White	Brown	Glaze	Mica-ceous	Total
Indeterminate		26 (13.2)			9 (28.1)	35 (9.2)
Bowl rim	1 (0.7)	8 (4.1)				9 (2.4)
Bowl body	1 (0.7)	104 (52.8)	1 (50)	2 (20)		108 (28.3)
Jar neck	3 (2.1)	4 (2.0)				7 (1.8)
Jar rim		1 (0.5)			1 (3.1)	2 (0.5)
Jar body	134 (95.0)	52 (26.4)	1 (50)	8 (80)	22 (68.8)	217 (56.8)
Indeterminate coil, strap handle	2 (1.4)					2 (0.5)
Miniature pinch pot rim		1 (0.5)				1 (0.3)
Jar rim w strap handle		1 (0.5)				1 (0.3)
Total	**141 (100)**	**197 (100)**	**2 (100)**	**10 (100)**	**32 (100)**	**382 (100)**

Table 58.85. Distribution of ware by form (count/percent) at LA 85404.

Form	Gray	White	Glaze	Total
Indeterminate	1 (0.8)	3 (7.0)	2 (5.9)	6 (3.0)
Bowl rim		7 (16.3)		7 (3.5)
Bowl body		27 (62.8)	1 (2.9)	28 (14.1)
Seed jar			7 (20.6)	7 (3.5)
Jar neck	7 (5.8)		2 (5.9)	9 (4.5)
Jar rim	3 (2.5)	1 (2.3)	1 (2.9)	5 (2.5)
Jar body	110 (90.9)	3 (7.0)	21 (61.8)	134 (67.7)
Gourd dipper		1 (2.3)		1 (0.5)
Miniature jar		1 (2.3)		1 (0.5)
Total	**121 (100)**	**43 (100)**	**34 (100)**	**198 (100)**

Table 58.86. Distribution of ware by form (count/percent) at LA 85861.

Form	Gray	White	Total
Indeterminate	3 (0.9)	7 (7.7)	10 (2.3)
Bowl rim		15 (16.5)	15 (3.4)
Bowl body		69 (75.8)	69 (15.7)
Jar neck	36 (10.3)		36 (8.2)
Jar rim	23 (6.6)		23 (5.2)
Jar body	286 (82.2)		286 (65.1)
Total	**348 (100)**	**91 (100)**	**439 (100)**

Table 58.87. Distribution of ware by form (count/percent) at LA 86606.

Form	Gray	White	Red	Total
Bowl rim		4 (23.5)		4 (2.8)
Bowl body		13 (76.5)	1 (100)	14 (9.8)
Jar neck	6 (4.8)			6 (4.2)
Jar rim	6 (4.8)			6 (4.2)
Jar body	113 (90.4)			113 (79.0)
Total	**125 (100)**	**17 (100)**	**1 (100)**	**143 (100)**

Table 58.88. Distribution of ware by form (count/percent) at LA 127635.

Form	Gray	White	Total
Indeterminate		3 (5.1)	3 (0.8)
Bowl rim	5 (1.6)	9 (15.3)	14 (3.8)
Bowl body	5 (1.6)	41 (69.5)	46 (12.4)
Jar neck	31 (9.9)		31 (8.4)
Jar rim	9 (2.9)		9 (2.4)
Jar body	257 (82.4)	6 (10.2)	263 (70.9)
Jar body with strap or coil handle	5 (1.6)		5 (1.3)

Form	Gray	White	Total
Total	**312 (100)**	**59 (100)**	**371 (100)**

Table 58.89. Distribution of ware by form (count/percent) at LA 127627.

Form	Gray	White	Glaze	Total
Indeterminate	4 (6.5)	10 (58.8)		14 (17.1)
Bowl rim		1 (5.9)		1 (1.2)
Bowl body		5 (29.4)		5 (6.1)
Jar neck	1 (1.6)			1 (1.2)
Jar body	57 (91.9)	1 (5.9)	3 (100)	61 (74.4)
Total	**62 (100)**	**17 (100)**	**3 (100)**	**82 (100)**

Table 58.90. Distribution of ware by form (count/percent) at LA 85413.

Form	Gray	White	Glaze	Total
Bowl rim		8 (14.3)	1 (7.1)	9 (1.8)
Bowl body		44 (78.6)	4 (28.6)	48 (9.7)
Jar neck	28 (6.6)	1 (1.8)	2 (14.3)	31 (6.3)
Jar rim	29 (6.8)			29 (5.9)
Jar body	367 (86.6)		7 (50.0)	374 (75.7)
Flared bowl rim		3 (5.4)		3 (0.6)
Total	**424 (100)**	**56 (100)**	**14 (100)**	**494 (100)**

Table 58.91. Distribution of ware by form (count/percent) at LA 85867.

Form	Gray	White	Total
Bowl rim		6 (42.9)	6 (8.8)
Bowl body		8 (57.1)	8 (11.8)
Jar neck	2 (3.7)		2 (2.9)
Jar rim	3 (5.6)		3 (4.4)
Jar body	49 (90.7)		49 (72.1)
Total	**54 (100)**	**14 (100)**	**68 (100)**

Table 58.92. Distribution of ware by form (count/percent) at LA 135291.

Form	Gray	White	Total
Indeterminate		3 (10.3)	3 (3.7)
Bowl rim		11 (37.9)	11 (13.4)
Bowl body	1 (1.9)	13 (44.8)	14 (17.1)
Jar neck	6 (11.3)		6 (7.3)
Jar body	46 (86.8)	2 (6.9)	48 (58.5)
Total	**53 (100)**	**29 (100)**	**82 (100)**

Table 58.93. Distribution of ware by form (count/percent) at LA 70025.

Form	Gray	White	Total
Indeterminate		9 (23.7)	9 (4.9)
Bowl rim		3 (7.9)	3 (1.6)
Bowl body		11 (28.9)	11 (5.9)
Jar neck	10 (6.8)	3 (7.9)	13 (7.0)
Jar rim	4 (2.7)	1 (2.6)	5 (2.7)
Jar body	132 (89.8)	11 (28.9)	143 (77.3)
Jar body with strap or coil handle	1 (0.7)		1 (0.5)
Total	**147 (100)**	**38 (100)**	**185 (100)**

Table 58.94. Distribution of ware by form (count/percent) at LA 85411.

Form	Gray	White	Total
Indeterminate		1 (1.1)	1 (0.3)
Bowl rim		13 (14.8)	13 (4.1)
Bowl body		72 (81.8)	72 (22.5)
Jar rim	4 (1.7)		4 (1.3)
Jar body	227 (97.8)		227 (70.9)
Body sherd unpolished		2 (2.3)	2 (0.6)
Indeterminate rim	1 (0.4)		1 (0.3)
Total	**232 (100)**	**88 (100)**	**320 (100)**

Table 58.95. Distribution of ware by form (count/percent) at LA 86637.

Form	Gray	White	Glaze	Total
Indeterminate	2 (6.9)	6 (7.7)		8 (7.3)
Bowl rim		4 (5.1)		4 (3.6)
Bowl body		15 (19.2)	1 (33.3)	16 (14.5)
Jar neck	3 (10.3)	19 (24.4)		22 (20.0)
Jar rim	2 (6.9)	2 (2.6)		4 (3.6)
Jar body	22 (75.9)	32 (41.0)		54 (49.1)
Body sherd polished int-ext			2 (66.7)	2 (1.8)
Total	**29 (100)**	**78 (100)**	**3 (100)**	**110 (100)**

Table 58.96. Distribution of ware by form (count/percent) at LA 15116.

Form	Gray	White	Glaze	Total
Indeterminate		22 (34.9)		22 (25.9)
Bowl body		14 (22.2)		14 (16.5)
Jar neck		2 (3.2)	1 (33.3)	3 (3.5)
Jar body	19 (100)	8 (12.7)	2 (66.7)	29 (34.1)
Miniature jar		16 (25.4)		16 (18.8)
Flared bowl rim		1 (1.6)		1 (1.2)

Form	Gray	White	Glaze	Total
Total	**19 (100)**	**63 (100)**	**3 (100)**	**85 (100)**

Table 58.97. Distribution of ware by form (count/percent) at LA 85408.

Form	Gray	White	Glaze	Total
Indeterminate		6 (9.5)		6 (7.5)
Bowl rim		7 (11.1)	3 (75)	10 (12.5)
Bowl body		49 (77.8)	1 (25)	50 (62.5)
Jar body	13 (100)			13 (16.25)
Flared bowl rim		1 (1.6)		1 (1.25)
Total	**13 (100)**	**63 (100)**	**4 (100)**	**80 (100)**

Table 58.98. Distribution of ware by form (count/percent) at LA 86605.

Form	Gray	White	Total
Indeterminate		10 (11.0)	10 (9.5)
Bowl rim		4 (4.4)	4 (3.8)
Bowl body		8 (8.8)	8 (7.6)
Jar neck		2 (2.2)	2 (1.9)
Jar rim	2 (14.3)	1 (1.1)	3 (2.9)
Jar body	12 (85.7)	65 (71.4)	77 (73.3)
Flared bowl rim		1 (1.1)	1 (1.0)
Total	**14 (100)**	**91 (100)**	**105 (100)**

Table 58.99. Distribution of ware by form (count/percent) at LA 87430.

Form	Gray	White	Total
Indeterminate	3 (0.7)	10 (12.8)	13 (2.7)
Bowl rim	5 (1.2)	1 (1.3)	6 (1.2)
Bowl body	1 (0.2)	41 (52.6)	42 (8.6)
Jar neck	8 (2.0)	3 (3.8)	11 (2.3)
Jar rim	19 (4.6)	1 (1.3)	20 (4.1)
Jar body	372 (91.0)	9 (11.5)	381 (78.2)
Miniature pinch pot body	1 (0.2)		1 (0.2)
Flared bowl rim		13 (16.7)	13 (2.7)
Total	**409 (100)**	**78 (100)**	**487 (100)**

Table 58.100. Distribution of ware by form (count/percent) at LA 127634.

Form	Gray	White	Glaze	Total
Indeterminate		8 (9.4)	1 (16.7)	9 (6.0)
Bowl rim		8 (9.4)		8 (5.4)
Bowl body		58 (68.2)		58 (38.9)
Jar neck	3 (5.2)			3 (2.0)
Jar rim	3 (5.2)	1 (1.2)		4 (2.7)

Form	Gray	White	Glaze	Total
Jar body	52 (89.7)	9 (10.6)	5 (83.3)	66 (44.3)
Jar rim with strap handle		1 (1.2)		1 (0.7)
Total	**58 (100)**	**85 (100)**	**6 (100)**	**149 (100)**

Table 58.101. Distribution of ware by form (count/percent) at LA 128804.

Form	Gray	White	Glaze	Micaceous	Total
Indeterminate		1 (2.7)	8 (36.4)		9 (3.4)
Bowl rim		1 (2.7)			1 (0.4)
Bowl body		21 (56.8)			21 (8.0)
Seed jar			2 (9.1)		2 (0.8)
Jar neck	45 (22.6)		4 (18.2)		49 (18.7)
Jar rim	4 (2.0)		1 (4.5)		5 (1.9)
Jar body	150 (75.4)	14 (37.8)	5 (22.7)	4 (100)	173 (66.0)
Body sherd polished int-ext			2 (9.1)		2 (0.8)
Total	**199 (100)**	**37 (100)**	**22 (100)**	**4 (100)**	**262 (100)**

Table 58.102. Distribution of ware by form (count/percent) at LA 128805.

Form	Gray	White	Red	Glaze	Micaceous	Total
Indeterminate		1 (2.0)		1 (5.6)		2 (1.0)
Bowl rim		5 (10.2)				5 (2.5)
Bowl body		19 (38.8)	1 (100)	3 (16.7)		23 (11.6)
Jar neck	19 (15.1)	3 (6.1)		3 (16.7)		25 (12.6)
Jar rim	4 (3.2)	3 (6.1)		1 (5.6)		8 (4.0)
Jar body	99 (78.6)	18 (36.7)		3 (16.7)	5 (100)	125 (62.8)
Mini pinch pot body	4 3.2)					4 (2.0)
Body sherd polished int-ext				6 (33.3)		6 (3.0)
Indet. lug handle				1 (5.6)		1 (0.5)
Total	**126 (100)**	**49 (100)**	**1 (100)**	**18 (100)**	**5 100)**	**199 (100)**

Table 58.103. Distribution of form by ware (count/percent) at LA 135292.

Form	Gray	White	Total
Indeterminate	4 (7.4)	4 (11.4)	8 (8.9)
Bowl rim	1 (1.8)		1 (1.1)
Bowl body		25 (71.4)	25 (28.0)
Jar neck	2 (3.7)	1 (2.9)	3 (3.4)
Jar body	47 (87.1)	5 (14.3)	52.4 (58.6)
Total	**54 (100)**	**35 (100)**	**89 (100)**

Table 58.104. Distribution of basic form for whitewares (count/percent) from sites with Classic period components.

Form	LA 21596B	LA 21596C	LA 85404	LA 85861	LA 86606	LA 127635	LA 127627	LA 85413	LA 85867
Bowl	60 (54.5)	112 (56.9)	34 (79.1)	84 (92.3)	17 (100)	50 (84.7)	6 (35.3)	55 (98.2)	14 (100)
Jar	30 (27.3)	57 (28.9)	5 (11.6)			6 (10.2)	1 (5.9)	1 (1.8)	
Other	20 (18.2)	28 (14.2)	4 (9.3)	7 (7.7)		3 (5.1)	10(58.8)		
Total	**110 (100)**	**197 (100)**	**43 (100)**	**91 (100)**	**17 (100)**	**59 (100)**	**17 (100)**	**56 (100)**	**14 (100)**

Table 58.104 (cont). Distribution of basic form for whitewares (count/percent) from sites with Classic period components.

Form	LA 135291	LA 70025	LA 85411	LA 86637	LA 15116	LA 85408	LA 86605	LA 87430	LA 127634
Bowl	24 (82.3)	14 (36.8)	85 (96.6)	19 (24.4)	17 (27)	57 (80.5)	13 (14.3)	55 (70.5)	66 (77.6)
Jar	2 (6.9)	15 (39.4)	2 (2.3)	63 (80.8)	24 (38.1)		68 (74.7)	13 (16.7)	11 (12.9)
Other	3 (10.3)	9 (23.7)	1 (1.1)	6 (7.7)	22 (34.9)	6 (9.5)	10 (11)	10 (12.8)	8 (9.4)
Total	**29 (100)**	**38 (100)**	**88 (100)**	**78 (100)**	**63 (100)**	**63 (100)**	**91 (100)**	**78 (100)**	**85 (100)**

Table 58.104 (cont). Distribution of basic form for whitewares (count/percent) from sites with Classic period components.

Form	LA 28804	LA 128805	LA 135292
Bowl	22 (59.5)	24 (49)	25 (71.4)
Jar	14 (37.8)	24 (49)	6 (17.1)
Other	1 (2.7)	1 (2)	4 (11.4)
Total	**37 (100)**	**49 (100)**	**35 (100)**

The variability in ware groups noted at assemblages assigned to the Classic period compared to trends noted for Coalition period assemblages may partly be a reflection of the small number of sherds in the Classic period assemblages. For example, all assemblages assigned to the Classic period consist of less than 500 sherds. In such assemblages, sherds from a single grayware or whiteware vessel can have a strong influence on the relative frequency of wares represented. Despite the influence of small sample size, it is still likely that the relatively high variation in ware group across sites indicates a real trend. This reflects a trend noted in other Classic period sites in the northern Rio Grande region and may indicate that a range of activities were being conducted at these sites.

The high variability in exterior surface finish of grayware types resulted in the identification of a wider range of grayware types. Classic period grayware pottery includes significant frequencies of forms with plain and smeared corrugated exteriors, as well as lower frequencies with micaceous slips, and a great deal of variation in the dominant form dominating at different sites. Grayware assemblages from some sites are dominated by plain exteriors and others by smeared corrugated exteriors. While smeared corrugated exterior treatments are still relatively common during this time period, there is an increase in obliteration resulting in more examples recorded with plain treatments. The combination of variation in surface and paste characteristics results in the dominance of different grayware types at different Classic period sites. Some are dominated by smeared corrugated forms similar to those dominating all Coalition period sites, while others are dominated by plain corrugated and Sapawe utilityware. This variation in types assigned to grayware vessels may also have functional implications. Another attribute that may have functional implications relates is the use of micaceous pastes or application of micaceous slips.

Another interesting contrast with Coalition period sites is the relatively high frequency of whiteware jars, which make up a small but significant frequency of the total whiteware sherds (Tables 58.77 through 58.81; Vierra 2000). This, along with the common occurrence of jars and other forms in the glazewares, seems to reflect a higher range of activities for which decorated wares were used during the Classic period. This may indicate a higher variation in activities for which different ware groups were used during the Classic period.

Other examples of historic ceramic types were identified at sites dominated by prehistoric types including LA 4618, LA 12587, and LA 85417 (Table 58.105). It is difficult to determine the specific time span represented by this pottery, although Tewa Polychrome, which was identified at LA 4618, dates to the 18th century.

Table 58.105. Distribution of Historic period ceramics (count/percent) at prehistoric sites.

Type	LA 4618	LA 12587	LA 85417
Tewa Polychrome	4 (57.1)		
Red-tan buff unpainted	1 (14.3)		
San Juan Red-on-tan	1 (14.3)		
Tewa Buff undifferentiated	1 (14.3)		
Buffware with mica slip			24 (100)
Unpolished mica slip		1 (100)	
Total	**7 (100)**	**1 (100)**	**24 (100)**

Ceramic Stylistic Change

Observations relating to the style and technology of pottery associated with various temporal periods indicate a long and gradual series of changes in the production of ceramic vessels produced in the northern Pajarito Plateau. The continual production of “whiteware” forms decorated in organic paint from the earliest part of the Coalition period to the Classic period and into the Historic period distinguishes the northern Pajarito Plateau pottery sequence from other regions to the south. In these more southerly regions, glazeware was produced during the Classic period and links it to those in the Tewa Basin and Chama Valley. The similarities provide further evidence that groups in the Pajarito Plateau are ancestral to the northern Tewa Pueblos that now occupy the Tewa Basin. In fact, some innovations and changes (e.g., the shift to biscuitware forms) may have been largely focused on the Pajarito Plateau. Thus, it is likely that changes documented in this area played a very important role in influencing pottery forms and styles that are still being produced by northern Tewa potters.

Characteristics associated with the earliest Santa Fe Black-on-white forms, including the general absence of forms other than bowls, the lack of polished or painted bowl exteriors, the dominance of tapered or painted rims, and the persistence of simple band organizations contrast with the characteristics associated with pottery produced from the Mesa Verde or northern San Juan region. In contrast, similarities in styles noted between Kwahe’e Black-on-white and Santa Fe Black-on-white suggest that populations may have migrated into the northern Pajarito Plateau from adjacent areas to the east (e.g., the Tewa Basin and Santa Fe Valley), although the Pueblo III styles occurring in Mesa Verde types also occur in Coalition period types in the northern Rio Grande region.

An examination of Santa Fe Black-on-white ceramics from sites dating to various parts of the Coalition period indicates a great deal of stylistic similarity across space and through time. Traits distinctive to Santa Fe Black-on-white include the absence of rim ticking or decoration, thin walls, and the lack of polish, slip, or painted decorations on the vessel exterior. Another distinctive characteristic of Santa Fe Black-on-white ceramics relative to other types of contemporaneous pottery from regions to the west is the total dominance of bowl forms and the almost complete absence of jars, kiva jars, and ladles.

Slight differences in the frequencies of pottery attributes recorded at LA 4618 indicate a greater average rim thickness and higher surface polish at components occupied during the Late Coalition period. Another change occurring during this time includes the shift to small, dense, Tuff 1 (unmodified) temper. Together these changes seem to mark the transition into Wiyo Black-on-white and early biscuitware types.

While the sample of rim sherds from Classic period sites was too small for stylistic analysis, attributes used to distinguish biscuitware types from earlier Coalition period types indicate the appearance of a new technology characterized by distinct pastes and temper, new firing regimes, thicker walls, and the use of wider lines organized into distinct overall designs such as Awanyu forms. Later biscuitware forms are represented by the presence of slipped, polished, and painted exterior surfaces, increased decoration, variable and flaring rim shapes, and increased jar forms.

Such changes continue during the Classic period where they are reflected by the distinct rims shapes associated with biscuitware and distinct pastes associated with Sankawi Black-on-cream.

One of the more interesting stylistic observations from this project was the occurrence of very low frequencies of Santa Fe Black-on-white from almost all the sites with Classic period components. At first such associations were assumed to reflect mixing from earlier components. A second look at evidence from this project and other areas seems to indicate that Santa Fe-like pottery continued to be made in low frequencies at much later dates than previously assumed. Recent analyses of the ceramics from the Civic Center in downtown Santa Fe indicate evidence of production of a late variety of Santa Fe Black-on-white that may be characterized as Pindi Black-on-white in contexts associated with early biscuitware and glazeware types. This type essentially represents a late variety of Santa Fe Black-on-white that may be distinguished from earlier varieties of this type by the presence of added vitric tuff temper and distinct paste and slip clays. In retrospect, it is likely that some of the Santa Fe Black-on-white ceramics identified from the Early Classic period C&T Project sites may actually represent Pindi Black-on-white or a related phenomenon associated with localized production of Santa Fe-like pottery after biscuitwares began to be produced on the Pajarito Plateau. Thus, it is not surprising that many of the Classic period sites included some Santa Fe Black-on-white.

CHAPTER 59
PETROGRAPHIC ANALYSIS OF POTTERY FOR THE CONVEYANCE AND TRANSFER PROJECT, LOS ALAMOS NATIONAL LABORATORY

Elizabeth J. Miksa

INTRODUCTION

Petrographic analysis of potsherds and corresponding resource samples (sands, clays, or crushed rock) has been used to develop provenance data for ceramics over the past 100 years or more. For the Pajarito Plateau Conveyance and Transfer (C&T) Project, pottery has been analyzed over all five project phases to add information about pottery provenance and technology.

Several pottery production and economy questions can be addressed using the sample set presented here. The first questions are very simple and direct in nature: what types of materials were used to make the pottery under study? Were they mixtures of clay and temper? If so, what types of tempering material were used? Is it possible to distinguish among primary rock temper, crushed rock temper, and various sources of sand? Once temper types—and thus broad sets of temper sources—are identified, can we see variations through place and time?

Previous yearly reports in this series have detailed the answers to some of these questions and hinted at patterns for others (Castro-Reino 2004, 2005; Castro-Reino and Lavayen 2002). In this chapter, I will examine primarily temporal, ware-based patterns that can be seen now that the full data set is available for comparison. Unfortunately, the petrographic sample was not selected as a strict representation of the overall ceramic set. It cannot be used to answer smaller scale questions such as geographic or contextual distribution of temper composition because the relative frequencies of the observed temper groups by ceramic type are not known.

THE PETROGRAPHIC SAMPLE

A total of 171 sherd, sand, and rock samples were submitted for thin-sectioning and subsequent petrographic analysis over the course of the project. The vast majority are sherd thin sections; only a few rock and sand comparative samples were collected (Table 59.1). Note that 175 sherds were actually submitted for analysis, but some were unsuitable for thin-sectioning (see Appendix Q, Table Q.1). In the end, 161 sherds, six rocks, and four sand samples were thin-sectioned. All of the sherds and sands were point counted, but the rocks were not. The sherds were drawn from 24 sites across the five tracts included in the C&T Project, as well as two previously excavated sites in two additional technical areas (LA 4618 and LA 4624 in Technical Area (TA) 54, Areas L and G, respectively). The sherds represent the full geographic range of the C&T Project sites (Figure 59.1).

Because of the nature of this data set, its primary use is in comparing the textural and compositional features of the sand-sized fraction by ware through time (see Appendix Q, Tables Q.1 and Q.2). Each year of analysis allowed various attributes to be explored.

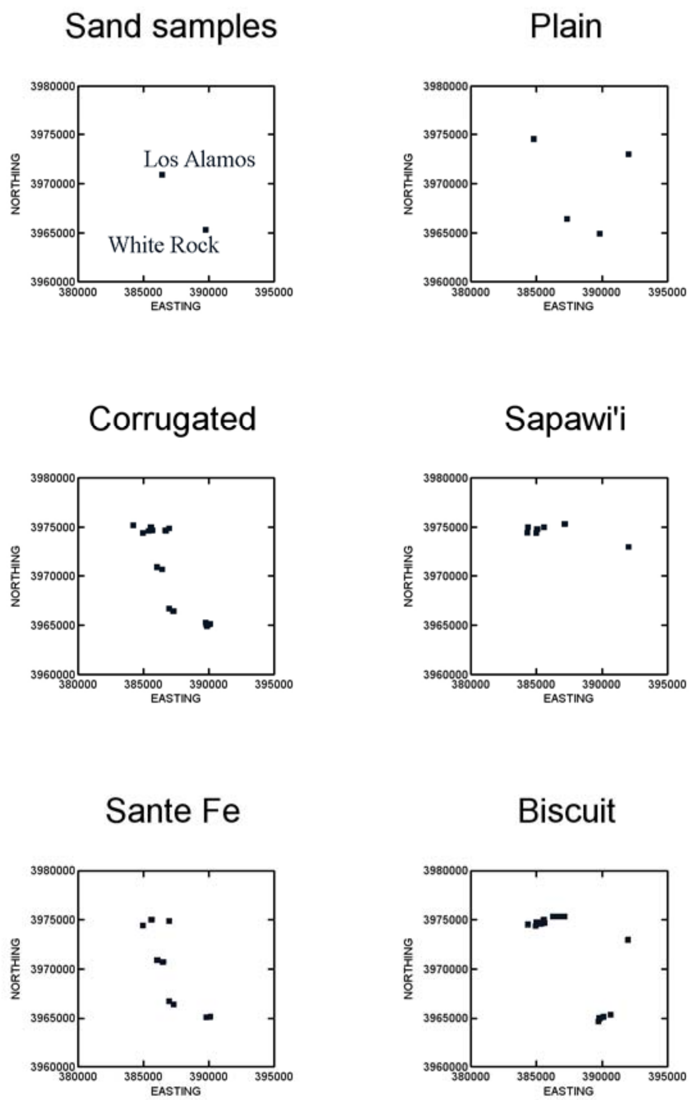


Figure 59.1. Geographic distribution of analyzed samples by sample type and ware.

Table 59.1. Petrographic sample by sample type and year of petrographic analysis.

Analysis Year	Rock[a]	Sand	Sherd	Row Totals
2002	0	0	18	18
2004	6	4	58	68
2005	0	0	40	40
2006	0	0	30	30
2007	0	0	15	15
Column Totals	**6**	**4**	**161**	**171**

[a]Rock samples were described petrographically but not point counted. An additional 16 rock samples were examined but not thin-sectioned.

The first year of petrographic analysis, 2002, occurred as fieldwork for the C&T Project was getting underway. To develop a sense of primary temper attributes, 18 sherds from LA 4624, a previously excavated site, were submitted for thin-sectioning (Tables 59.2 through 59.4). These sherds were evenly split among plain, corrugated, and Santa Fe wares and were examined primarily to establish temper type. Petrographic analysis was conducted by Sergio Castro-Reino and Carlos Lavayen. All of the sherds were found to have sand temper, though some differences in the angularity, roundness, and sorting of the sands were observed (Castro-Reino and Lavayen 2002). Diane Curewitz (personal communication) suggested that some of the differences might point to alluvial sources of sand versus those available from large anthills, and arrangements were made to test this hypothesis.

Table 59.2. Thin-sectioned sherds by ware and year of petrographic analysis.

Analysis Year	Biscuit	Corrugated	Plain	Santa Fe	Sapawi'i	Row Totals
2002	0	6	7	5	0	18
2004	11	22	3	21	1	58
2005	0	22	0	18	0	40
2006	14	6	1	2	7	30
2007	7	3	0	0	5	15
Column Totals	**32**	**59**	**11**	**46**	**13**	**161**

Table 59.3. Thin-sectioned sherds by ware, site, and tract.

Site (By Tract)	Biscuit	Corrugated	Plain	Santa Fe	Sapawi'i	Row Total
Areas G and L						
LA 4618	0	11	0	8	0	19
LA 4624	0	6	7	5	0	18
Subtotal	0	17	7	13	0	37
Airport						
LA 135290	0	10	0	9	0	19
LA 86534	0	6	0	9	0	15
Subtotal	0	16	0	18	0	34
White Rock						

Site (By Tract)	Biscuit	Corrugated	Plain	Santa Fe	Sapawi'i	Row Total
LA 12587	0	10	0	11	0	21
LA 86637	1	3	0	1	0	5
LA 127625	1	0	0	0	0	1
LA 128804	3	2	0	0	0	5
LA 128805	2	1	1	0	0	4
Subtotal	7	16	1	12	0	36
TA-74						
LA 21596B	4	0	2	0	1	7
Subtotal	4	0	2	0	1	7
Rendija						
LA 15116	1	0	0	0	1	2
LA 70025	0	0	0	0	1	1
LA 85404	1	1	0	1	1	4
LA 85408	2	0	0	0	0	2
LA 85411	3	0	0	0	0	3
LA 85413	2	0	0	0	5	7
LA 85417	0	1	0	0	0	1
LA 86605	2	0	0	0	0	2
LA 86606	0	2	0	0	0	2
LA 87430	3	0	0	0	2	5
LA 99396	0	1	0	1	0	2
LA 127627	0	0	1	0	0	1
LA 127634	2	0	0	0	1	3
LA 127635	2	3	0	1	1	7
LA 135291	1	1	0	0	0	2
LA 135292	2	1	0	0	0	3
Subtotal	21	10	1	3	12	47
Grand Totals	**32**	**59**	**11**	**46**	**13**	**161**

Table 59.4. Inventory of sherds selected for petrographic analysis[a].

Project Year	Thin-section Number	Site	Object Identifier[b]	Ceramic Type	Note
2002	PAX33-001	LA 4624	4624-143-123	Plain	
2002	PAX33-002	LA 4624	4624-143-124	Plain	
2002	PAX33-003	LA 4624	4624-1-142	Plain	
2002	PAX33-004	LA 4624	4624-12-279	Plain	
2002	PAX33-005	LA 4624	4624-21-360	Santa Fe B/w	
2002	PAX33-006	LA 4624	4624-49-595	Indented corrugated	
2002	PAX33-007	LA 4624	4624-50-606	Santa Fe	
2002	PAX33-008	LA 4624	4624-61-695	Plain	
2002	PAX33-009	LA 4624	4624-154-780	Smeared Indented corrugated	
2002	PAX33-010	LA 4624	4624-48-794	Santa Fe B/w	
2002	PAX33-011	LA 4624	4624-152-833	Santa Fe	
2002	PAX33-012	LA 4624	4624-152-837	Indented corrugated	
2002	PAX33-013	LA 4624	4624-126-991	Indented corrugated	
2002	PAX33-014	LA 4624	4624-185-1021	Santa Fe B/w	
2002	PAX33-015	LA 4624	4624-125-1043	Smeared Indented corrugated	
2002	PAX33-016	LA 4624	4624-95-1080	Plain	
2002	PAX33-017	LA 4624	4624-85-1149	Indented corrugated	
2002	PAX33-018	LA 4624	4624-86-1151	Plain	
2004	PAX37-0001	LA 86534	86534-351-2	Smeared Indented corrugated	
2004	PAX37-0002	LA 86534	86534-585-2	Indented corrugated	
2004	PAX37-0003	LA 86534	86534-596-7	Smeared Indented corrugated	
2004	PAX37-0004	LA 86534	86534-666-1	Santa Fe B/w	
2004	PAX37-0005	LA 86534	86534-708-2	Santa Fe B/w	
2004	PAX37-0006	LA 86534	86534-708-2	Santa Fe B/w	
2004	PAX37-0007	LA 86534	86534-708-2	Santa Fe B/w	
2004	PAX37-0008	LA 86534	86534-708-26		*Not thin-sectioned*
2004	PAX37-0009	LA 86534	86534-735-7	Santa Fe B/w	
2004	PAX37-0010	LA 86534	86534-735-12	Smeared Indented corrugated	

Project Year	Thin-section Number	Site	Object Identifier[b]	Ceramic Type	Note
2004	PAX37-0011	LA 86534	86534-1712-7	Indented corrugated	
2004	PAX37-0012	LA 86534	86534-1748-12	Santa Fe B/w	
2004	PAX37-0013	LA 86534	86534-1748-13	Santa Fe B/w	
2004	PAX37-0014	LA 86534	86534-1596-1	Indented corrugated	
2004	PAX37-0015	LA 86637	86637-79-1	Biscuit	
2004	PAX37-0016	LA 86637	86637-84-1	Santa Fe B/w	
2004	PAX37-0017	LA 86637	86637-7-1	Smeared Indented corrugated	
2004	PAX37-0018	LA 86637	86637-109-1	Smeared corrugated	
2004	PAX37-0019	LA 86637	86637-110-1	Smeared corrugated	
2004	PAX37-0020	LA 12587	12587-3244-5	Smeared corrugated	
2004	PAX37-0021	LA 12587	12587-3244-15	Santa Fe B/w	
2004	PAX37-0022	LA 12587	12587-3908-37	Indented corrugated	
2004	PAX37-0023	LA 12587	12587-3908-18	Santa Fe B/w	
2004	PAX37-0024	LA 12587	12587-3908-18	Santa Fe B/w	
2004	PAX37-0025	LA 12587	12587-3908-43	Smeared Indented corrugated	
2004	PAX37-0026	LA 12587	12587-3908-45	Smeared Indented corrugated	
2004	PAX37-0027	LA 12587	12587-3228-9	Santa Fe B/w	
2004	PAX37-0028	LA 12587	12587-3228-9	Santa Fe B/w	
2004	PAX37-0029	LA 12587	12587-3228-11	Santa Fe B/w	
2004	PAX37-0030	LA 12587	12587-3228-27	Smeared Indented corrugated	
2004	PAX37-0031	LA 12587	12587-3228-27	Indented corrugated	
2004	PAX37-0032	LA 12587	12587-3233-5	Santa Fe B/w	
2004	PAX37-0033	LA 12587	12587-3233-5	Santa Fe B/w	
2004	PAX37-0034	LA 12587	12587-3233-5	Santa Fe B/w	
2004	PAX37-0035	LA 12587	12587-3233-5	Smeared Indented corrugated	
2004	PAX37-0036	LA 12587	12587-3233-5	Smeared Indented corrugated	
2004	PAX37-0037	LA 128804	128804-90-1	Smeared Indented corrugated	
2004	PAX37-0038	LA 128804	128804-167-1	Biscuit B	
2004	PAX37-0039	LA 128804	128804-128-4	Biscuit	
2004	PAX37-0040	LA 128804	128804-230-1	Biscuit	

Project Year	Thin-section Number	Site	Object Identifier[b]	Ceramic Type	Note
2004	PAX37-0041	LA 128804	128804-179-1	Smeared Indented corrugated	
2004	PAX37-0042	LA 128805	128805-158-1	Biscuit B	
2004	PAX37-0043	LA 128805	128805-232-1	Smeared Indented corrugated	
2004	PAX37-0044	LA 128805	128805-197-2	Biscuit	
2004	PAX37-0045	LA 128805	128805-203-2	Plain Ware rim	
2004	PAX37-0046	LA 21596	21596-17-5	Biscuit B	
2004	PAX37-0047	LA 21596B	21596-12-17	Thin Plain Ware	
2004	PAX37-0048	LA 21596B	21596-12-2	Biscuit B	
2004	PAX37-0049	LA 21596	21596-9-17	Thin Plain Ware	
2004	PAX37-0050	LA 21596B	21596-9-5	Biscuit B	
2004	PAX37-0051	LA 21596B	21596-16-4	Sapawi'i Micaceous	
2004	PAX37-0052	LA 21596	21596-19-11	Biscuit B	
2004	PAX37-0053	LA 86534	86534-735-1	Santa Fe B/w	
2004	PAX37-0054	LA 127625	127625-22-1	Biscuit B	
2004	PAX37-0055	LA 127625	127625-64-1	Smeared Indented corrugated	*Not thin-sectioned*
2004	PAX37-0056	LA 12587	12587-2127-8	Smeared corrugated	
2004	PAX37-0057	LA 12587	12587-2127-24	Santa Fe B/w	
2004	PAX37-0058	LA 12587	12587-40414-33	Santa Fe B/w	
2004	PAX37-0059	LA 12587	12587-40414-8	Smeared corrugated	
2004	PAX37-0060	LA 86534	86534-1688-8	Santa Fe B/w	
2005	PAX41-0139-2	LA 135290	135290-0139-2	Santa Fe B/w	*Not thin-sectioned*
2005	PAX41-0166-1	LA 4618	4618-0166-7	Smeared Corrugated	
2005	PAX41-0166-2	LA 4618	4618-0166-1	Santa Fe B/w	*Not thin-sectioned*
2005	PAX41-0171-1	LA 4618	4618-0171-6	Smeared Corrugated	
2005	PAX41-0171-2	LA 4618	4618-0171-1	Santa Fe B/w	
2005	PAX41-0197-1	LA 4618	4618-0197-12	Smeared Corrugated	
2005	PAX41-0197-2	LA 4618	4618-0197-4	Santa Fe B/w	
2005	PAX41-0204-1	LA 4618	4618-0204-13	Smeared Corrugated	
2005	PAX41-0204-2	LA 4618	4618-0204-1	Santa Fe B/w	
2005	PAX41-0248-01	LA 135290	135290-0248-1	Smeared Corrugated	

Project Year	Thin-section Number	Site	Object Identifier[b]	Ceramic Type	Note
2005	PAX41-0248-1	LA 4618	4618-0248-9	Smeared Corrugated	
2005	PAX41-0248-2	LA 4618	4618-0248-6	Santa Fe B/w	
2005	PAX41-0256-1	LA 99396	99396-0256-1	Smeared Corrugated	*Not thin-sectioned*
2005	PAX41-0371-1	LA 4618	4618-0371-7	Smeared Corrugated	
2005	PAX41-0371-2	LA 4618	4618-0371-12	Santa Fe B/w	
2005	PAX41-0456-1	LA 99396	99396-0456-1	Smeared Corrugated	
2005	PAX41-0579-1	LA 4618	4618-0579-12	Smeared Corrugated	
2005	PAX41-0579-2	LA 4618	4618-0579-6	Santa Fe B/w	
2005	PAX41-0631-1	LA 99396	99396-0631-1	Smeared Corrugated	
2005	PAX41-0642-1	LA 4618	4618-0642-30	Smeared Corrugated	
2005	PAX41-0642-2	LA 4618	4618-0642-15	Santa Fe B/w	
2005	PAX41-0652-1	LA 4618	4618-0652-7	Smeared Corrugated	
2005	PAX41-0652-2	LA 4618	4618-0652-21	Santa Fe B/w	
2005	PAX41-0715-1	LA 4618	4618-0715-15	Smeared Corrugated	
2005	PAX41-0715-2	LA 4618	4618-0715-8	Santa Fe B/w	
2005	PAX41-0872-1	LA 135290	135290-872-5	Santa Fe B/w	
2005	PAX41-0925-2	LA 135290	135290-0925-1	Santa Fe B/w	
2005	PAX41-0942-1	LA 135290	135290-0942-2	Smeared Corrugated	
2005	PAX41-0969-1	LA 135290	135290-969-1	Santa Fe B/w	
2005	PAX41-1254-0	LA 135290	135290-1254-1	Santa Fe B/w	
2005	PAX41-1254-1	LA 135290	135290-1254-15	Smeared Corrugated	
2005	PAX41-1254-2	LA 135290	135290-1254-3	Santa Fe B/w	
2005	PAX41-1352-1	LA 135290	135290-1352-8	Smeared Corrugated	
2005	PAX41-1352-2	LA 135290	135290-1352-1	Santa Fe B/w	
2005	PAX41-1384-1	LA 135290	135290-1384-3	Smeared Corrugated	
2005	PAX41-1384-2	LA 135290	135290-1384-1	Santa Fe B/w	
2005	PAX41-1753-1	LA 135290	135290-1753-8	Smeared Corrugated	
2005	PAX41-1753-2	LA 135290	135290-1753-2	Santa Fe B/w	*Not thin-sectioned*
2005	PAX41-1900-1	LA 135290	135290-1900-10	Smeared Corrugated	
2005	PAX41-1900-2	LA 135290	135290-1900-3	Santa Fe B/w	

Project Year	Thin-section Number	Site	Object Identifier[b]	Ceramic Type	Note
2005	PAX41-2106-2	LA 135290	135290-2106-2	Smeared corrugated	
2005	PAX41-2202-2	LA 135290	135290-2202-1	Santa Fe B/w	
2005	PAX41-2307-1	LA 135290	135290-2307-7	Smeared Corrugated	
2005	PAX41-2307-2	LA 135290	135290-2307-5	Santa Fe B/w	*Sherd destroyed during thin-sectioning. Nothing remains.*
2005	PAX41-2351-1	LA 135290	135290-2351-8	Smeared Corrugated	
2005	PAX41-2351-2	LA 135290	135290-2351-5	Santa Fe B/w	*Not thin-sectioned*
2005	PAX41-2421-1	LA 135290	135290-2421-17	Smeared Corrugated	*Not thin-sectioned*
2006	LANL4-0001	LA 15116	15116-016-01	Biscuit	
2006	LANL4-0002	LA 15116	15116-057-01	Sapawi'i Micaceous	
2006	LANL4-0003	LA 70025	70025-032-01	Sapawi'i Micaceous	
2006	LANL4-0004	LA 70025	70025-044-02	Biscuit B	*Not thin-sectioned*
2006	LANL4-0005	LA 85404	85404-083-03	Smeared Indented corrugated	
2006	LANL4-0006	LA 85404	85404-086-02	Santa Fe B/w	
2006	LANL4-0007	LA 85404	85404-086-03	Sapawi'i Micaceous	
2006	LANL4-0008	LA 85404	85404-011-01	Biscuit	
2006	LANL4-0009	LA 86605	86605-83-02	Biscuit B	
2006	LANL4-0010	LA 86605	86605-97-01	Biscuit B	
2006	LANL4-0011	LA 87430	87430-012-03	Sapawi'i Micaceous	
2006	LANL4-0012	LA 87430	87430-014-01	Sapawi'i Micaceous	*Not thin-sectioned*
2006	LANL4-0013	LA 87430	87430-019-01	Biscuit B	
2006	LANL4-0014	LA 87430	87430-088-03	Biscuit B	
2006	LANL4-0015	LA 87430	87430-092-02	Sapawi'i Micaceous	
2006	LANL4-0016	LA 87430	87430-106-01	Biscuit	
2006	LANL4-0017	LA 127627	127627-090-03	Plain gray	
2006	LANL4-0018	LA 127634	127634-034-01	Biscuit A	
2006	LANL4-0019	LA 127634	127634-100-04	Biscuit B	
2006	LANL4-0020	LA 127634	127634-067-01	Sapawi'i Micaceous	
	LANL4-0021	LA 127635	127635-002-01	Smeared corrugated	*Not thin-sectioned*
2006	LANL4-0022	LA 127635	127635-005-02	Smeared Indented Corrugated	

Project Year	Thin-section Number	Site	Object Identifier[b]	Ceramic Type	Note
2006	LANL4-0023	LA 127635	127635-068-04	Smeared Indented Corrugated	
2006	LANL4-0024	LA 127635	127635-031-01	Sapawi'i Micaceous	
2006	LANL4-0025	LA 127635	127635-037-04	Santa Fe B/w	
2006	LANL4-0026	LA 127635	127635-039-03	Smeared Indented Corrugated	
2006	LANL4-0027	LA 127635	127635-064-05	Smeared Indented Corrugated	*Not thin-sectioned*
2006	LANL4-0028	LA 127635	127635-106-01	Smeared Indented Corrugated	*Not thin-sectioned*
2006	LANL4-0029	LA 127635	127635-129-01	Biscuit A	
2006	LANL4-0030	LA 127635	127635-146-01	Biscuit B	
2006	LANL4-0031	LA 135291	135291-038-01	Smeared Indented Corrugated	
2006	LANL4-0032	LA 135291	135291-072-01	Biscuit B	
2006	LANL4-0033	LA 135292	135292-023-02	Smeared Corrugated	
2006	LANL4-0034	LA 135292	135292-025-02	Biscuit B	
2006	LANL4-0035	LA 135292	135292-046-02	Biscuit	
2007	LANL5-01	LA 85408	85408-31-1	Biscuit B	
2007	LANL5-02	LA 85411	85411-97-1	Biscuit A	
2007	LANL5-03	LA 85413	85413-103-1	Biscuit A	
2007	LANL5-04	LA 85413	85413-79-1	Biscuit A	
2007	LANL5-05	LA 85408	85408-60-4	Biscuit B	
2007	LANL5-06	LA 85411	85411-14-1	Biscuit B	
2007	LANL5-07	LA 85411	85411-97-3	Biscuit B	
2007	LANL5-08	LA 85413	85413-97-1	Sapawi'i Micaceous	
2007	LANL5-09	LA 85413	85413-164-1	Sapawi'i Micaceous	
2007	LANL5-10	LA 85413	85413-89-1	Sapawi'i Micaceous	
2007	LANL5-11	LA 85413	85413-71-2	Sapawi'i Micaceous	
2007	LANL5-12	LA 85413	85413-79-2	Sapawi'i Micaceous	
2007	LANL5-13	LA 86606	86606-67-4	Smeared Corrugated	
2007	LANL5-14	LA 86606	86606-40-1	Smeared Corrugated	
2007	LANL5-15	LA 85417	85417-143-1	Smeared Corrugated	

[a]Some sherds could not be thin-sectioned for size or other considerations, but this inventory preserves the complete original list of sherds sent for analysis.
[b]This column contains object-specific identifier information, in the format "Site-Accession code-Catalog number" or "Site-Provenience code-Object number."

The second group of samples, submitted in 2003 but analyzed in 2004, comprised 68 samples. The six rock samples were thin-sectioned to establish a baseline of rock composition and texture for comparison. Table Q.3 summarizes the rock analysis. Two alluvial sands and two anthill sands were submitted for both textural and compositional analysis (Table 59.5), and thin-section analysis was ultimately completed for 58 of the 60 sherds submitted (see Tables 59.2 through 59.4). LA 86534 from the Airport Tract; LA 12587, LA 86637, LA 127625, LA 128804, and LA 128805 from the White Rock Tract, and LA 21596B from TA-74 are represented in this sample. All of the wares (Biscuit, Corrugated, Plain, Santa Fe Black-on-white, and Sapawi'i) are represented, though plain and Sapawi'i sample numbers were too low for statistical comparisons. The previous year's analysis had suggested that temper type was likely to be sand, so the analysis of this group of sherds was focused on identifying and characterizing the different types of sand. Additionally, both primary and secondary tuff was identified as a temper type in the Santa Fe Black-on-white sherds and in the biscuitwares. Petrographic analysis was conducted by Sergio Castro-Reino. A detailed report of the findings of this phase of analysis was submitted in 2004. Background geology and archaeology and preliminary textural and compositional findings are presented in the report (Castro-Reino 2004).

Table 59.5. Inventory of thin-sectioned rock and sand samples.

Project Year	Sample	Sample type	Location	Sample notes/sampled unit	Type of analysis
2004	PAX37-0061	Tuff	State Road 502 road cut	Guaje Pumice, upper	Qualitative
2004	PAX37-0062	Tuff	Los Alamos Canyon	Cerro Toledo; Lower; OU 1106, Strat. 1-6	Qualitative
2004	PAX37-0063	Tuff	Los Alamos Canyon	Tsankawi Member (sample from pumice bed)	Qualitative
2004	PAX37-0064	Tuff	Los Alamos Canyon	Qbt 1g, lower	Qualitative
2004	PAX37-0065	Tuff	Los Alamos Canyon	Colonnade Tuff	Qualitative
2004	PAX37-0066	Tuff	Los Alamos Canyon	Qbt 2	Qualitative
2004	PAX37-0067	Anthill sand	LA 12587	Bandelier Tuff "Colonnade"	Point count/ qualitative
2004	PAX37-0068	Anthill sand	LA 86534	Bandelier Tuff "Unit 3"	Point count/ qualitative
2004	PAX37-0069	Alluvial sand	Pajarito Canyon	From a channel in Pajarito Canyon, between TA's 36 & 54	Point count/ qualitative
2004	PAX37-0070	Alluvial sand	Pueblo Canyon	From a trench across a channel in Pueblo Canyon	Point count/ qualitative

The third group of samples, submitted in 2004 and analyzed in 2005, comprised 47 sherds submitted for analysis. Of these, six were too small to attempt thin-sectioning, and one was destroyed in the process leaving a total of 40 thin-sectioned sherds (see Tables 59.2 through

59.4). These sherds comprise primarily a set of matched corrugated and Santa Fe Black-on-white sherds, one each from a series of contexts in LA 4618, LA 135290, and LA 99396. The goal of this phase of analysis was to explore compositional and textural variation in the anthill sand and tuff tempers. Petrographic analysis was conducted by Sergio Castro-Reino. Results from this analysis were included in the 2005 Society of American Archaeology presentation by Wilson and Castro-Reino (2005). A copy of this presentation was submitted as a report on the year's progress. The petrographic data strengthened patterns seen in the comprehensive 2004 data set and no additional conclusions were drawn.

The final two groups of samples, submitted in 2005 and 2006 for analysis in 2006 and 2007, comprise sherds from Rendija Tract sites. Thirty sherds from LA 15116, LA 70025, LA 85404, LA 86605, LA 87430, LA 127627, LA 127634, LA 127635, LA 135291, and LA 135292 were analyzed in 2006 by Sergio Castro-Reino. Fifteen sherds from LA 85408, LA 85411, LA 85413, LA 85417, and LA 86606 were analyzed in 2007 by Elizabeth Miksa. Primary analyzed wares were Sapawi'i Micaceous, corrugated, and biscuit, with only a handful of plain and Santa Fe Black-on-white examined. The primary goal of the final two years of petrographic analysis was to further explore composition of the temper in biscuitwares and Sapawi'i Micaceous sherds. The 2006 data were submitted as an interim tabular report. The 2007 data were incorporated into a paper presented at the C&T Project symposium at the 2007 Society for American Archaeology meetings but are presented here in their complete form for the first time.

METHODS

The petrographic analysis used standard qualitative and quantitative evaluation methods. Quantitative analysis of mineralogical composition was accomplished through petrographic modal analysis, or point counting, of all grains that were sand-sized or larger, that is greater than or equal to 0.0625 mm on the medial axis (Chayes 1956). Point counting involves imposing a virtual grid over the sample and counting the grain type found under each grid point. The grid size is based on the coarseness of the sample, with the goal of counting each grain only once. This goal is harder to achieve when the sample is poorly sorted (Chayes 1956).

A Gazzi-Dickinson method was used for the point counting, wherein all sand-sized mineral grains are counted as their specific mineral type, regardless of whether or not they occur in a rock fragment. For instance, a sand-sized quartz grain would be counted as "Quartz" whether it occurs as a free mineral or in a fragment of granite (Dickinson 1970). This method is particularly well-suited to archaeological materials, as it allows comparison of temper to source materials such as sand or rock, even if the relative maturity of the source is not the same as that of the temper (Miksa and Heidke 2001). The only "rock" types encountered using this method are fine-grained lithics in which the individual grain sizes are less than 0.0625 mm. This includes the volcanic rocks, which make up the bulk of the Pajarito Plateau.

The Gazzi-Dickinson point count method can be used with varying degrees of separation of rock types. For instance, one might count "fine-grained rocks," "metamorphic rocks," "sedimentary rocks," and "volcanic rocks," or even break these categories down into specific types of metamorphic, sedimentary, and volcanic rocks. The point count parameters, or groups of grain types selected for this analysis, were developed by researchers at Desert Archaeology, Inc. They follow Dickinson's method but separate the grains into groups that are generally easily recognized under both low- and high-power magnification (Lombard 1987; Miksa and Heidke 2001). This allows maximum use of the petrographic data by ceramicists who are attempting to identify temper characteristics while sorting sherds under low-power magnification. At present there are approximately 50 point count parameters, with the set of parameters used depending on the sample type and geographic area. Some parameters, such as "grog," are unique to sherds. Not all parameters are encountered in all sherds. In general, only 10 to 15 parameters may be encountered in any given sample. A full description of the point count parameters can be found in Table 59.6. At the end of the table are some "calculated parameters," or common parameter combinations used in the statistical analysis. The full set of point count data for the sherds is presented in Tables Q.4.1 through Q.4.4, while the full set of point count data for the sands is presented in Table Q.5; all of these tables can be found in Appendix Q. An attempt was made to count 400 sand-sized grains per sample, whenever possible.

Table 59.6. Point count parameters and calculated parameters used for quantitative petrographic analysis.

PARAMETER	DESCRIPTION
Mineralic Grains	
QTZ	All quartz types.
KSPAR	Alkali feldspars: yellow-stained potassium feldspars or unstained sodium feldspars, perthite, antiperthite.
SANID	Sanidine (alkali feldspar of volcanic origin). This feldspar was only counted separately for samples in the 2004, 2005, and 2006 analysis years. In other years, sanidine was included with potassium feldspar (KSPAR).
MICR	Microcline/anorthoclase: alkali feldspar with polysynthetic (cross-hatch) twinning, stained yellow or unstained.
PLAG	Plagioclase feldspar stained pink, commonly with albite twinning, occasional carlsbad twinning, alteration or sericitization affects less than 10 percent of the grain.
PLAGAL	Altered plagioclase: alteration affects 10 percent to 90 percent of the grain. Alteration products include sericite, clay minerals, carbonate, and epidote.
PLAGGN	Considerably altered plagioclase, with alteration affecting more than 90 percent of the grain.
MUSC	Muscovite mica.
BIOT	Biotite mica.
CHLOR	Undifferentiated chlorite group minerals.
PX	Undifferentiated members of the pyroxene group.
AMPH	Undifferentiated members of the amphibole group.
OLIV [a, b]	Undifferentiated members of the olivine group.
OPAQ	Undifferentiated opaque minerals such as magnetite/ilmenite, rutile, and iron oxides.
GAR [a, b]	Undifferentiated members of the garnet group.

PARAMETER	DESCRIPTION
EPID [b]	Undifferentiated members of the epidote group
SPHENE [b]	Sphene.
CACO [b]	Undifferentiated calcium carbonate minerals (not aggregates; see LSCA below)
Mineralic Grains Derived from Foliated Metamorphic Rocks	
SQTZ [a]	In schist-tempered sherds: All quartz derived from or contained within schist.
SPLAG [b]	In schist-tempered sherds: Plagioclase feldspar (sodic or calcic, altered or fresh) derived from or contained within schist.
SKSPAR [b]	In schist-tempered sherds: Alkali feldspar (sodic or potassic) derived from or contained within schist.
SMUSC [b]	Muscovite mica derived from or contained within schist.
SBIOT [a, b]	Biotite mica derived from or contained within schist.
SCHLOR [a, b]	Undifferentiated chlorite group minerals derived from or contained within schist.
SOPAQ [a, b]	Undifferentiated opaque minerals derived from or contained within schist.
Volcanic Lithic Fragments	
LVF	Felsic volcanic such as rhyolite: microgranular nonfelted mosaics of submicroscopic to microscopic quartz and feldspars, commonly with microphenocrysts of feldspar, quartz, or rarely ferromagnesian minerals. Groundmass is fine to glassy, always has well-developed potassium feldspar (yellow) stain, may have calcium plagioclase (pink) stain as well.
LVFB	Biotite-bearing felsic volcanic: microgranular nonfelted mosaics of submicroscopic quartz and feldspars, often with microphenocrysts of feldspar, quartz, always with phenocrysts of biotite. Groundmass is fine to glassy, always has well-developed potassium feldspar (yellow) stain.
LVI	Intermediate volcanic rock such as rhyodacite, dacite, latite, and andesite.
LVM [b]	Mafic volcanic: visible microlites or laths of feldspar crystals in random to parallel fabric, usually with glassy, devitrified, or otherwise altered dark groundmass. Often with phenocrysts of opaque oxides, occasional quartz, pyroxene, or olivine. Rarely yellow-stained, usually has well-developed pink stain, representing intermediate to basic lavas such as latite, andesite, quartz-andesite, basalt, or trachyte.
LVV	Glassy volcanics: vitrophyric grains showing relict shards, pumiceous fabric, welding, or perlitic structure, sometimes with microphenocrysts, representing pyroclastic or glassy volcanic rocks.

PARAMETER	DESCRIPTION
LVH	Hypabyssal volcanics (shallow igneous intrusive rocks): equigranular anhedral to subhedral feldspar-rich rocks with no glassy or devitrified groundmass, coarser-grained than LVF, most have yellow and pink stain.
	Sedimentary Lithic Fragments
LSS	Siltstones: granular aggregates of equant subangular to rounded silt-sized grains with or without interstitial cement. May be well to poorly sorted, with or without sand-sized grains. Composition varies from quartzose to lithic-arkosic with some mafic-rich varieties.
LSA [b]	Argillaceous: dark, semi-opaque, extremely fine-grained, without visible foliation, may have mass extinction, variable amounts of silt-sized inclusions, representing shales, slates, and mudstones.
LSCH [b]	Chert: microcrystalline aggregates of silica.
LSCA [b]	Carbonate: mosaics of very fine calcite crystals (micrite) with or without interstitial clay- to sand-sized grains. Most appear to be fragments of soil carbonate and are subround to very round. In sherds, this parameter can be broken down into three types: LSCA1 is lumps of carbonate from a soil or sand, LSCA2 is of uncertain origin, and LSCA3 is carbonate that has clearly developed in place within the fabric of the sherd, i.e., carbonate growing within pore spaces.
	Metamorphic Lithic Fragments
LMMF [b]	Microgranular quartz aggregate or foliated quartz aggregate: polygonal aggregates of newly grown strain-free quartz with sutured, planar, or curved grain boundaries.
LMA2 [b]	Metamorphic aggregate: quartz, feldspars, mica, and opaque oxides in aggregates with highly sutured grain boundaries but no planar-oriented fabric. Includes amphibolites, metasediments, and metavolcanics.
LMTTP [b]	Quartz-feldspar-mica tectonite (phyllite, schist, or gneiss): quartz, feldspars, mica, and opaque oxides with strong planar-oriented fabric. Often display mineral segregation with alternating quart-felsic and mica ribbons. Grains are often extremely sutured and/or elongated.
	Other Grains
UNKN	Grains that cannot be identified, grains that are indeterminate, and grains such as zircon and tourmaline that occur in extremely low percentages.
GROG [b]	Also called sherd temper: Dark, semiopaque angular to subround grains with discrete margins, including silt to sand size temper grains in a clay, iron oxide, and/or micaceous matrix. The grains differ in color and/or texture from the surrounding matrix of the "host" ceramic. This parameter is

PARAMETER	DESCRIPTION
	counted only in sherd samples.
CLAY LUMP [b]	Dark semiopaque round grains with discrete margins and a clay, iron oxide, and/or micaceous matrix. The grains have a color and texture similar to the paste in which they occur, but lack silt- or sand-sized fragments. This parameter is counted only in sherd samples.
Totals and Paste Parameters	
Total	The total number of point-counted sand-sized grains.
Paste	The total number of points counted in the silt- to clay-sized fraction of the paste. (Not counted in sand samples.)
Voids	The total number of points counted in open spaces within the paste. (Not counted in sand samples)
Grand Total	The sum of Total+Paste+Voids. In sand samples Total=Grand Total.
Calculated Parameters	
TQtz	QTZ + SQTZ
Tkspar	KSPAR + SKSPAR
TKsparSanid	Sum of Tkspar and sanidine = KSPAR+SKSPAR+SANID
K	Sum of all alkali feldspars = KSPAR+SKSPAR+ MICR+SANID
Tplag	Total plagioclase = PLAG + PLAGAL + PLAGGN+SPLAG
TplagMicr	Sum of Tplag and Micr = Tplag + Micr
F	Total feldspar = K+Tplag
TKsparSanid/F	Ratio of TKSPAR to the sum of all feldspars.
TplagMicr/F	Ratio of MICR to the sum of all feldspars.
Tbiot	BIOT + SBIOT
Tchlor	CHLOR + SCHLOR
Tmusc	MUSC + SMUSC
Topaq	OPAQ + SOPAQ
Pyr	PX + AMPH
Lvf2	LVF + LVFB
Lvm2	LVM + LVI
Tuff	Sum of Lvv (tuff) and related alkali feldspars = LVV + TKsparSanid. (Overall indicator for tuff and its component minerals.)
Plutonic	TplagMicr+Tbiot+Tchlor+Pyr+Topaq. (Overall indicator for the presence of granitic rocks and its component minerals.)
Generic temper composition	Total

[a]These parameters were not encountered in the sherd samples. [b]These parameters were not encountered in the reference sand samples.

The qualitative analysis was accomplished using visual estimation of the "temper" elements of the sherds. For the sand-sized fraction, grain size, roundness, shape, and sorting were estimated. In addition, the composition of the dominant grain type was indicated, as was the composition of up to three accessory grain types. This characterization helps identify the most easily seen grain types in the sample. One consequence of the Gazzi-Dickinson point count method is that the compositional data may not reflect what is most easily seen by eye. For instance both an arkosic sand temper and a crushed granite might have abundant quartz, plagioclase, and potassium feldspar, but the arkose might have plagioclase as the dominant grain type while the crushed granite would have "granite" as the visually dominant grain type. Table 59.7 provides definitions for the textural attributes recorded for the sherds, while Table Q.6 provides the full set of textural and qualitative data collected for each sherd.

Table 59.7. Description of qualitative attributes recorded for the sand-sized fraction.

<table>
<tr><td colspan="2">Textural Attributes</td></tr>
<tr><td>Sphericity</td><td>Are the grains most like a sphere or cube (high sphericity), a shoebox or football (moderate sphericity) or a rod or pancake (low sphericity)?</td></tr>
<tr><td>Angularity</td><td>Does the grain have sharp edges (angular) or are the edges somewhat removed (subangular to subround) or entirely removed (well-rounded)?</td></tr>
<tr><td>Sorting</td><td>Do grains occur in a wide variety of sizes with no dominant size (very poorly sorted), or is there a restricted set of grain sizes (moderately sorted to well sorted)? Are there two distinct modes of grain size (Bimodal)?</td></tr>
<tr><td>Grain size</td><td>Wentworth grain sizes are used to describe the sand-sized fraction
very fine sand (0.0625 - .125 mm)
fine sand (0.125 - 0.250 mm)
medium sand (0.250 - 0.5 mm)
coarse sand (0.5-1.0 mm)
very coarse sand (1.0 - 2.0 mm)
granule (>2.0 mm)</td></tr>
<tr><td colspan="2">Compositional Attributes</td></tr>
<tr><td>Sand fraction grain types</td><td>What are the most common grain types seen in the sand fraction? These may differ from the point count parameters, for instance, a temper counted as coarse-grained quartz, plagioclase, and potassium feldspar might have a dominant grain type of "Granite" or "Plagioclase" depending on whether the parent material is cohesive or disaggregated.</td></tr>
<tr><td>Dominant
Accessory 1
Accessory 2
Accessory 3</td><td>What is the dominant grain type in the coarse fraction?
What is the second most common grain type in the coarse fraction?
What is the third most common grain type in the coarse fraction?
What is the fourth most common grain type in the coarse fraction?</td></tr>
<tr><td>Dominant (grouped)</td><td>This column illustrates how grain types were lumped together for comparison. As an example, granite, granite-gneiss, muscovite granite, and meta-granite were combined together into "Granite or Granite-gneiss" for the purposes of this analysis.</td></tr>
</table>

During the textural analysis, temper type and generic temper group assessments were made. Temper type was not fully evaluated until the second year of analysis, when rock and sand samples and a full suite of ware samples were available for comparison. As used here, temper type refers strictly to the type of material used as temper in the sherds. Broad groups such as "sand," "crushed rock," or "grog" are separated at this level. The temper type distinction is meant to represent the broad class of materials collected to make a paste and should get at basic technological distinctions in pottery technology. Collecting a sand, selecting and crushing a rock, or curating old sherds to grind up later are activities that require quite different planning, procurement, and processing strategies. Table 59.8 presents the criteria developed for temper type analysis for the Pajarito Plateau sherds. It is drawn from work conducted at Desert Archaeology, Inc. (Heidke 1986; Lombard 1987; Miksa 2001a, b; Miksa and Heidke 2001) and from Castro-Reino's work on the 2003 analytical year sherds (Castro-Reino 2004). Note that Table 59.8 includes some "non-tempered" paste types. These are pastes that seem to be made from clays that include sand-sized grains and to which no additional sand-sized materials seem to have been added.

Table 59.8. Qualitative grain characteristics generalized by temper type.

Attribute	**Sand**	**Tuff**
Sphericity	Moderate-high	Low-moderate
Angularity	Subangular	Angular
Sorting	Variable; moderate-well or bimodal	V. Poor-moderate
Modal grain size	V. coarse	Medium
Occurrence of unaltered, cohesive rock fragments	Rare	Common-abundant
Occurrence of phenocrysts (crystals embedded in volcanic rock)	Rare	Common
Occurrence of monocrystalline quartz, feldspar (not in rock fragments)	Common-abundant	Rare
Ratio of minerals:rock	High	Low

By contrast, the generic temper groups are meant to represent similar groups of tempers. For instance, if a sand tempered is desired, then collecting sand, whether from an anthill or a stream, requires broadly similar behaviors. Collecting a particular non-tempered clay with just the right amount of sand-sized inclusions, however, requires a different set of actions. Table 59.9 presents the criteria developed for temper group assignments for the Pajarito Plateau sherds, primarily on the basis of Castro-Reino's work (2004) with modifications based on observations on the 2006 and 2007 materials.

Table 59.9. Generic temper group qualitative characteristics.

Temper Group	Description
Anthill sand	Moderate-high sphericity, subangular to subround, bimodally sorted mineralic sand. Can appear to have polished, dissolved, or rounded edges under high magnification. Mineral:Rock ratio high.
Anthill sand with clay lumps	Same characteristics as anthill sand with the addition of clay lumps in the paste. The clay lumps have low sphericity but are round, medium to coarse grain sizes. They lack the silt fraction apparent in the overall paste and are not tempered. It is not clear if the clay lumps are an additional temper or represent incompletely wetted paste.
Alluvial sand	Moderate sphericity, subangular, moderately to well-sorted mineralic sand. Can appear to have some broken edges or frosted faces under high magnification. Mineral:Rock ratio high.
Granitic sand	Low/moderate sphericity, subangular to subround, poorly sorted, coarse grain size. Granite or granite-gneiss fragments are large and conspicuous, paste is frequently micaceous.
Sedimentary sand	Much like alluvial sand, except that sedimentary rock fragments are present.
Tuff 1 (Unmodified tuff of Castro-Reino 2004)	Fine-grained tuff with small phenocrysts. Low sphericity, angular, moderately/poorly sorted, medium grain size over all. Often has delicate glassy bubbles or stirrup shapes preserved intact. Mineral:Rock ratio very low.
Tuff 2 (Modified tuff of Castro-Reino 2004)	Fine-grained tuff with small phenocrysts. Low sphericity, angular-subangular, moderately sorted, medium grain size over all. Often has broken bubbles or broken glassy fragments; fragments may be rounded. Mineral:Rock ratio elevated over Tuff 1.

RESULTS

The point count and qualitative data from all five years of analysis was combined and evaluated on the basis of composition and texture. For the most part, samples that had been assigned to a particular temper type or group stayed in their original group. Outliers were re-evaluated to see if their temper group should be changed for the final integrated analysis. Table 59.10 presents a summary and explanation of the 36 samples whose final temper assignment was altered.

Table 59.10. List of samples that were reassigned for the final temper groups, with discussion.

Sample	Ware	Tplag Micrpct	Lvpct	Claypct	Petrographer's original temper characterization	Final Temper Group	Comments
PAX33-001	Plain	11.2	1.3	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-002	Plain	16.0	17.3	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-003	Plain	22.9	11.0	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-004	Plain	34.0	0.9	0.0	Sand	Granitic	There was not enough data at the time of the first analysis to define temper groups.
PAX33-005	Santa Fe	14.8	25.2	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-006	Corrugated	5.0	20.0	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-007	Santa Fe	20.2	7.3	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-008	Plain	8.6	3.3	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-009	Corrugated	3.5	14.0	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-010	Santa Fe	2.9	30.4	0.0	Sand	Anthill	There was not enough data at the

Sample	Ware	Tplag Micrpct	Lvpct	Claypct	Petrographer's original temper characterization	Final Temper Group	Comments
							time of the first analysis to define temper groups.
PAX33-011	Santa Fe	19.2	38.5	1.9	Sand	Tuff 2	There was not enough data at the time of the first analysis to define temper groups.
PAX33-012	Corrugated	5.9	12.5	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-013	Corrugated	37.0	0.7	0.0	Sand	Granitic	There was not enough data at the time of the first analysis to define temper groups.
PAX33-014	Santa Fe	13.6	10.7	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-015	Corrugated	4.4	6.3	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-016	Plain	4.8	9.6	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-017	Corrugated	3.4	10.9	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX33-018	Plain	9.7	14.5	0.0	Sand	Anthill	There was not enough data at the time of the first analysis to define temper groups.
PAX37-0006	Santa Fe	13.9	15.3	0.0	Tuff 1	Anthill	Lvpct is more than three standard deviations below the mean for Tuff 1.
PAX37-0007	Santa Fe	12.0	9.3	0.0	Tuff 2	Anthill	Lvpct is more than two standard

Sample	Ware	Tplag Micrpct	Lvpct	Claypct	Petrographer's original temper characterization	Final Temper Group	Comments
							deviations below the mean for Tuff 2.
PAX37-0009	Santa Fe	11.8	12.7	0.0	Tuff 2	Anthill	Lvpct is more than two standard deviations below the mean for Tuff 2.
PAX37-0013	Santa Fe	8.5	10.0	0.0	Tuff 2	Anthill	Lvpct is more than two standard deviations below the mean for Tuff 2.
PAX37-0028	Santa Fe	0.7	92.6	0.0	Tuff 2	Tuff 1	Lvpct is more than two standard deviations above the mean for Tuff 2.
PAX37-0034	Santa Fe	14.5	18.2	3.6	Anthill/Clay	Anthill	Claylump percent is more than three standard deviations below the mean for Anthill/clay.
PAX37-0035	Corrugated	18.2	8.3	2.3	Anthill/Clay	Anthill	Claylump percent is more than three standard deviations below the mean for Anthill/clay.
PAX37-0039	Biscuit	2.4	71.2	0.0	Tuff 1	Tuff 2	Lvpct is more than two standard deviations below the mean for Tuff 1.
PAX37-0047	Plain	14.5	75.6	0.0	Tuff 2	Tuff Other	The volcanic tuff in this sample is considerably different than all other samples.
PAX41-0197-2	Santa Fe	2.3	62.4	3.0	Tuff 1	Tuff 2	Lvpct is more than two std. deviations outside of the mean for Tuff 1.
PAX41-0204-2	Santa Fe	11.8	15.2	7.1	Granitic	Anthill	Lvpct is far more than three standard deviations above the mean for Granitic sand, while TplagMicrpct is three standard

Sample	Ware	Tplag Micrpct	Lvpct	Claypct	Petrographer's original temper characterization	Final Temper Group	Comments
							deviations below the mean for Granitic sand.
PAX41-0579-2	Santa Fe	16.5	6.5	11.0	Granitic	Anthill	Lvpct is three standard deviations above the mean for Granitic sand, while TplagMicrpct is two standard deviations below the mean for Granitic sand.
PAX41-0652-2	Santa Fe	4.9	47.9	2.1	Tuff 1	Tuff 2	Lvpct is more than three standard deviations below the mean for Tuff 1.
PAX41-1352-2	Santa Fe	1.6	66.4	23.7	Anthill	Tuff 1	Lvpct is far more than three standard deviations above the mean for Anthill sand. This sample also has claylumps, which suggest its paste is similar to the Anthill/clay group, but it clearly has added volcanic temper.
LANL4-0016	Biscuit	7.3	63.9	3.7	Tuff 1	Tuff 2	Lvpct is more than three standard deviations below the mean for Tuff 1.
LANL5-02	Biscuit	16.7	59.0	0.0	Tuff 1	Tuff 2	Lvpct is more than three standard deviations below the mean for Tuff 1.
LANL5-05	Biscuit	38.7	44.3	0.0	Tuff 1	Tuff Other	The volcanic tuff in this sample is considerably different than all other samples.
LANL5-07	Biscuit	16.9	57.8	0.0	Tuff 1	Tuff 2	Lvpct is more than three standard deviations below the mean for Tuff 1.

The sherds from the 2002 analytical year were originally assigned to the temper group "sand" because the criteria for distinguishing among sand types had not been established. Of the 18 sherds from the 2002 analytical year, 15 were assigned to anthill sand, two were assigned to granitic sand, and one, PAX33-11, was assigned to Tuff 2.

For the remaining 18 sherds, the compositional point count data were compared on the basis of means and standard deviations for the groups. If a sample exceeded two or more standard deviations from the mean it was evaluated for membership in the other temper groups. Table 59.10 provides values for the comparative parameters and the reassignment rationale for each sample. Table 59.11 provides the final temper type and temper group evaluation for each analyzed sherd sample, as well as the initial temper characterizations by the ceramicist and petrographer. Table 59.12 provides a cross-tabulation of these data, so that temper group changes by category can be easily reviewed. Note that there are only five major temper type changes, from sand to tuff or vice-versa, out of 161 sherds. These are noted in boldface type in the table. Some changes from Castro-Reino (2004) should also be noted. First, "unmodified" and "modified" volcanic tuff have been changed to the more neutral "Tuff 1" and "Tuff 2," respectively, and no samples have been assigned to alluvial sand. In the end, no particular signature could be identified for alluvial versus anthill sand. The two alluvial sand samples plot very close to the anthill samples on most measures.

Two of the final temper categories in Table 59.12 will not be addressed further. The two "Tuff other" samples have tuff compositions that are extremely different from the other samples in the Tuff 1 and Tuff 2 temper groups. Without comparative samples, it is impossible to evaluate these samples, so they will not be considered further. For the same reason, the single "sedimentary sand" sample will not be evaluated in the integrated analysis to follow. With these categories deleted, there are 158 sherds for the final integrated analysis.

Table 59.11. Temper characterization of the thin-sectioned sherds.

Thin-section Number	Ceramic Type	Generic Temper Composition[a]	Ceramicist's Temper Designation	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
PAX33-001	Plain	M	-	Sand	Sand	Anthill
PAX33-002	Plain	M	-	Sand	Sand	Anthill
PAX33-003	Plain	M	-	Sand	Sand	Anthill
PAX33-004	Plain	M	-	Sand	Sand	Granitic
PAX33-005	Santa Fe Black-on-white	M	-	Sand	Sand	Anthill
PAX33-006	Indented corrugated	M	-	Sand	Sand	Anthill
PAX33-007	Santa Fe Black-on-white	M	-	Sand	Sand	Anthill
PAX33-008	Plain	M	-	Sand	Sand	Anthill
PAX33-009	Smeared-indented corrugated	M	-	Sand	Sand	Anthill
PAX33-010	Santa Fe Black-on-white	M	-	Sand	Sand	Anthill
PAX33-011	Santa Fe Black-on-white	mLv	-	Sand	Tuff	Tuff 2
PAX33-012	Indented corrugated	M	-	Sand	Sand	Anthill
PAX33-013	Indented corrugated	M	-	Sand	Sand	Granitic
PAX33-014	Santa Fe Black-on-white	M	-	Sand	Sand	Anthill
PAX33-015	Smeared-indented corrugated	M	-	Sand	Sand	Anthill
PAX33-016	Plain	M	-	Sand	Sand	Anthill
PAX33-017	Indented corrugated	M	-	Sand	Sand	Anthill
PAX33-018	Plain	M	-	Sand	Sand	Anthill
PAX37-0001	Smeared-indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0002	Indented corrugated	mLv	Anthill sand	Anthill	Sand	Anthill
PAX37-0003	Smeared-indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0004	Santa Fe Black-on-white	M	Fine tuff or ash	Modified volcanic tuff	Tuff	Tuff 2
PAX37-0005	Santa Fe Black-on-white	mLv	Fine tuff or ash	Modified volcanic tuff	Tuff	Tuff 2
PAX37-0006	Santa Fe Black-on-white	M	Fine tuff or ash	Unmodified volcanic tuff	Sand	Anthill
PAX37-0007	Santa Fe Black-on-white	M	Fine tuff or ash	Modified volcanic tuff	Sand	Anthill
PAX37-0008		.				

Thin-section Number	Ceramic Type	Generic Temper Composition[a]	Ceramicist's Temper Designation	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
PAX37-0009	Santa Fe Black-on-white	M	Fine tuff or ash, with shale	Modified volcanic tuff	Sand	Anthill
PAX37-0010	Smeared-indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0011	Indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0012	Santa Fe Black-on-white	Lv	Fine tuff or ash	Modified volcanic tuff	Tuff	Tuff 2
PAX37-0013	Santa Fe Black-on-white	M	Fine tuff or ash	Modified volcanic tuff	Sand	Anthill
PAX37-0014	Indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0015	Biscuit	Lv	Fine tuff or ash	Unmodified volcanic tuff	Tuff	Tuff 1
PAX37-0016	Santa Fe Black-on-white	mLv	Fine tuff or ash	Modified volcanic tuff	Tuff	Tuff 2
PAX37-0017	Smeared-indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0018	Smeared corrugated	M	Granite with mica	Granitic	Sand	Granitic
PAX37-0019	Smeared corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0020	Smeared corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0021	Santa Fe Black-on-white	Lv	Tuff and sand	Unmodified volcanic tuff	Tuff	Tuff 1
PAX37-0022	Indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0023	Santa Fe Black-on-white	M	Fine tuff or ash	Modified volcanic tuff	Tuff	Tuff 2
PAX37-0024	Santa Fe Black-on-white	M	Fine tuff or ash	Modified volcanic tuff	Tuff	Tuff 2
PAX37-0025	Smeared-indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0026	Smeared-indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0027	Santa Fe Black-on-white	M	Tuff and anthill	Modified volcanic tuff	Tuff	Tuff 2
PAX37-0028	Santa Fe Black-on-white	Lv	Tuff and anthill	Modified volcanic tuff	Tuff	Tuff 1
PAX37-0029	Santa Fe Black-on-white	Lv	Tuff and anthill	Modified volcanic tuff	Tuff	Tuff 2
PAX37-0030	Smeared-indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0031	Indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0032	Santa Fe Black-on-white	Lv	Fine tuff or ash	Modified volcanic tuff	Tuff	Tuff 2
PAX37-0033	Santa Fe Black-on-white	mLv	Fine tuff or ash	Modified volcanic tuff	Tuff	Tuff 2

Thin-section Number	Ceramic Type	Generic Temper Composition[a]	Ceramicist's Temper Designation	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
PAX37-0034	Santa Fe Black-on-white	mLv	Fine tuff or ash with shale	Anthill/Clay	Sand	Anthill
PAX37-0035	Smeared-indented corrugated	M	Anthill sand	Anthill/Clay	Sand	Anthill
PAX37-0036	Smeared-indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0037	Smeared-indented corrugated	M	Anthill sand	Granitic	Sand	Granitic
PAX37-0038	Biscuit B	Lv	Fine tuff or ash	Unmodified volcanic tuff	Tuff	Tuff 1
PAX37-0039	Biscuit	Lv	Fine tuff or ash	Unmodified volcanic tuff	Tuff	Tuff 2
PAX37-0040	Biscuit	Lv	Fine tuff or ash	Unmodified volcanic tuff	Tuff	Tuff 1
PAX37-0041	Smeared-indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0042	Biscuit B	Lv	Fine tuff or ash	Unmodified volcanic tuff	Tuff	Tuff 1
PAX37-0043	Smeared-indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0044	Biscuit	Lv	Fine tuff or ash	Unmodified volcanic tuff	Tuff	Tuff 1
PAX37-0045	Plainware rim	M	Anthill sand?	Granitic	Sand	Granitic
PAX37-0046	Biscuit B	Lv	Ash, mica and sand	Unmodified volcanic tuff	Tuff	Tuff 1
PAX37-0047	Thin Plainware	Lv	Granite with mica	Modified volcanic tuff	Tuff	Tuff Other
PAX37-0048	Biscuit B	Lv	Tuff and phenocrystals	Unmodified volcanic tuff	Tuff	Tuff 1
PAX37-0049	Thin Plainware	M	Granite with mica	Granitic	Sand	Granitic
PAX37-0050	Biscuit B	Lv	Fine tuff or ash	Unmodified volcanic tuff	Tuff	Tuff 1
PAX37-0051	Sapawi'i Micaceous	M	Granite with mica	Granitic	Sand	Granitic

Thin-section Number	Ceramic Type	Generic Temper Composition[a]	Ceramicist's Temper Designation	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
PAX37-0052	Biscuit B	Lv	Fine tuff or ash	Unmodified volcanic tuff	Tuff	Tuff 1
PAX37-0053	Santa Fe Black-on-white	Lv	Fine tuff or ash	Unmodified volcanic tuff	Tuff	Tuff 1
PAX37-0054	Biscuit B	Lv	Tuff and phenocrystals	Unmodified volcanic tuff	Tuff	Tuff 1
PAX37-0056	Smeared corrugated	M	Anthill sand	Anthill	Sand	Anthill
PAX37-0057	Santa Fe Black-on-white	M	Indeterminate	Sedimentary	Sedimentary	Sedimentary
PAX37-0058	Santa Fe Black-on-white	mLv	Indeterminate	Unmodified volcanic tuff	Tuff	Tuff 2
PAX37-0059	Smeared corrugated	M	Indeterminate	Anthill	Sand	Anthill
PAX37-0060	Santa Fe Black-on-white	mLv	Fine tuff or ash	Modified volcanic tuff	Tuff	Tuff 2
PAX41-0166-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-0171-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-0171-2	Santa Fe Black-on-white	M	-	Anthill	Sand	Anthill
PAX41-0197-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-0197-2	Santa Fe Black-on-white	mLv	-	Unmodified volcanic tuff	Tuff	Tuff 2
PAX41-0204-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-0204-2	Santa Fe Black-on-white	M	-	Granitic	Sand	Anthill
PAX41-0248-01	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-0248-	Smeared Corrugated	M	-	Anthill	Sand	Anthill

Thin-section Number	Ceramic Type	Generic Temper Composition[a]	Ceramicist's Temper Designation	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
1						
PAX41-0248-2	Santa Fe Black-on-white	Lv	-	Unmodified volcanic tuff	Tuff	Tuff 1
PAX41-0371-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-0371-2	Santa Fe Black-on-white	Lv	-	Unmodified volcanic tuff	Tuff	Tuff 1
PAX41-0456-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-0579-1	Smeared Corrugated	mLv	-	Anthill	Sand	Anthill
PAX41-0579-2	Santa Fe Black-on-white	M	-	Granitic	Sand	Anthill
PAX41-0631-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-0642-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-0642-2	Santa Fe Black-on-white	Lv	-	Unmodified volcanic tuff	Tuff	Tuff 1
PAX41-0652-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-0652-2	Santa Fe Black-on-white	mLv	-	Unmodified volcanic tuff	Tuff	Tuff 2
PAX41-0715-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-0715-2	Santa Fe Black-on-white	Lv	-	Unmodified volcanic tuff	Tuff	Tuff 1
PAX41-0872-1	Santa Fe Black-on-white	mLv	-	Anthill/claylumps	Sand	Tuff/claylumps
PAX41-0925-	Santa Fe Black-on-white	mLv	-	Anthill/claylumps	Sand	Tuff/claylump

Thin-section Number	Ceramic Type	Generic Temper Composition[a]	Ceramicist's Temper Designation	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
2						s
PAX41-0942-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-0969-1	Santa Fe Black-on-white	mLv	-	Anthill/claylumps	Sand	Tuff/claylumps
PAX41-1254-0	Santa Fe Black-on-white	mLv	-	Anthill/claylumps	Sand	Tuff/claylumps
PAX41-1254-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-1254-2	Santa Fe Black-on-white	mLv	-	Anthill/claylumps	Sand	Tuff/claylumps
PAX41-1352-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-1352-2	Santa Fe Black-on-white	Lv	-	Anthill/claylumps	Tuff	Tuff/claylumps
PAX41-1384-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-1384-2	Santa Fe Black-on-white	mLv	-	Anthill/claylumps	Sand	Tuff/claylumps
PAX41-1753-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-1900-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
PAX41-1900-2	Santa Fe Black-on-white	mLv	-	Anthill/claylumps	Sand	Tuff/claylumps
PAX41-2106-2	corr or washboard	M	-	Anthill	Sand	Anthill
PAX41-2202-2	Santa Fe Black-on-white	mLv	-	Anthill/claylumps	Sand	Tuff/claylumps
PAX41-2307-	Smeared Corrugated	M	-	Anthill	Sand	Anthill

Thin-section Number	Ceramic Type	Generic Temper Composition[a]	Ceramicist's Temper Designation	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
1						
PAX41-2351-1	Smeared Corrugated	M	-	Anthill	Sand	Anthill
LANL4-0001	Biscuit	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL4-0002	Sapawi'i Micaceous	M	Granitic (micaceous)	Granitic	Sand	Granitic
LANL4-0003	Sapawi'i Micaceous	M	Granitic (micaceous)	Granitic	Sand	Granitic
LANL4-0005	Smeared-indented corrugated	M	Anthill sand	Anthill	Sand	Anthill
LANL4-0006	Santa Fe Black-on-white	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL4-0007	Sapawi'i Micaceous	M	Granitic (micaceous)	Granitic	Sand	Granitic
LANL4-0008	Biscuit	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL4-0009	Biscuit B	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL4-0010	Biscuit B	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL4-0011	Sapawi'i Micaceous	M	Granite with mica	Granitic	Sand	Granitic
LANL4-0013	Biscuit B	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL4-0014	Biscuit B	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL4-0015	Sapawi'i Micaceous	M	Granitic (micaceous)	Granitic	Sand	Granitic
LANL4-0016	Biscuit	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 2

Thin-section Number	Ceramic Type	Generic Temper Composition[a]	Ceramicist's Temper Designation	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
LANL4-0017	Plain gray	M	Granite	Granitic	Sand	Granitic
LANL4-0018	Biscuit A	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL4-0019	Biscuit B	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL4-0020	Sapawi'i Micaceous	M	Granitic (micaceous)	Granitic	Sand	Granitic
LANL4-0022	Smeared-indented Corrugated	M	Anthill sand	Anthill	Sand	Anthill
LANL4-0023	Smeared-indented Corrugated	M	Anthill sand	Anthill	Sand	Anthill
LANL4-0024	Sapawi'i Micaceous	M	Granitic (micaceous)	Granitic	Sand	Granitic
LANL4-0025	Santa Fe Black-on-white	Lv	Fine tuff	Modified volcanic tuff	Tuff	Tuff 2
LANL4-0026	Smeared-indented Corrugated	M	Anthill sand	Anthill	Sand	Anthill
LANL4-0029	Biscuit A	Lv	Fine tuff	Modified volcanic tuff	Tuff	Tuff 2
LANL4-0030	Biscuit B	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL4-0031	Smeared-indented Corrugated	M	Anthill sand	Anthill	Sand	Anthill
LANL4-0032	Biscuit B	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL4-0033	Smeared Corrugated	M	Anthill sand	Anthill	Sand	Anthill
LANL4-0034	Biscuit B	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL4-0035	Biscuit	Lv	Fine tuff	Unmodified volcanic tuff	Tuff	Tuff 1
LANL5-01	Biscuit B	Lv	fine tuff and sand	Unmodified volcanic tuff	Tuff	Tuff 1

Thin-section Number	Ceramic Type	Generic Temper Composition[a]	Ceramicist's Temper Designation	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
LANL5-02	Biscuit A	mLv	fine tuff and sand	Unmodified volcanic tuff	Tuff	Tuff 2
LANL5-03	Biscuit A	Lv	fine tuff and sand	Unmodified volcanic tuff	Tuff	Tuff 1
LANL5-04	Biscuit A	Lv	fine tuff and sand	Unmodified volcanic tuff	Tuff	Tuff 1
LANL5-05	Biscuit B	mLv	fine tuff and sand	Unmodified volcanic tuff	Tuff	Tuff Other
LANL5-06	Biscuit B	Lv	fine tuff and sand	Unmodified volcanic tuff	Tuff	Tuff 1
LANL5-07	Biscuit B	mLv	fine tuff and sand	Unmodified volcanic tuff	Tuff	Tuff 2
LANL5-08	Sapawi'i Micaceous	M	Granitic (micaceous)	Granitic	Sand	Granitic
LANL5-09	Sapawi'i Micaceous	M	Granitic (micaceous)	Granitic	Sand	Granitic
LANL5-10	Sapawi'i Micaceous	M	Granitic (micaceous)	Granitic	Sand	Granitic
LANL5-11	Sapawi'i Micaceous	M	Granitic (micaceous)	Granitic	Sand	Granitic
LANL5-12	Sapawi'i Micaceous	M	Granitic (micaceous)	Granitic	Sand	Granitic
LANL5-13	Smeared Corrugated	M	Anthill sand	Anthill	Sand	Anthill
LANL5-14	Smeared Corrugated	M	Anthill sand	Anthill	Sand	Anthill
LANL5-15	Smeared Corrugated	M	Anthill sand	Anthill	Sand	Anthill

[a]M = "mineral-rich," mLV = "Mineral-rich with subordinate volcanics," Lv = "Volcanic-rich."

Table 59.12. Cross-tabulation of original by final temper group according to the petrographic analysis of the sand-sized fraction.

	Final Temper group							
	Sand tempers				Volcanic tempers			
Original Temper Group	Ant-hill	Anthill/ Clay	Gran-itic	Sedimen-tary	Tuff 1	Tuff 2	Tuff Other	Total
Sand Tempers								
Anthill	53	8	0	0	**1**	0	0	62
Granitic	2	0	18	0	0	0	0	20
Sand	15	0	2	0	0	**1**	0	18
Sedimentary	0	0	0	1	0	0	0	1
Volcanic Tempers								
Tuff 1	**1**	0	0	0	33	7	1	42
Tuff 2	**3**	0	0	0	1	13	1	18
Total	**74**	**8**	**20**	**1**	**35**	**21**	**2**	**161**

Note: Temper *type* changes, i.e., from sand to volcanic or vice-versa, are indicated by boldface type.

COMPOSITIONAL CHARACTERISTICS OF THE FINAL TEMPER GROUPS

Since there are only four comparative sand samples available for this analysis, it seems unlikely that the entire compositional range of Pajarito Plateau alluvial and anthill sands has been captured and expressed. Given the final temper groups established using the combined point count data, it would be best to evaluate the compositional characteristics of each temper group, and evaluate the ware data by temper group.

Figures 59.2 through 59.4 illustrate the gross composition of the point counted sherds. Figure 59.2 shows that the Anthill and Granitic sands are enriched in quartz compared to the other groups. Tuff 2 has an intermediate amount of quartz, while Tuff 1 is quartz poor. The combined potassium feldspar plus sanidine (Ksanid) parameter measures the presence of monocrystalline alkalic feldspars derived from volcanic rocks. It is elevated in the Anthill sand samples and slightly elevated in the Tuff 2 and Anthill/Clay groups. The combined plagioclase feldspar and microcline parameter measures plagioclase derived from granitic rocks or arkose. It is elevated in Anthill sand, very high in Granitic sand, modestly elevated in Tuff 2, and low in Tuff 1 and Anthill/Clay. Total muscovite (Tmusc) and total biotite (Tbiot) are present only in Granitic sand samples. Chlorite, total opaque minerals, and pyroxene and amphibole (Pyr) are not particularly patterned by temper group. Figure 59.4 shows that felsic volcanic rock fragments (Lvf2) are elevated in Anthill Sand and Tuff 2, while Tuff fragments proper (Lvv) are elevated in Tuff 1 and Tuff 2, though they are also present in Anthill/Clay and Anthill sand. The Anthill/Clay samples have the only appreciable amount of clay lumps. Note that there is a single outlier sample of Tuff 1 that also bears clay lumps.

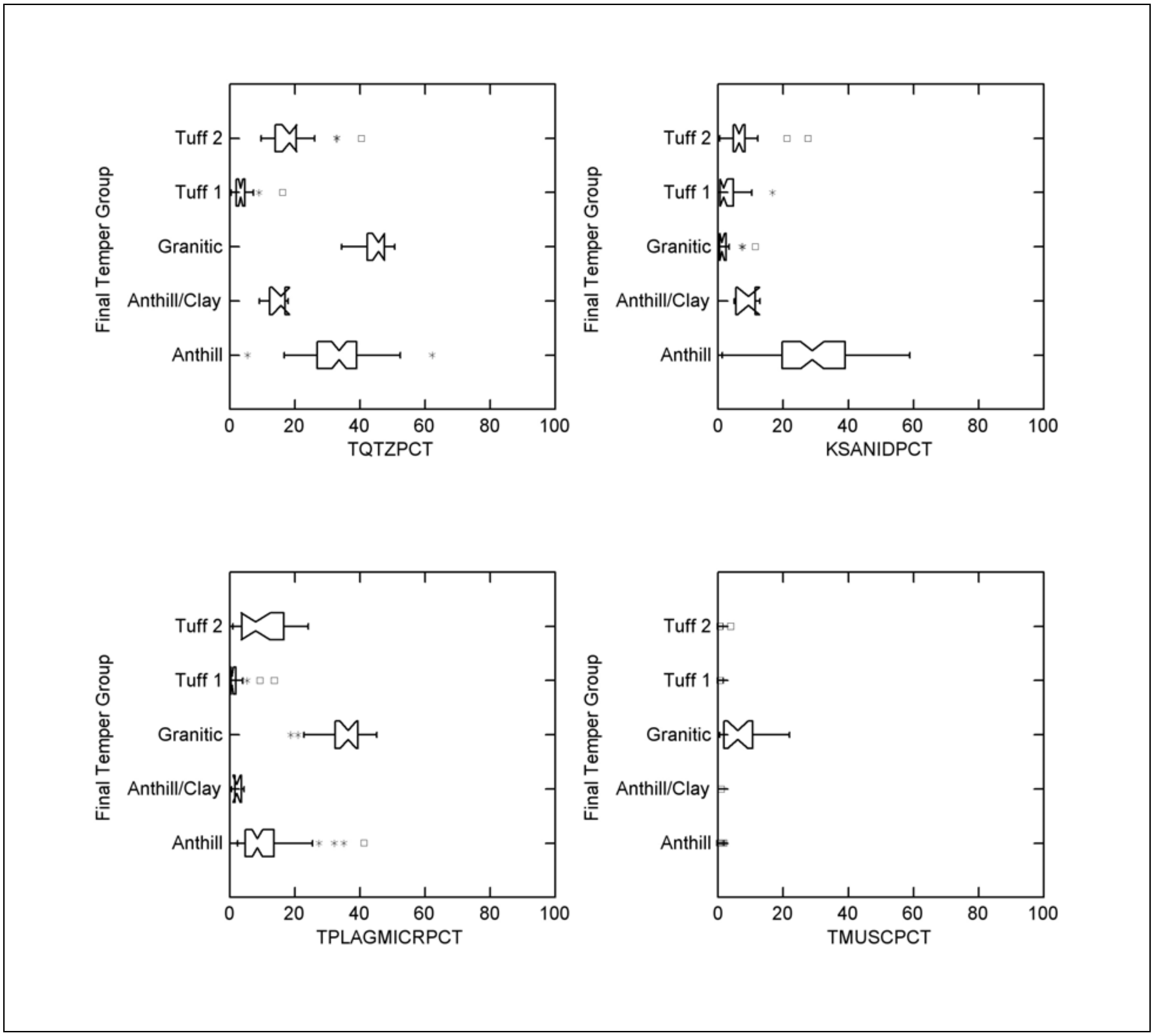


Figure 59.2. Box-and-whiskers plot of Tqtz percent, Tkspar+Sanid percent, Tplag+Micr percent, and Tmusc percent, for the sherds by final temper group.

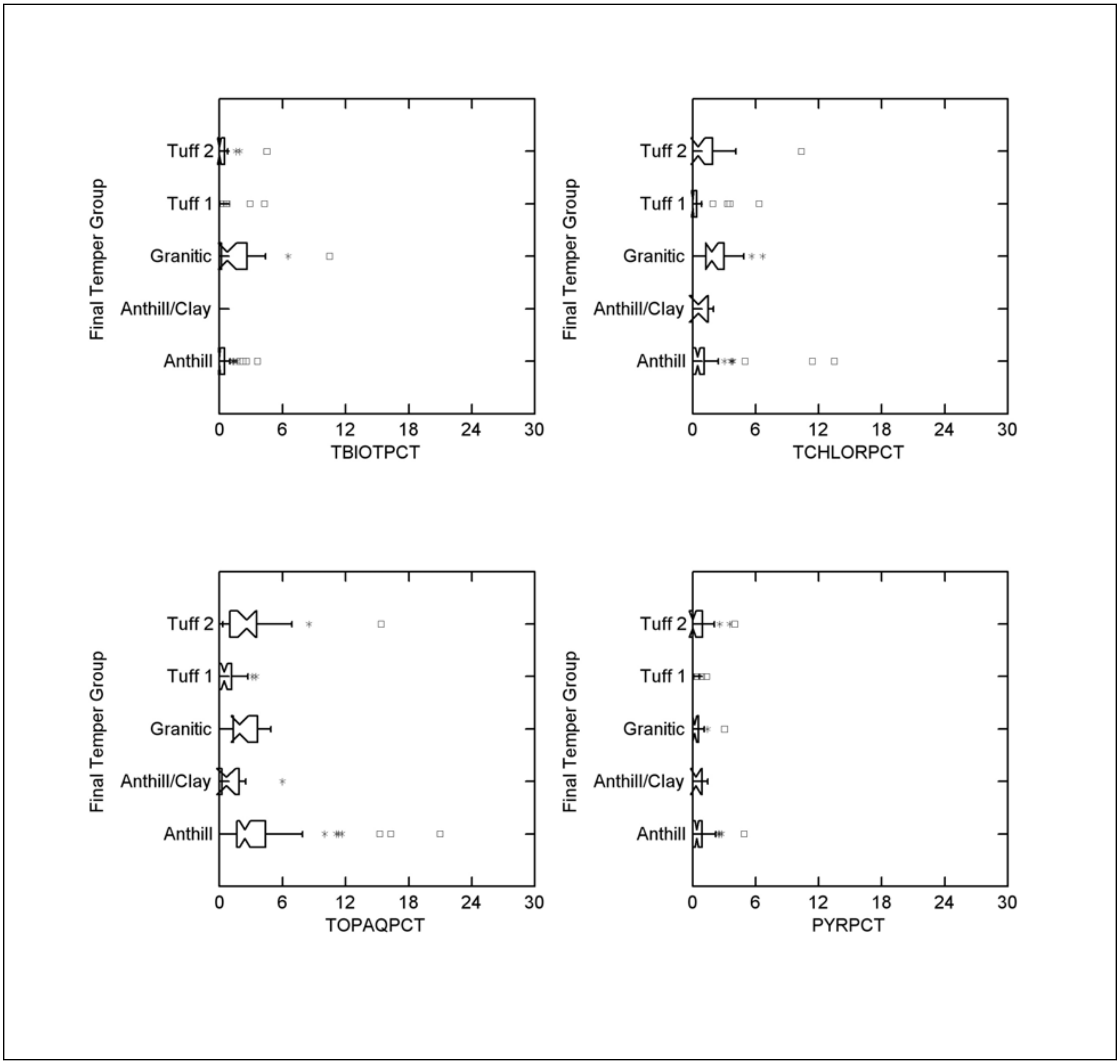


Figure 59.3. Box-and-whiskers plot of Lvf2 percent, Lvm2 percent, Lvv percent, and Claylump percent, for the sherds by final temper group.

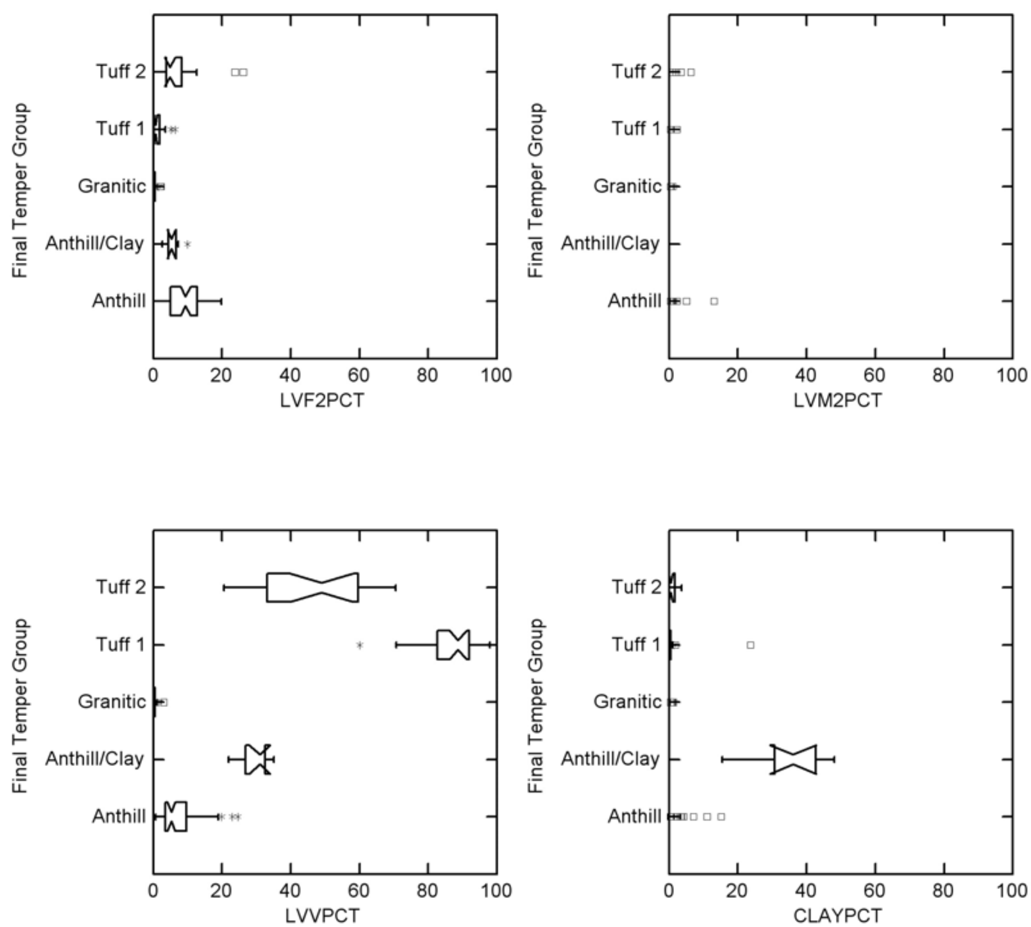


Figure 59.4. Box-and-whiskers plot of Tbiot percent, Tchlor percent, Topaq percent, and Pyr percent, for the sherds by final temper group.

Figure 59.5 combines the most distinctive of these basic compositional parameters into a ternary diagram, with the axes Tqtz, Tplag+Micr, and Kspar+Sanid+Lvv. Although these are not the standard axes for this diagram, this combination of variables combines those that are distinctive by temper group to provide a more clear picture of the compositional groups. Note that the Tuff 1 samples plot very close to the Kspar+Sanid+Lvv apex while the Granitic sands form a cohesive group opposite that apex. There is considerable overlap amongst the remaining groups in this view. Figure 59.6 takes these same data and submits them to a correspondence analysis. In this view we see that the Tuff 1 samples show a strong affinity to Lvv, while the Granitic sand samples plot with Tmusc, Tbiot, and Tplag. The Anthill temper samples are pulled by Lvf2 and sanidine, while the Anthill/Clay and Tuff 2 samples form an overlapping group at the center of the diagram. Alluvial sand samples fully within the Clay lumps could not be included, since they occur in only one subgroup in relatively low proportions compared to other parameters.

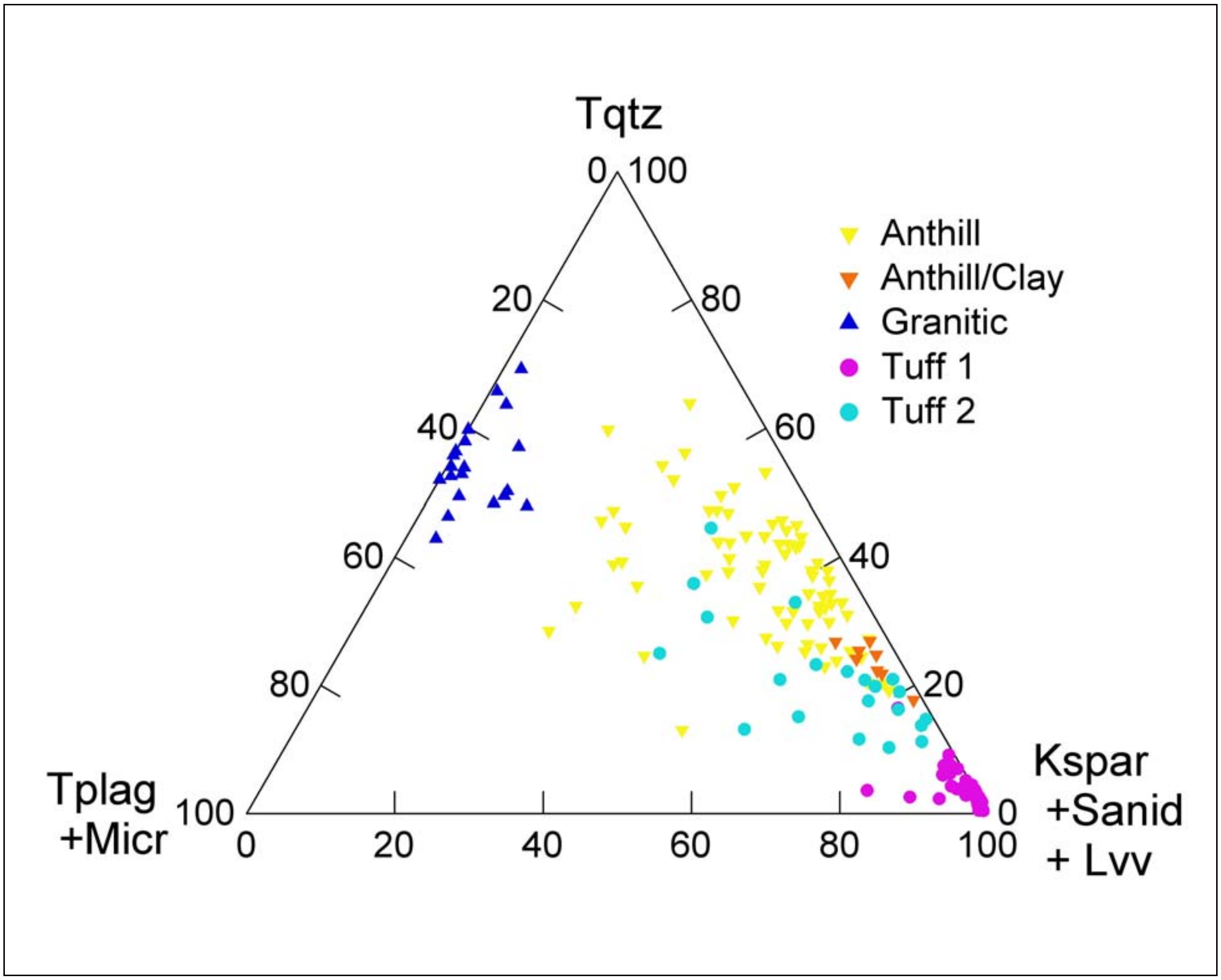


Figure 59.5. Ternary diagram of sherd samples by final temper group. Axes are Tqtz, Tplag+Micr, and Tkspar+Sanid+Lvv.

Having accepted the final temper group assignments as a useful measure of actual temper group, we can examine the textural attributes by temper group (Figure 59.7). Note the strong tendency to bimodal grain size moderate sphericity, and angular to subangular grains in the anthill and anthill/clay tempers. The split in sphericity characterization for the Tuff 1 tempers may be an artifact of having different analysts. These bar charts can be compared to the data for the four available sands samples (Table 59.13).

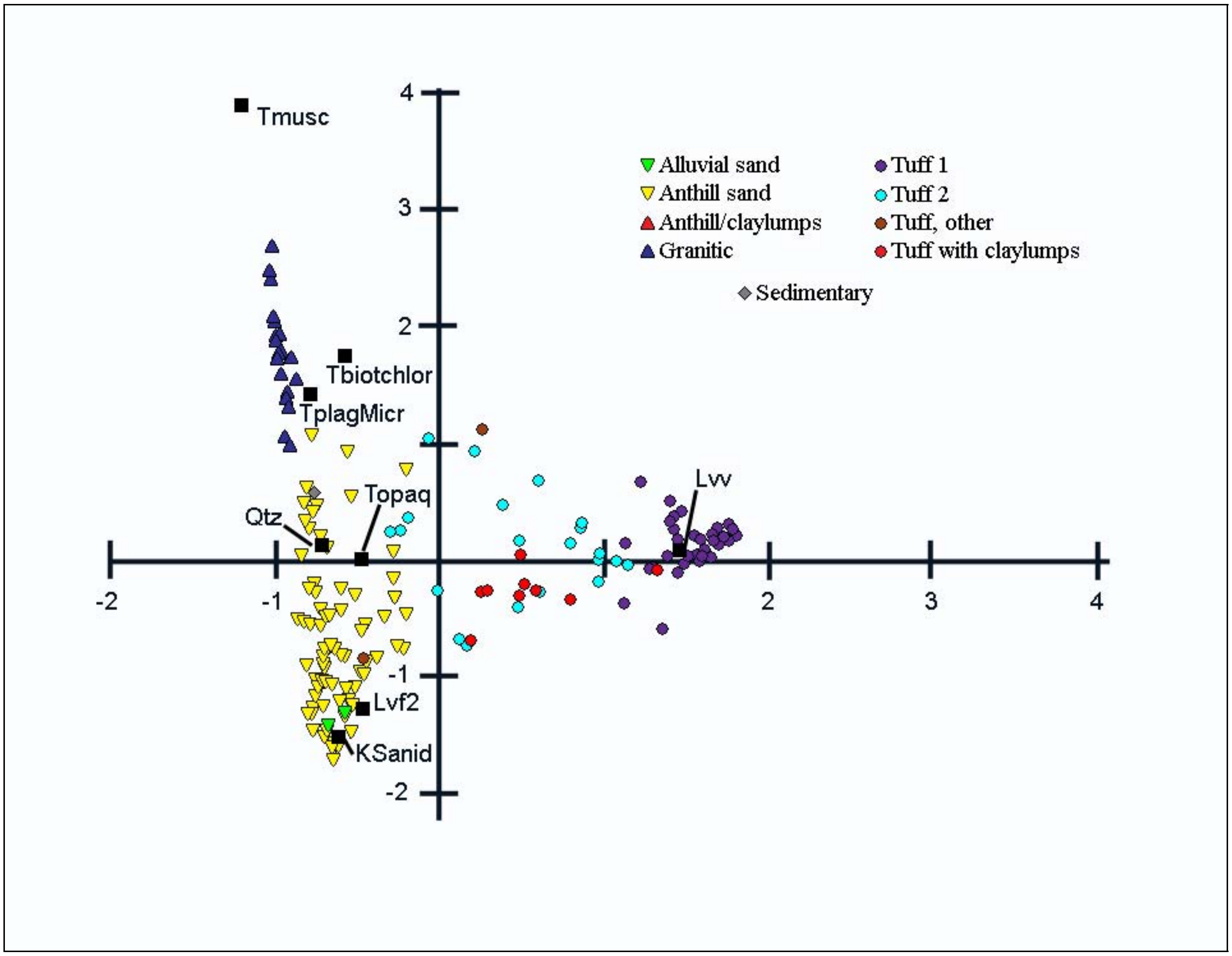


Figure 59.6. Scatter plot of the first two axes of the correspondence analysis of sand and sherd samples, plotted by final temper group.

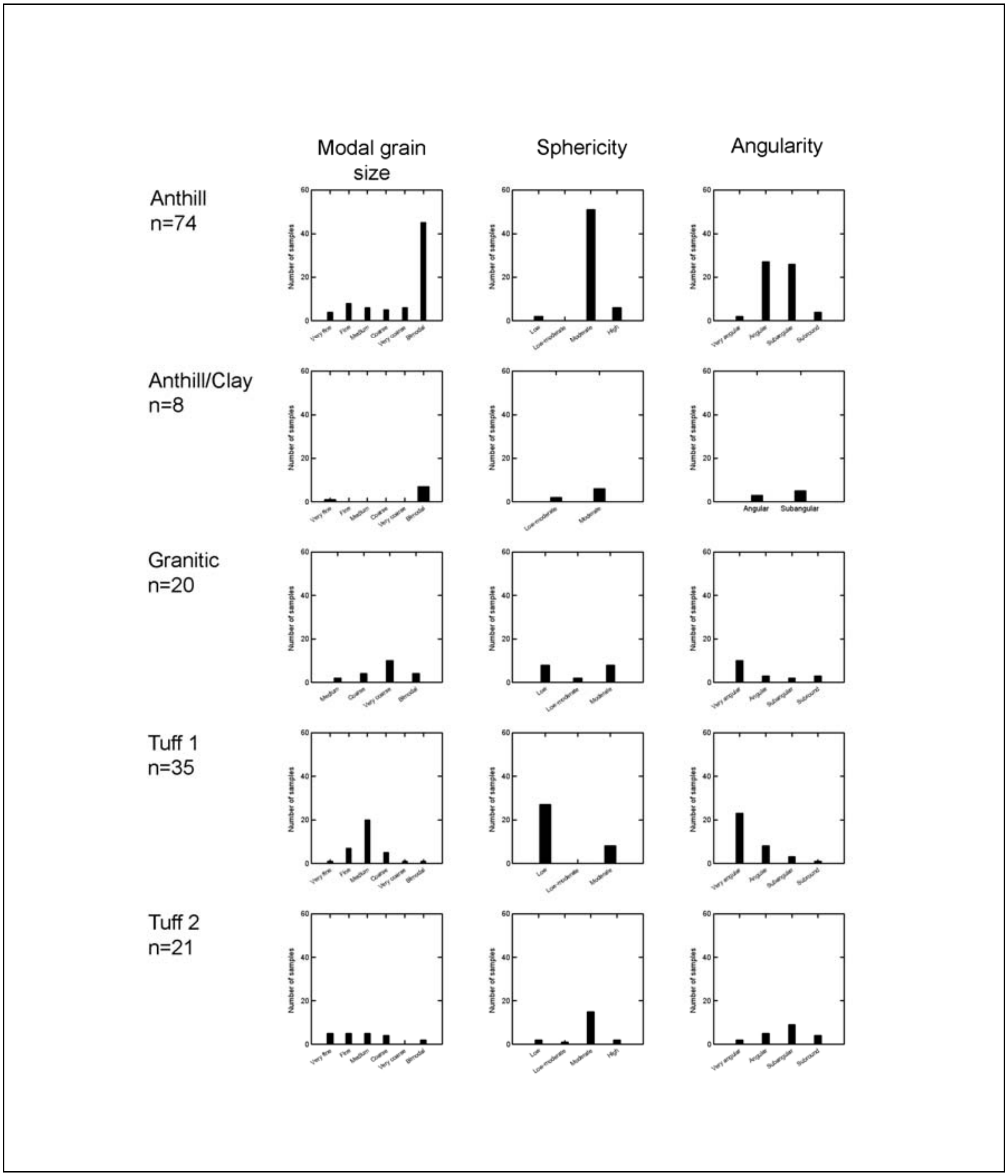


Figure 59.7. **Bar diagram of textural attributes of the sherd samples, plotted by final temper group for each attribute**.

Table 59.13. Qualitative attributes for sand samples: texture, morphology, and grain types.

		Texture and Grain Size Distributions				Sand Fraction Grain Types			
Sample	Temper Group	Sphericity	Angularity	Sorting	Modal Grain Size	Dominant	Accessory 1	Accessory 2	Accessory 3
PAX37-0067	Anthill	High	Subangular	Well	V. coarse	Quartz	Sanidine	Felsite	Vitric felsite
PAX37-0068	Anthill	Moderate	Subangular	Well	V. coarse	Quartz	Sanidine	Sanid. felsite	Interm. volc.
PAX37-0069	Alluvial	Moderate	Angular	Moderate	V. coarse	Sanidine	Quartz	Vitric felsite	Interm. volc.
PAX37-0070	Alluvial	Moderate	Angular	Moderate	V. coarse	Sanidine	Quartz	Vitric felsite	Interm. volc.

INTERPRETATION

By examining the sherds by temper group first, we are able to evaluate patterns by ceramic type much more easily. Castro-Reino (2004) concluded that the temper group was specific to ceramic type, though there were a number of samples outside of the suggested pattern. Table 59.14 cross-tabulates the temper group data by ware.

Table 59.14. Cross-tabulation of final temper group by ware.

	Ware					
Final temper group	**Plain**	**Corrugated**	**Santa Fe**	**Sapawi'i**	**Biscuit**	**Row Total**
Anthill	6	56	12	0	0	74
Anthill/Clay	0	0	8	0	0	8
Granitic	4	3	0	13	0	20
Total, sand tempers	*10*	*59*	*20*	*13*	*0*	*102*
Tuff 1	0	0	9	0	26	35
Tuff 2	0	0	16	0	5	21
Total, volcanic tempers	*0*	*0*	*25*	*0*	*31*	*56*
Column total	10	59	45	13	31	158

Castro-Reino (2004) applied a ratio of mineralic content to the analyzed pottery as one measure of composition. However, he evaluated the ratio in terms of ceramic type instead of temper group. For this reason, he had many outlying samples to explain, and the M/M+Lv parameter became difficult to use as a measure of group membership. By examining M/M+Lv by temper group, however, much of the within-group variation is lost, leaving a strongly patterned data set (Figure 59.8). Anthill and Granitic sands are strongly mineralic, Tuff 2 and Anthill/Clay tempers overlap in the middle, Tuff 1 temper is rich in volcanic rock fragments, sometimes to the near exclusion of single crystals of quartz and feldspar.

A breakdown of the ternary diagram by ware shows strong temper type by ware patterning (Figure 59.9). There are only a small number of plainware sherds, but none are tuff-rich. Similarly, only three of the corrugated sherds are granitic sand. The bulk of the corrugated sherds are tempered with anthill sand. None are tuff-rich. All of the Sapawi'i Micaceous sherds are tempered with granitic sand. Santa Fe Black-on-white shows the greatest variation, except that it is never tempered with granitic sand. All of the Biscuit sherds are tempered with either Tuff 1 or Tuff 2.

Evaluating the Compositional Patterns by Ware

The plainware sherds show considerable variation through time and space. There are a number of different plain ceramic types, and they are spread across the entire project area. Even so, they are tempered only with Anthill sand, Granitic sand, and a single "Tuff other" temper (Table 59.15). These sherds do not represent a cohesive enough group to evaluate further.

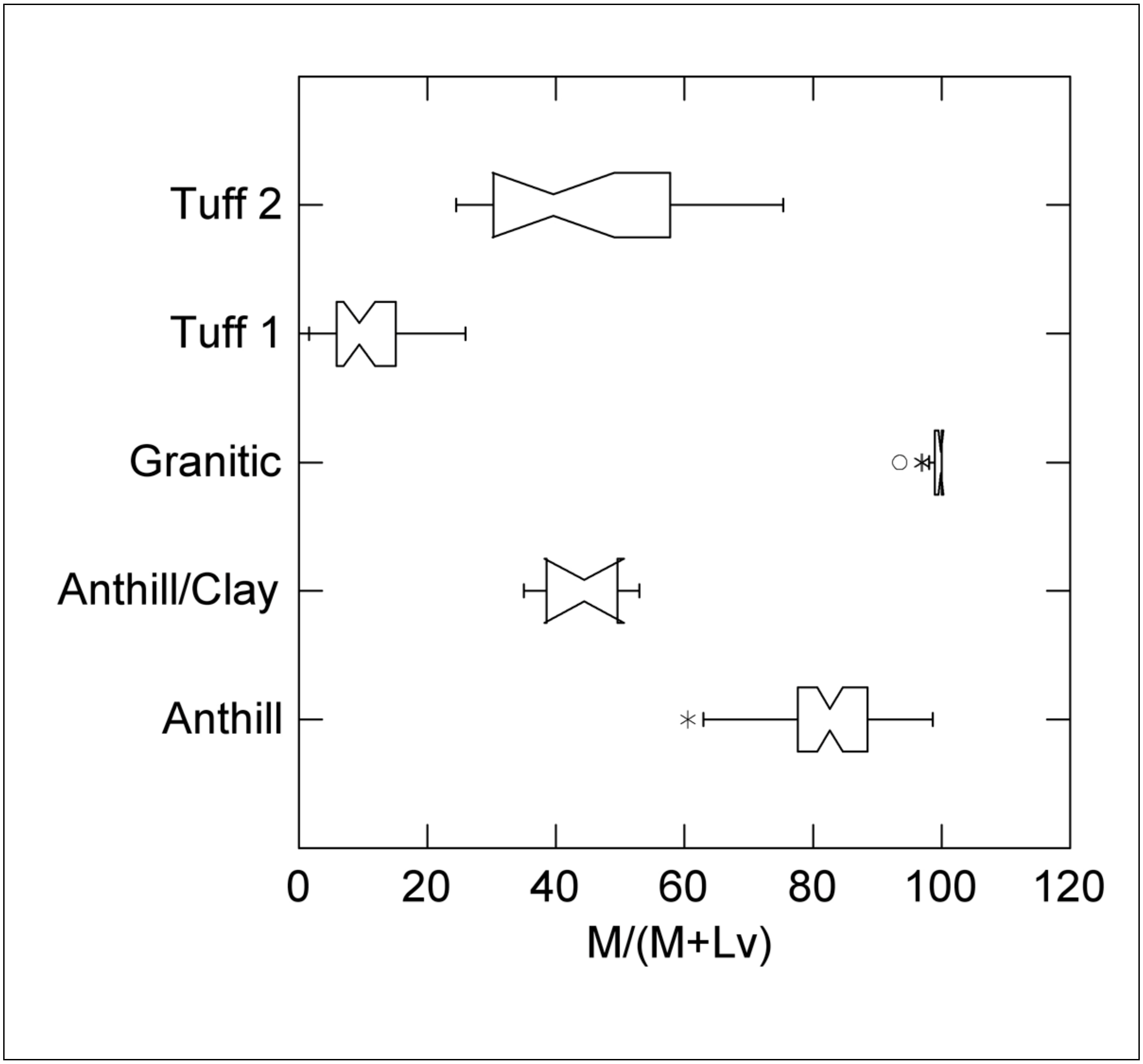


Figure 59.8. Box-and-whiskers plot of the mineral to lithic ratio M/M+Lv for the sherds by final temper group.

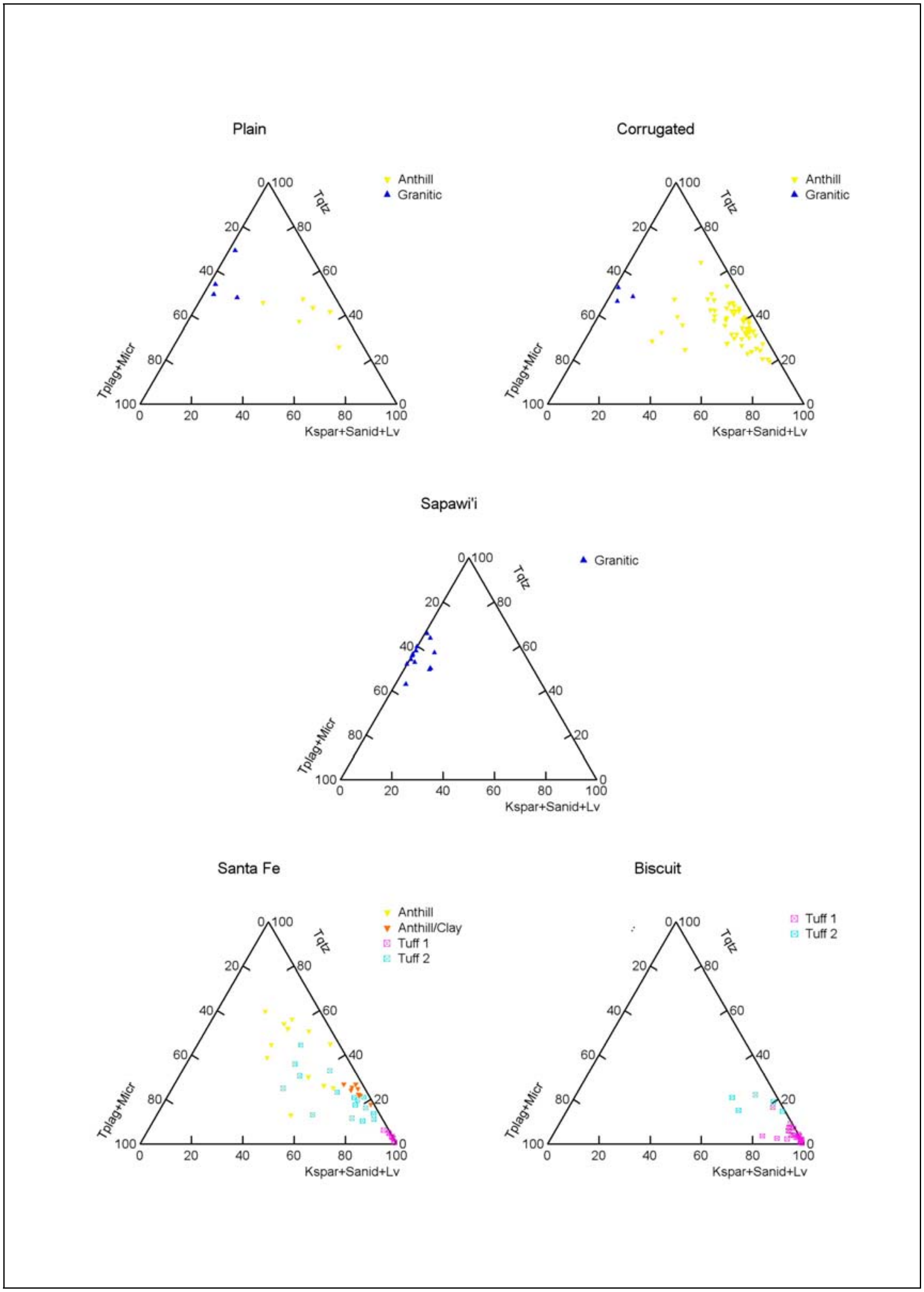


Figure 59.9. Ternary diagram of sherd samples by ware and final temper group. Axes are Tqtz, Tplag+Micr, and Tkspar+Sanid+Lvv.

Table 59.15. Thin-sectioned plain ware sherds, showing ceramic type, period (by context) and final temper group.

Sample	Site	Period	Final Temper Group	Ceramic Type
PAX33-001	LA4624	Early Middle Coalition	Anthill	Plain
PAX33-002	LA4624	Early Middle Coalition	Anthill	Plain
PAX33-003	LA4624	Early Middle Coalition	Anthill	Plain
PAX33-004	LA4624	Early Middle Coalition	Granitic	Plain
PAX33-008	LA4624	Early Middle Coalition	Anthill	Plain
PAX33-016	LA4624	Early Middle Coalition	Anthill	Plain
PAX33-018	LA4624	Early Middle Coalition	Anthill	Plain
PAX37-0047[a]	LA21596B	Coalition/Classic	Tuff Other	Thin Plainware
PAX37-0049	LA21596	Coalition/Classic	Granitic	Thin Plainware
LANL4-0017	LA127627	Classic	Granitic	Plain
PAX37-0045	LA128805	Late Classic	Granitic	Plain

[a]Note that this sherd is excluded from the summary diagrams, as noted in the text.

The corrugated sherds are all sand tempered, and the vast majority (56/59) are tempered with Anthill sand (Table 59.16). The granitic-sand-tempered corrugated sherds span the corrugated types found on the site, but two-thirds come from mixed contexts. These three sherds seem to be outliers on more than one level.

Table 59.16. Cross-tabulation of thin-sectioned corrugated sherds, showing period by ceramic type, subdivided by final temper group.

Anthill Sand (*n* = 56)					
Period	Indented	Smeared Indented	Smeared	Row Total	Note
Archaic	0	0	1	1	
Coalition	6	5	21	32	
Coal./Class.	2	9	6	17	
Classic	0	2	1	3	
Classic/ Historic	0	1	0	1	
Mixed	0	1	1	2	
Column Total	*8*	*18*	*30*	*56*	
Granitic Sand (*n* = 3)					
Period	Indented	Smeared Indented	Smeared	Row total	Note
Coalition	1	0	0	1	Sample PAX33-013, Site LA 4624, Areas G/L
Classic/ Historic	0	1	0	1	Sample PAX37-0037, Site LA 128804, White Rock
Mixed	0	0	1	1	Sample PAX37-0018, Site

Anthill Sand (*n* = 56)					
Period	Indented	Smeared Indented	Smeared	Row Total	Note
					LA 86637, White Rock
Column Total	*1*	*1*	*1*	*3*	
Grand Total	**9**	**19**	**31**	**59**	

The Santa Fe Black-on-white sherds have a variety of tempers, however, they uniformly lack granitic sand. Examination of the Santa Fe Black-on-white sherds by time (Table 59.17, Figure 59.10), shows that there is a definite trend through time, with Anthill and Anthill/clay sherds occurring earlier, in general, while the Tuff tempers seem to reach a peak later in time.

Table 59.17. Cross tabulation of point counted Santa Fe Black-on-white sherds, showing period by final temper group.

Period	**Anthill**	**Anthill/Clay**	**Tuff 1**	**Tuff 2**	**Row Total**
Archaic	0	1	0	0	1
Early/Middle Coalition	4	0	0	1	5
Middle Coalition	5	6	2	5	18
Late Coalition	2	1	4	1	8
Late Coalition/Classic	1	0	3	8	12
Mixed	0	0	0	1	1
Column Total	**12**	**8**	**9**	**16**	**45**

The Sapawi'i sherds are uniformly tempered with granitic sand (Table 59.18).

Table 59.18. Cross-tabulation of point counted Sapawi'i Micaceous sherds showing period by tract.

Period	**Rendija**	**TA-74**	**Row Total**
Coalition/Classic	2	1	3
Early Classic	5	0	5
Late Classic	5	0	5
Column Total	**12**	**1**	**13**

The Biscuit sherds are tempered only with Tuff, though both Tuff 1 and Tuff 2 are represented. There does not seem to be any patterning by time or assigned type within the Biscuit group (Tables 59.19a and 59.19b), though there are very few identified Biscuit B sherds in the data set, and there is a large number of unassigned Biscuit sherds as well.

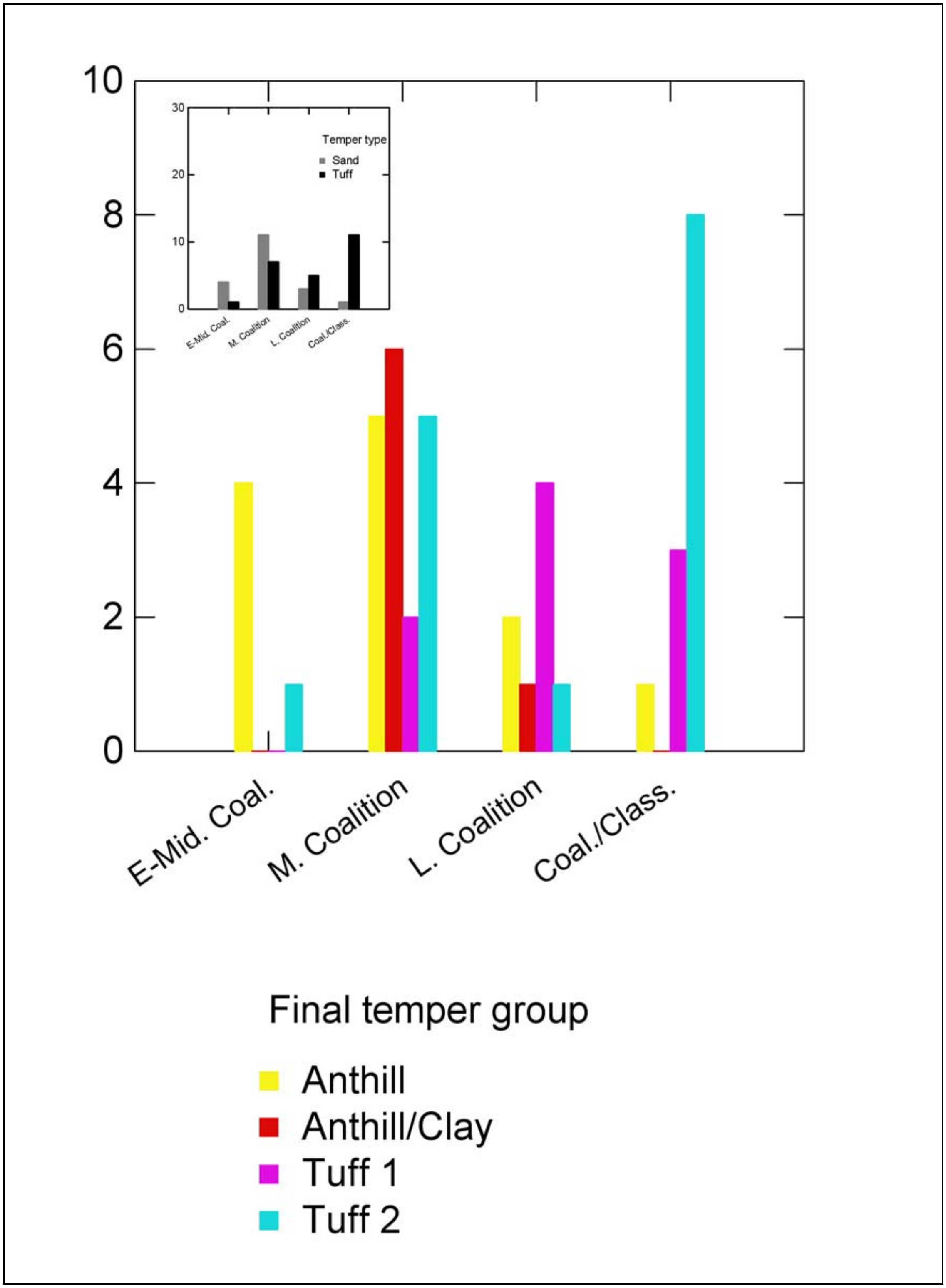


Figure 59.10. Bar diagram of final temper group for Santa Fe Black-on-white through time, where time is based on archaeological context of recovery. Inset bar diagram shows temper type, sand versus tuff, for the ware.

Table 59.19a. Cross-tabulation of biscuitware sherds showing period by final temper group.

Period	Final Temper Groups			Ceramic Types			
	Tuff 1	**Tuff 2**	**Row Total**	**Biscuit**	**Biscuit A**	**Biscuit B**	**Row Total**
Coalition	1	0	1	0	0	1	1
Coalition/ Classic	6	1	7	1	1	5	7
Classic	16	3	19	4	4	11	19
Classic/ Historic	2	1	3	2	0	1	3
Mixed	1	0	1	1	0	0	1
Column Total	**26**	**5**	**31**	**8**	**5**	**18**	**31**

Table 59.19b. Period by ceramic type, separated by temper group.

Final Temper Group = Tuff 1				
Period	**Biscuit**	**Biscuit A**	**Biscuit B**	**Row Total**
Coalition	0	0	1	1
Coalition/Classic	1	0	5	6
Classic	3	3	10	16
Classic/Historic	1	0	1	2
Mixed	1	0	0	1
Column subtotal	*6*	*3*	*17*	*26*
Final Temper Group = Tuff 2				
Period	**Biscuit**	**Biscuit A**	**Biscuit B**	**Row total**
Coalition/Classic	0	1	0	1
Classic	1	1	1	3
Classic/Historic	1	0	0	1
Column subtotal	*2*	*2*	*1*	*5*
Grand Total	**8**	**5**	**18**	**31**

Provenance Interpretation

Returning to Table 59.9, the characteristics assigned to the temper groups, some provenance interpretation of the groups may be in order. Granitic sand is very distinctive both compositionally and texturally. It stands out from the other tempers very well and is seen in Plain, Corrugated, and Sapawi'i sherds, but never in the Santa Fe or biscuitwares. Because of its coarse grain size and distinctive granitic rock fragments, the Granitic temper must have been imported onto the Pajarito Plateau. As of this writing, there is no known source of this material on the plateau or within a reasonable distance. Thus the Sapawi'i Micaceous, some plain, and three point counted corrugated wares must have been brought into the C&T Project sites from elsewhere. The low compositional variation suggests a single source or set of closely related sources.

The Anthill and Anthill/clay temper groups are generally rich in mineral grains and show signs of transport (increased rounding and sphericity), however, they rarely lack at least some volcanic rock fragments, and the rock fragments and minerals in these samples are similar to those in the local bedrock (if in very different proportions). They are probably best interpreted as local to the Pajarito Plateau. Their wide compositional variation suggests collection of potting materials from a number of different sources and probably represents multiple manufacture locations around the study area.

The Tuff 1 and Tuff 2 tempers are closely related. Tuff 1 contains delicate glass spicules and other features that do not transport easily, if at all. Tuff 1 is interpreted as a clay source collected at or very near a primary deposit—possibly a clay deposit forming on tuff bedrock, or pooling at the base of a tuff bedrock. The grain sorting is more uniform and the grain size is finer. There is moderate to low compositional variation in this group, suggesting a high degree of control over the source, the production technology, or both. The potters could have removed coarse materials or they could have just chosen deposits that were finer grained/glassy, had fewer phenocrysts of quartz and feldspar, and were better sorted overall. Both Santa Fe Black-on-white and Biscuit ceramics were made with this source, and its use seems to be concentrated toward the later occupations, especially the Classic period. That is, the biscuitware potters were more selective, using a narrow range of materials.

Tuff 2 is much more variable in composition and texture and was commonly used for the production of Santa Fe Black-on-white than Tuff 1. It has a higher mineralic composition than Tuff 1, slightly better sorting, and lacks the really delicate features and finely controlled grain size of Tuff 1. For these reasons, Tuff 2 is interpreted as transported tuff. It could be pooling and providing a source for clay formation, or it could be added to volcanic clay. It seems to be collected from a number of locations. Overall, the potters producing Santa Fe Black-on-white used a wider range of materials, they were not as selective and primarily used the tempering material as occurred naturally.

CONCLUSIONS

The petrographic analysis of pottery from the Pajarito Plateau shows strong trends in resource selection by ware and over time. Corrugated pottery is tempered with sand with a wide variation in composition; thus it seems to have been made in a variety of places but with a "sand+clay" recipe that remains fairly uniform. Sapawi'i Micaceous pottery has a granitic temper that does not correspond to resources known from the Pajarito Plateau. It is also relatively uniform in composition, suggesting a particular trade source (or set of related sources) for this distinctive pottery. Santa Fe Black-on-white pottery changes through time, and exhibits a wide variety of textures and compositions. Earlier pots are more likely to be tempered with anthill sand with a low proportion of tuff and volcanics, but later Santa Fe Black-on-white sherds are rich in volcanics and seem to represent a slow switch to a volcanic tuff temper preference instead of sand. Biscuit pottery is uniformly tuff tempered, and seems to represent much more controlled selection of materials and possibly much better control of production technology.

CHAPTER 60
COPING WITH CHANGE: STONE TOOL TECHNOLOGY ON THE PAJARITO PLATEAU

Bradley J. Vierra and Michael J. Dilley

INTRODUCTION

The by-products of stone tool manufacturing are some of the most ubiquitous remains in the archaeological record. They represent a complicated process involving the acquisition of raw materials, tool production, tool use, and the subsequent discard of expended tools. Stone tools offer a direct link into how people coped with the uncertainties of living in a variety of natural and social ecological settings. The Land Conveyance and Transfer (C&T) Project provides a rare opportunity to study technological change over a roughly 7000 year time period on the central Pajarito Plateau.

The project research design presents a series of research questions that involves interpretations based on the analysis of the chipped and ground stone assemblages. The defined research contexts that include relevant lithic artifact data consist of chronometrics, land-use, community and site organization, subsistence, and technology, production, and exchange (Vierra 2002). The project lithic analysis has been designed to generate the information necessary to answering these research questions.

UNDERSTANDING STONE TOOL TECHNOLOGY

To answer these questions we must understand several key aspects of technological organization involving the stone tool manufacturing process. As previously noted, these components include tool design, the selection of raw materials, stone tool production, tool use and maintenance, and the eventual discard of worn out tools (Binford 1973, 1977, 1979; Hayden et al. 1996; Nelson 1991; Torrance 1989). How might these various aspects of tool organization affect the structure of the archaeological record and provide us with insights into the 7000 years of human occupation on the Pajarito Plateau?

When I refer to *technology*, I am referring to all the tools and facilities needed to help a person survive. This information is passed on to subsequent generations, with selection favoring those individuals who develop a technology that provides them with a competitive advantage over their neighbors. This competitive advantage enhances their ability to survive and reproduce at greater rates than their neighbors, eventually replacing technologies that may be less efficient at completing their tasks.

Significant changes in mobility and labor organization occurred during this 7000 year period. How people positioned themselves across the landscape changed radically from a foraging to agricultural-based society. This includes changes in *foraging strategies* (i.e., what foods people eat) and *foraging tactics* (i.e., how people procure these foods). There are two organizational components to foraging tactics and these are residential and logistical mobility. *Residential mobility* is when the whole group, including men, women, and children, move to a new residential location; whereas, *logistical mobility* is when a specialized task group moves out from the residential base for the purpose of conducting a specific activity. The former tactic involves the movement of food to people and the latter tactic moves people to food. Any hunter-gatherer group uses a mixture of these two foraging tactics as a means of reducing the spatial and temporal incongruities in the distribution of resources. This mixture is conditioned by several factors including the structure of the environment, a dependence on storage, and regional demographic factors. Nonetheless, as hunter-gatherers shift from an economy based on foraging to agriculture, there is a decrease in the use of residential mobility and subsequent increase in the use of logistical mobility. The types of tools needed for the completion of foraging versus task-group oriented activities can be quite different (Binford 1980; Bleed 1986; Keeley 1988; Kelly 1983, 1995; Kuhn 1989; Vierra 1995).

Material Selection

How people procured stone raw materials and whether they obtained them from local or nonlocal sources is important for understanding the organization of these past economic systems. Two important concepts need to be defined: procurement strategy and procurement tactic. *Procurement strategy* refers to the specific material types selected for tool production. This information is readily available in the archaeological record as the varying proportions of worked material types present. *Procurement tactic*, on the other hand, refers to the specific methods used to procure them (Vierra 1993a:141). Raw materials can be obtained in three ways. An *embedded* tactic involves the collection of raw material incidentally to subsistence-related movements (Binford 1977, 1979; Binford and Stone 1985). A *direct* tactic involves making a trip to the source location for the sole purpose of collecting raw materials (Binford 1979; Gould and Saggers 1985; Renfrew 1975:41). A distinction is made here between embedded and direct tactics, although these have often been subsumed as direct procurement tactics (e.g., Ericson 1984:6; McAnany 1988; Meltzer 1989). An *indirect* tactic involves obtaining items from an intermediary. This usually involves some form of trade or exchange relationship (Earle and Ericson 1977; Ericson and Earle 1982; Renfrew 1975, 1977; Santley et al. 1988).

Is has generally been argued that Southwestern hunter-gatherer groups procured lithic raw materials using an embedded procurement tactic (Shackley 1990:63, 1995; Vierra 1985, 1990, 1993b). In this case, tools are replaced with locally available materials during a group's annual rounds. The distribution of these materials may provide information on the procurement range or annual range traversed by hunter-gatherer groups. On the other hand, Meltzer (1989) suggests that exchange networks may have existed among prehistoric hunter-gatherer groups, but identifying the archaeological signature for this pattern is difficult.

Southwestern agriculturalists could have obtained lithic raw materials using an embedded, direct or indirect procurement tactic (Brown 1990; Cameron 1984, 2001; Findlow and Bolognese 1980, 1982a, 1982b; Harry 1989; Parry 1987; Vierra 1993a, 1997; Walsh 1997, 1998; Young and Harry 1989). A direct procurement tactic involves the bulk acquisition of raw materials, since these items are stored for future use. This might include nodules, prepared cores, or formal tools made of raw materials that are not locally available. Local materials are defined as any lithic material that is obtainable within a 10 km (6 mi) catchment radius of the site, and nonlocal materials are those from outside this catchment. This is the typical foraging radius covered during daily activities around a habitation site (Binford 1982).

This of course raises the question of how lithic raw materials were entering a site. That is, were they entering as unmodified nodules, prepared cores or formal tools, and what would the archaeological implications of these differing procurement tactics be? The reduction of nodules at a site would presumably produce a relatively greater proportion of primary and secondary cortical flakes with cortical platforms; the reduction of cores should produce relatively more secondary noncortical flakes with single-faceted platforms; and the reduction of formal tools should produce more tertiary retouch flakes with multi-faceted platforms (Vierra 1993a). It has been suggested that nodules, prepared cores, and formal tools may have been exchanged in some portions of the northern Southwest (Brown 1990, 1991; Cameron 1984; Harry 1989; Vierra 1993a, 1997). It has also been suggested that increases in material diversity during the Ceramic period may reflect growing exchange networks (Green 1985), and in some areas of the Southwest may be associated with periods of site aggregation (Harry 1989). Craft specialization could indicate the presence of formal trade networks. Archaeological evidence for stone tool craft specialists has been identified at the Salmon Ruins site in northwest New Mexico (Shelley 1983) and several Sinagua sites in the Anderson Mesa area of northern Arizona (Brown 1990; LePere 1981). In contrast, Cameron's (1984) study of Pueblo sites in Chaco Canyon did not identify any evidence of craft specialists.

Lithic Reduction

Stone tool design in North America is often characterized as a dichotomy of core reduction and bifacial tool production. That is, simple flake tools are generally associated with settled village communities, versus an emphasis on the production of bifacial tools by hunter-gatherers. In this case, *tools* are chipped or ground stone artifacts that exhibit evidence of retouch, grinding, and/or use-wear. Most rock types can be used for the production of simple flake tools since the sharp edge is used for a relatively short period of time and then discarded. However, higher quality materials that are easily worked by both percussion and pressure flaking techniques are required for the production of bifacial tools that are maintained over longer periods of time. Therefore, core reduction activities tend to be associated with the use of low quality materials like basalt that are available within the vicinity of the habitation site. In contrast, the production of bifacial tools is associated with the use of fine-grained materials like chalcedony and obsidian, which occur in restricted locations across the landscape and can end up in the archaeological record as a nonlocal rock type. Nonetheless, as was the case with residential versus logistical mobility, North American stone tool technologies include a mix of both core reduction and bifacial tool production as a means of coping with the uncertainties of food procurement and processing (Andrefsky 1994; Bamforth 1986; Goodyear 1979; Johnson and Morrow 1987; Kelly 1988; Nelson 1991; Odell 1996; Parry and Kelly 1987; Sullivan and Rozen 1985; Vierra 1990, 1993a).

The concept of residential mobility as a possible explanation for this technological variation often assumes that mobility limits the size and number of tools that a group can efficiently carry with them (Carr 1994; Ebert 1979; Kuhn 1994; Odell 1996; Shott 1986). For example, Parry and Kelly (1987) suggest that bifaces are portable tools that can also act as cores, something important for mobile groups with varying access to lithic materials; whereas, an expedient flake technology is sufficient for sedentary groups with access to locally available materials. In contrast, other studies of stone tool technology have emphasized the importance of time constraints, energetic efficiency, and risk reduction for explaining technological variation and long-term changes in technology (Jeske 1992; Nelson 1991; Torrance 1983, 1989; Vierra 1995). With the shift to agricultural-based economies, the conflicting demands of subsistence pursuits, labor, technology, and social activities need to be balanced in respect to energetic investment (Jeske 1992). This process has the *residual effect* on the stone tool technology, when increasing amounts of energy are diverted into other aspects of technology and labor organization. More specifically, there is a de-emphasis on the stone tool technology per se, and an increased emphasis on corporate labor group structure and that aspect of technology associated with agricultural intensification. This includes milling equipment, ceramics, storage facilities, architecture, and agricultural features. We need to remember that increasing "sedentism" actually reflects the increasing use of logistical mobility and changes in labor organization.

As Binford (1980:13) pointed out, technology does not consist solely of tools, but also labor. Indeed technological organization is a direct reflection of corporate labor group structure and economic organization. I have recently argued that differences between the chipped and ground stone assemblages at the early agricultural site of Cerro Juanaqueña would appear to reflect changes in the sexual division of labor. Spatial differences in the distribution of tool production, versus expedient flake and ground stone use may reflect the changing roles of men and women at these sites. That is, the increasing emphasis on core reduction and simple flake use at village sites probably represents the increasing importance of female activities and not simply "sedentism." (Vierra 2004, 2005b). This corresponded with Ogilvie's (2005) biological study of the structure of the femur. She observed that males residing at early Southwestern agricultural villages appeared to resemble their Archaic foraging counterparts. In contrast, the females from these early villages resembled women from later Ceramic period communities.

This raises the question of which lithic materials are being used to produce simple flake tools and formal tools, and how do these reduction trajectories differ from that exhibited by artifacts made of local and nonocal materials? The term r*eduction trajectory* refers to a stage-like sequence of stone tool manufacturing beginning with the preparation of a core and ending with the completion of a finished tool (e.g., Chapman 1982; Collins 1975; Inizan et al. 1999; Van Peer 1992). For example, this process might consist of a cobble-flake or a prepared core-flake-bifacial tool trajectory. Again, a distinction is made between reduction strategies and reduction tactics; *reduction strategy* refers to the specific tool being produced, such as a biface or flake, and *reduction tactic* refers to the manner in which the tool is produced, or the reduction trajectory (Vierra 2004). Although some raw material determinists propose that raw material availability conditions the reduction strategy (Bamforth 1986), this is not the case. It is the foraging strategy—what you eat—and the foraging tactic—how you get it—that conditions the reduction strategy. By contrast, it is the reduction tactic that is primarily affected by raw material availability. Nonetheless, a flint knapper produces a variety of by-products during the stone tool manufacturing process. It is these by-products that provide the intricate details of the specific techniques used to produce stone tools (Andrefsky 2001; Shott 1994; Whittaker 1994).

Bifacial technologies are hunting technologies, including projectile points and bifacial knives. One of the most important aspects of bifacial tools is that retouch can be used to extend tool use-life. This does, however, require the use of high quality materials that are easily worked by both percussion and pressure flaking techniques (Goodyear 1979, 1989; Kelly 1988; Kelly and Todd 1988). In general, higher quality (nonlocal) materials are used for the production of formal tools with longer use lives, versus lower quality materials (local) for the production of expedient flake tools (e.g., Bamforth 1986; Brown 1990).

Tool Use

Chipped stone use-wear studies in the American Southwest have been limited. Although the results of the high-power technique were promising, it involved training and access to specialized equipment. Therefore, most lithic analysts implement a low-power technique using a binocular scope with a 10x range that identifies the presence of obvious edge damage that could be attributed to use. In addition, edge angle measurements also provide an easy and quantifiable measure of possible tool function. This has been particularly informative concerning possible expedient flake use. For example, large flakes are often selected as hand held tools and edge angle distributions often mimic those represented by the retouched tool assemblage.

Traditional lithic analyses have tended to focus on the chipped stone component with less detailed work on the ground stone artifacts; however, recent studies have also begun to focus on ground stone implements as important sources for understanding past subsistence activities (J. Adams 1999, 2002). Although limited work has been done on ground stone artifact production (although see Fratt and Biancaniello 1993; B. Huckell 1986; VanPool and Leonard 2002), most analysts have emphasized tool function based on the artifact's form and presence of use-wear (e.g., see J. Adams 1988, 1989, 1999, 2002; Calamia 1991; Hard 1986, 1990; Lancaster 1984; Morris 1990). Adams' (2002) study separates ground stone implements into four major groups: grinding and pulverizing, abrading, smoothing and polishing, and percussion tools (i.e., hafted and nonhafted).

Manos and metates certainly form the primary basis for ground stone artifact analysis. They provide the technological means of milling various plant seeds into flour, which is something that Southwestern peoples have been doing for thousands of years. Researchers have recently begun to understand the data potential represented by this history, and have therefore used the information to help clarify the forager to farmer transition.

The one-hand cobble mano and millingstone or basin metates have been the hallmarks of the Archaic period and are associated with generalized grinding activities. In contrast, agriculturally dependent communities have required two-hand manos and specialized slab or trough metates for processing maize (e.g., Bartlett 1933; Haury 1950). Given their importance to pueblo life, milling bins containing multiple metates with varying textural grinding surfaces became the focus of daily activities. Hard (1986, 1990; Hard et al. 1996) has explored this relationship between ground stone tools and subsistence, arguing that mano length and the total area of the grinding surface on manos will increase as a function of a growing dependence on maize agriculture and corn processing (also see Mauldin 1993; Morris 1990).

Hard's study was designed to create a quantitative measure for identifying changes in subsistence economy. This was based on the regression analysis of ethnohistorically documented manos, from which he was able to demonstrate a significant linear relationship between increasing mano length and dependence on agriculture. For example, manos less than 11 cm in length presumably reflect an economy 0 to 15 percent dependent on agriculture, 11 to 15 cm of a 0 to 45 percent dependence, 15 to 20 cm of a 35 to 75 percent dependence. and greater than 20 cm of over 65 percent dependence. Figure 60.1 illustrates mano length data for a sample of sites in the San Juan Basin (Vierra 1993a). There is a step-like increase in mean mano length from the Archaic, to Basketmaker III to Pueblo I, with a leveling off during the Ancestral Pueblo time period. This is also reflected in the changing mano form over time; one-hand quartzite cobble manos with oval grinding surfaces, to one-hand sandstone manos with rectangular grinding surfaces, to two-hand manos with rectangular grinding surfaces. Macrobotanical studies in the northern Southwest appear to reveal a similar pattern of increasing dependence on agriculture (e.g., Hard et al. 1996; McBride 1994; Minnis 1989).

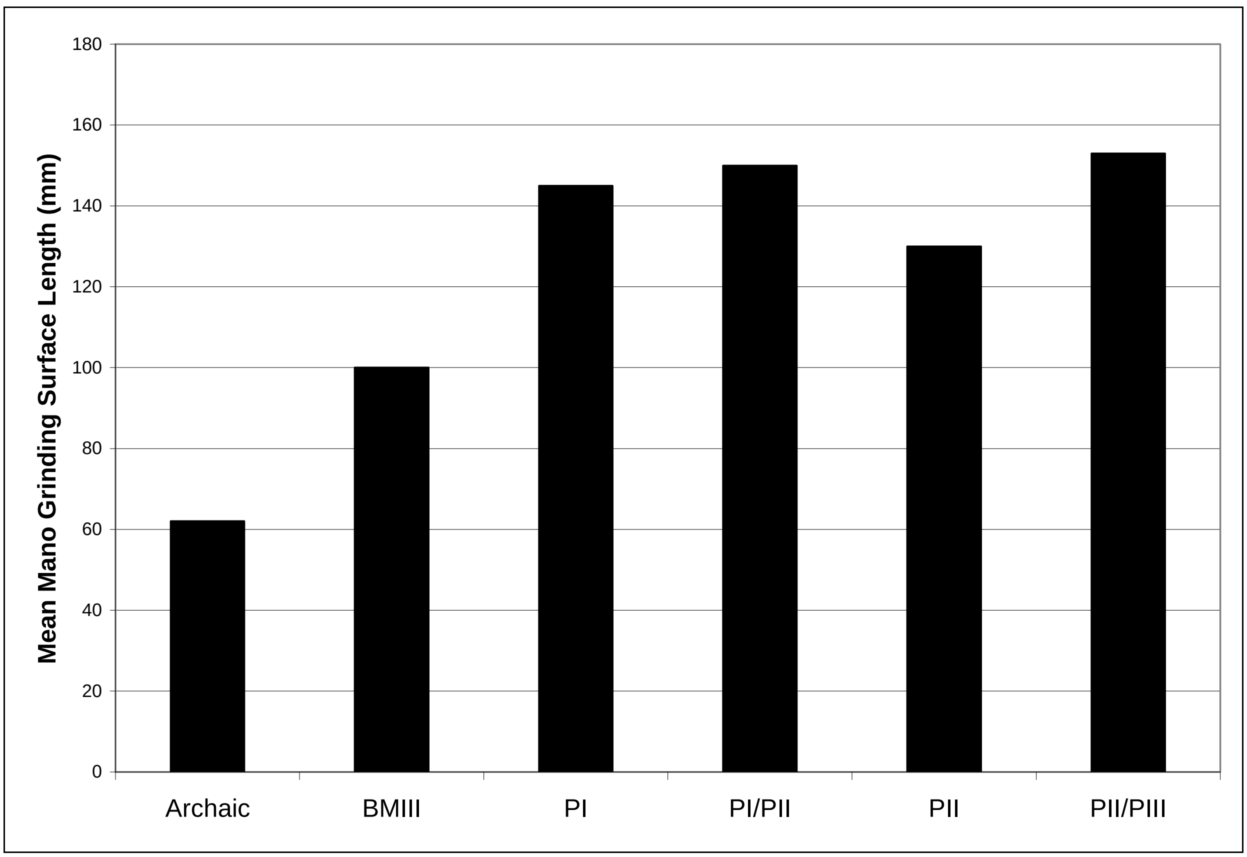


Figure 60.1. Mean mano grinding length for sites in the San Juan Basin.

Adams' (1999) critically reviewed the status quo of form equals function for ground stone analysts. She specifically questioned the assumptions of grinding surface size as an indirect measure of a group's dependence on agriculture, and suggests that variations in tool design may actually reflect differences in food processing strategies and not overall subsistence economy. For example, basin metates are equally well designed to process wet or oily seeds (e.g., wild or soaked maize kernels), while trough metates help to confine dry maize kernels while milling them into meal or flour. The confined space, with a larger mano, makes the trough metate more efficient at producing meal or flour than the basin or slab metate. By contrast, the basin metate would work well for processing soaked maize kernels for *masa*. Slab metates can also be efficient if they are placed within the confined space of a milling bin. At any rate, both Hard and Adams' studies are productive for understanding the complexities of ground stone tool use.

Other items associated with agricultural communities include axes, mauls, and hoes. A variety of axe forms have been documented from notched to full-grooved, with the amount of energy invested in tool manufacture correlated with tool use-life. However, Adams (2002:173) notes that some forms of axe-hafting technology may relate to regional cultural (i.e., stylistic) differences. In addition, axes may be either flaked or ground, and resharpening is conducted by either flake removal or by grinding the bit. The former technique is certainly less efficient in respect to extending tool use-life because it removes more material with each resharpening event. In the northern Rio Grande, fibrolite or sillimanite materials were used to produce ground stone axes (Montgomery 1977). Mauls are used for various heavy duty activities that range from building construction to warfare. They also exhibit a range in hafting techniques. Lastly, hoes vary greatly across the Southwest and include items called *tchamajillas*. Although *tchamajillas* are present on Ancestral Pueblo sites in the San Juan Basin, none have been identified in the northern Rio Grande Valley. On the other hand, notched cobbles that were presumably used as hoes are commonly found on agricultural features in the valley (Anschuetz 2001).

Hammerstones can also be used for a variety of activities. As a result, the evidence of use-wear should vary over time given changes in subsistence and residence patterns. For example, studies of Archaic hammerstones at Armijo Rockshelter near Albuquerque indicate that they were used for shaping and roughening the surfaces of metates and for processing plant and animal materials on metates. These activities created the extensive battering exhibited by many of the hammerstones (Dodd 1979). Cameron's (1984) Black Mesa study identified several temporal patterns in hammerstone use. This includes changes in raw material selection and use-location from Basketmaker II through the Ceramic periods. In the case of material selection, she identified changes from quartzite and siltstone dominated, to quartzite and silicified wood dominated, to silicified wood dominated. With respect to use-location, this involved changes from the primary use of edges and multiple surfaces, to convex and multiple surfaces to solely multiple surfaces. Lastly, although hammerstone size was generally constant, chopper size did decrease through time. Cameron notes that similar raw materials were selected for choppers and cores. Therefore, I suggest that these cores were being reused as choppers more frequently during the Ceramic period (e.g., see Vierra 1985). Indeed, with increasing length of occupation at Ceramic period sites we would expect to observe greater intensity of core reduction, artifact recycling, and multiple functions for cores, hammerstones, and choppers.

STONE TOOL STUDIES ON THE PAJARITO PLATEAU

Most current studies involving Southwestern stone tool technology focus on understanding the forager to farmer transition and the long-term effects of subsistence intensification on prehistoric society. The few systematic studies conducted of stone tool technology on the Pajarito Plateau have primarily focused on understanding the effects of Ancestral Pueblo site aggregation on stone tool procurement, production, and use. These are based on the studies conducted by Walsh (1997, 1998, 2000) and Head (1988, 1999).

Walsh specifically looks at the evidence for increasing site aggregation, resource competition, and territoriality from Coalition to Classic times. He suggests that there were significant changes in territoriality, and therefore, access to lithic raw material sources through time as a result of the site aggregation process. Assuming that lithic raw materials were incidentally collected during subsistence related activities and that the raw material sources are spatially distinct, then any shifts in land-use would therefore be reflected in the proportion of lithic materials represented in the archaeological record. Walsh's research focused on three primary lithic materials types: Pedernal chert, obsidian, and basalt. Walsh proposed that the Pajarito Plateau was open space that was used by the initial agricultural colonizing groups during the Early-Middle Coalition period, and that these people had few constraints on mobility and resource acquisition. This, however, changed during the Late Coalition period when increasing population densities restricted movement across the plateau due to marked territoriality. These limitations were subsequently relaxed during the Classic period when the occupants of the plaza pueblos controlled access to large resource areas or "buffer zones." Therefore, Walsh's predictions were: 1) lithic materials would reflect a simple distance-decay effect, with little conservation of materials during the Early-Middle Coalition period; 2) a decrease in lithic material diversity, the use of "alternative" materials, and increased conservation during the Late Coalition period; and 3) an increase in material diversity, a decrease in the use of alternative materials, and a decrease in efforts to conserve raw materials during the Classic period. His sample included five Early/Middle Coalition, eight Late Coalition, and a single Classic period (LA 170) site, and the results did provide some tentative support to his lithic procurement model. For example, in respect to material selection, he found that the Early/Middle Coalition period sites contained mostly chert and basalt, the Late Coalition period sites mostly chert, and the Classic period site of Tsirege mostly chert and obsidian. Lithic material diversity was generally greater during the Early/Middle Coalition and Classic periods, and lower during the Late Coalition period. The use of alternative materials (i.e., all other types) almost doubles during the Late Coalition period. Lastly, flake size was used as a proxy measure for raw material conservation. He found decreased mean flake weights for the three lithic types during the Late Coalition period and assumes this represents an attempt to maximize the use of these materials.

Head (1999) also focused her research on the effects of population growth and site aggregation on lithic procurement, manufacture and use activities; however, her study included both chipped and ground stone artifacts, and a broader range of research issues. These research issues involve studying the archaeological implications of reduced residential mobility, agricultural intensification, trade/exchange, and the delineation of social boundaries. Her database is different from Walsh's, as she had a much larger sample of sites from the southern Pajarito Plateau at Bandelier National Monument.

In respect to decreasing residential mobility Head refers to the common arguments following Parry and Kelly (1987). As previously discussed, this argument holds that biface technologies are associated with highly mobile groups and expedient flake technologies with sedentary (or residentially stable) groups. She therefore predicts an increasing emphasis on the production and use of informal tools, and a shift from the use of mostly chert/basalt to obsidian for tool production. Her analysis finds some preliminary support for these contentions, with an increase in both indicators during the Early to Middle Classic period.

Agricultural intensification is certainly an important factor affecting changes in labor and technology. Head predicted a decrease in hunting activities (i.e., projectile points) and an increase in the importance of milling activities. The latter would involve the increasing representation of two-hand manos, increases in mano grinding surface area, and increases in the presence of slab metates for milling flour. Her prediction for the decreasing presence of projectile points did not find support with the archaeological data. Indeed, it appears that the presence of projectile points decreases at habitation sites and increases at non-habitation sites. Head therefore suggests that maintenance of hunting gear was shifting to the non-habitation sites, which were acting as the focus for hunting activities. She also found basin, trough, and slab metates are present during all time periods; however, the presence of basin metates actually increased through time, trough metates decreased, and slab metates varied through time. That is, slab metates exhibit a saw-wave pattern with multiple peaks and valleys throughout the entire sequence, although she suggests that most of the peaks are associated with periods of marked aggregation. There is also no clear relation between one and two-hand manos through time, however, mean mano grinding surface area does exhibit a marked increase and leveling across the Late Coalition and Classic periods (140 to 148 sq cm).

Of course, the exchange of goods across the landscape in order to deter the effects of poor growing seasons is always seen as an important advantage to site aggregation (Hill et al. 1996; Kohler and Linse 1993; Powers and Orcutt 1999c). In this case, Head suggests a shift from the use of an embedded procurement tactics to the exchange of obsidian with increasing site aggregation. Indeed, the archaeological evidence indicates an increase in the presence of obsidian during the Early Classic period (with a decrease in basalt). She also documented a potential increase in the intensity of obsidian reduction with debitage/core ratios rising to about 6 to 9 also during the Early Classic period. Based on this evidence, and the presence of more cores and bifaces broken in manufacture, she suggests that bifaces were being produced for exchange (also see Root 1989:83).

Lastly, Head also addresses the issue of territoriality through the possible presence of the Keres/Tewa social boundary at Frijoles Canyon during the Early Classic period. She submitted a sample of 36 and 64 pieces of obsidian from the areas to the north and south of Frijoles Canyon, respectively. The results were that the north side of the canyon contained a mix of Cerro Toledo (58%) and Valle Grande (38%), with a little El Rechuelos (8.3%). Samples from the south side of the canyon were dominated by Cerro Toledo (99%) with very little Valle Grande (1%) and no El Rechuelos. The dominance of Cerro Toledo obsidian on the south side of the canyon can easily be explained by the location of the source within this area. But, Head felt that the Cerro Toledo source was actually closer to the north side sample than the Valle Grande source and was unclear why so much Valle Grande material was represented there. In actuality, both sources are about equally distant but the Valle Grande source is actually closer due to the presence of several canyons between the Tsankawi area and the Cerro Toledo source area near Rabbit Mountain and Obsidian Ridge. Nonetheless, Head concluded that there were no social barriers present that restricted access to these separate obsidian source areas.

ANALYTICAL METHODS

The lithic analysis methods were designed to collect information necessary to address the research issues as presented in Volume 4. The sampling methods, explicit artifact definitions, and more detailed information on the specific attributes recorded are presented in this section (also see Appendix R). In addition, data on the infield analysis and field collections of potential lithic raw material sources in the Rio Grande Valley and Pajarito Plateau are also presented in the following section. These field data were collected in order to document local raw material sources, raw material variation, and range in cobble size.

Sampling

One hundred percent of the collected lithic artifacts were submitted for analysis on most of the excavated sites. However, intra-site sampling was implemented on four sites with extremely large collections. These consist of the three Ancestral Pueblo roomblocks (LA 12587, LA 86534, and LA 135290) and a lithic scatter (LA 85859). On the other hand, the sampling strategy at LA 12587 (Area 8) was focused on the area of the scatter that represented the Late Archaic occupation and not the section that was a continuation of the surface scatter from the nearby pueblo roomblock.

The sampling strategy implemented for the Ancestral Pueblo roomblocks consists of selecting two or more 1 by 1 m grids within each room and analyzing all the artifacts from the stratigraphic column. In addition, all floor artifacts were analyzed and exterior activity areas and middens were also systematically sampled based on the overall aerial extent of the deposits. This was primarily done at LA 12587, which was the only site that contained a midden deposit. The result was that samples ranging from 16 to 18 percent for LA 12587 and LA 86534, and 35 percent for LA 135290 were selected for the lithic artifacts. Lastly, a sample of lithic artifacts was also selected from the Early Archaic lithic scatter at LA 85859. Lithic artifacts were only analyzed from a central section of the excavation, which provided the best example of the site stratigraphy. The result was that a 38 percent sample of the lithic artifacts from the site was studied.

ARTIFACT TYPE DEFINITIONS

Cores and Hammerstones

Cores (*n* = 84) are nodules that have faceted platforms from which specific kinds of flakes are removed. They are subdivided into unidirectional, bi-directional, multi-directional, bipolar, flake core, and undetermined fragment types (Figure 60.2). Flake cores were produced on large flakes, bipolar and undetermined types from flakes on nodules, and the remaining core types were produced directly from pebbles or cobbles. *Tested materials* (*n* = 5) are nodules with a single flake removed from an unprepared cortical platform at one or more isolated locations. They probably represent nodules that have been tested for material quality and were then rejected. *Cobble unifaces* (*n* = 5) have two or more flakes unifacially removed along a single edge margin, usually at one end of the pebble or cobble. Cobble unifaces probably represent unprepared cobble cores. *Cobble bifaces* (*n* = 1) have two or more flakes bifacially removed from a single edge at the end of a pebble or cobble. They presumably represent formal heavy-duty chopping tools (i.e., choppers), but might have also been used as a source for flakes. Cobble bifaces differ from bifacial cores in that bifacial cores are generally made of siliceous materials and have more than one continuous bifacially retouched edge perimeter. A *hammerstone* (*n* = 20) is a nodule that exhibits battering on an otherwise unmodified cortical portion of its surface. This battering usually occurs on the end or along the perimeter of the pebble or cobble. In contrast, *anvils* (*n* = 0) are artifacts that exhibit repeated battering in a specific isolated location, so that a small circular depression is created on a planar surface.

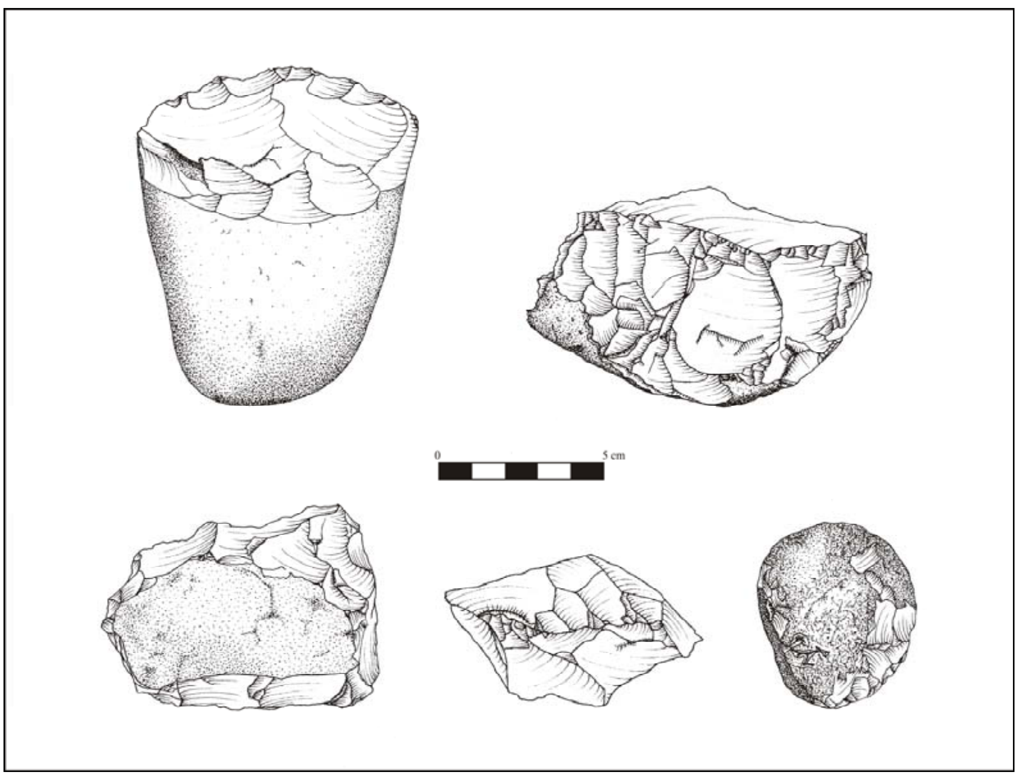


Figure 60.2. Cobble uniface and unidirectional (single face) core (upper). Unidirectional (multi face) core, bi-directional (bifacial) core, and hammerstone (bottom).

Debitage

Debitage consists of the by-products of core reduction and tool production. *Flakes* are pieces of material that have been detached from a core or tool by percussion or pressure, as opposed to *angular debris* (*n* = 990), which are pieces that are incidentally broken off during core reduction. These pieces of shatter lack definable flake characteristics, such as a platform, bulb of percussion, *eraillure*, ventral/dorsal surface, and proximal/distal ends. *Microdebitage* (*n* = 2556) are pieces of debitage with a maximum length equal to or less than 10 mm.

Core flakes (*n* = 4292) are flakes that have been detached from a core. A polythetic set (Clark 1968:36–37) of attributes for core flakes consists of a single or dihedral platform, a platform that is approximately as wide as the flake, a platform angle of greater than 75^{o}, cortex present on the dorsal surface, dorsal scars that may be absent, parallel, or perpendicular to the platform, a thickness of greater than about 5 mm, a pronounced bulb of percussion, and an *eraillure* scar. To be classified as a core flake, the flake must exhibit at least six of the eight defining attributes.

Bipolar flakes (*n* = 4) are flakes that have been detached from a core through the use of a bipolar reduction technique. That is, the core is set on an anvil and struck with the percussor (Crabtree 1972:42). The resultant flake differs from a core flake in that it may have two bulbs of percussion (positive or negative), *eraillures*, and/or scaling/crushing at one or both ends.

Core trimming flakes (*n* = 15) are pieces that have been struck at a 90^{o} angle to the major flaking axis of the core along the edge of the core platform and dorsal flaking surface. They are sometimes referred to as platform renewal or rejuvenation flakes, since they often remove the step fractures that can occur adjacent to the edge of the platform. However, they may also represent an attempt to change the orientation of the core, by preparing and reorienting a new flaking surface that is perpendicular to the previous major flaking axis. Core trimming flakes are similar to uniface rejuvenation flakes (Highley 1995:482), but are struck perpendicular and not parallel to the major flaking axis of the core or tool. *Core tablets* (*n* = 0) are also flakes that have been struck perpendicular to the major flaking axis of the core; however, they have been struck just below the platform to remove the whole striking platform from the core (Marks 1976:374).

Opposing core flakes (*n* = 2) have been detached from the bottom of the core by striking it at a 90^{o} angle to the major flaking axis. This then acts to create a platform from which flakes are removed in the opposite direction from previous removals. *Change-of-orientation flakes* (*n* = 1) are flakes removed from the opposite end of the major flaking axis of the core. Both flakes exhibit marked ventral curvature and multiple dorsal flake scars; however, these dorsal scars are perpendicular to the proximal-distal flake axis on the opposing core flake as opposed to radiating towards the proximal end (i.e., platform) of the change-of-orientation flake. These flakes are similar to overstruck flakes in that the distal end of the core is removed (e.g., Tixier 1963:43–44), but they do not originate from the major flaking axis platform.

Blades (*n* = 3) are specialized forms of flakes that are twice as long as they are wide, with parallel lateral sides and one or more parallel dorsal arrises (Bordes 1981:16). *Biface flakes* (*n* = 1995) are flakes that have been detached from a bifacially retouched artifact. A polythetic set of attributes for biface flakes consists of a multi-faceted platform, an isolated platform, a lipped platform, a platform angle less than 75°, a weak bulb of percussion, cortex absent on the dorsal surface, dorsal scars that are roughly parallel to each other and perpendicular to the platform, a thickness of less than 5 mm that is relatively even from proximal to distal ends, and a pronounced ventral curvature. A flake must exhibit at least six of the nine attributes to be classified as a biface flake. Biface flakes removed from retouched tools tend to exhibit a platform angle less than 50°, whereas, flakes removed from bifacial cores generally have platform angles from about 50 to 75°.

Overstruck flakes (*n* = 17) are flakes removed from the edge of a biface, but go over and beyond the face of the artifact detaching a portion of the opposite edge. These items are also referred to as *outrepassé* flakes (Tixier 1963:43–44). *Notching flakes* (*n* = 1) are flakes that exhibit a negative dorsal scar originating from the platform, a small indentation at the platform, a convex ventral profile, and a salient bulb of percussion (Titmus 1985:251–252).

Uniface flakes (*n* = 0) are flakes that have been detached from a unifacially retouched artifact (Jelinek 1966; Shafer 1970). A polythetic set of attributes for uniface flakes consists of a single-faceted platform, a platform angle of greater than 60^{o}, dorsal scars that are parallel to each other and perpendicular to the platform, a single distal scar on the dorsal surface of the flake (sometimes separated by an arris), and marked ventral curvature.

Burin spalls (*n* = 0) are pieces that have been struck from the edge of a flake, so the resulting scar (or facet) approaches a 90^{o} angle to the plane of the blank from which it was removed. *Pot lids* (*n* = 2) are Hertzian cones produced when siliceous rocks are subjected to heat. *Hammerstone flakes* (*n* = 9) are flakes with cortex on the platform and dorsal surface, with the platform being heavily battered. *Ground stone flakes* (*n* = 7) are flakes that have a ground facet(s) situated on their dorsal surface. *Undetermined flake fragments* (*n* = 701) are fragments for which flake type could not be determined.

Manuports (*n* = 7) are unmodified pieces of lithic raw material that have been transported from their source area to another location as a result of human behavior. This may include materials to be used in lithic reduction, ceramic production, or other miscellaneous functions.

Retouched Tools

Retouched tools are the result of the secondary percussion or pressure flaking of a piece in order to produce a specific tool shape (Figures 60.3 and 60.4). *Marginally retouched pieces* (*n* = 82) are pieces of debitage with retouch that extends over less than one-third of the surface of the artifact (Chapman and Schutt 1977:86). This is non-invasive retouch limited to the edge margin, but may be unidirectional or bidirectional. *Notches* (*n* = 3) are flakes with one or two contiguous notches along the edge of the piece, while *denticulates* (*n* = 1) are flakes with three or more contiguous notches along the edge of the piece (GEEM 1975). *Perforators and gravers* are flakes with retouched projections. Gravers (*n* = 1) exhibit a blunt end and perforators (*n* = 6) a pointed end. *Burins* (*n* = 0) are flakes that have had a portion of their edge removed (Crabtree 1972:48).

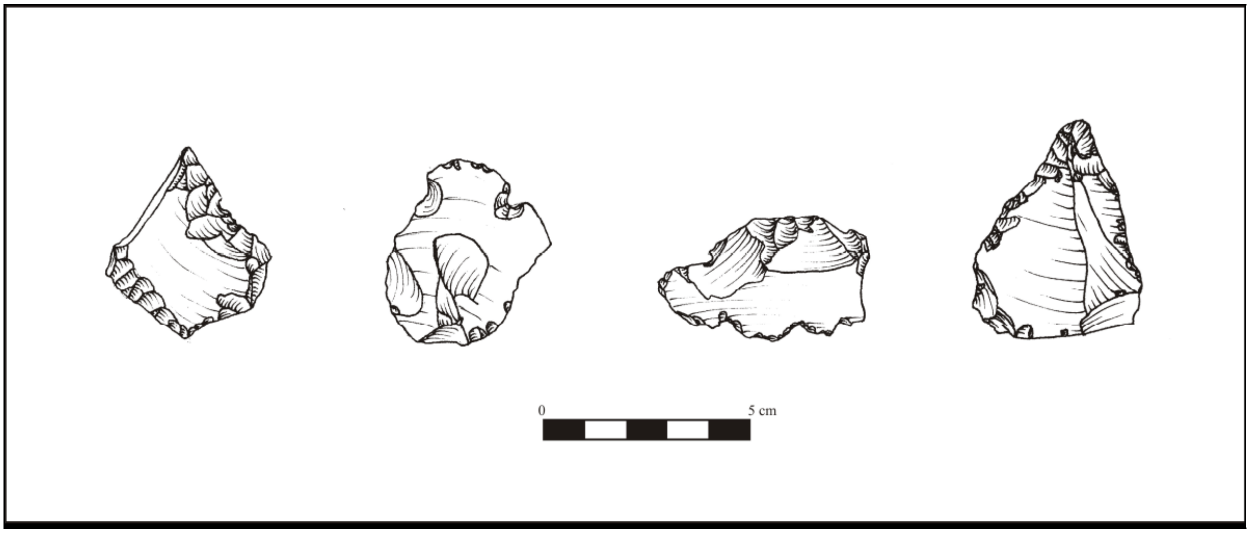


Figure 60.3. Informal tools; retouched piece, notch, denticulate, and perforator.

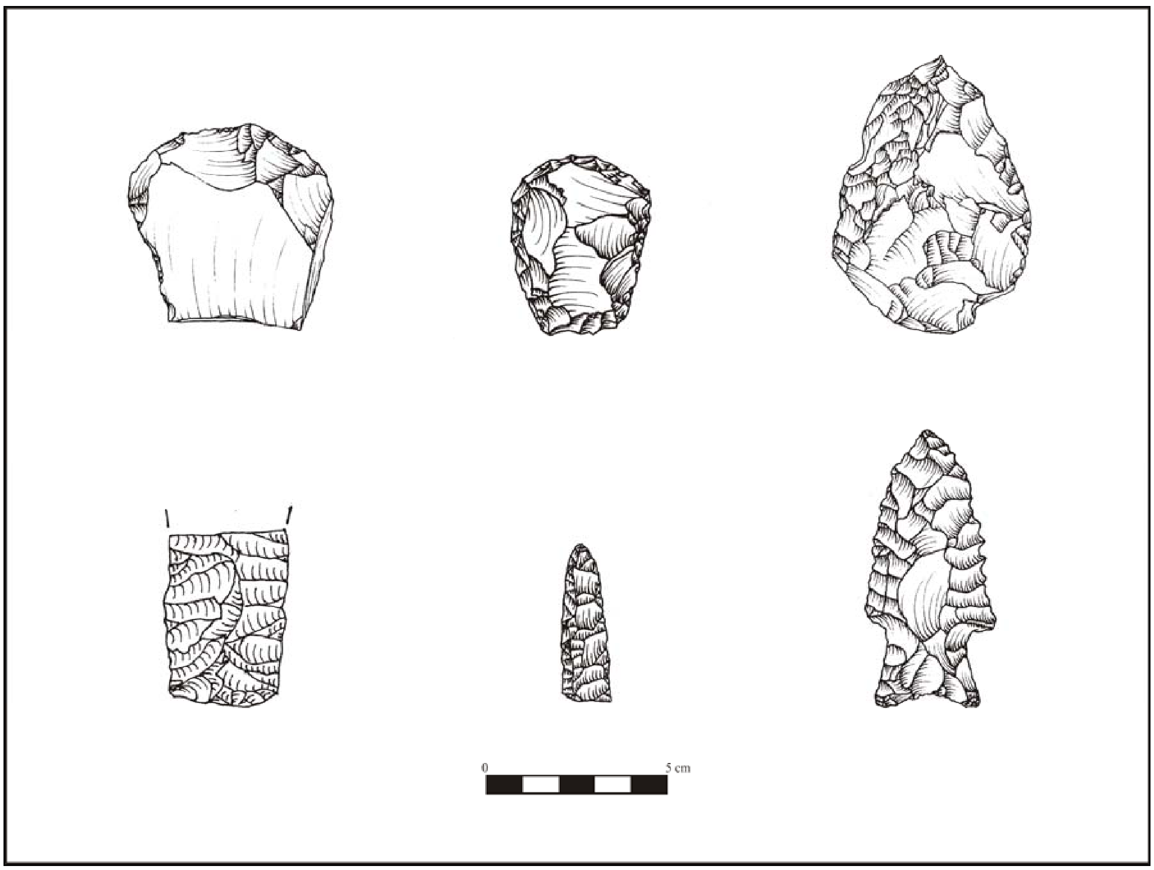


Figure 60.4. Uniface, scraper, and biface (upper). Biface, drill, and projectile point (lower).

Unifaces (*n* = 14) are artifacts that exhibit retouch scars over one-third or more of only one of their surfaces. This type of retouch can be defined as invasive. Unifaces exhibit initial edge retouch that lack a formal overall shape. In contrast, *scrapers* (*n* = 2) are specialized forms of unifaces that exhibit secondary edge retouch producing a formal shaped tool with an edge angle between 60 to 80°.

Bifaces (*n* = 45) are artifacts that exhibit retouch scars extending over one-third or more of both of their surfaces (Chapman and Schutt 1977:93). Generalized bifaces tend to be ovate or lanceolate in shape, with edge angles between about 30 to 50°. Drills and projectile points are specialized forms of bifaces. Drills (*n* = 7) are bifacially retouched flakes that are twice as long as they are wide, about as thick as they are wide and often exhibit a diamond-shaped cross-section. Projectile points (*n* = 27) are bifaces that exhibit hafting modifications that distinguish a stem from the blade. Composite tools (*n* = 5) are single artifacts that exhibit more than one tool type. These include retouched piece/perforator, perforator/notch, and denticulate/notch.

Ground Stone Tools

Ground stone tools are artifacts that exhibit ground and/or abraded surfaces. *Manos* are cobbles or slabs with at least one surface characterized by one or more smooth facets produced through grinding (Figure 60.5). They were handheld artifacts that were primarily used to crush and grind vegetal foodstuffs against a metate (Chapman and Schutt 1977:95; Christenson 1987:44). Polished surfaces on manos may indicate a function other than vegetal processing (e.g., hide processing [Adams 1988]). One-hand manos (*n* = 50) are less than 170 mm in length and two-hand manos (*n* = 26) have a length equal to or greater than 170 mm. *Undetermined manos* (*n* = 56) are fragments where the projected length of the artifact could not be determined.

Metates are characterized by at least one large grinding surface upon which vegetal foodstuffs may have been crushed and ground with a mano (Figure 60.6). They generally have a grinding surface greater than 450 cm^2 in size (Christenson 1987:47). *Millingstones* (*n* = 13) are informal unmodified slabs with flat grinding surfaces. Although the grinding surface may exhibit some pecking, the slab itself exhibits little in the way of formal shaping. *Basin metates* (*n* = 2) are slabs with concave basin-shaped grinding surfaces. These two metate types are usually associated with generalized seed processing and the use of a one-hand mano in a rotary motion, although millingstones can also be used with two-hand manos in a longitudinal grinding fashion. *Slab metates* (*n* = 6) are formal-shaped metates with large, flat prepared grinding surfaces.

Trough metates (*n* = 0) have a deep prepared trough as a grinding surface. The trough may be open at one or both ends. These two metate types are usually associated with more specialized corn milling and the use of two-hand manos in a longitudinal back and forth motion. If the type of metate could not be determined, it was classified as an undetermined metate fragment. *Grinding slabs* (*n* = 31) were, however, distinguished from millingstones by having a length less than 250 mm. These artifacts may have been used for a variety of purposes. Grinding slab fragments were separated from undetermined ground stone fragments by having a length greater than 100 mm. *Undetermined metate*s (*n* = 52) are fragments sufficiently large to determine that they represent portions of metates, but specific metate type could be determined.

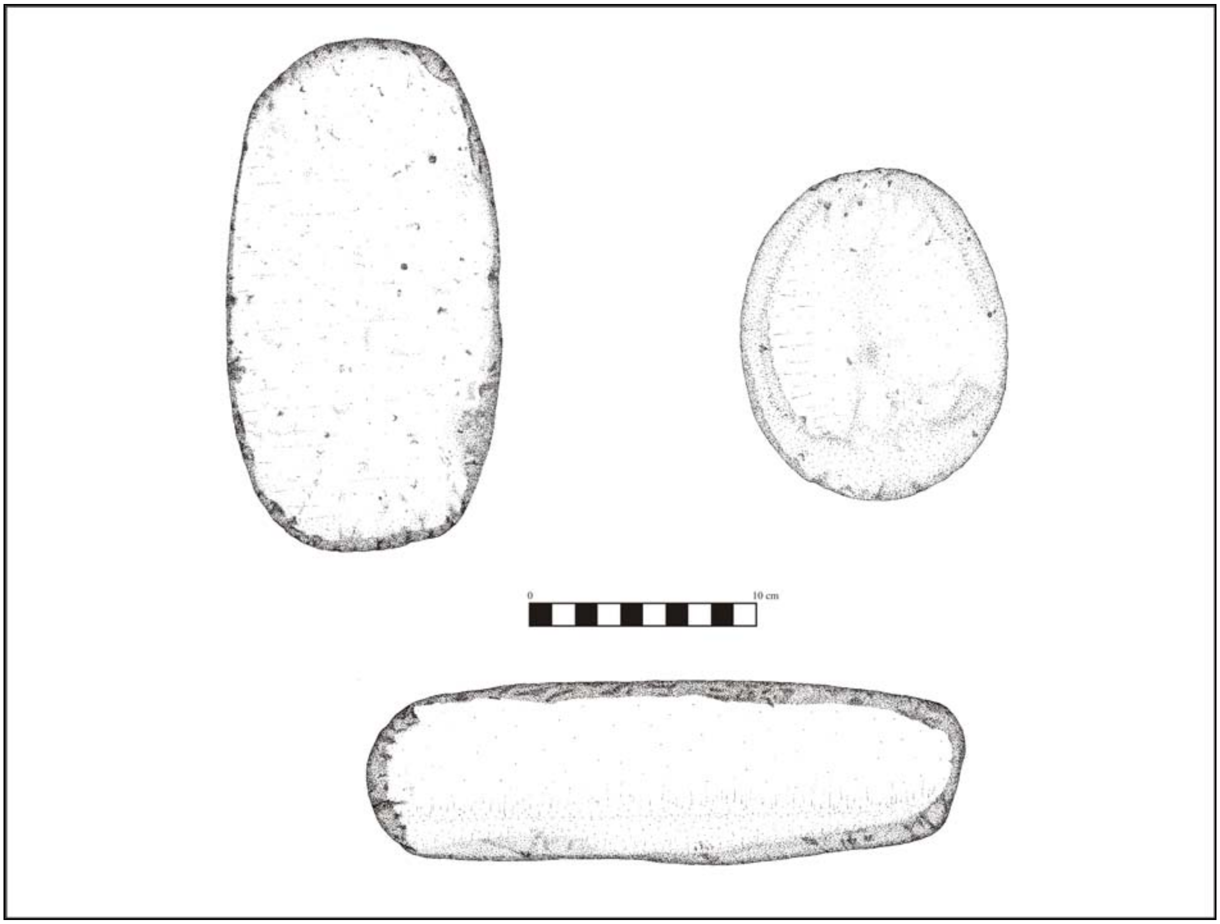


Figure 60.5. One- and two-hand manos.

Polishing stones (*n* = 15) are pebbles with finely ground and polished surfaces (Figure 60.7). These generally consist of small quartzite pebbles that could have been used to polish ceramic vessels. *Palettes* (*n* = 1) are tabular-shaped artifacts with finely ground and polished flat surfaces (Figure 60.7). *Mortars* (*n* = 0) are artifacts with large, deep, pecked, and ground concavities. *Pestles* (*n* = 1) are oblong artifacts with one or more ground ends. They presumably were used with the mortars to pulverize and grind various substances. *Abrading stones* (*n* = 13) are artifacts with localized but irregularly ground surfaces, with a distinction made between generalized abrading stones and *grooved abraders* (*n* = 2) (Figure 60.7). *Axes* (*n* = 6) exhibit a prepared bit (flaked or ground), whereas *mauls* (*n* = 2) exhibit battering on one or both butts (Figure 60.8). Either can be grooved for hafting (full or partial). In contrast, *hoes* (*n* = 6) exhibit an unprepared bit that often exhibits rounding and striations and hafting notches. *Vent plugs* (*tiponis*; *n* = 0) are pieces of the tuff that have been worked (ground) into cylindrical and conical shapes that are approximately 150 to 230 mm in length and 120 to 140 mm in width.

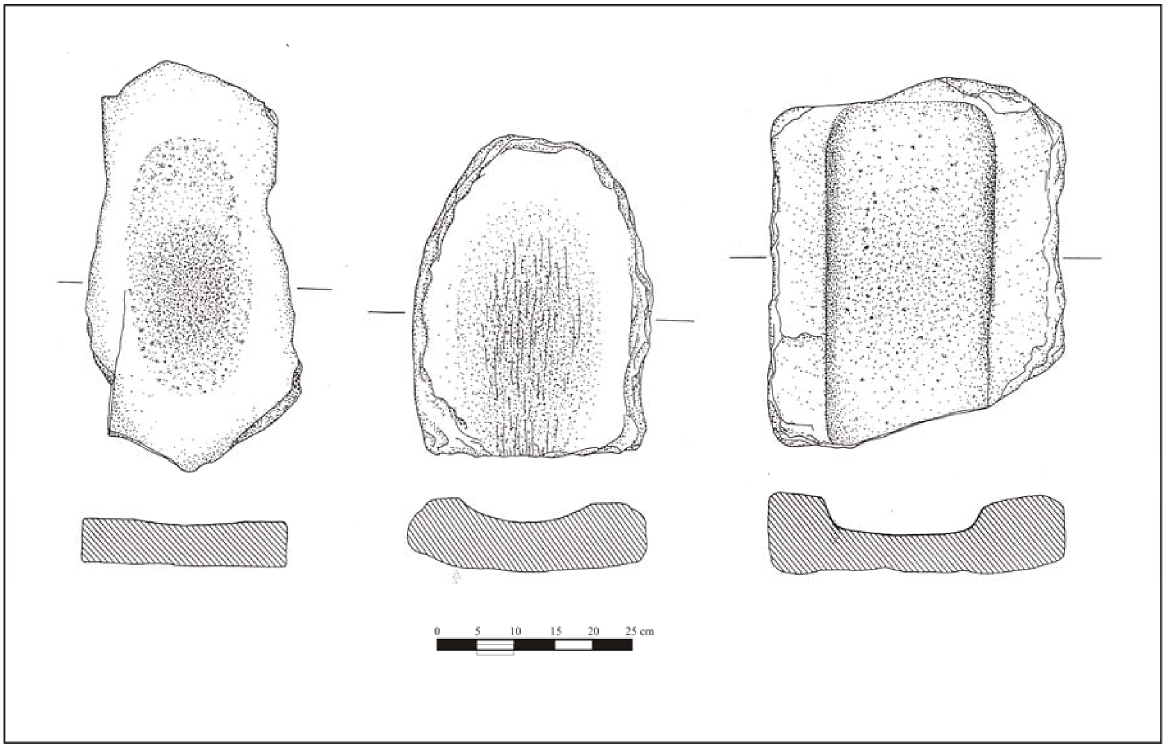


Figure 60.6. Milling stone, basin metate, and trough metate.

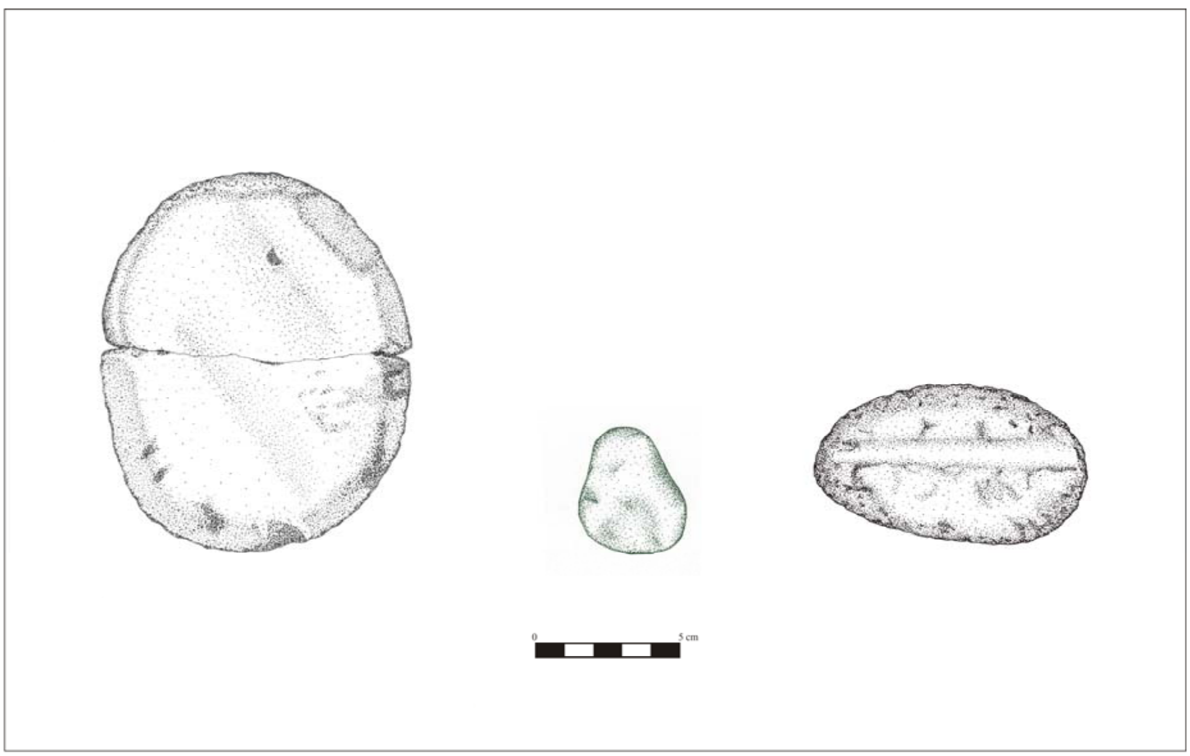


Figure 60.7. Palette, polishing stone, and grooved abrader.

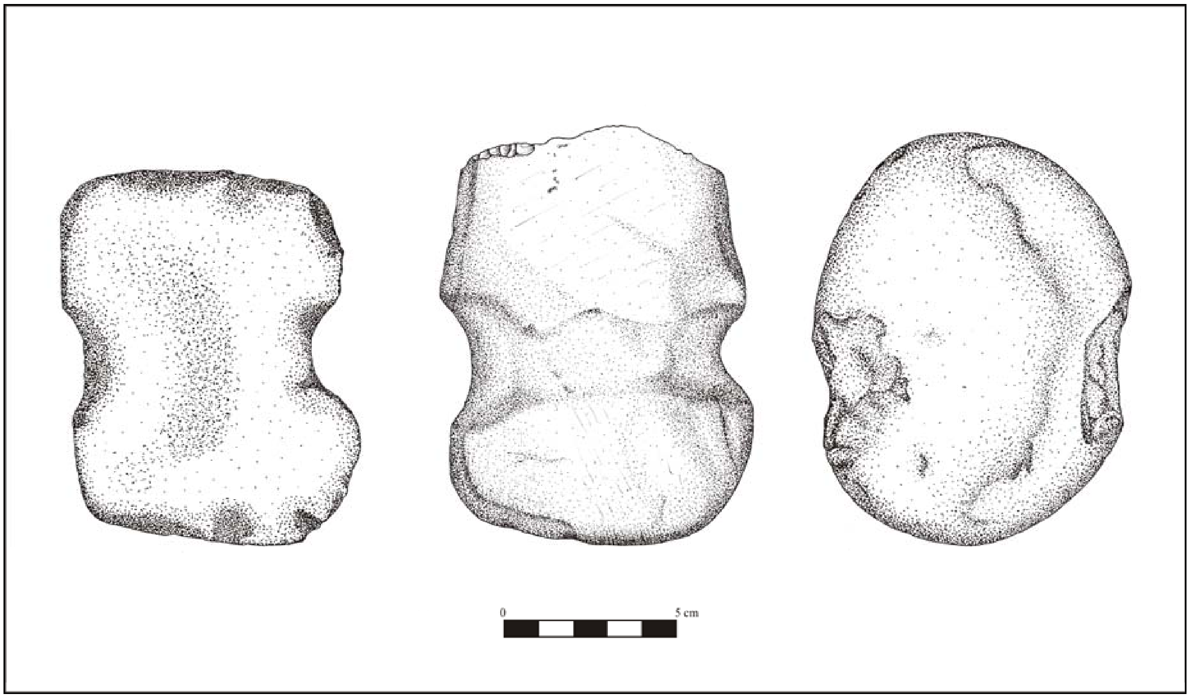


Figure 60.8. Maul, axe, and hoe.

Ornaments (*n* = 1) are beads, pendants, and other forms of jewelry. *Effigies* (*n* = 0) are anthropomorphic or zoomorphic figurines. *Stone ceramic lids* (*n* = 1) are thin circular-shaped artifacts whose perimeters have been bidirectionally retouched. These lids may have been used to cover storage or cooking vessels. *Shaped slabs* (*n* = 30) are large rectangular-shaped slabs (or fragments) that have been bidirectionally flaked along their perimeters. These artifacts were often used to cover ventilator shafts or door openings. A whet stone (*n* = 1) is a flat rectangular-shaped artifact that is finely ground. The *miscellaneous ground stone* (*n* = 15) category was used when the artifact could not be placed within any of the defined types, but was a recognizable artifact. In contrast, *undetermined ground stone* (*n* = 65) are unclassifiable ground stone fragments. These fragments often exhibit a single flat grinding surface.

Artifact Attributes

Cores and Core Tools

Material type and material grain were recorded for all the artifacts. Fine-grained materials are those that are glossy and translucent. Medium-grained materials exhibit a smooth surface, dull to glossy luster, and are aphanetic. Coarse-grained materials are grainy to the touch, dull in luster, and are porphyritic. Artifact condition was monitored as whole or fragmentary. Length for cores and cobble unifaces was measured in mm along the axis through the major flaking surface. Width was measured perpendicular to the length and thickness was measured as the remaining dimension. By contrast, the length of hammerstones was measured in mm along the longest axis, the width was measured perpendicular to length, and thickness was the smallest dimension of the artifact. Each artifact was weighed to the nearest tenth of a gram with an Ohaus digital scale. Weight was the only measurement recorded for core fragments.

Several core types were recorded based on platform orientation and core shape. As previously noted, these consist of single-directional, bi-directional, multidirectional, bipolar, flake cores, and core fragments. In addition, these core types were subdivided into specific subtypes. The single-directional cores as single-face, multi-face, prismatic, or pyramidal cores with flakes being removed from a single striking platform. Bi-directional cores are change-of-orientation, discoidal, bifacial, opposed same face, opposed different face, and 90° cores with flakes being removed from two separate striking platforms. In the case of the change-of-orientation cores, these flakes are removed from separate platforms at oblique angles to each other. Multi-directional cores are globular, opposed/90°, and opposed same/different face cores, with flakes being removed from three or more platforms. Bipolar cores exhibit battering, crushing, and/or negative or positive bulbs of percussion at one or both opposing ends. Flake cores are same-face and multi-face. Core fragments are broken cores.

Number of platforms, platform type, and platform preparation were recorded. Number of platforms was coded as zero for non-cores and core fragments. Bipolar cores were arbitrarily assigned a single platform. Platform type was cortical, single-faceted, multi-faceted, cortical/single-faceted, and undetermined/non-applicable (i.e., core fragments and non-cores). Platform preparation, either on the platform or along the platform edge, was recorded as none, abraded/crushed, ground, abraded/ground, and undetermined/non-applicable.

Cortex type was recorded as nodular, tabular, waterworn, quartz crystal, and undetermined. Nodule or tabular cortex is the natural weathered surface of a nodule or tabular-shaped rock. Waterworn cortex is the rolled surface created through water transport of a rock. The percentage of the cortical or unflaked surface was measured for whole artifacts as less than 25 percent, 26 percent to 50 percent, 51 percent to 75 percent, more than 75 percent, and undetermined fragments. The reason for discard was monitored for cores and cobble unifaces. This consisted of broken (material flaw), broken (culturally induced fracture), extensive hinging/stepping, exhausted, still useable, extensive battering, burned, undetermined, and non-applicable (i.e., hammerstones). The presence or absence of burning was recorded. This could be represented by the presence of discoloration, pot lids, and/or crackling.

The number of damaged loci was also recorded. This damage refers to possible use-wear and not to kind of platform preparation. Each damaged locus was given a sequential number for each artifact. The type of damage present was monitored as battering, rounding, scarring, and abrasion/ground. Battering is the pounding application of force to a specific locus when one object is struck against another. This action can produce conical impact rings (hertzian cones) on a natural surface, or bi-directional step fracturing and the deterioration of an edge margin. Rounding is the damage that results in the rounding of an edge margin and scarring from the removal of microflakes along an edge margin. Abrasion/ground is the presence of any abraded or ground surface on an artifact. Only damage that was obviously visible, or could be identified with a 10x hand lens, was recorded.

The location of the damage was recorded as an edge, convex surface, ridge, flat surface, flake scar ridge, or all over the artifact. An edge is the intersection of one or more negative flake scar facets, and edge damage is associated with the artifact being used as a chopper or pecking stone. A convex surface is a non-acute, natural convex surface of an object; damage in this location reflects use as a hammerstone. A ridge is an acute, naturally sharp surface; the damage on a ridge reflects use as an angular hammerstone. Flat is a naturally flat surface; damage on this surface reflects use as a hammerstone or anvil. Flake scar ridges (arrises) are the high points along the edge of negative flake scars; sometimes these areas are ground (e.g., on cobble unifaces) indicating that the tool may have been used as a plane or adze. Damage over the entire surface of an artifact presumably reflects a multi-functional use of the artifact (e.g., heavily battered hammerstone or pecking stone).

Debitage

Material type and material grain were recorded for each piece. The condition of the artifact was recorded as whole, proximal, mid-section, distal, lateral, or undetermined (e.g., flakes smaller than 10 mm). All pieces of angular debris were considered to be whole. Measurements were taken on all whole flakes. Length was defined as the distance along the proximal-distal axis of a flake (i.e., perpendicular to the platform) and was measured in mm using a sliding digital caliper. Weight was recorded for all debitage items to the nearest tenth of a gram.

The type of platform was recorded for all flakes as absent, cortical, single-faceted, dihedral, multi-faceted, crushed, collapsed, battered, and non-applicable (for angular debris and microdebitage). A cortical platform is unprepared and situated on cortex. A single-faceted platform consists of a single flake scar. A dihedral platform consists of two flake scars and a multi-faceted platform of three or more flake scars. A crushed platform is one in which the proximal end of the flake is covered with step fractures, indicative of crushing along the edge of the core platform. A collapsed platform is identified on whole flakes that lack a clear platform and any traces of crushing. A battered platform is a cortical platform that is covered with battering and impact marks, which may be indicative of a hammerstone spall. Platform preparation was monitored as none, abraded/crushed, ground, abraded/ground, retouched, retouched/abraded, retouched/ground, and undetermined/non-applicable. The latter category was used for flakes with collapsed, crushed, or battered platforms, as well as flake fragments, angular debris, and microdebitage.

Cortex type was recorded using the same attributes as for the cores. The placement of the cortex was recorded on whole flakes only. It was monitored as absent, on the platform only, on the dorsal surface only, on the platform and partially on the dorsal surface, orange rind (i.e., along the platform and lateral edge), on the platform, and/or totally covering the dorsal surface. The presence or absence of burning was recorded.

The presence or absence of edge damage was recorded as a possible indication of artifact use. A binocular scope at 10x or greater power was used, with possible damage being recorded if it was consistent along the edge margin (e.g., scarring, rounding, and polish). If present, the total number of modified edges was noted. The location with edge damage was recorded as end, lateral, projection, and dorsal (i.e., ground stone flake), and edge outline as straight, concave, convex, straight/concave, straight/convex, concave/convex, projection (i.e., graver or perforator), and flat (i.e., abraded/ground surface). Lastly, the edge angle of all the damaged edges was recorded to the nearest 5°. This measurement is equivalent to the "spine plane angle" (Tringham et al. 1974), which measures the intersection of the dorsal and ventral surfaces of the edge. If the angle varied along the edge, then a mean edge angle or the angle that characterized the majority of the edge was recorded. A "shurikan" edge-angle template was used for this analysis. It consists of a circular disk template with angles cut into its side at 5° increments from 20 to 90°. The edge to be measured is placed within a notch until the angle that fits most accurately is found.

Retouched Tools

Material type, material grain, condition, cortex type, cortex placement, and burning were recorded for retouched tools using the same attributes as those monitored for the debitage. Measurements were taken in mm for whole tools. Length was measured along the proximal-distal axis. Width was measured at a 90° angle to the proximal-distal axis. Thickness was the greatest measurement once the proximal-distal axis was rotated 90°. The proximal end is the same as that defined for flakes on informal retouched tools and the possible hafted end on formal tools (e.g., bifaces, projectile points, and scrapers). Weight was measured to the nearest tenth of a gram. Tool fragments were only weighed.

Biface shape and projectile (haft) type were recorded as ovoid, ovate, lanceolate, round, triangular, stemmed, contracting stemmed, corner-notched, side-notched, side-notched with basal notch, and non-applicable (i.e., not a biface).

The number of separate retouched edges was monitored on each tool. Each edge was given a sequential number. Only one edge was recorded on tools exhibiting a continuously retouched edge (e.g., bifaces, projectile points, drills, and scrapers). It is the marginally retouched pieces that most often exhibit separate retouched edges. Retouch type was recorded as unidirectional ventral (inverse), unidirectional dorsal (obverse), bi-directional (continuous on both faces), alternating (inverse and obverse retouch along the same edge), alternate (inverse and obverse retouch along opposite edges), beveled, alternate/beveled, burination, backed, and bi-directional/beveled.

Edge outline was recorded as straight, concave, convex, straight/concave, straight/convex, concave/convex (i.e., denticulate or double notch), projection (i.e., graver or perforator), flat (i.e., abraded or ground surface), and undetermined (i.e., fragments). Edge outline and edge angles were monitored, as was each edge of a retouched piece or along the blade of a biface and projectile point and the retouched edges on scrapers. Edge angles were measured the same as for utilized debitage.

A sketch was also made of each retouched tool and information on the presence and location for breakage type and the presence of hafting polish was noted. The bases of hafted tools were observed using a binocular scope at 10x or greater power in order to identify possible hafting wear (i.e., polish on arrises or tool surface). All of these data were used to infer possible manufacturing and use-related breakage patterns (see Callahan 1979; Crabtree 1972; Johnson 1979).

Ground Stone Tools

Material type and condition was monitored the same as for cores. Measurements were recorded in mm for all whole artifacts. Length was the greatest measurement along the longest axis of the artifact. Width is the greatest measurement perpendicular to the longest axis. Thickness is the greatest measurement on a 90° plane to the length and width. Weight was recorded in grams. Ground stone fragments were only weighed. It should be noted that the length measurement for some manos is actually perpendicular to the actual grinding motion. In addition to these measurements, the maximum length and width of the primary grinding surface was also recorded for manos and metates.

Use location was recorded as single unopposed surface, two opposed surfaces, perimeter (e.g., on abrading stones), edge (e.g., on axes), other (e.g., ornaments), undetermined, and non-applicable (e.g., stone lids). Tool cross-section was monitored for ground stone tools with single or double grinding surfaces as plano (flat), concave, convex, bi-plano, plano-convex, bi-convex, wedge-shaped (beveled), other (i.e., tools without grinding surfaces), and undetermined. Surface shape provides a general description of the primary grinding surface shape. It was recorded as roughly ovoid, rectangular, irregular, and other. Surface modification describes the nature of the modification to the primary worked surface. It was monitored as ground, pecked, ground/pecked, and polished.

The presence/absence of fingerholds on manos was recorded as absent, one side, two side, and non-applicable (i.e., non-manos). Non-ground stone use-wear was recorded as absent, battering (e.g., mauls or manos used as hammerstones), and flaked/rounded (e.g., axes). The presence or absence of burning (heating) was monitored (e.g., blackening or fire-cracked).

Lithic Raw Material Sources

Lithic raw materials are available from various locations across the Pajarito Plateau, Rio Grande Valley, and Jemez Mountains. Broxton et al. (Volume 1, Chapter 2) and Shackley (Volume 1, Chapter 10) have already discussed the bedrock geology and obsidian source studies for the east Jemez Mountains area. A variety of materials were available to the prehistoric Pajaritans for stone tool production. This ranges from obsidian, Pedernal chert, and basalt for chipped stone artifacts, to the use of tuff, dacite, quartzite, and vesicular basalt for ground stone artifacts.

The Cerros del Rio basalts and Bandelier Tuff formations are a source of local raw materials, as are the secondary drainages that cross-cut the plateau. An infield analysis was conducted of these secondary deposits to identify its lithology, including the range of lithic material types and cobble sizes that are represented. An exposure of gravels was identified in Rendija Canyon. A single 1- by 1-m sample grid was selected and all cobbles greater than 5 cm in diameter recorded. A total of 135 cobbles were identified; the results are presented in Table 60.1. Most of the cobbles are composed of dacite, with some rhyodacite, rhyolite and Bandelier tuff. The rhyolite is actually a gray coarse-grained material that would not be well suited for knapping. Information on the range of cobble size materials is presented in Table 60.2.

Table 60.1. Lithic materials recorded in the Rendija Canyon gravels.

Material	Frequency	Percent
Bandelier tuff	1	0.7
Dacite	107	79.3
Rhyodacite	18	13.3
Rhyolite	9	6.7
Total	**135**	**100.0**

Table 60.2. Cobble size recorded in the Rendija Canyon gravels (cm).

Material	*N*	Minimum	Maximum	Mean	Std Deviation
Bandelier tuff	1	10	--	--	--
Dacite	107	6	27	9.3	3.4
Rhyodacite	18				
Rhyolite	9				

The Totavi Lentil formation consists of late Pliocene axial gravels that are distributed along the Rio Grande Valley (Chapter 2, Volume 1; Walsh 1998; Warren 1977). An infield analysis was also conducted of this formation to identify its lithology, including the range of lithic material types and cobble sizes that are represented. An exposure of gravels was identified in White Rock Canyon below the community of White Rock. Four 1- by 1-m sample grids were selected and all cobbles greater than 5 cm in diameter recorded (Figure 60.9). A total of 102 cobbles were identified; the results are presented in Table 60.3. Most of the cobbles are composed of quartzite (61.1%), with a variety of other materials present. Other materials include Pedernal chert (chalcedony), a generalized chert (grays and tans), rhyolite, and sandstone, which are also present in the archaeological assemblages. Although smaller pieces of sandstone could be procured from exposures of the Totavi Lentil gravels, large tabular pieces would have been obtained from more distant formations in the Santa Fe or Abiquiu areas. Silicified wood was rarely observed in the surface gravels, but was not present within the sample. On the other hand, obsidian was not identified in the sample and could not be found in a surface reconnaissance of the gravel exposure or in a second exposure located nearby. Moore et al. (1998) report that they were also unable to identify any obsidian in the gravel outcrops near Totavi. However, Shackley (personal communication) has identified some El Rechuelos obsidian near Cochiti, and Church (2000) found a small number of nodules in his southern New Mexico gravel sample. Information on the range of cobble size materials for the Totavi Lentil gravels is presented in Table 60.4. Pedernal chert cobbles range in size from 7 to 17 cm in diameter; however, cobbles were observed as large as 20 cm in diameter. The chert cobbles are smaller, ranging from 6 to 10 cm in diameter with quartzite also ranging from 6 to 20 cm in diameter.

Table 60.3. Lithic materials recorded in the Totavi Lentil formation.

Material	Frequency	Percent
Basalt	17	8.4
Chert	6	3.0
Dacite	18	8.9
Gneiss	3	1.5
Granite	7	3.4
Metaconglomerate	7	3.4
Pedernal chert	7	3.4
Pegmatite	5	2.5
Quartzite	124	61.1
Rhyolite	2	1.0
Sandstone	7	3.4
Total	**203**	**100.0**

Table 60.4. Cobble size recorded in the Totavi Lentil formation (cm).

Material	*N*	Minimum	Maximum	Mean	Std Deviation
Basalt	17	6	15	8.1	2.6
Chert	6	6	10	8.3	1.6
Dacite	18	6	13	8.6	2.5
Gneiss	3	7	18	10.3	4.9
Granite	7	6	15	10.1	3.9
Metaconglomerate	7	6	17	9.2	4.2
Pedernal chert	7	7	17	11.4	4.3
Pegmatite	5	6	7	6.0	1.0
Quartzite	124	6	20	9.9	3.6
Rhyolite	2	6	8	7.0	1.4
Sandstone	7	6	13	7.5	2.6

Three primary obsidian sources were commonly exploited by the prehistoric inhabitants of the Pajarito Plateau. The Cerro Toledo source is exposed at the heads of Frijoles, Alamo, and Capulin canyons, as well as the mesa tops in the area of Rabbit Mountain and Obsidian Ridge (Figure 60.10). In addition, small pebbles are present in secondary deposits associated with the Cerro Toledo interval that are scattered across the mesa top in Rendija Canyon.

Figure 60.9. Totavi Lentil gravel exposure in White Rock Canyon.

Figure 60.10. Close up of Cerro Toledo pebble source material.

The Valle Grande source is located at Cerro del Medio inside the Valles Caldera. This source provides some of the largest obsidian cobbles available in the region, ranging up to about 30 cm in diameter (see Figure 60.11). It appears that this source is restricted to the caldera, either at Cerro del Medio or interior drainages. Obsidian cobbles have not been observed in San Antonio Creek or Jemez River gravel deposits situated outside of the caldera (Shackley, personal communication). Although very small pebbles of this obsidian have been observed in pumice deposits located in Los Alamos, these pieces are too small for stone tool production. Lastly, El Rechuelos obsidian is present in the area around Polvadera Peak near Abiquiu (Figure 60.12).

As previously noted, no obsidian was observed in the Totavi Lentil; therefore, it is assumed that any artifacts made of El Rechuelos obsidian were primarily derived from exposures located further to the north in the Polvadera Peak or Abiquiu areas. Otherwise, a single artifact made of Bear Springs obsidian was also identified in an archaeological assemblage. This source is located in the southern Jemez Mountains.

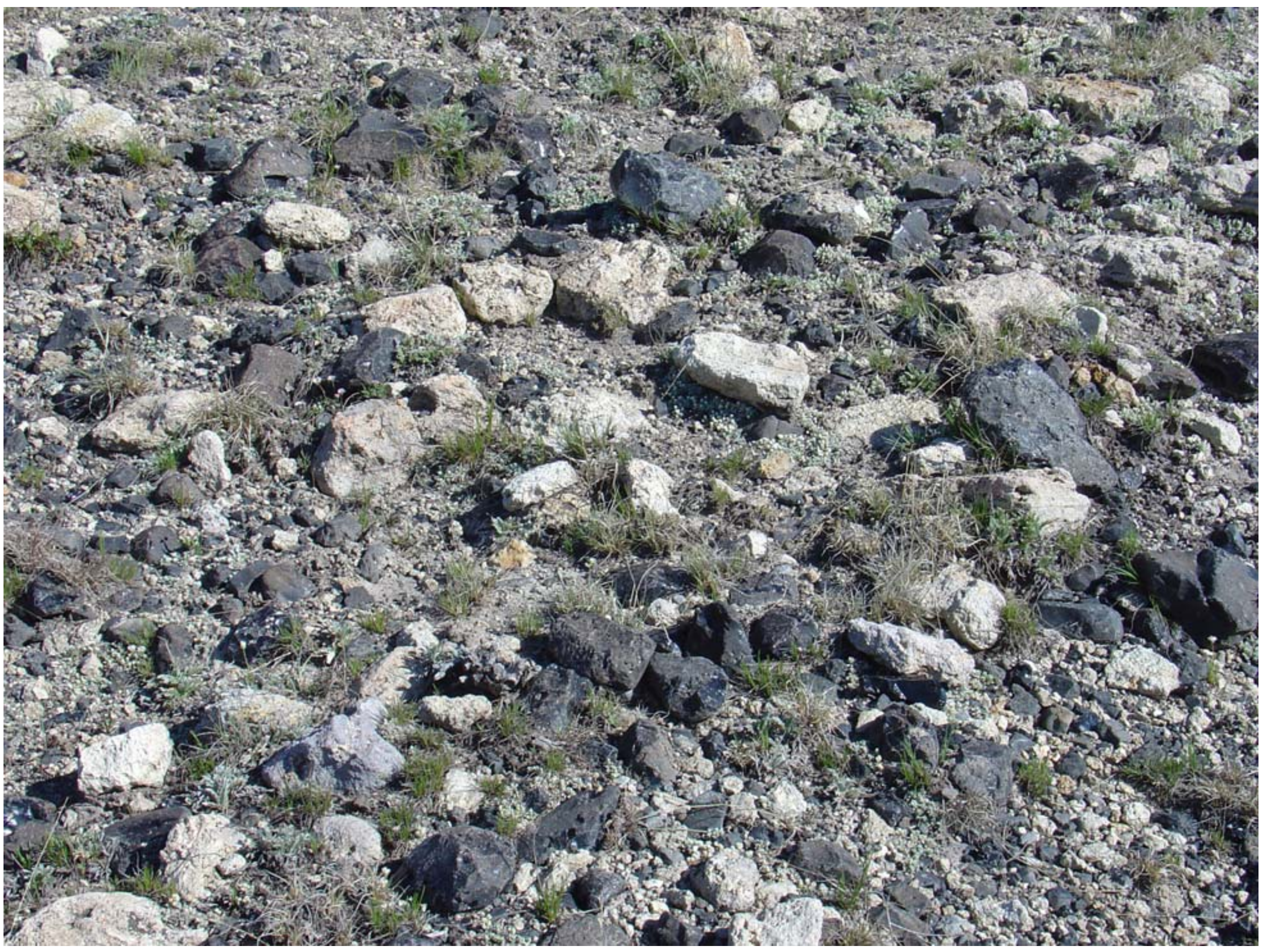


Figure 60.11. Valles Caldera obsidian cobble source material.

Basalt was a common material used for prehistoric stone tool production; however, it appears that some of the material referred to as fine-grained basalt is actually a fine-grained black dacite.

For example, this is the case for most of the Early Archaic artifacts that have been described in the northern Rio Grande. Three distinct fine-grained dacite sources have been identified through the fieldwork conducted by Vierra and Shackley (Chapter 10, Volume 1). A preliminary reconnaissance of a fine-grained dacite quarry was conducted by Dave Broxton, Rory Gauthier, and Brad Vierra in Bandelier National Monument. This outcrop comprises a roughly 2.5-m-thick horizontal zone of black dacite that forms the base of a thick Cerros del Rio lava flow exposed in a small butte near the Rio Grande at the mouth of Lummis Canyon. The fine-grained nature of the material is probably due to the rapid cooling of the deposit at the base of the flow (Figure 60.13). Maar deposits are exposed on the slope a few meters below the level of the quarry that appear to represent a mixing of flow material with alluvial deposits in the Rio Grande. In addition, two other distinctive dacite sources have been identified at San Antonio Mountain and Newman's Dome located about 115 km (70 miles) north of Los Alamos, and west of Taos and the Rio Grande (also see Newman and Nielson 1987).

Figure 60.12. El Rechuelos source area. Polvadera Peak is in the background and the obsidian-bearing domes are in the right foreground.

Lithic Artifacts

A total of 11,311 lithic artifacts were analyzed for the project. Table 60.5 presents the information on lithic artifact type by material type for the entire analyzed collection. A range of materials were used for core reduction and retouched tool and ground stone tool production. The cores are primarily made of chalcedony with less Pedernal chert, obsidian, basalt, and other materials. The debitage assemblage mostly consists of obsidian and chalcedony, with less Pedernal chert, basalt, and other materials, and a similar pattern for the retouched tools with chalcedony, obsidian, and less Pedernal chert, basalt, and other materials. In contrast, ground stone artifacts are primarily made of dacite, with less andesite, quartzite, tuff, basalt, vesicular basalt, sandstone, and other materials.

Figure 60.13. Dacite quarry in Bandelier National Monument.

X-Ray Fluorescence Analysis of Obsidian and Possible Dacite Artifacts

A total of 300 obsidian artifacts were submitted for X-ray fluorescence (XRF) analysis (Table 60.6). Five separate obsidian sources were identified: Cerro Toledo (Rabbit Mountain/Obsidian

Ridge area), Valle Grande (Cerro del Medio), El Rechuelos (Polvadera Peak area), Bear Springs, and an unknown source. The artifacts can be visually distinguished into six different types. A chi-square analysis of a contingency table of obsidian color by obsidian type (i.e., major sources) indicates that there are significant differences in this distribution (*chi-sq* = 329.7, *df* = 6, $p \leq 0.001$). Adjusted residuals were calculated to determine which of the cells were contributing to the significant chi-square value. Adjusted residuals greater than 1.96 or -1.96 are significant at the 0.05 level (Everett 1977:47). Valle Grande and El Rechuelos obsidian sources are significantly correlated with translucent (8.2) and black dusty (16.5) colors. In contrast, the Cerro Toledo source is characterized by a wider variety of color types, including black opaque (7.2) and other (2.7; green, brown and gray). A single piece of translucent Bear Spring obsidian and black opaque obsidian from an undetermined source were also identified.

Table 60.5. C&T Project lithic artifact type by material type.

Artifact Type		Material													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal Chert	Sil. Wood	Quartzite	Other	Total
Cores	Core	4	0	2	0	1	0	6	38	1	32	0	0	0	84
	Cobble uniface	1	0	1	2	0	0	0	1	0	0	0	0	0	5
	Cobble biface	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	Tested cobble	0	0	0	0	0	0	4	1	0	0	0	0	0	5
	Subtotal	6	0	3	2	1	0	10	40	1	32	0	0	0	95
Debitage	Angular debris	17	0	13	2	3	0	274	501	3	157	2	15	3	990
	Core flake	194	0	52	27	21	0	1612	1784	32	484	25	43	18	4292
	Blade	0	0	0	1	0	0	1	0	0	1	0	0	0	3
	Biface flake	32	0	1	1	0	0	1813	124	2	18	3	1	0	1995
	Notching flake	0	0	0	0	0	0	4	0	0	0	0	0	0	4
	Bipolar flake	0	0	0	0	0	0	3	1	0	0	0	0	0	4
	Pièce esquillée	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Core trimming flake	0	0	0	0	0	0	4	9	0	2	0	0	0	15
	Opposing core flake	0	0	0	0	0	0	1	1	0	0	0	0	0	2
	Change-orient. flake	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Outrepassé	2	0	0	0	0	0	15	1	0	0	0	0	0	17
	Pot lid	0	0	0	0	0	0	0	1	0	1	0	0	0	2

Artifact Type		**Material**													
		Basalt	**Vesic. Basalt**	**Rhyolite**	**Andesite**	**Dacite**	**Tuff**	**Obsidian**	**Chalcedony**	**Chert**	**Pedernal Chert**	**Sil. Wood**	**Quartzite**	**Other**	**Total**
	Hammerstone flake	0	0	0	1	0	0	0	0	0	0	0	8	0	9
	Ground stone flake	2	0	0	2	2	0	0	0	0	0	0	0	1	7
	Microdebitage	53	0	2	2	2	0	1842	539	8	53	1	8	2	2556
	Und. flake	15	0	1	3	1	0	520	118	4	32	1	1	1	701
	Subtotal	315	0	69	39	29	0	6137	3079	44	750	32	76	25	10,600
Retouched Tools	Retouched piece	8	0	4	1	3	0	10	36	0	18	0	1	1	82
	Notch	0	0	0	0	0	0	0	2	0	1	0	0	0	3
	Denticulate	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Biface	1	0	0	0	0	0	28	10	1	5	0	0	0	45
	Projectile point	1	0	0	0	0	0	19	4	1	2	0	0	0	27
	Uniface	0	0	0	0	0	0	3	3	1	7	0	0	0	14
	Endscraper	0	0	0	0	0	0	0	1	0	1	0	0	0	2
	Drill	0	0	0	0	0	0	2	5	0	0	0	0	0	7
	Perforator	0	0	0	0	0	0	3	3	0	0	0	0	0	6
	Graver	0	0	0	0	0	0	0	1	0	1	0	0	0	1
	Composite tools	0	0	0	0	0	0	1	3	0	1	0	0	0	5
	Subtotal	10	0	4	1	3	0	66	68	3	19	0	1	1	194
	One-hand mano	2	4	0	2	21	4	0	0	0	0	2	15	0	50

Artifact Type		Material													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal Chert	Sil. Wood	Quartzite	Other	Total
Ground Stone	Two-hand mano	1	6	0	2	12	1	0	0	0	0	2	15	0	26
	Und. mano frag	4	3	0	0	0	4	0	0	0	0	3	23	2	56
	Millingstone	0	0	0	1	8	4	0	0	0	0	0	0	0	13
	Basin metate	1	0	0	1	0	0	0	0	0	0	0	0	0	2
	Slab metate	1	1	0	1	1	2	0	0	0	0	0	0	0	6
	Grinding slab	0	1	1	6	14	7	0	0	0	0	2	0	0	31
	Und. metate frag	3	3	0	8	26	10	0	0	0	0	2	0	0	52
	Polishing stone	2	0	0	3	6	0	0	1	0	0	0	3	0	15
	Palette	0	0	0	0	0	0	0	0	0	0	1	0	0	1
	Pestle	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Abrading stone	0	0	0	3	8	1	0	0	0	0	0	1	0	13
	Grooved abrader	0	0	0	0	1	1	0	0	0	0	0	0	0	2
	Axe	2	0	0	2	0	0	0	0	0	0	0	1	1	6
	Maul	1	0	0	0	0	0	0	0	1	0	0	0	0	2
	Hoe	1	0	0	1	2	0	0	0	0	0	0	2	0	6
	Ornament	0	0	0	0	0	0	0	0	1	0	0	0	0	1
	Stone ceramic lid	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Shaped slab	0	0	3	5	22	0	0	0	0	0	0	0	0	30
	Whet stone	0	0	0	0	0	0	0	0	0	0	1	0	0	1

Artifact Type		Material													
		Basalt	Vesic. Basalt	Rhyolite	Andesite	Dacite	Tuff	Obsidian	Chalcedony	Chert	Pedernal Chert	Sil. Wood	Quartzite	Other	Total
	Misc. ground stone	0	0	2	3	7	3	0	0	0	0	0	0	0	15
	Und. ground stone	3	1	1	11	32	3	0	0	0	0	3	10	1	65
	Subtotal	18	17	9	58	172	41	0	1	2	0	15	56	5	395
Other	Hammerstone	1	0	0	0	0	0	0	7	0	3	0	8	1	20
	Manuport	0	0	0	0	0	0	1	0	0	0	0	1	5	7
	Subtotal	1	0	0	0	0	0	1	7	0	3	0	9	6	27
Total		**350**	**17**	**85**	**100**	**205**	**41**	**6214**	**3195**	**50**	**804**	**47**	**142**	**37**	**11,311**

Table 60.6. Results of the XRF analysis of obsidian artifacts.

Obsidian Color	Obsidian Type				
	Cerro Toledo	Valle Grande	El Rechuelos	Bear Springs Peak	Unknown
Translucent	87	117	2	1	0
Black Opaque	48	1	0	0	1
Black Dusty	0	0	21	0	0
Green	11	2	0	0	0
Brown	1	0	0	0	0
Gray	6	3	0	0	0
Total	**153**	**123**	**23**	**1**	**1**

A DESCRIPTION OF THE PROJECT LITHIC ASSEMBLAGE GROUPS

Eleven separate lithic assemblage groups were defined for the C&T Project excavation data. Together they span a 7000-year history of stone tool technology on the Pajarito Plateau. These data are summarized and contrasted in this section.

No Paleoindian sites were identified during the C&T Project survey; however, an isolated Late Paleoindian projectile point was found in the White Rock Y Tract at LA 61041 (Hoagland et al. 2000). The point is a lanceolate-shaped point with a concave base (Figure 60.14).

Figure 60.14. Late Paleoindian projectile point.

In contrast to the lack of Paleoindian materials, the Archaic occupation of the project area is represented by several sites. These consist of an Early Archaic lithic scatter (LA 85859), which is radiocarbon dated to circa 5000 BC, a Late Archaic lithic scatter (LA 12587, Area 8), and two sites (LA 99396 and LA 99397) that appear to be Archaic, but whose exact period of occupation is unclear. Based on the radiocarbon, obsidian hydration, and projectile point chronology data, these sites may have Middle and Late Archaic site components. In addition, several surface artifact scatters appear to contain Archaic components. These sites include LA 86533, LA 86637, and LA 139418.

There were no Early Coalition period sites excavated during the course of the C&T Project. However, LA 4624, an Early Coalition period roomblock, was partially excavated on Mesita del Buey near the White Rock Tract (Vierra et al. 2002). Two Middle Coalition period roomblocks (LA 86534 and LA 135290) were fully excavated during the C&T Project; both were located in the Airport Tract. A single Late Coalition period roomblock (LA 12587) was excavated in the White Rock Tract as part of the C&T Project. A second Late Coalition period roomblock (LA 4618) was excavated on Mesita del Buey in the early 1990s (Schmidt 2006).

The Classic period sites excavated as part of the C&T Project are restricted to fieldhouses that were excavated primarily in Rendija Canyon, with two in the Airport and White Rock tracts. These cover the entire occupation span of the Classic period, from the 14th through the 16th centuries. Five Late Coalition period fieldhouses were also excavated in these two tracts.

A late 18th or early 19th century Jicarilla Apache tipi ring site was excavated in Rendija Canyon (LA 85869). The site consists of two rock rings with an associated artifact scatter, which includes a lithic reduction locus situated near one of the tipi rings.

A single Homestead Era site (LA 85407) was excavated in Rendija Canyon. The Serna Homestead included a cabin, a horno, a corral, and a trash dump, as well as a prehistoric artifact scatter. The McDougall Homestead cabin was excavated in 2005 on Mesita del Buey (McGehee et al. 2006). A few chipped stone items were recovered, although they may not be associated with the homestead occupation.

These temporal lithic assemblage groups will be used to identify intra-group and inter-group variability, while making generalizations about assemblage composition and long-term changes in stone tool technology. Sample sizes vary, as do the nature of the site types represented. Nonetheless, they provide an excellent sample of changing land-use and technology on the Pajarito Plateau.

The following descriptions of the lithic groups are divided into three sections: material selection, lithic reduction, and tool use. The first section describes the variation in lithic raw materials and the possible sources of these materials. The lithic reduction section provides information on core reduction techniques, stages of reduction represented, and evidence of retouched tool production. The tool use section presents information on possible tool function, including presence/absence of use-wear and the variation among ground stone tools.

The Archaic Period

Early Archaic

A total of 2057 artifacts were analyzed from LA 85859, consisting of one core, 2046 pieces of debitage, 10 retouched tools, and one mano. This represents a 37 percent sample of the 5595 total lithic artifacts recovered during the site excavations. Three charcoal samples obtained from the lower contexts of the site provided calibrated intercepts ranging from 5300 to 4860 BC. However, no diagnostic projectile points were recovered from the Early Archaic context.

Late Archaic

A total of 485 artifacts were analyzed from LA 12587 (Area 8), consisting of one core, 465 pieces of debitage, three retouched tools, and 11 ground stone items. This represents a 22 percent sample of the 2196 total lithic artifacts recovered during the site excavations. Late Archaic components were also present in the surface scatters at LA 86533, LA 86637, and LA 139418, which contained projectile points (Figure 60.15).

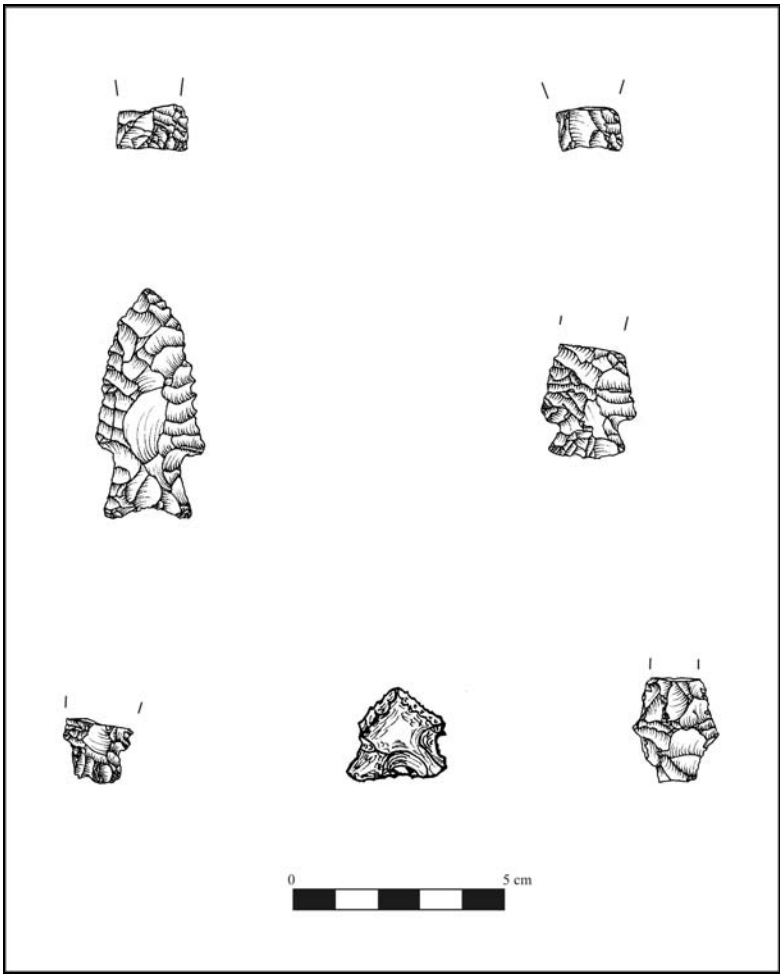


Figure 60.15. Archaic projectile points from the C&T Project.

Undetermined Archaic (Middle to Late?)

Two sites located in the Rendija Tract contain possible Middle to Late Archaic components. LA 99396 is a multi-component site that includes a surface Archaic lithic scatter with an ephemeral Coalition period structure. A total of 1252 lithic artifacts were analyzed from the Archaic component. No radiocarbon dates are available for this component, but obsidian hydration dates and several projectile point fragments indicate a possible Middle to Late Archaic occupation span. The assemblage recovered from LA 99397 was mostly removed from the upper 50 cm of excavation. Two charcoal samples yielded radiocarbon dates with calibrated intercepts of 380 and 160 BC from deposits containing the lithic artifacts. A total of 1090 artifacts were analyzed from this assemblage, including a possible Late Archaic point base (see Figure 60.15). In addition, obsidian hydration dates indicate possible Middle to Late Archaic period occupations.

Material Selection

A comparison of debitage assemblages indicate that all four of the sites are dominated by obsidian, with lesser amounts of chalcedony, Pedernal chert, igneous materials, and chert (Table 60.7). LA 85859 contains the most obsidian, followed by LA 12587 (Area 8) and LA 99396, and then LA 99397. The lower percentage for the latter site is due to the increased presence of chalcedony and Pedernal chert at the site.

Table 60.7. Archaic lithic debitage material types.

Site	Material Types (n/%)					
	Igneous	**Obsidian**	**Chalcedony**	**Pedernal**	**Chert**	**Total**
LA 85859	2	2036	6	2	0	2046
	0.1	99.5	0.3	0.1	0.0	
LA 12587 (Area 8)	3	438	16	6	1	464
	0.6	94.3	3.4	1.2	0.2	
LA 99396	4	1138	53	23	0	1218
	0.3	93.3	4.3	1.8	0.0	
LA 99397	1	845	166	55	1	1068
	0.1	79.1	15.5	5.1	0.1	
Total	**10**	**4457**	**241**	**86**	**2**	**4796**

Table 60.8 presents the results of the XRF analysis of 77 artifacts from the four Archaic sites and some noteworthy results were returned. All the obsidian samples at LA 85859 and LA 99397 were derived from the Valle Grande source. The Valle Grande source is situated about 17 km (11 mi) as the "crow flies" to the west of the sites. It appears that the occupants of the site geared up with obsidian from the caldera and then moved into the Rendija Canyon area. LA 99396 is also located in Rendija Canyon, but contains a mixture of Cerro Toledo, Valle Grande, and El Rechuelos obsidian. This site presumably reflects a north-south movement pattern with debitage from all three sources procured and deposited at the site. It is unclear if the Ceramic period component at this site is also contributing to the mixed pattern. Lastly, most of the obsidian at LA 12587 was derived from the Cerro Toledo source. The Cerro Toledo and Valle Grande sources are located about 15 km (10 mi) as the "crow flies" to the southwest and west of the site, respectively. The Late Archaic site occupants had presumably moved northeast out of the Cerro Toledo source area and into the White Rock Tract.

Table 60.8. Archaic obsidian source samples.

Site	Obsidian Source					
	Cerro Toledo	**Valle Grande**	**El Rechuelos**	**Bear Springs**	**Unknown**	**Total**
LA 85859	0	18	0	0	0	18
LA 12587 (Area 8)	24	1	0	0	0	25
LA 99396	9	9	5	0	1	24
LA 99397	0	10	0	0	0	10
Total	**33**	**38**	**5**	**0**	**1**	**77**

Lithic Reduction

Very few cores were recovered from the Archaic sites. A single bifacial chalcedony core was recovered from both LA 85859 and LA 99397. The cores exhibited waterworn cortex, which indicates that they were obtained from the Totavi Lentil gravels. The site occupants presumably retrieved the cobbles during a visit to the valley. LA 12587 (Area 8) contained a single chalcedony core that was reduced using a bidirectional opposed-different-face technique. LA 99396 contained an obsidian pebble and large rhyolite cobble core. Both cores were reduced using a bidirectional, multi-face technique.

Table 60.9 presents the information on debitage type by site. All of the sites are dominated by microdebitage and biface flakes. Only LA 99397 contains more biface flakes than microdebitage; however, both debitage types presumably reflect the reduction of bifacial artifacts at these sites. This is best represented in Figure 60.16, which illustrates the distribution of biface edge angles for LA 85859 and LA 99397. This figure shows that bifacial cores and bifacial blanks were being produced at both sites and that finished projectile point or knives were also being made at LA 99397. The bifacial cores have platform angles ranging from 70 to 85°, the bifacial blanks from 55 to 65°, and projectile point/knives with edge angles ranging from 40 to 50°. LA 85867 probably represents a temporary campsite where bifacial tool blanks were being produced. By contrast, LA 99397 exhibits a wider range of core reduction and tool production/maintenance activities and therefore may represent a habitation site. Given this dichotomy, LA 12587 (Area 8) could represent a temporary campsite and LA 99396 a habitation site.

Table 60.9. Archaic debitage types.

Site	**Debitage Type (*n*/%)**							
	Debris	Core flake	Biface flake	*Outre-passé*	Micro-debitage	Und. Flake	Other	Total
LA 85859	46 2.2	409 19.9	681 33.2	4 0.1	773 37.7	129 6.3	4 0.1	2046
LA 12587 (Area 8)	15 3.2	71 15.2	122 26.2	0 0.0	245 52.9	11 2.3	0 0.0	464

Site	Debitage Type (*n*/%)							
	Debris	Core flake	Biface flake	*Outre-passé*	Micro-debitage	Und. Flake	Other	Total
LA 99396	90 7.3	365 29.9	270 22.1	2 0.1	314 25.7	176 14.4	2 0.1	1219
LA 99397	79 7.3	314 29.4	329 30.8	0 0.0	228 21.3	117 10.9	1 0.01	1068
Total	230	1159	1402	6	1560	433	7	4797

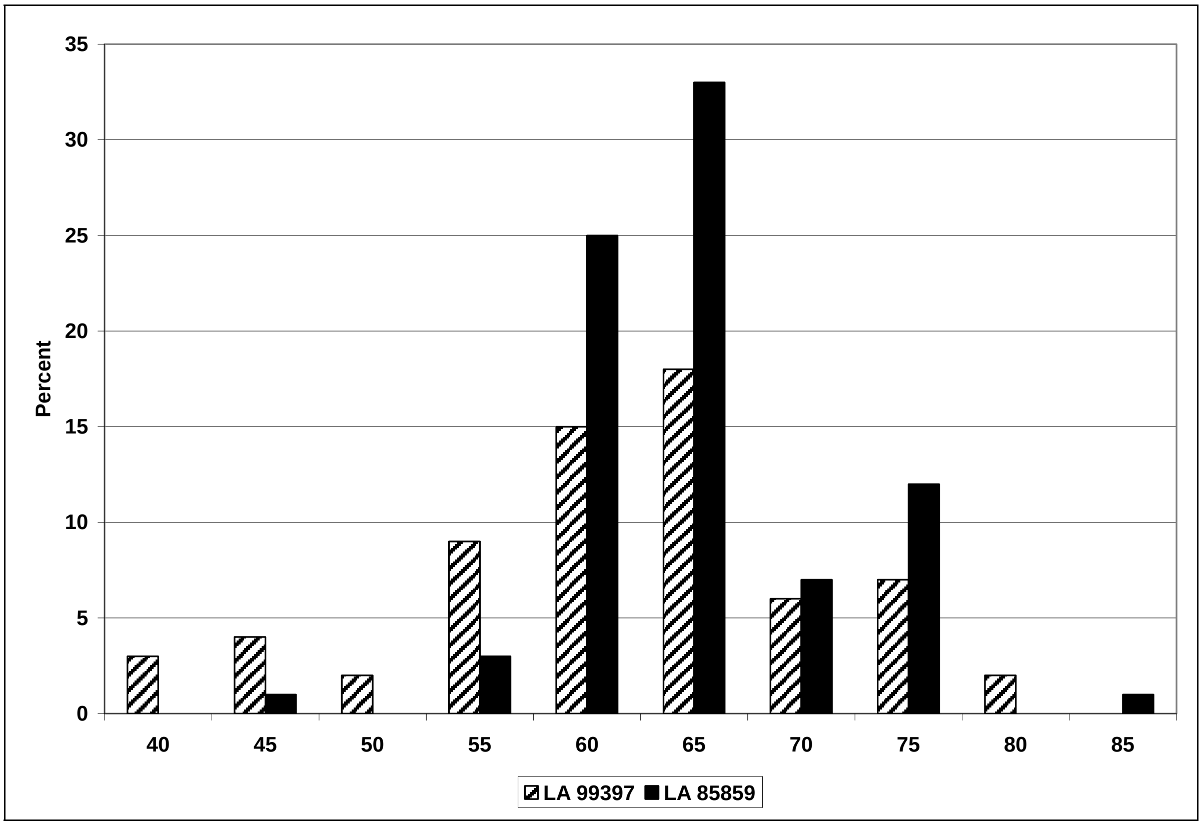


Figure 60.16. Biface flake platform angles from LA 85859 and LA 99397.

Given the importance of reducing obsidian raw materials for tool production, it should not be surprising that most of the flake platforms are crushed, with many collapsed and multi-faceted platforms (Table 60.10). Excluding LA 12587 (Area 8) due to its small sample size, 72.7 percent to 97.8 percent of the platforms exhibit preparation on the remaining three sites. Again, preparing the platform for flake removal would be important for the production of tools on obsidian.

Table 60.10. Archaic period platform types.

Site	Platform Types (*n*/%)						
	Cortical	Single	Dihedral	Multi	Collapsed	Crushed	Total
LA 85859	3 0.1	58 1.7	0 0.0	54 16.6	34 10.4	176 54.1	325
LA 12587 (Area 8)	0 0.0	15 45.4	1 3.0	4 12.1	3 9.0	10 30.3	33
LA 99396	9 5.4	7 4.2	0 0.0	31 18.7	24 14.5	94 56.9	165
LA 99397	9 4.3	38 18.5	4 1.9	26 12.6	38 18.5	90 43.9	205
Total	21	118	5	115	99	370	728

There are consistently few whole core or biface flakes in the Archaic assemblages (Tables 60.11 and 60.12). The majority of the core flakes are distal and midsection fragments, whereas most of the biface flakes are proximal fragments. The latter is in part due to the importance of platforms in classifying biface flakes. Indeed, many remnants of the biface manufacturing process end up classified as microdebitage or the distal fragments as undetermined flakes. Lastly, the core and biface flakes at LA 85859 are larger than those from LA 99396 and LA 99397 (Table 60.13). This presumably reflects the emphasis on the reduction of large bifacial cores and the production of bifacial blanks at LA 85859. By contrast, the LA 99396 and LA 99397 assemblages emphasize the full range of core reduction and tool production activities, including finished projectile points and knives.

Table 60.11. Archaic core flake condition.

Site	Core Flake Condition (*n*/%)						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 85859	46 11.2	35 8.5	84 20.5	242 59.1	2 0.4	0 0.0	409
LA 12587 (Area 8)	1 1.4	4 5.6	27 38.0	37 52.1	1 1.4	1 1.4	71
LA 99396	23 5.7	51 12.8	131 32.9	167 42.0	6 1.5	19 4.7	397
LA 99397	21 6.6	45 14.3	86 27.3	145 46.1	3 0.9	14 4.4	314
Total	72	135	328	591	12	34	1172

Figure 60.17 illustrates the distribution of retouched tool types by site. LA 12587 (Area 8) contains only four retouched tools and include bifaces and projectile points. On the other hand, the larger samples do exhibit some variability. LA 85859 solely contains retouched flakes and bifaces (n = 10). This presumably reflects the emphasis on the production of bifacial blanks at this campsite, with a few other subsistence related activities. By contrast, LA 99397 contains retouched flakes, bifaces, and projectile points (n = 18) and LA 99396 contains these tools plus a

composite tool (*n* = 23). As previously noted, these sites may represent habitation sites that include a variety of domestic activities.

Table 60.12. Archaic biface flake condition.

Site	Biface Flake Condition (*n*/%)						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 85859	92 13.5	152 22.3	99 14.5	330 48.4	8 1.1	0 0.0	681
LA 12587 (Area 8)	1 0.8	25 20.6	53 43.8	42 34.7	0 0.0	0 0.0	121
LA 99396	11 3.6	112 36.9	103 33.9	71 23.4	1 0.3	5 1.6	303
LA 99397	14 4.2	127 38.6	99 30.0	85 25.8	2 0.6	2 0.6	329
Total	118	416	354	528	11	7	1434

Table 60.13. Archaic mean flake length (mm) and angular debris weight (g).

Site	Debitage Type (std)		
	Core Flake	Biface Flake	Angular Debris
LA 85859	24.2 (12.7)	25.9 (11.9)	0.5 (0.5)
LA 12587 (Area 8)	21.0	22.5 (16.2)	0.7 (0.6)
LA 99396	18.6 (5.6)	18.5 (6.8)	1.8 (3.9)
LA 99397	20.4 (8.2)	16.0 (6.9)	1.4 (1.8)

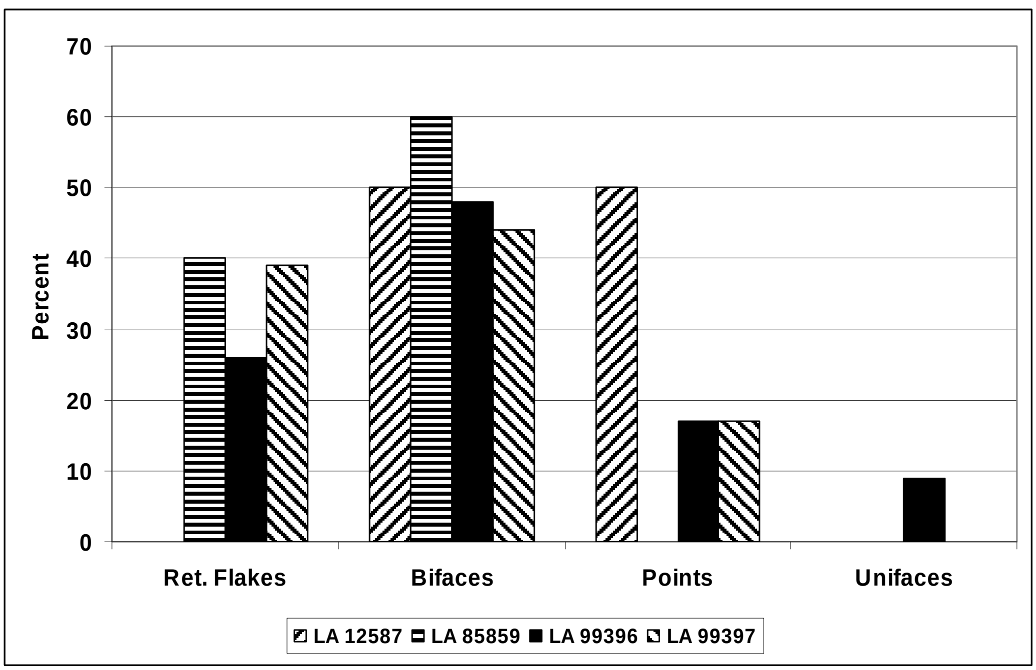


Figure 60.17. Archaic retouched tool types.

Tool Use

A very low frequency of edge damage, which could potentially be the result of use-wear, was present in all of the Archaic assemblages. Use-wear was identified as micro-scarring, rounding, and/or polish that was consistent along an edge margin and easily recognizable under 10x magnification. The paucity of use-wear is noteworthy, given the dominance of obsidian in these assemblages. The fragile nature of obsidian flakes should make them more susceptible to edge wear or post-occupational damage. Nonetheless, less than 1 percent of the individual flake assemblages exhibit obvious edge damage. The single exception is LA 12587 (Area 8) for which 4.2 percent of the flakes exhibit damage. The high percentage of damaged flakes at LA 12587 may be due to the site's location in a highly eroded and deflated area. Otherwise, a total of eight flakes (0.6%, *n* = 1159) were identified with possible use-wear in these assemblages, including six core flakes from LA 12587 and LA 99396 and two biface flakes from LA 85859. The latter reflects the importance of bifacial cores at the site, and their use for biface blank production and as sources for expedient flake tools (e.g., see Parry and Kelly 1987).

The distribution of ground stone items varies greatly between the Archaic sites. Two of these have very few ground stone artifacts, whereas the other two have numerous items. For example, there is only a single one-hand quartzite mano at LA 85859 and three millingstones at LA 99397. This contrasts with 11 ground stone artifacts at LA 12587 (Area 8) and nine ground stone artifacts at LA 99396. However, these latter two sites also contain Ceramic period components that could have contributed to their assemblages. This is certainly the case at LA 99396, which contains a two-hand mano. LA 99396 also has two one-hand manos, an undetermined mano fragment, two grinding slabs, two undetermined metate fragments, and a piece of undetermined ground stone. LA 12587 contains three undetermined mano fragments, an undetermined metate fragment, a polishing stone, an abrading stone, and five pieces of undetermined ground stone.

Early and Middle Coalition Period Roomblocks

Three Early and Middle Coalition period roomblocks have been excavated at LANL. LA 4624 is located on Mesita del Buey, which is located to the west of the White Rock Tract. LA 4624 consists of a 25-room pueblo that was partially excavated (Vierra et al. 2002). LA 86534 and LA 135290 are both nine-room pueblos that were fully excavated in the Airport Tract.

Material Selection

A comparison of debitage assemblages at these sites indicates that the sites are dominated by chalcedony, with lesser amounts of Pedernal chert, igneous rocks, and other materials (Table 60.14). The other materials mostly include chert and silicified wood. LA 86534 and LA 135290 contain similar material assemblages, with some minor differences. By contrast, LA 4624 contains relatively more igneous rock materials than the other two sites. There are geographical differences between the sites that may contribute to some of these differences.

Table 60.14. Early and Middle Coalition period roomblock lithic debitage material types.

Site	Material Types (n/%)						
	Igneous	Obsidian	Chalcedony	Pedernal	Quart-zite	Other	Total
LA 4624	50 28.4	18 10.2	79 44.8	25 14.2	0 0.0	4 2.2	176
LA 86534	26 5.4	45 9.4	267 55.8	104 21.7	28 5.8	19 1.6	488
LA 135290	40 8.1	28 5.7	303 61.7	117 23.8	2 0.4	6 0.1	496
Total	**116**	**91**	**649**	**246**	**30**	**29**	**1161**

Table 60.15 presents the results of the XRF analysis of 46 artifacts from the three Pueblo sites. There are some noteworthy differences. LA 4624 is dominated by Cerro Toledo obsidian. The Cerro Toledo (Rabbit Mountain/Obsidian Ridge) and Valle Grande (Cerro del Medio) source areas are located about 15 km (10 mi) as the "crow flies" to the southwest and west of the site. The El Rechuelos (Polvadera Peak) source area is located about 30 km (19 mi) to the northwest of the site. However, the Valle Grande source may be closer in actual walking distance, while the Cerro Toledo source area involves crossing Frijoles Canyon. Despite these differences, the obsidian from the Cerro Toledo source area was preferentially selected for at LA 4624. The Valle Grande (Cerro del Medio) and Cerro Toledo (Rabbit Mountain/Obsidian Ridge) source areas are located about 17 km (11 mi) as the "crow flies" to the west and southwest of LA 86534 and LA 135290. The Valle Grande source is actually closer in walking distance than the Cerro Toledo source from these two sites. Despite this, there is a mixture of Valle Grande and Cerro Toledo obsidian at LA 86534 and a predominance of Valle Grande obsidian at LA 135290. Two of the three artifacts made of El Rechuelos obsidian are retouched tools that could have been made while on trips to the source area.

Table 60.15. Early and Middle Coalition period roomblock obsidian source samples.

Site	Obsidian Source					
	Cerro Toledo	Valle Grande	El Rechuelos	Bear Springs	Unknown	Total
LA 4624	11 78.5	2 14.2	1 7.1	0 0.0	0 0.0	14
LA 86534	7 30.4	14 60.8	2 8.6	0 0.0	0 0.0	23
LA 135290	1 11.2	8 88.8	0 0.0	0 0.0	0 0.0	9
Total	**19**	**24**	**3**	**0**	**0**	**46**

Lithic Reduction

Sixteen cores were recovered from the sites, however, only seven of these were found at LA 4624 and LA 86534 and nine from LA 135290. Nonetheless, they were reduced using a single-directional (*n* = 4), bidirectional (*n* = 7), and bipolar (*n* = 1) reduction technique. In addition, a single cobble biface and a core fragment were also identified. These are platform cores that were made on chalcedony and Pedernal chert cobbles. The cobbles are broken to create a single platform core. The direction of flake removals increases as the core is reoriented with increasing reduction. In addition, at least one small piece of Pedernal chert was reduced with a bipolar technique. The cobble biface was made of basalt and exhibited battering along the edge perimeter; this item may not represent a core, but rather a heavy-duty chopping tool.

Table 60.16 presents the information on debitage type by site. All three sites are dominated by core reduction activities, including mostly core flakes, with some angular debris, microdebitage, and other types. LA 86534 does, however, contain relatively more microdebitage than the other two sites. The "other" debitage type includes hammerstone flakes, ground stone flakes, and notching flakes, which represent domestic and tool production activities.

Table 60.16. Early and Middle Coalition period roomblock debitage types.

Site	Debitage Type (*n*/%)						
	Debris	Core flake	Biface flake	Micro-debitage	Und. Flake	Other	Total
LA 4624	29 16.4	130 73.8	0 0.0	12 6.8	2 1.1	3 1.7	176
LA 86534	90 18.4	260 53.1	20 4.0	99 20.2	14 2.8	5 1.0	488
LA 135290	83 16.7	343 69.1	11 2.2	43 8.6	14 2.8	5 1.0	496
Total	**202**	**733**	**31**	**154**	**30**	**13**	**1163**

Given the emphasis on core reduction at these sites, it is not surprising that most of the platforms are single-faceted, with fewer that are cortical, collapsed, and crushed (Table 60.17). There is, however, a wide range of variability exhibited across the sites in relation to platform preparation. Only 3.3 percent of the platforms exhibit preparation at LA 135290, in contrast to 13.7 percent at LA 4624 and 20 percent at LA 86534.

Table 60.17. Early and Middle Coalition period roomblock platform types.

Site	Platform Types (*n*/%)						
	Cortical	**Single**	**Dihedral**	**Multi**	**Collapsed**	**Crushed**	**Total**
LA 4624	11 12.7	68 79.0	2 2.3	0 0.0	3 3.4	2 2.3	86
LA 86534	11 10.4	65 61.9	0 0.0	4 3.8	12 11.4	13 12.3	105
LA 135290	30	57	1	2	36	22	148

Site	Platform Types (*n*/%)						
	Cortical	Single	Dihedral	Multi	Collapsed	Crushed	Total
	20.2	38.5	0.6	1.3	24.3	14.8	
Total	**52**	**190**	**3**	**6**	**51**	**37**	**339**

There is also some variability exhibited between the sites in relation to flake condition. Most of the core flakes at LA 4624 are whole, whereas most of those recovered from LA 86534 and LA 135290 are distal fragments (Table 60.18). Despite differences in core flake attributes, the patterns are similar for biface flakes (Table 60.19). Core flake size is similar between the sites, but angular debris size does vary. Interestingly, biface flake size is unusually larger at LA 135290 (Table 60.20).

Table 60.18. Early and Middle Coalition period roomblock core flake condition.

Site	Core Flake Condition (*n*/%)						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 4624	67 51.5	17 13.0	14 10.7	28 21.5	3 2.3	1 0.7	130
LA 86534	63 24.2	33 12.6	39 15.0	117 45.0	5 1.9	3 1.1	260
LA 135290	96 27.9	41 11.9	27 7.8	179 23.0	0 0.0	0 0.0	343
Total	**226**	**91**	**80**	**324**	**8**	**4**	**733**

Table 60.19. Early and Middle Coalition period roomblock biface flake condition.

Site	Biface Flake Condition (*n*/%)						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 4624	0	0	0	0	0	0	0
LA 86534	6	3	2	8	1	0	20
LA 135290	3	3	1	4	0	0	11
Total	**9**	**6**	**3**	**12**	**1**	**0**	**31**

Table 60.20. Early and Middle Coalition period roomblock mean flake length (mm) and angular debris weight (g).

Site	Debitage Type (std)		
	Core Flake	Biface Flake	Angular Debris
LA 4624	22.5 (7.8)	0.0	3.0 (5.9)
LA 86534	21.8 (10.5)	15.4 (5.1)	2.8 (4.7)
LA 135290	23.8 (12.5)	30.0 (10.5)	3.9 (5.5)

Figure 60.18 illustrates the distribution of retouched tools between the sites. The assemblages contain retouched flakes, bifaces, projectile points, and unifaces. The retouched flake category includes retouched pieces, denticulates, perforators, and a perforator/notch. These retouched items can be separated into two groups: informal tools and formal tools. The former consist of

retouched flakes that are created with minimal energy investment and marginal retouch. The bifaces, projectile points, and unifaces are classified as formal tools since they involved a greater investment in production through shaping and facial retouch. The formal:informal tool ratio indicates that LA 4624 (2.5) and LA 86534 (1.5) contain relatively more formal tools, while LA 135290 (1.0) contains an equal number of informal and formal tools.

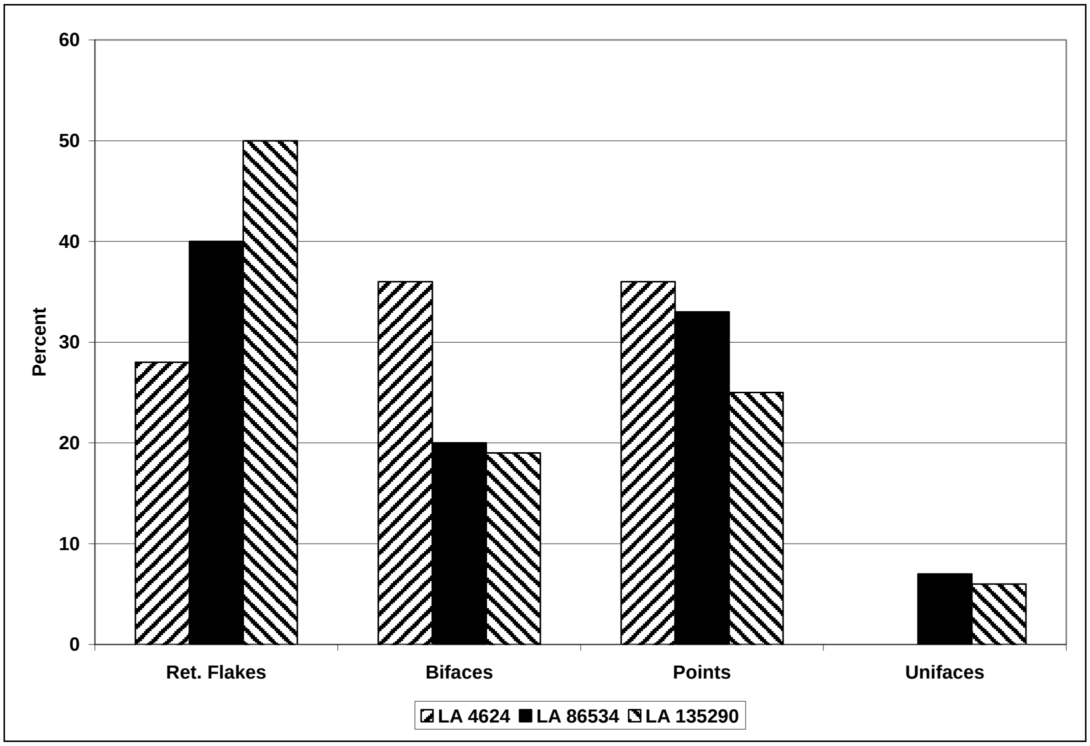


Figure 60.18. Early and Middle Coalition period roomblock retouched tool types.

There are slightly more, or relatively equal, amounts of formal and informal tools present at the sites. However, there does appear to be an inverse relationship between retouched flakes and bifaces and projectile points. Although each site contains a similar number of tools, LA 4624 has a much smaller overall sample size and therefore contains relatively more tools than the other two sites (e.g., bifaces and projectile points). Sample sizes range from 14 at LA 4624 to 15 at LA 86534 and 16 at LA 135290.

Tool Use

The percentage of flakes with damaged edges that could be attributed to use-wear ranges from 2.3 percent at LA 86534, to 3.8 percent at LA 135290, to 6.1 percent at LA 4624. The overall mean percent is 3.6 percent.

Figure 60.19 illustrates the distribution of ground stone tools between the sites. The assemblages contain a variety of ground stone tools including one- and two-hand manos, millingstones, slab metates, grinding slabs, polishing stones, abrading stones, and undetermined ground stone fragments. The most notable difference is the absence of one-hand manos from the LA 4624 assemblage and the absence of two-hand manos from the LA 86534 assemblage. The presence of formal slab metates at LA 4624 and LA 86534 corresponds to the presence of two-hand manos at the former site, but implies that two-hand manos were being used at the latter site (even if they were not present in the sample analyzed). By contrast, LA 135290 contained mostly undetermined metate fragments with some grinding slabs. The presence of two-hand manos indicates that slab metates were also used at this site, even though none were recovered.

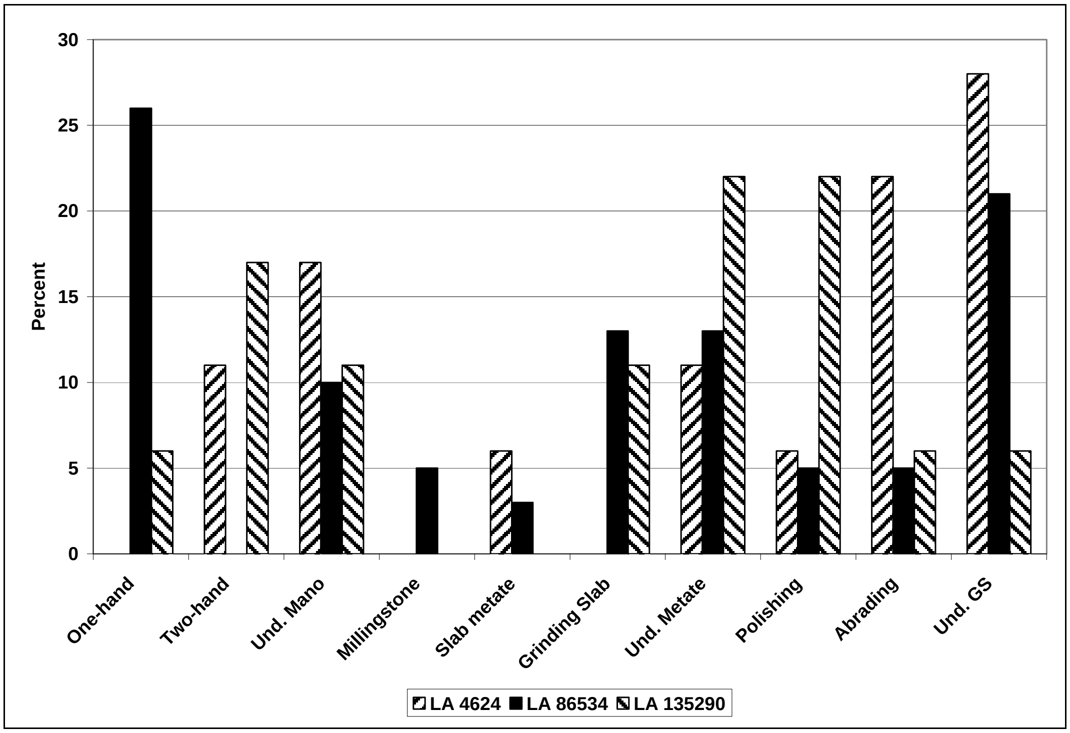


Figure 60.19. Early and Middle Coalition period roomblock ground stone tool types.

Besides the ground stone artifacts, a few other tools used for domestic activities, construction, and clearing fields were identified. These include a single flaked axe, two mauls, and nine hammerstones.

Late Coalition Period Roomblocks

Two Late Coalition period roomblocks have been excavated at Los Alamos National Laboratory. LA 4618 is located on Mesita del Buey, which is located west of the White Rock Tract near the town of White Rock. LA 4618 was completely excavated and contained 13 rooms including a subterranean circular kiva and an above-ground masonry kiva (Schmidt 2006). LA 12587 includes a seven-room pueblo that was fully excavated and a linear row of 13 rooms in which the construction was never completed. LA 12587 is located in the White Rock Tract and was excavated as part of the C&T Project.

Material Selection

A comparison of the debitage assemblages from LA 12587 and LA 4618 indicates that both are dominated by the use of chalcedony, with less obsidian, igneous rock, Pedernal chert, quartzite, and other materials (Table 60.21). The "other" materials include chert and silicified wood. LA 4618 contains relatively more debitage made of igneous rock and obsidian than LA 12587.

Table 60.21. Late Coalition period roomblock lithic debitage material types.

Site	Material Types (*n*/%)						
	Igneous	Obsidian	Chalcedony	Pedernal	Quart-zite	Other	Total
LA 4618	113 11.5	214 21.9	547 55.9	78 7.9	6 0.6	19 1.9	977
LA 12587	164 7.1	389 16.9	1505 65.5	150 6.5	34 1.4	54 2.3	2296
Total	**277**	**603**	**2052**	**228**	**40**	**73**	**3273**

Table 60.22 presents the results of the XRF analysis of 44 artifacts from LA 12587 and LA 4618. Even though the two sites are located near each other, they contain very different obsidian source profiles. LA 4618 primarily contains Valle Grande obsidian with some Cerro Toledo obsidian, while LA 12587 contains mostly Cerro Toledo obsidian, with some Valle Grande and El Rechuelos obsidian. Four of the five artifacts made from El Rechuelos obsidian are projectile points that could have been obtained while on trips to the source area. One possible explanation for the dominance of Cerro Toledo obsidian at LA 12587 is that the site occupants are collecting obsidian artifacts from the Late Archaic site located nearby (Area 8). The Late Archaic site is dominated by Cerro Toledo obsidian, although XRF source analyses failed to identify any El Rechuelos obsidian.

Table 60.22. Late Coalition period roomblock obsidian source samples.

Site	Obsidian Source					
	Cerro Toledo	Valle Grande	El Rechuelos	Bear Springs	Unknown	Total
LA 4618	2 18.1	7 63.6	0 0.0	0 0.0	2 18.1	11
LA 12587	22 66.6	6 18.2	5 15.2	0 0.0	0 0.0	33
Total	**24**	**13**	**5**	**0**	**2**	**44**

Lithic Reduction

Twenty-three cores were recovered from LA 12587 and LA 4618. Several different reduction techniques were used at the sites including single-directional (n = 9), bidirectional (n = 14), multi-directional (n = 7), and bipolar (n = 1). In addition, a flake core was also identified. The full range of core reduction techniques are represented, indicating that these cores were being fully reduced. Again, this primarily includes the reduction of chalcedony and Pedernal chert cobbles.

Table 60.23 presents the information on debitage type by site. Both sites are dominated by core reduction activities, including mostly core flakes, with some angular debris, microdebitage, and other types. The "other" debitage type includes hammerstone flakes, ground stone flakes, and notching flakes that represent domestic and tool production activities.

Table 60.23. Late Coalition period roomblock debitage types.

Site	Debitage Type (*n*/%)						
	Debris	Core flake	Biface flake	Micro-debitage	Und. Flake	Other	Total
LA 4618	121 12.3	642 65.7	39 3.9	111 11.3	50 5.1	13 1.3	977
LA 12587	294	1224	125	570	58	21	2296
Total	**415**	**1866**	**164**	**681**	**108**	**34**	**3273**

Given the emphasis on core reduction at these sites, it is not surprising that most of the platforms are single-faceted, with fewer that are cortical, collapsed, and crushed (Table 60.24). However, there is a wide difference in relation to platform preparation. Only 4.5 percent of the platforms at LA 4618 exhibit preparation, while 12.8 percent of the platforms at LA 12587 exhibit platforms.

Table 60.24. Late Coalition period roomblock platform types.

Site	Platform Types (*n*/%)						
	Cortical	**Single**	**Dihedral**	**Multi**	**Collapsed**	**Crushed**	**Total**
LA 4618	33 10.7	145 47.3	5 1.6	11 3.5	52 16.9	60 19.6	306
LA 12587	92 17.6	269 51.7	10 1.9	11 2.1	63 12.1	75 14.4	520
Total	**125**	**414**	**15**	**22**	**115**	**135**	**826**

There is also some variability exhibited between the sites in relation to flake condition. Most of the core flakes are distal fragments at both sites, although there are relatively more whole flakes at LA 4618 (Table 60.25). Otherwise, LA 4618 contains relatively more proximal/midsection fragments for biface flakes, while LA 12587 contains more distal fragments (Table 60.26). Lastly, core flake, biface flake, and angular debris sizes are similar between the two sites (Table 60.27).

Table 60.25. Late Coalition period roomblock core flake condition.

Site	Core Flake Condition (*n*/%)						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 4618	199 30.9	83 12.9	68 10.5	287 44.6	3 0.4	3 0.4	643
LA 12587	262 21.4	200 16.3	174 14.2	563 45.9	12 0.9	13 1.0	1224
Total	**461**	**283**	**242**	**850**	**15**	**16**	**1867**

Table 60.26. Late Coalition period roomblock biface flake condition.

Site	Biface Flake Condition (*n*/%)						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 4618	5 12.8	13 33.3	13 33.3	8 20.5	0 0.0	0 0.0	39
LA 12587	12 9.6	37 29.6	28 22.4	48 38.4	0 0.0	0 0.0	125
Total	**17**	**50**	**41**	**56**	**0**	**0**	**164**

Table 60.27. Late Coalition period roomblock mean flake length (mm) and angular debris weight (g).

Site	Debitage Type (std)		
	Core Flake	Biface Flake	Angular Debris
LA 4618	22.6 (10.0)	20.8 (5.5)	2.2 (2.7)
LA 12587	21.0 (9.3)	18.5 (7.8)	2.4 (4.8)

Figure 60.20 illustrates the distribution of retouched tools between the two sites. In this case, the retouched flakes consist of retouched pieces, notches, denticulates, perforators, and gravers, whereas, the formal tools consist of biface, projectile points, unifaces, and drills. The formal:informal tool ratio for LA 4618 (0.7) and LA 12587 (1.0) indicate that there are somewhat more informal tools, or equal numbers of informal and formal tools on the sites.

Tool Use

The percentage of flakes with damaged edges that could be attributed to use-wear ranges from 1.2 percent at LA 12587 to 3.89 percent at LA 4618, and has an overall mean of 2.1 percent. Figure 60.21 graphically illustrates the distribution of ground stone tools between the sites. The assemblages contain a variety of ground stone tools including one- and two-hand manos, millingstones, slab metates, grinding slabs, polishing stones, abrading stones, and undetermined ground stone fragments. However, there are some notable differences between the two sites. LA 4618 contains relatively more one-hand manos, millingstones, and grinding slabs, while there are relatively more two-hand manos and slab metates at LA 12587.

Besides the ground stone artifacts, there are also a range of other tools used for domestic activities, construction, clearing, and tending fields. These include flaked axes (*n* = 3), mauls (*n* = 5), hoes (*n* = 7), and hammerstones (*n* = 5). In addition, 10 vent plugs were recovered from LA 4618, but none were recovered at LA 12587.

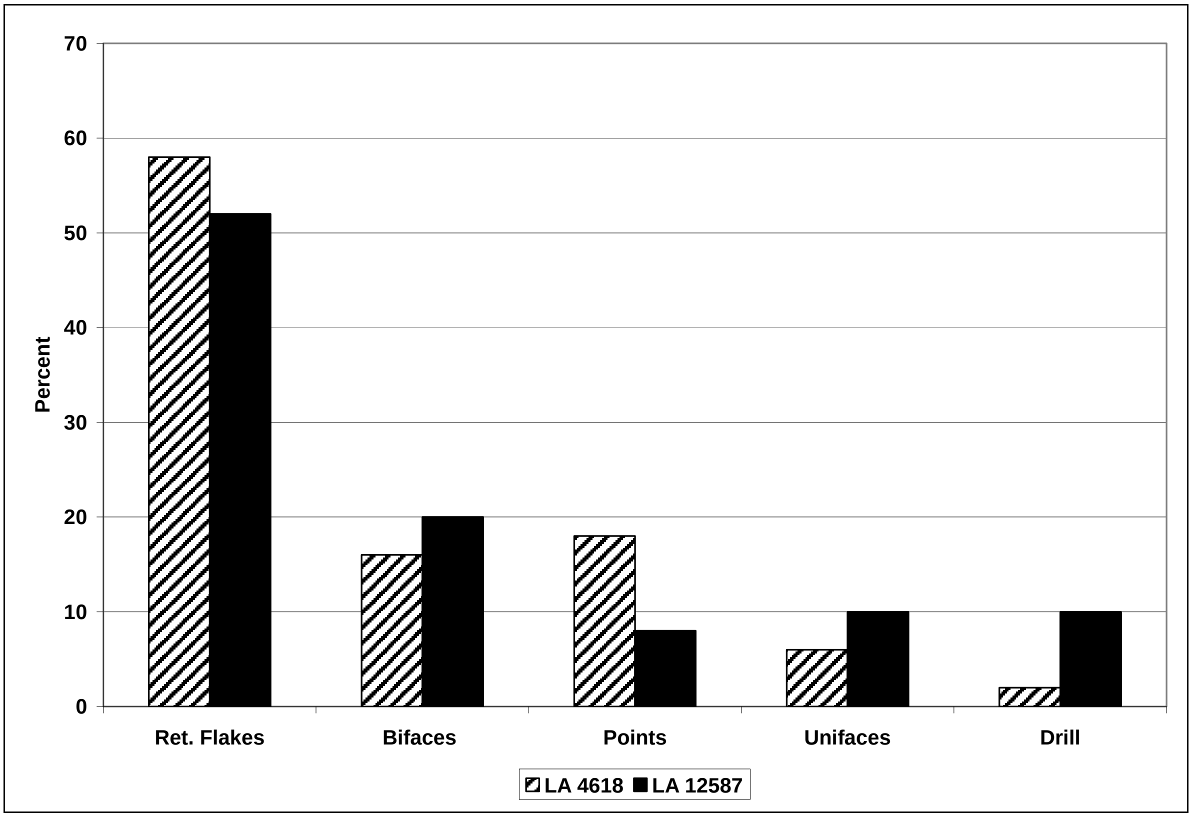


Figure 60.20. Late Coalition period roomblock retouched tool types.

Late Coalition Period Fieldhouses

Four Late Coalition period fieldhouses were excavated in Rendija Canyon. These consist of LA 85417, LA 85861, LA 86606, and LA 86607. All of these sites are one-room structures that represent two sets of sites located near each other. The first set is located in Cabra Canyon, whereas, the latter two sites are situated on the mesa top. No lithic artifacts were recovered from LA 86607.

Material Selection

The samples sizes are relatively small for two of the three sites, with chalcedony dominating the debitage assemblages and fewer pieces of Pedernal chert and obsidian (Table 60.28).

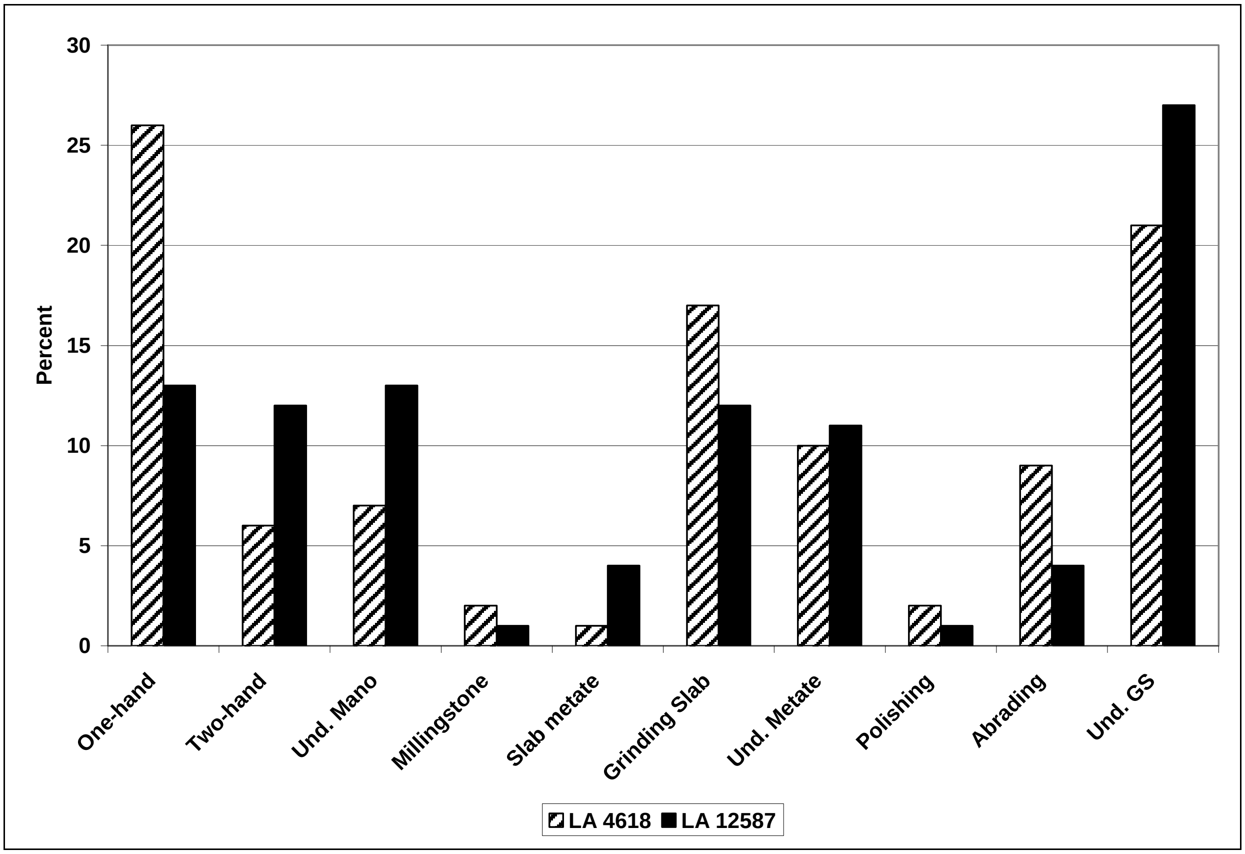


Figure 60.21. Late Coalition period roomblock ground stone tool types.

Table 60.28. Late Coalition period fieldhouse lithic debitage material types.

Site	Material Types (*n*/%)						
	Igneous	Obsidian	Chalcedony	Pedernal	Quart-zite	Other	Total
LA 85417	1 7.6	0 0.0	8 61.5	4 30.7	0 0.0	0 0.0	13
LA 85861	2 2.5	15 18.9	39 49.3	22 27.8	1 1.2	0 0.0	79
LA 86606	5 29.4	2 11.7	7 41.1	3 17.6	0 0.0	0 0.0	17
Total	**8**	**17**	**54**	**29**	**1**	**0**	**109**

Table 60.29 presents the results of the XRF analysis of 12 artifacts from two of the three fieldhouses. LA 85417 did not contain any obsidian artifacts. LA 85861 exhibits a larger sample size and contains mostly Cerro Toledo obsidian with some Valle Grande. A single item made of Cerro Toledo and one made of Bear Springs obsidian was identified at LA 86606. The Valle Grande (Cerro del Medio) and Cerro Toledo (Obsidian Ridge/Rabbit Mountain) source areas are located about 17 km (11 mi) and 19 km (12 mi) to the west and southwest, respectively. However, Cerro Toledo obsidian is also present on the nearby mesa top as small pebbles. These

pebbles compose part of the secondary deposits associated with the Cerro Toledo interval. The Bear Springs source area is situated 38 km (24 mi) to the southwest as the "crow flies." This artifact represents the only piece of Bear Springs obsidian identified on the entire project.

Table 60.29. Late Coalition period fieldhouse obsidian source samples.

Site	Obsidian Source					
	Cerro Toledo	Valle Grande	El Rechuelos	Bear Springs	Unknown	Total
LA 85417	0	0	0	0	0	0
LA 85861	8	2	0	0	0	10
LA 86606	1	0	0	1	0	2
Total	**9**	**2**	**0**	**1**	**0**	**12**

Lithic Reduction

Four cores were recovered from the three sites. Two are made of Pedernal chert, one of chalcedony, and the other of obsidian. The chert and chalcedony cores were reduced using a single-directional, bidirectional/discoidal, and 90° techniques, whereas, the obsidian core was reduced using a bidirectional/bifacial technique.

Table 60.30 presents the information on debitage type by site. All three sites are dominated by core reduction activities, including mostly core flakes, with some angular debris, biface flakes, and other types.

Table 60.30. Late Coalition period fieldhouse debitage types.

Site	Debitage Type (*n*/%)						
	Debris	Core flake	Biface flake	Micro-debitage	Und. Flake	Other	Total
LA 85417	1 7.6	9 69.2	2 15.3	1 7.6	0 0.0	0 0.0	13
LA 85861	13 16.4	47 59.4	14 17.7	1 1.2	4 5.0	0 0.0	79
LA 86606	3 17.6	13 76.4	0 0.0	0 0.0	0 0.0	1 5.8	17
Total	**17**	**69**	**16**	**2**	**4**	**1**	**109**

Given the emphasis on core reduction at these sites, it is again not surprising that the most of the platforms are single-faceted, with fewer that are cortical, collapsed, and crushed (Table 60.31). None of the platforms at LA 86606 or LA 85417 exhibit any obvious evidence of preparation; however, preparation was observed on four (11.7%) of the platforms at LA 85861.

All three sites exhibit a mix of whole and distal core flakes fragments, with a similar pattern for biface flakes at LA 85861 (Tables 60.32 and 60.33). Otherwise, there is some variation in core flake, biface flake, and angular debris sizes, but this is presumably due to the small samples sizes (Table 60.34).

Table 60.31. Late Coalition period fieldhouse platform types.

Site	Platform Types (*n*/%)						
	Cortical	Single	Dihedral	Multi	Collapsed	Crushed	Total
LA 85417	0 0.0	5 55.5	0 0.0	0 0.0	1 11.1	3 33.4	9
LA 85861	1 3.0	19 55.8	0 0.0	1 3.0	5 14.7	8 23.5	34
LA 86606	1 14.2	4 57.1	0 0.0	0 0.0	2 28.7	0 0.0	7
Total	**2**	**28**	**0**	**1**	**8**	**11**	**50**

Table 60.32. Late Coalition period fieldhouse core flake condition.

Site	Core Flake Condition (*n*/%)						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 85417	6 54.5	1 9.0	0 0.0	4 36.5	0 0.0	0 0.0	11
LA 85861	20 42.5	6 12.8	3 6.3	18 38.2	0 0.0	0 0.0	47
LA 86606	4 30.7	3 23.0	1 7.7	5 38.4	0 0.0	0 0.0	13
Total	**30**	**10**	**4**	**27**	**0**	**0**	**71**

Table 60.33. Late Coalition period fieldhouse biface flake condition.

Site	Biface Flake Condition (*n*/%)						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 85417	2 100.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2
LA 85861	7 50.0	1 7.1	2 14.3	4 28.6	0 0.0	0 0.0	14
LA 86606	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0
Total	**9**	**1**	**2**	**4**	**0**	**0**	**16**

Table 60.34. Late Coalition period fieldhouse mean flake length (mm) and angular debris weight (g).

Site	Debitage Type (std)		
	Core Flake	Biface Flake	Angular Debris
LA 85417	23.6 (5.7)	22.0 (4.2)	8.8 (0.0)
LA 85861	20.2 (8.9)	28.7 (7.6)	4.0 (5.7)

Site	Debitage Type (std)		
	Core Flake	Biface Flake	Angular Debris
LA 86606	28.5 (7.5)	0.0	2.9 (2.3)

LA 85861 is the only site that contains retouched tools. These consist of five retouched pieces, three bifaces, and two unifaces.

Tool Use

A single flake from LA 86561 (2.1%) is the only piece of debitage that exhibits edge damage that can possibly be attributed to use.

Figure 60.22 illustrates the distribution of ground stone tools between the sites. The assemblages contain a limited number of ground stone tools including one- and two-hand manos, grinding slabs, undetermined metate fragments, and undetermined ground stone fragments. Most of these are from LA 85861. In addition to the ground stone artifacts, a grooved abrader and two hoes were recovered from LA 85861, and a flaked axe was recovered from LA 86606. The grooved abrader indicates that arrows were being produced at the site, whereas, the hoes were presumably used for maintaining agricultural fields. The axe may have been used for fieldhouse construction or possibly for clearing forested land for field plots. Five hammerstones were also recovered from the sites. Three of these were recovered from LA 85861.

Classic Period Fieldhouses

Two Classic period fieldhouses were excavated in the White Rock Tract (LA 127631 and LA 128805), one in the Airport Tract (LA 141505), and 16 in the Rendija Tract (LA 15116, LA 70025, LA 85403, LA 85404, LA 85408, LA 85411, LA 85413, LA 85414, LA 85867, LA 86605, LA 87430, LA 127627, LA 127634, LA 127635, LA 135291, and LA 135292).

Material Selection

The samples sizes vary among the sites, from a low of 14 to a high of 331 (Table 60.35). Nonetheless, most of the site assemblages are dominated by chalcedony, with less Pedernal chert, obsidian, and igneous rock materials. LA 128805 is the only notable difference to this pattern with 52.2 percent of the debitage assemblage consisting of obsidian. Otherwise, the igneous rocks primarily consist of basalt, with some andesite, rhyolite, and dacite, whereas, the other category includes chert and silicified wood.

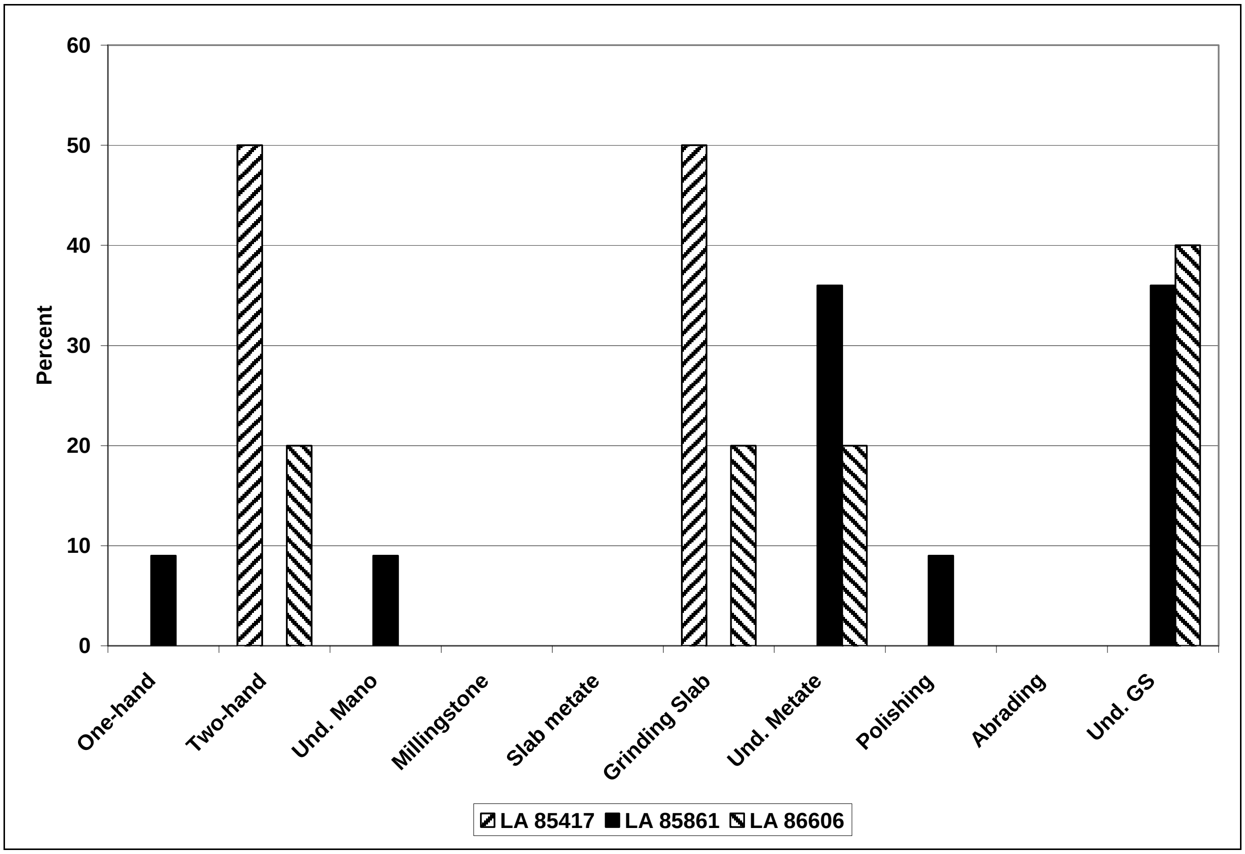


Figure 60.22. Late Coalition period fieldhouse ground stone tool types.

Table 60.35. Classic period fieldhouse lithic debitage material types.

Site	Material Types (*n*/%)						
	Igneous	Obsidian	Chalcedony	Pedernal	Quartz-ite	Other	Total
LA 127631	1	5	7	1	0	0	14
LA 128805	56	173	78	17	2	5	331
LA 141505	3	0	11	4	0	1	19
LA 15116	5	0	20	13	0	2	38
LA 70025	0	1	10	3	0	0	14
LA 85403	6	1	5	5	0	0	17
LA 85404	9	8	28	13	0	1	59
LA 85408	4	5	33	12	0	8	62
LA 85411	10	41	19	25	0	0	95
LA 85413	5	26	112	64	12	5	224
LA 85414	1	4	12	9	0	2	28
LA 85867	14	3	21	7	0	0	45
LA 86605	10	6	32	16	1	2	67
LA 87430	5	10	34	29	0	2	80
LA 127627	7	2	26	32	0	0	68

Site	Material Types (*n*/%)						
	Igneous	Obsidian	Chalcedony	Pedernal	Quartz-ite	Other	Total
LA 127634	16	5	46	27	0	0	94
LA 127635	3	3	37	28	0	0	71
LA 135291	0	1	5	7	0	1	14
LA 135292	7	15	35	19	0	2	78
Total	**162**	**309**	**571**	**331**	**15**	**31**	**1419**

Table 60.36 presents the results of the XRF analysis of 73 artifacts from the 19 fieldhouses. Most of this obsidian was identified as Cerro Toledo, with less from the Valle Grande and El Rechuelos sources. However, if we separate out the White Rock and the Rendija Canyon sites, we find that LA 128805 only has Cerro Toledo obsidian, LA 127631 has a mix of Cerro Toledo, Valle Grande, and El Rechuelos obsidian, and the Rendija Canyon sites contain mostly Cerro Toledo (55.3%), with less Valle Grande (33.9%) and El Rechuelos (10.7%). Cerro Toledo is locally available in Rendija Canyon, so it is not surprising that this obsidian and the nearby Valle Grande source were both being exploited. It is unclear how much, if any, of the Cerro Toledo obsidian identified in Rendija Canyon was actually procured from the Rabbit Mountain source area. On the other hand, all the Cerro Toledo obsidian identified at the White Rock sites was presumably obtained from the Rabbit Mountain source area. Although the Rendija Canyon source can not be excluded, the small pebble size limits the use of this material for small flakes and larger retouched tools.

Table 60.36. Classic period fieldhouse obsidian source samples.

Site	Obsidian Source					
	Cerro Toledo	Valle Grande	El Rechuelos	Bear Springs	Unknown	Total
LA 127631	2	2	1	0	0	5
LA 128805	12	0	0	0	0	12
LA 141505	0	0	0	0	0	0
LA 15116	0	0	0	0	0	0
LA 70025	0	0	0	0	0	0
LA 85403	0	0	0	0	0	0
LA 85404	0	3	0	0	0	3
LA 85408	2	1	0	0	0	3
LA 85411	5	4	0	0	0	9
LA 85413	10	0	0	0	0	10
LA 85414	4	0	1	0	0	5
LA 85867	3	0	0	0	0	3
LA 86605	1	2	1	0	0	4
LA 87430	1	4	0	0	0	5
LA 127627	0	0	1	0	0	1
LA 127634	1	1	1	0	0	3
LA 127635	1	2	0	0	0	3

Site	Obsidian Source					
	Cerro Toledo	Valle Grande	El Rechuelos	Bear Springs	Unknown	Total
LA 135291	0	0	0	0	0	0
LA 135292	3	2	2	0	0	7
Total	**45**	**21**	**7**	**0**	**0**	**73**

Lithic Reduction

Four cores were recovered from the sites. Two are made of Pedernal chert, one of chalcedony, and the other of obsidian. The chert and chalcedony cores were reduced using a single-directional, bidirectional/discoidal, and 90° technique, whereas, the obsidian core was reduced using a bidirectional/bifacial technique.

Table 60.37 presents the information on debitage type by site. All the sites are dominated by core reduction activities, including mostly core flakes, with some angular debris, biface flakes, microdebitage, and other types. The other debitage types include core trimming flakes, change-of-orientation flakes, bipolar flakes, hammerstone flakes, and ground stone flakes. The most notable difference to this pattern is LA 128805, which contains relatively more biface flakes (20.5%) and microdebitage (21.1%) than the other sites. In addition, although no biface flakes were recorded at LA 85413, the presence of an *outrepassé* and uniface flake indicate that tool production activities were also occurring at this site.

Table 60.37. Classic period fieldhouse debitage types.

Site	Debitage Types						
	Debris	Core flake	Biface flake	Microdebitage	Und. Flake	Other	Total
LA 127631	1	9	1	2	0	0	14
LA 128805	30	145	68	70	17	1	331
LA 141505	2	16	0	0	0	1	19
LA 15116	3	32	0	1	2	0	38
LA 70025	0	14	0	0	0	0	14
LA 85403	5	10	1	1	0	0	17
LA 85404	21	34	1	2	1	0	59
LA 85408	11	49	0	0	2	0	62
LA 85411	11	68	8	3	2	3	95
LA 85413	37	173	0	6	5	2	224
LA 85414	5	23	0	0	0	0	28
LA 85867	1	36	1	1	0	0	45
LA 86605	7	50	2	5	2	1	67
LA 87430	7	62	8	1	2	0	80
LA 127627	3	59	2	1	3	0	68
LA 127634	20	60	4	4	4	2	94
LA 127635	6	41	2	11	11	0	71

Site	Debitage Types						
	Debris	Core flake	Biface flake	Microdebitage	Und. Flake	Other	Total
LA 135291	4	8	1	0	0	1	14
LA 135292	9	45	11	4	9	0	78
Total	**183**	**934**	**110**	**112**	**60**	**11**	**1410**

Given the emphasis on core reduction at these sites, it is again not surprising that the most of the platforms are single-faceted, with fewer that are cortical, collapsed, and crushed (Table 60.38). Very few site assemblages exhibit evidence of platform preparation. LA 85867, LA 85403, LA 127634, LA 127635, LA 135291, and LA 127631 contain one to three prepared platforms, with a total of nine. In contrast, 24 platforms exhibit evidence of preparation at LA 128805. This provides a total of 33 platforms, or about 10 percent of the single, dihedral, and multi-faceted platforms.

The sites exhibit a mix of mostly whole, proximal, and distal core flakes fragments, with mostly proximal, midsection, and distal portions of bifaces flakes (Tables 60.39 and 60.40). There is some variation in core flake and angular debris sizes, but this is presumably due in part to the small samples sizes (Table 60.41). Nonetheless, in looking at the six sites with the greatest number of debitage pieces, we find a range from 21 to 30 mm for mean core flake size and 3.5 to 7.5 g for mean angular debris weight suggesting that even these sites exhibit a wide range in flake and debris size.

The majority of the retouched tools recovered from the Classic period fieldhouses are retouched flakes (n = 25; 56.8%). There are fewer bifaces (n = 9) and projectile points (n = 7), with two unifaces and a drill.

Table 60.38. Classic period fieldhouse platform types.

Site	Platform Type						
	Cortical	Single	Dihedral	Multi	Collapsed	Crushed	Total
LA 127631	0	3	0	0	0	0	3
LA 128805	10	31	2	7	9	14	73
LA 141505	1	1	0	0	4	1	7
LA 15116	1	10	0	0	3	4	18
LA 70025	0	6	0	0	2	0	8
LA 85403	0	3	0	0	1	2	6
LA 85404	3	13	0	0	0	0	16
LA 85408	5	19	0	0	8	0	32
LA 85411	8	27	0	1	13	4	53
LA 85413	24	56	0	1	17	11	109
LA 85414	0	5	0	0	4	11	20
LA 85867	7	14	0	1	2	3	27
LA 86605	2	16	0	0	7	9	34
LA 87430	3	29	0	3	11	5	51
LA 127627	1	31	0	0	4	5	41

Site	Platform Type						
	Cortical	Single	Dihedral	Multi	Collapsed	Crushed	Total
LA 127634	3	20	1	0	3	9	36
LA 127635	1	11	1	0	4	3	20
LA 135291	1	2	2	0	3	0	8
LA 135292	0	20	0	1	9	10	40
Total	**70**	**317**	**6**	**14**	**104**	**91**	**602**

Table 60.39. Classic period fieldhouse core flake condition.

Site	Core Flake Condition						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 127631	1	1	1	6	0	0	9
LA 128805	20	28	34	60	2	1	145
LA 141505	5	2	2	7	0	0	16
LA 15116	18	3	2	9	0	0	32
LA 70025	8	1	1	3	0	0	13
LA 85403	1	3	1	5	0	0	10
LA 85404	14	4	3	13	0	0	34
LA 85408	24	8	4	12	1	0	49
LA 85411	31	15	3	19	0	0	68
LA 85413	80	29	9	54	1	0	173
LA 85414	9	1	1	11	1		23
LA 85867	21	5	3	9	0	0	38
LA 86605	13	22	6	9	0	0	50
LA 87430	21	24	2	15	0	0	62
LA 127627	28	10	6	13	0	1	58
LA 127634	12	19	5	24	0	0	60
LA 127635	11	8	2	20	0	0	41
LA 135291	8	3	1	2	0	0	14
LA 135292	16	15	0	13	0	1	45
Total	**341**	**201**	**86**	**304**	**5**	**2**	**939**

Table 60.40. Classic period fieldhouse biface flake condition.

Site	Biface Flake Condition						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 127631	1	0	0	0	0	0	1
LA 128805	1	22	23	22	0	0	68
LA 85411	1	3	1	2	0	0	7
LA 85867	1	0	0	0	0	0	1
LA 87430	0	6	0	2	0	0	8
LA 127627	1	0	0	0	0	0	1
LA 127634	2	1	0	1	0	0	4
LA 127635	1	0	0	1	0	0	2

Site	Biface Flake Condition						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 135291	1	0	0	1	0	0	2
LA 135292	2	7	2	0	0	0	11
Total	**11**	**39**	**26**	**29**	**0**	**0**	**105**

Table 60.41. Classic period fieldhouse mean flake length (mm) and angular debris weight (g).

Site	Debitage Type (std)		
	Core Flake	Biface Flake	Angular Debris
LA 127631	27.0	12.0	33.3
LA 128805	21.6 (8.9)	14.0	4.0 (7.2)
LA 141505	36.0 (6.8)	0.0	34.7 (48.5)
LA 15516	25.8 (8.9)	0.0	1.2 (1.2)
LA 70025	24.2(18.4)	0.0	0.0
LA 85403	27.0	0.0	8.7 (5.6)
LA 85404	26.4 (12.7)	0.0	4.8 (5.6)
LA 85408	27.4 (9.7)	0.0	2.2 (4.5)
LA 85411	25.3 (7.9)	44.0 (5.6)	3.4 (2.5)
LA 85413	29.3 (11.9)	0.0	7.5 (8.5)
LA 85414	34.5 (10.3)	0.0	1.7 (1.2)
LA 85867	27.8 (16.2)	38.0	6.5 (7.6)
LA 86605	23.5 (6.9)	0.0	1.3 (8.8)
LA 87430	28.6 (9.4)	0.0	4.5 (4.6)
LA 127627	31.7 (11.1)	23.0	6.7 (5.8)
LA 127634	30.8 (14.8)	13.0 (2.8)	5.6 (12.6)
LA 127635	25.0 (10.5)	16.0	2.3 (3.1)
LA 135291	36.5 (6.3)	12.0	2.8 (2.3)
LA 135292	24.1 (11.4)	24.5 (7.7)	1.5 (1.4)

Tool Use

Only nine flakes from seven sites exhibit edge damage that can possibly be attributed to use. This represents less than one percent of the total core flakes. Figure 60.23 illustrates the distribution of 77 ground stone tools recovered from the Classic period fieldhouses. The assemblages contain a range of items including one- and two-hand manos, undetermined mano fragments, millingstones, grinding slabs, undetermined metate fragments, and abrading and polishing stones. Two grooved abraders, two flaked axes, two hoes, and six hammerstones were also identified. The grooved abraders indicate that arrows were being produced at the site, whereas, the hoes were presumably used for maintaining agricultural fields and the axes for fieldhouse construction or possibly clearing forested land for field plots.

Classic Period Plaza Pueblos

No Classic period pueblo sites were excavated during the project; however, survey data are available from two Early Classic period sites located within the TA-72 Tract. These are the sites of Otowi (LA 169) and Little Otowi (LA 32), which are located in Pueblo Canyon. These data are compared with Coalition period roomblock sites that were surveyed during the original site recording project (Vierra 2002). Table 60.42 presents the information on debitage material type. Most of the artifacts are made of chalcedony/chert (including Pedernal); however, there is relatively more obsidian in the Classic period sample. Head's (1999:507) study at Bandelier National Monument indicated that obsidian began to dominate the site lithic assemblages during the Early Classic period. This corresponds with the data from Otowi and Little Otowi.

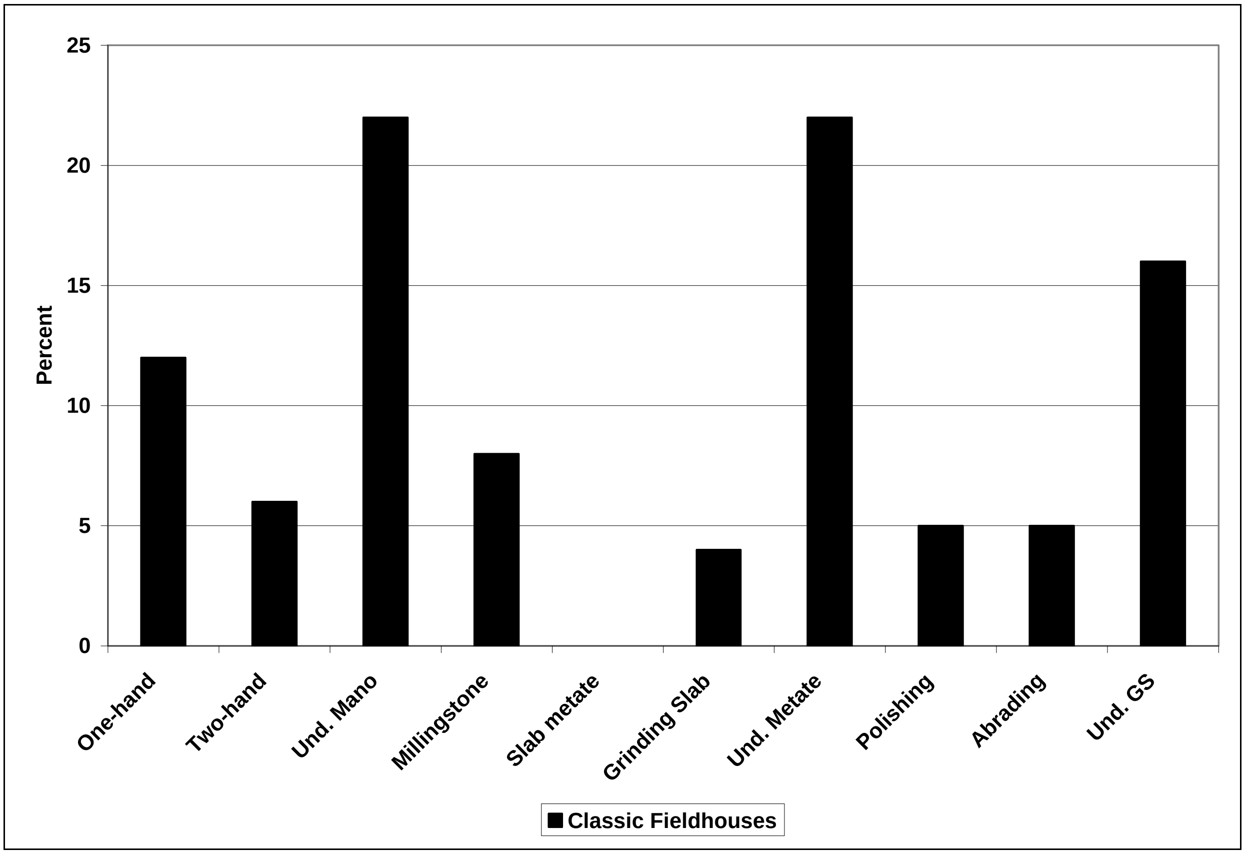


Figure 60.23. Classic period fieldhouse ground stone tool types.

Table 60.42. Coalition period roomblock and Classic period plaza pueblo lithic debitage material types.

Site	Material Types (n/%)			
	Igneous	Obsidian	Chalcedony/chert	Total
Coalition Roomblock	140 9.1	54 3.5	1344 87.3	1538
Classic Plaza Pueblo	28 4.3	80 12.4	537 83.2	645
Total	**168**	**134**	**1881**	**2183**

Head (1999:537) also submitted 10 pieces of obsidian debitage for XRF analysis from the Late Classic period site of Tsankawi. Tsankawi is situated roughly in between Otowi and Tsirege. Seven of the items analyzed were identified as Valle Grande obsidian (70%) and three were identified as Cerro Toledo obsidian. Twenty pieces of obsidian were submitted for analysis by the C&T Project from the Classic period plaza site of Tsirege. Tsirege is located on Mesita del Buey, which is located west of the White Rock Tract. Sixteen (80%) of the sampled items were identified as Cerro Toledo obsidian and four were identified as Valle Grande obsidian. Tsirege exhibits the opposite pattern as Tsankawi; however, the sample sizes are quite small. The sample of 20 artifacts from Tsirege was actually divided into two spatially distinct 10-item samples from the west and north of the site, respectively. Both samples contain the same frequency of Valle Grande and Cerro Toledo obsidian; the pattern exhibited at Tsankawi could not be replicated at Tsirege.

Table 60.43 presents the information on debitage type. Both Coalition period roomblocks and Early Classic period plaza pueblo sites are dominated by the by-products of core reduction activities, including core flakes and angular debris.

Table 60.43. Coalition period roomblock and Classic period plaza pueblo debitage types.

Site	Debitage Types (n/%)					
	Debris	Core flake	Biface flake	Microdebitage	Und. Flake	Total
Coalition Roomblock	481 31.3	749 48.7	24 1.5	128 8.3	154 10.0	1536
Classic Plaza Pueblo	151 24.0	327 51.9	2 0.3	115 18.2	34 5.4	629
Total	632	1076	26	243	188	2165

Jicarilla Apache Tipi Ring Site

LA 85869 is a turn-of-the-20th-century Jicarilla Apache tipi ring site located in Rendija Canyon. Two tipi rings were excavated and surface artifacts collected from a surrounding lithic and ceramic scatter. There appears to be a lithic reduction area located near one of the structures.

Information on debitage material types is presented in Table 60.44. The majority of the artifacts are made of obsidian. An analysis of 10 obsidian artifacts from the site indicates that nine of these are made from Valle Grande materials and only one from Cerro Toledo (Table 60.45). This is interesting given the fact that the surface gravels (Cerro Toledo interval) are present in the area of the site that contains small obsidian pebbles. Nonetheless, the site occupants presumably geared up with obsidian from the nearby caldera before camping in this location.

Table 60.44. Jicarilla Apache lithic debitage material types.

Site	Material Types						
	Igneous	Obsidian	Chalcedony	Pedernal	Quart-zite	Other	Total
LA 85869	4	308	29	24	0	0	364

Table 60.45. Jicarilla Apache obsidian source samples.

Site	Obsidian Source					
	Cerro Toledo	Valle Grande	El Rechuelos	Bear Springs	Unknown	Total
LA 85869	1	9	0	0	0	10

The majority of the debitage at the site represents the by-products of core reduction activities, including core flakes and angular debris (Table 60.46). Biface flakes do comprise 14 percent of the assemblage, however, and the presence of a single *outrepassé* flake indicates that bifaces were being manufactured at the site. In addition, a single bipolar flake was identified, indicating that the small local obsidian pebbles were also being reduced to produce flakes. Presumably the larger Valle Grande materials were being used for core reduction and biface production, while the local pebbles were used for simple flakes.

Table 60.46. Jicarilla Apache debitage types.

Site	Debitage Types (*n*/%)						
	Debris	Core flake	Biface flake	Microdebitage	Und. Flake	Other	Total
LA 85869	48 13.1	189 51.9	51 14.0	30 8.2	44 12.0	2 0.5	364

Given the emphasis on obsidian core reduction, it is again not surprising that the most of the platforms are single-faceted, with fewer that are cortical, collapsed, and crushed (Table 60.47). However, at least some of the collapsed platforms are on obsidian biface flakes. Five of the flake platforms exhibit evidence of preparation. Therefore, about 22 percent of the single and multi-faceted platforms exhibit preparation.

The core flake assemblage is dominated by distal fragments, with fewer other pieces, whereas, the biface flakes exhibit a mix of proximal, midsection, and distal fragments (Tables 60.48 and 60.49). The information on debitage size is provided in Table 60.50.

Table 60.47. Jicarilla Apache platform types.

Site	Platform Type (*n*/%)						
	Cortical	Single	Dihedral	Multi	Collapsed	Crushed	Total
LA 85869	12 17.9	22 32.8	0 0.0	1 1.4	14 20.8	18 26.8	67

Table 60.48. Jicarilla Apache core flake condition.

Site	Core Flake Condition (*n*/%)						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 85869	17 8.9	35 18.5	43 22.7	90 47.6	1 0.5	3 1.5	189

Table 60.49. Jicarilla Apache biface flake condition.

Site	Biface Flake Condition (*n*/%)						
	Whole	Proximal	Midsection	Distal	Lateral	Und.	Total
LA 85869	3 5.8	14 27.4	17 33.3	17 33.3	0 0.0	0 0.0	51

Table 60.50. Jicarilla Apache mean flake length (mm) and angular debris weight (gm).

Site	Debitage Type (std)		
	Core Flake	Biface Flake	Angular Debris
LA 85869	20.1 (6.5)	18.6 (3.1)	2.1 (2.4)

Only two retouched flakes, a proximal biface fragment, and an undetermined fragment of a projectile point that could represent a dart or lance point were analyzed. The biface was probably broken during the manufacturing process. Only a single flake exhibits evidence of damage that could possibly be attributed to use-wear. Otherwise, two one-hand cobble manos, an undetermined mano fragment that probably represents a one-hand mano, a millingstone, and a polishing stone were also recovered. The millingstone is a large fragment of dacite with a single flat ground surface, whereas, the polishing stone is a small dacite pebble that exhibits polish and grinding along a single surface. The manos and millingstone represent generalized milling activities.

A COMPARISON OF TEMPORAL LITHIC ASSEMBLAGE GROUPS

The previous sections provided detailed lithic information for each site and temporal period, and thereby illustrated the variability represented within each temporal period. In contrast, this section will attempt to make normative inter-group comparisons by lumping together the previously described data into the six defined temporal groups: Archaic, Early/Middle Coalition Roomblock, Late Coalition Roomblock, Late Coalition Fieldhouse, Classic Fieldhouse, and

Jicarilla Apache. Again, information on material selection, tool production, and tool use will be compared. These data can then be used to understand long-term changes in stone tool technology.

The following data will often be presented in two-way tables, with a chi-square analysis conducted of the contingency table. The null hypothesis of no difference between the variables is rejected if the probability (*p*) value is less than 0.05. If the chi-square test shows that there is a significant difference in the expected frequency of observations for the table at the 0.05 significance level, then adjusted residuals will be calculated to determine which of the cells is contributing to the significant chi-square value. Adjusted residuals greater than 1.96 or -1.96 are significant at the 0.05 level (Everett 1977:47; Haberman 1973; Reynolds 1984). The chi-square statistic, degrees of freedom (*df*), and *p*-values will be presented below for each contingency table.

Material Selection

Table 60.51 provides the information on lithic debitage material types by temporal group. It appears that the Archaic and Jicarilla Apache sites contain significantly more obsidian, while the Ancestral Pueblo sites contain relatively more igneous, chalcedony, Pedernal chert, and other materials. However, if we rerun the analysis including only the Ancestral Pueblo sites, we find that the Early/Middle Coalition period roomblocks contain significantly more Pedernal chert and "other" materials, the Late Coalition period roomblocks contain more chalcedony and obsidian, the Late Coalition period fieldhouses contain more Pedernal chert, and the Classic period fieldhouses contain more igneous, obsidian, and Pedernal chert (chi-square = 449.0; $df = 12$, $p \leq 0.001$).

This temporal pattern is contrary to the data and territoriality argument presented by Walsh. Although relatively more obsidian is present during the Classic period, there is also significantly more obsidian in the Late Coalition period roomblock assemblages. This seems more in keeping with Head, who suggested that obsidian became an important trade and exchange item; however, these exchange relationships may have already begun during the Late Coalition period.

Tables 60.52 and 60.53 provide information on the obsidian source studies by White Rock and Airport tracts versus the Rendija Tract. As can be seen, the Cerro Toledo source dominates the lower-elevation tracts and the Valle Grande source in the upper-elevation tract for the Archaic sites. In contrast, the Ancestral Pueblo sites in the White Rock and Airport tracts reveal a change from relatively more Valle Grande during the Early/Middle Coalition to more Cerro Toledo during the Late Coalition and Classic periods; however, Cerro Toledo obsidian was probably obtained from local surface gravels in Rendija Canyon and not from the Rabbit Mountain/Obsidian Ridge source area as at the White Rock and Airport tracts. Again, this pattern seems to indicate that an important shift in obsidian procurement, and possibly exchange, had already occurred during the Late Coalition period and continued into the later Classic period. Lastly, the Jicarilla site assemblage contains mostly Valle Grande obsidian, indicating that the site's occupants geared up with this material in the nearby caldera before arriving at the Rendija Canyon campsite.

Table 60.51. Lithic debitage material types.

Period	Material Types					
	Igneous	Obsidian	Chalce-dony	Peder-nal	Other	Total
Archaic	10 0.2 -20.6	4457 92.9 **75.2**	241 5.0 -53.6	86 1.8 -22.1	2 0.0 -12.8	4796
Early/Middle Coalition Roomblock	116 10.1 **7.8**	91 7.9 -31.8	649 56.4 **18.1**	246 21.4 **16.4**	48 4.2 **8.0**	1161
Late Coalition Roomblock	277 8.5 **10.1**	603 18.4 -45.8	2052 62.7 **44.2**	228 7.0 -3.7	113 3.5 **7.2**	3273
Late Coalition Fieldhouse	8 7.3 1.0	17 15.6 -7.6	54 49.5 **3.9**	29 26.6 **6.8**	1 0.9 -0.8	109
Classic Fieldhouse	162 11.4 **11.3**	309 21.8 -24.4	571 40.2 **6.8**	331 23.3 **21.5**	46 3.2 **3.6**	1418
Jicarilla Apache	4 1.1 -3.6	308 84.4 **12.6**	29 7.9 -10.1	24 6.6 -1.3	0 0.0 -2.8	364

Chi-square = 6947.9, *df* = 20, $p \leq 0.001$

Table 60.52. Obsidian source samples from the White Rock and Airport tracts.

Period	Obsidian Source					
	Cerro Toledo	Valle Grande	El Rechuelos	Bear Springs	Unknown	Total
Archaic	24	1	0	0	0	25
Early/Middle Coalition Roomblock	19	24	3	0	0	46
Late Coalition Roomblock	24	13	5	0	2	44
Classic Fieldhouse	14	2	1	0	0	17
Classic Plaza Pueblo	16	4	0	0	0	20

Table 60.53. Obsidian source samples from the Rendija Tract.

Period	Obsidian Source					
	Cerro Toledo	Valle Grande	El Rechuelos	Bear Springs	Unknown	Total
Archaic	9	37	5	0	1	52
Early/Middle	0	0	0	0	0	0

Period	Obsidian Source					
	Cerro Toledo	Valle Grande	El Rechuelos	Bear Springs	Unknown	Total
Coalition Roomblock						
Late Coalition Roomblock	0	0	0	0	0	0
Late Coalition Fieldhouse	9	2	0	1	0	12
Classic Fieldhouse	31	19	6	0	0	56
Jicarilla Apache	1	9	0	0	0	10

Lithic Reduction

Information on core reduction technique and core type was collected during the analysis. The increasing intensity of core reduction is reflected when viewing decreases in core size from single to bidirectional to multi-directional core types, with small bipolar cores and core fragments being the smallest (Table 60.54). On the other hand, flake cores appear to be intermediate in size.

Table 60.54. Combined core type data for the C&T Project.

Core Type	N	Mean Weight (g)	Std.
Single-directional	31	176.2	157.8
Bidirectional	39	106.8	118.6
Multi-directional	14	97.2	86.9
Bipolar	2	32.2	26.2
Core fragment	5	35.3	17.9
Flake core	10	60.6	64.5

The few Archaic cores are bifacial cores from which biface blanks are produced for making dart points (Table 60.55). The Ancestral Pueblo site assemblages primarily contain platform cores, with a few bipolar and flake cores; however, the increasing intensity of core reduction is represented when comparing these sites through time. That is, Early/Middle Coalition period roomblock sites contain mostly single and bi-directional cores, with the increasing presence of multi-directional cores during the Late Coalition period. Although this would support Walsh's contention of increased raw material conservation during the Late Coalition period, it may also be due to increasing length of site occupation at these sites. On the other hand, the Classic period fieldhouses contain mostly single and bidirectional cores, but also have some multi-directional cores. In this case, the cores probably represent site furniture, with the early-stage cores having been brought recently to the site, while the later-stage (multi-directional) cores having been present at the site for a longer period of time.

Table 60.55. Core type by temporal period.

Period	Core type						
	Single	Bidirectional	Multi.	Bi-polar	Frag-ment	Flake	Total
Archaic	0	3 100.0	0	0	0	0	3
Early/Middle Coalition Roomblock	4 23.5	7 41.1	0 0.0	1 5.8	1 5.8	4 23.5	17
Late Coalition Roomblock	10 27.0	16 43.2	7 18.9	1 2.7	0 0.0	3 11.1	37
Late Coalition Fieldhouse	0	0	0	0	0	0	0
Classic Fieldhouse	11 37.9	9 31.0	4 13.7	0 0.0	1 3.4	4 13.7	29
Jicarilla Apache	0	0	0	0	0	0	0

The few Archaic cores were classified as exhausted and still useable when discarded (Table 60.56). Although the majority of the Early/Middle Coalition period roomblock cores were exhausted, this is not the case for Late Coalition period roomblock or Classic period fieldhouses. This is somewhat contrary to the core type data, where the latter two periods are characterized by the presence of relatively more multi-directional cores, which tend to be exhausted. It is also contrary to Walsh's argument that raw material conservation should be greatest at the Late Coalition period sites. This pattern continues with the Early/Middle Coalition period roomblocks exhibiting the only evidence of recycling cores as heavy duty tools (i.e., with edge damage); however, this might also be expected at the Late Coalition period roomblock sites with increased site occupation.

Table 60.56. Reason for discard by temporal period.

Period	Reason for Discard							
	Flaw	Cultural	Stepping	Exhausted	Useable	Dam-age	Und.	Total
Archaic	0 0.0	0 0.0	0 0.0	2 66.6	1 33.3	0 0.0	0 0.0	3
Early/Middle Coalition Roomblock	2 11.7	2 11.7	1 5.8	7 41.1	2 11.7	2 11.7	0 0.0	17
Late Coalition Roomblock	9 24.3	2 5.4	4 10.8	9 24.3	13 35.1	0 0.0	3 8.1	37
Late Coalition Fieldhouse	0	0	0	0	0	0	0	0
Classic Fieldhouse	8 27.5	3 10.3	2 6.8	5 17.2	11 37.9	0 0.0	4 13.7	29
Jicarilla Apache	0	0	0	0	0	0	0	0

Table 60.57 presents a contingency table of debitage type by temporal period. As is often the case, the Archaic assemblages emphasize bifacial core reduction and tool production, with significantly more biface flakes, microdebitage and undetermined flake fragments. In contrast, the Ancestral Pueblo and Jicarilla Apache sites emphasize core reduction activities, containing significantly more core flakes and angular debris. Nonetheless, the Jicarilla site assemblage is intermediate in percentage of biface flakes to the Archaic and Ancestral Pueblo sites.

Table 60.57. Debitage types.

Period	Debitage Type						
	Debris	Core flake	Biface flake	Micro-debitage	Und. Flake	Other	Total
Archaic	230 4.8 -15.6	1159 24.2 -37.7	1401 29.2 **33.2**	1561 32.5 **21.2**	433 9.0 **11.2**	13 0.3 -4.5	4797
Early/Middle Coalition Roomblock	202 17.4 **9.1**	733 63.0 **13.4**	31 2.7 -13.1	154 13.2 -8.3	30 2.6 -5.3	13 1.1 **2.0**	1163
Late Coalition Roomblock	415 12.7 **6.5**	1866 57.1 **17.2**	164 5.0 -20.3	681 20.8 -3.3	108 3.3 -8.0	34 1.0 **3.1**	3268
Late Coalition Fieldhouse	17 15.6 **2.0**	69 63.3 **4.0**	16 14.7 -0.4	2 1.8 -5.3	4 3.7 -1.1	1 0.9 0.3	109
Classic Fieldhouse	183 13.0 **4.2**	934 66.2 **17.5**	110 7.8 -8.9	112 7.9 -14.3	60 4.3 -3.1	11 0.8 0.6	1410
Jicarilla Apache	48 13.2 **2.2**	189 51.9 **2.9**	51 14.0 -1.0	30 8.2 -6.8	44 12.1 **4.8**	2 2.4 -0.3	364

Chi-square = 2642.1, $df = 25$, $p \leq 0.001$

The presence of relatively more biface flakes at fieldhouses relative to roomblocks may support Head's contention that more bifaces and projectile points were being produced at these field locations. This corresponds with the fact that grooved abraders were also recovered from both Late Coalition and Classic period fieldhouses. On the other hand, there are relatively more biface flakes at the Late Coalition period fieldhouses than at the Classic period fieldhouses as predicted by Head.

Information on the debitage reduction stages is provided in Table 60.58. This is based on the presence/absence of cortex and debitage type. These stages are defined somewhat differently than those used by some Southwestern researchers (e.g., Brown 1991; Parry 1987). Assuming that cobble raw materials are used, the outer cortex of the cobble is slowly removed during the reduction sequence so that primary reduction refers to core flakes with 100 percent dorsal cortex. Secondary cortical reduction consists of core flakes with a cortical platform and/or partial dorsal cortex and secondary noncortical reduction refers to core flakes with no cortex. These are removed during the later stages of core reduction. Lastly, tertiary reduction solely consists of retouch/resharpening flakes that are removed during the tool manufacturing/maintenance process (e.g., biface flakes). Only whole flakes are included in this tabulation. The reduction of nodules at the site would therefore produce a greater proportion of primary and secondary cortical flakes with cortical platforms; the reduction of prepared cores, relatively more secondary noncortical flakes, and single-faceted platforms; and the production of retouched tools more tertiary flakes and multi-faceted platforms. Low cortical:noncortical ratios reflect an emphasis on the latter stages for core reduction and/or tool production maintenance and high ratios on the earlier stages of core reduction.

The Archaic assemblage exhibits a low cortical:noncortical ratio of 0.20, which presumably reflects an emphasis on the reduction of bifacial cores and the production of bifacial tools. In contrast, the Ancestral Pueblo sites all reflect an emphasis on the latter stages of core reduction, with somewhat lower ratios at the fieldhouses (0.24 and 0.29), while there are higher ratios at the roomblocks (0.35 and 0.38). The small sample from the Jicarilla site reflects a roughly equal emphasis on the early and later stages of core reduction, with some biface production (0.55). There is little evidence of primary reduction in any of the assemblages, indicating that prepared cores (or large flakes) were primarily brought onto the sites for reduction.

Table 60.58. Debitage reduction stages.

Material	Primary	Secondary Cortical	Secondary Non-cortical	Tertiary	Cortical: Non-cortical ratio
Archaic	1	33	47	118	0.20
Early/Middle Coalition Roomblock	2	53	147	9	0.35
Late Coalition Roomblock	6	117	311	17	0.38
Late Coalition Fieldhouse	0	40	127	10	0.29
Classic Fieldhouse	0	29	112	8	0.24
Jicarilla Apache	0	6	8	3	0.55

Table 60.59 presents the information on platform type by temporal group. The Archaic period is characterized by more multi-faceted and crushed platforms. The former represents the reduction of bifacial cores and the production of bifaces and the latter platform preparation for reducing obsidian cores. In contrast, the Ancestral Pueblo roomblock sites contain relatively more cortical, single, and dihedral platforms, and Ancestral Pueblo fieldhouses contain more single faceted platforms. Both cobble and prepared cores were reduced at the roomblocks, while the platform or flake cores were being reduced at the fieldhouses. Nonetheless, both sites emphasize core reduction activities. Lastly, the Jicarilla Apache sample does not differ significantly from any other assemblage, however, the cortical platform frequency is close to being significant. All but one of these is obsidian, indicating that obsidian nodules were being reduced at the site; however, since none of these artifacts were submitted for XRF analysis, there is no way to determine which source they are derived from. They could represent cobbles that were brought from the nearby caldera, or the reduction of obsidian pebbles that were available in surface lag

gravels in the area of the site. Otherwise, the high percentage of collapsed and crushed platforms at this site also represents platform preparation for the reduction obsidian materials.

Table 60.59. Platform types.

Period	Platform Types						
	Cortical	**Single**	**Dihedral**	**Multi**	**Col-lapsed**	**Crushed**	**Total**
Archaic	21 2.9 -8.1	118 16.2 -16.4	5 0.7 -1.3	115 15.8 **12.9**	99 13.6 -1.2	370 50.8 **18.6**	728
Early/Middle Coalition Roomblock	52 15.3 **2.9**	190 56.0 **5.7**	3 0.9 -0.4	6 1.8 -3.6	51 15.0 0.0	37 10.9 -6.5	339
Late Coalition Roomblock	125 15.1 **4.9**	414 50.1 **5.9**	15 1.8 **2.3**	22 2.7 -5.0	115 13.9 -1.0	135 16.3 -7.2	826
Late Coalition Fieldhouse	2 4.0 -1.6	28 56.0 **2.1**	0 0.0 -0.8	1 2.0 -1.2	8 16.0 0.2	11 22.0 -0.5	50
Classic Fieldhouse	70 11.6 0.7	317 52.7 **6.2**	6 1.0 -0.3	14 2.3 -4.4	104 17.3 1.8	91 15.1 -6.6	602
Jicarilla Apache	12 17.9 1.9	22 32.8 -1.5	0 0.0 -0.9	1 1.5 -1.6	14 20.9 1.4	18 26.9 0.3	67

Chi-square = 668.3, *df* = 25, $p \leq 0.001$

Given the importance of obsidian biface production at the Archaic sites, it is not surprising that the flake assemblage is characterized by a high percentage of prepared platforms (82.7%). This contrasts with a much lower percentage for the roomblocks (19.0%, 19.2%) and Jicarilla Apache site (21.7%). The percentage for prepared platforms is even lower at the fieldhouses (13.7%, 10.9%). On the one hand, this would be expected in the case of simple expedient flake production; however, we might expect a higher percentage given the production of flake blanks to be used for tool production at these sites.

The majority of the assemblages contain relatively more distal core flake fragments (Tables 60.60 and 60.61). The Archaic and Jicarilla Apache sites contain significantly more midsection and distal flake fragments, while the Ancestral Pueblo sites contain significantly more whole flakes. The presence of more broken flakes at the Archaic and Jicarilla sites is presumably due to both biface production and the reduction of fragile materials like obsidian.

Table 60.60. Core flake condition.

Period	Core Flake Condition				
	Whole	Proximal	Midsection	Distal	Total
Archaic	72 6.4 -15.5	135 12.0 -3.7	328 29.1 **13.6**	591 52.5 **5.9**	1126
Early/Middle Coalition Roomblock	226 31.3 **5.3**	91 12.6 -2.3	80 11.1 -3.9	324 44.9 0.0	721
Late Coalition Roomblock	461 25.1 **2.0**	283 15.4 -0.1	242 13.2 -4.3	850 46.3 1.5	1836
Late Coalition Fieldhouse	30 42.3 **3.7**	10 14.1 -0.3	4 5.6 -2.4	27 38.0 -1.2	71
Classic Fieldhouse	341 36.6 **10.4**	201 21.6 **5.7**	86 9.2 -6.3	304 32.6 -8.4	932
Jicarilla Apache	17 9.2 -4.7	35 18.9 1.3	43 23.2 **2.7**	90 48.6 1.1	185

Chi-square = 517.5, *df* = 15, $p \leq 0.001$)

Table 60.61. Biface flake condition.

Period	Biface Flake Condition				
	Whole	Proximal	Midsection	Distal	Total
Archaic	118 8.3 -3.0	416 29.4 -0.3	354 25.0 0.3	528 37.3 1.8	1416
Early/Middle Coalition Roomblock	9 30.0 **3.9**	6 20.0 -1.2	3 10.0 -1.9	12 40.0 0.4	30
Late Coalition Roomblock	17 10.4 0.5	50 30.5 0.3	41 25.0 0.0	56 34.1 -0.6	164
Late Coalition Fieldhouse	9 56.3 **6.5**	1 6.3 -2.0	2 12.5 -1.1	4 25.0 -0.9	16
Classic Fieldhouse	11 10.5 0.4	39 37.1 1.8	26 24.8 0.0	29 27.6 -1.9	105
Jicarilla Apache	3 5.9 -0.9	14 27.5 -0.3	17 33.3 1.4	17 33.3 -0.4	51

Chi-square = 68.5, *df* = 15, $p \leq 0.001$

Table 60.62 provides the information on mean flake length and angular debris weight. With the exception of the Late Coalition period fieldhouses, most core flakes have a mean length of about 20 to 22 mm. Late Coalition period fieldhouses tend to have larger core flakes, which presumably reflects their use as expedient flake tools. Again, with the exception of the Late Coalition period fieldhouses, the Ancestral Pueblo and Jicarilla assemblages have smaller biface flakes that range from 18 to 19 mm in length. These were presumably derived from smaller bifaces and arrow points. In contrast, the larger size of biface flakes from Archaic sites reflects the use of larger bifacial cores and biface blanks for dart point production. Angular debris is also smaller in size at the Archaic sites due to the soft hammer reduction of bifacial cores. The larger debris in the other assemblages are primarily the result of the hard hammer reduction of platform cores.

The Late Coalition period roomblocks do exhibit a somewhat smaller mean core flake and angular debris size. This could possibly support Walsh's argument of increased reduction intensity during this period; however, it seems more likely that this is primarily the result of increased length of site occupation, rather than a restricted access to raw materials.

Table 60.62. Mean flake length (mm) and angular debris weight (g).

Period	Debitage Type (std)		
	Core Flake	Biface Flake	Angular Debris
Archaic	22.0 (10.6)	24.3 (11.7)	1.3 (2.8)
Early/Middle Coalition Roomblock	22.5 (7.8)	---	3.0 (5.9)
Late Coalition Roomblock	21.7 (9.6)	19.2 (7.1)	2.3 (4.3)
Late Coalition Fieldhouse	22.0 (8.5)	27.2 (7.3)	4.1 (5.2)
Classic Fieldhouse	27.5 (11.4)	18.1 (6.1)	4.2 (7.2)
Jicarilla Apache	20.1 (3.1)	18.6 (3.1)	2.1 (2.4)

This emphasis on the production of bifaces at the Archaic sites is also represented in their relative frequency. As presented in Table 60.63, there are relatively more bifaces in the Archaic assemblages and more retouched flakes in the Ancestral Pueblo assemblages. The latter continues to reflect the importance of core reduction for simple flake use at these sites. However, the trend towards increasing expedient flake production increases through time with informal:formal tool ratios ranging from 0.45 (Archaic) to 0.67 (Early/Middle Coalition period roomblock) to 1.2 (Late Coalition period roomblock). This presumably corresponds with an increasing dependence on agriculture and residential site stability. These higher ratios are also present at the fieldhouses (1.0, 1.3), which reflect the importance of expedient flake use at these temporary sites as well.

Table 60.63. Retouched tool types.

Period	Retouched Tool Types (*n*/%)					
	Ret. Flakes	Bifaces	Points	Unifaces	Drills	Total
Archaic	17 30.9	27 49.0	9 16.3	2 3.6	0 0.0	55

Period	Retouched Tool Types (*n*/%)					
	Ret. Flakes	Bifaces	Points	Unifaces	Drills	Total
Early/Middle Coalition Roomblock	18 37.7	11 24.4	14 31.1	2 4.4	0 0.0	45
Late Coalition Roomblock	60 54.5	20 18.1	14 12.7	9 8.1	7 6.3	110
Late Coalition Fieldhouse	5 50.0	3 30.0	2 20.0	0 0.0	0 0.0	10
Classic Fieldhouse	25 56.8	9 20.4	7 15.9	2 4.5	1 2.2	44
Jicarilla Apache	2 50.0	1 25.0	1 25.0	0 0.0	0 0.0	4

Tool Use

Given the increasing importance of expedient flake use through time, we would expect this to be reflected in an increasing proportion of utilized debitage through time. There does appear to be an inverse relationship between the percent of flakes exhibiting edge damage and the frequency of retouched tools. Obvious edge damage, which could be attributed to use, was only identified on 0.8 percent of the Archaic debitage, 1.1 percent of the Early/Middle Coalition period roomblock debitage, and 2.3 percent of the Late Coalition period roomblock debitage. By contrast, 1.4 percent of the debitage at the Late Coalition period fieldhouses, 0.6 percent at the Classic period fieldhouses, and 0.5 percent of the debitage at the Jicarilla site exhibit edge damage.

Figure 60.24 presents a frequency polygon with utilized debitage edge angles (including multiple edges on same flake). Frequency data are used due to the small samples sizes. Most of the edge angles range from 30 to 70°. The larger Early/Middle Coalition period roomblock sample exhibits a peak at 55° and the Late Coalition period roomblock sample exhibits a bimodal distribution with peaks at 35 and 55°. The lower angles presumably reflect the importance of cutting activities, with the more obtuse angles being primarily used for scraping activities (e.g., Gould et al. 1971).

Information on the distribution of ground stone tools is provided in Figure 60.25. The histogram illustrates that Archaic sites are characterized by the presence of one-hand cobble manos, millingstones, and grinding slabs. The roomblock sites also contain mostly one-hand manos, but two-hand manos are represented as well. The percentage of two-hand manos actually increases slightly from the Early/Middle to the Late Coalition period, but is highest at the Late Coalition period fieldhouses. Slab metates are also present at the roomblock sites, and no trough metates were identified. The fieldhouses contain both one- and two-hand manos, with some grinding slabs and undetermined metate fragments. Lastly, one one-hand cobble mano and one slab metate were recovered from the Jicarilla site.

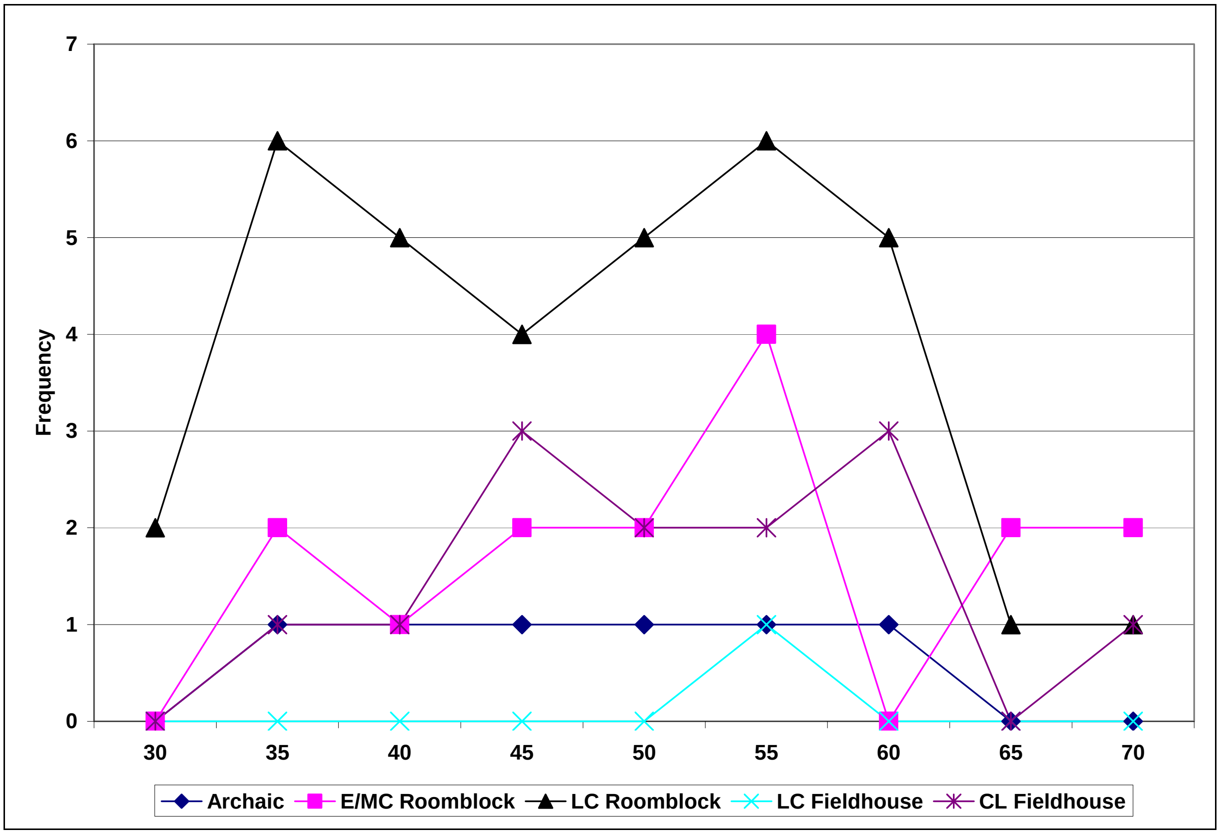


Figure 60.24. The distribution of edge angles for damaged flakes.

The sample sizes vary greatly for mean mano lengths. Samples are from the Archaic period (*n* = 3), the Early/Middle Coalition period roomblocks (*n* = 11), the Late Coalition period roomblocks (*n* = 38), the Late Coalition period fieldhouses (*n* = 3), and the Classic period fieldhouses (*n* = 13). These comparisons are also difficult given that two-hand manos tend to be discarded when broken and cannot therefore provide overall length measurements. Nonetheless, the information on mean mano length is presented in Figure 60.26. The histogram shows a similar pattern with smaller mean lengths for the Archaic period (mean = 118 mm, *std* = 16.0), the Early/Middle Coalition period (mean = 133 mm, std = 44.9), and the Late Coalition period roomblocks (mean = 120 mm, *std* = 48.2), and larger mean lengths for the Late Coalition period fieldhouses (mean = 176.6 mm, *std* = 52.5) and Classic period fieldhouses (mean = 151, *std* = 57.6). This trend emphasizes the general importance of smaller-size manos at the roomblock sites.

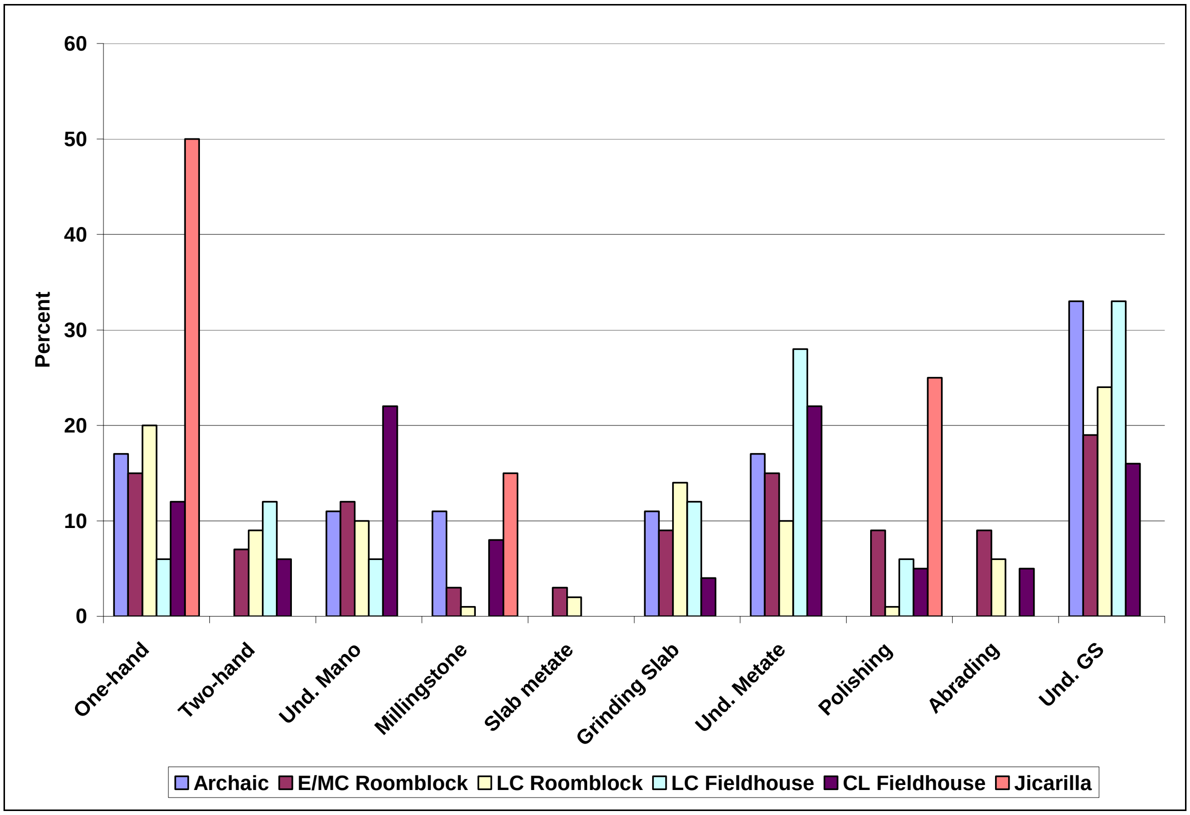


Figure 60.25. The distribution of ground stone artifact types.

Information on ground stone use-location and grinding surface shape is provided in Table 60.64. The Archaic manos tend to have ovoid-shaped grinding surfaces on cobble manos with one or more ground sides. The Early/Middle Coalition period roomblocks have slightly more one-sided manos, with mainly ovoid-shaped grinding surfaces. This pattern begins to change with the Late Coalition period roomblocks, which exhibit more two-sided manos, but still with mostly ovoid grinding surfaces. Not until the Classic period fieldhouses is there a shift to both more two-sided manos with the larger rectangular grinding surfaces. This includes the large "loaf-shaped" manos recovered at several of the fieldhouses. These data also correspond with the mano type and length data. Based on this information it appears that maize was being more intensively processed with large two-sided manos that exhibited rectangular grinding surfaces in the Classic period. Data from the Late Coalition period plaza pueblos would also help to clarify this long-term pattern.

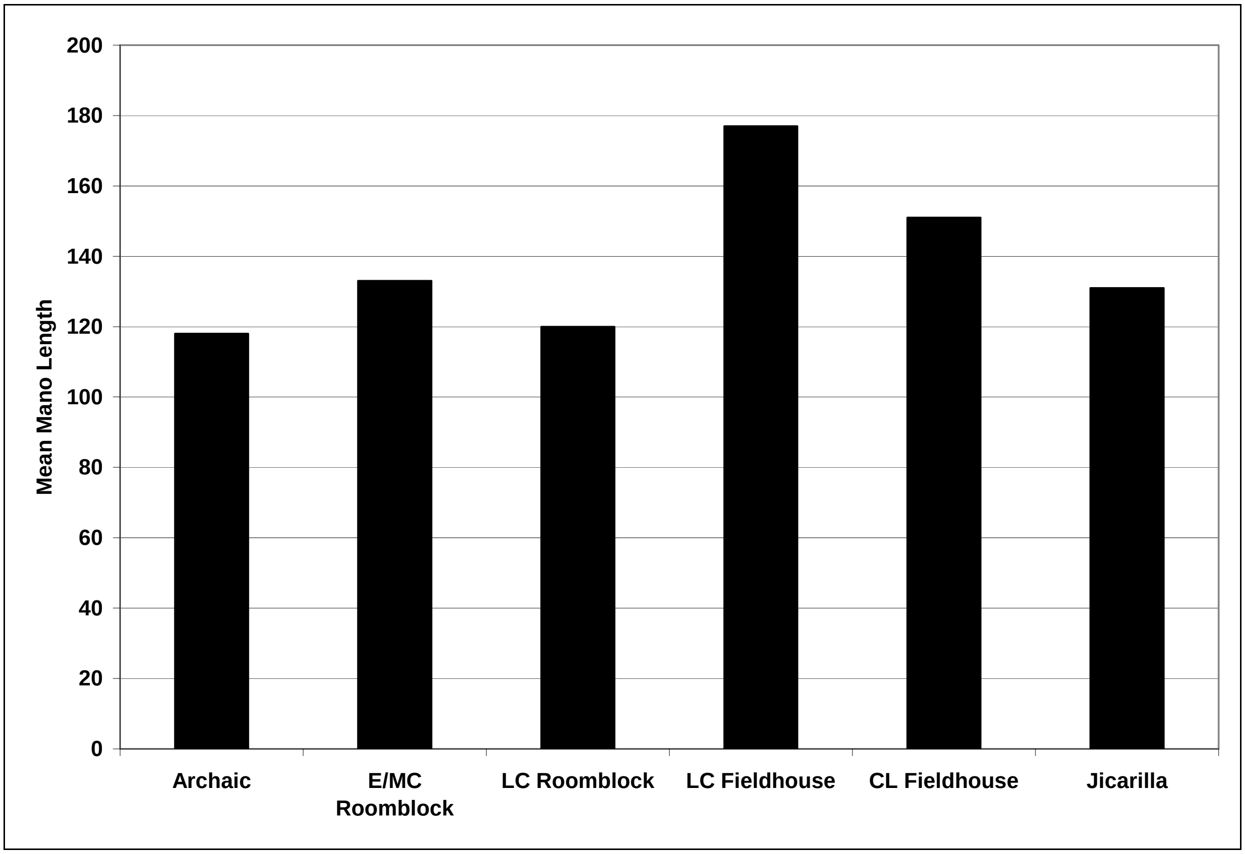


Figure 60.26. Mean mano length.

Table 60.64. Ground stone grinding surface location and shape.

Period	Use-location		Surface shape		
	1-side	2-sides	Ovoid	Rectangular	Und.
Archaic	2	2	3	0	1
Early/Middle Coalition Roomblock	8	5	10	3	1
Late Coalition Roomblock	27	31	39	9	10
Late Coalition Fieldhouse	2	3	2	3	0
Classic Fieldhouse	7	11	6	9	3
Jicarilla Apache	1	1	1	0	1

The sample sizes are again small for the hammerstones. Nonetheless, the available information on number of damaged loci and location of damage is presented in Table 60.65. Both roomblock assemblages are similar, ranging from one to three battered loci, with mostly angular ridges and battering "all over." In contrast, the Classic period fieldhouses exhibit one to two loci, with ridge and convex battered surfaces, but no "all over." The latter are typically used for roughening metate surfaces and processing materials on these surfaces, so the presence of these heavily battered items should be expected at the roomblock sites with longer occupation spans.

Table 60.65. Number of damaged loci and location of damage for hammerstones.

Period	No. Loci			Location of Damage		
	1	2	3	Ridge	Convex	All Over
Archaic	0	0	0	0	0	0
Early/Middle Coalition Roomblock	5 50.0	4 40.0	1 10.0	5 50.0	2 20.0	3 30.0
Late Coalition Roomblock	6 60.0	2 20.0	2 20.0	5 50.0	1 10.0	4 40.0
Late Coalition Fieldhouse	0	0	0	0	0	0
Classic Fieldhouse	2 66.6	1 33.3	0 0.0	3 50.0	3 50.0	0 0.0
Jicarilla Apache	0	0	0	0	0	0

Although no vent plugs (tiponis) were included in the systematic sample of the site lithic assemblages, several were in fact recovered during the site excavations. Since these items are distinctive to the Pajarito Plateau, a brief discussion of these items will be included. The artifacts are typically cylindrical or conical shaped being made of tuff (Figure 60.27). Steen (1982:48–51) suggests that that they may represent earth mother fetish stones. However, as he points out "none was found in a position in which it had been used or stored. Each was found in the rubble of the fallen walls (ibid:510)." This also appears to be the case with the vent plugs recovered from the recently excavated sites. Two were found at LA 86534 and both were situated in wall debris within and adjacent to Room 4. A single vent plug was also recovered from wall debris in Room 2 at LA 135290, with two vent plugs found in a similar context at LA 12587 within and adjacent to Room 9. Lastly, 10 vent plugs were recovered during the excavations at LA 4618. Most of these were found within Room 11 (a kiva), with a single item being situated in adjacent Room 1 (Schmidt 2006). Again, all of these artifacts appear to have been recovered from secondary wallfall deposits. The ones found at LA 12587, LA 86534, and LA 135290 are conical shaped, ranging from 180 to 230 mm in length and 120 to 140 mm in width. In contrast, the artifacts from LA 4618 are mostly cylindrical shaped (n = 6) with fewer conical shaped (n = 3) and a single disc shaped. They also range from about 150 to 200 mm in length. The function of the artifacts is undetermined, but their context indicates that they may have been incorporated into the wall architecture.

CONCLUSION

This chapter summarized approximately 7000 years of stone tool technology on the Pajarito Plateau. The Early Archaic inhabitants of the plateau appear to have periodically visited the Valles Caldera to collect obsidian raw materials. These materials were then used for the production of bifacial cores, which were subsequently reduced into biface blanks for dart points. The Middle to Late Archaic site assemblage also reflects an emphasis on the production of obsidian bifacial tools, but with a full range of by-products that could represent a habitation, rather than temporary campsite. Obsidian source studies indicate that the Rendija Canyon Middle to Late Archaic site contains Cerro Toledo, Valle Grande, and El Rechuelos obsidian that possibly reflects a north-south pattern of movement. In contrast, the Late Archaic site that is situated in the White Rock Tract may represent a temporary campsite with the occupants having recently visited the Cerro Toledo obsidian source area.

Figure 60.27. Cylindrical (left) and conical (right) shaped vent plugs (tiponis).

The Coalition period roomblocks reflect an emphasis on chalcedony core reduction activities. Obsidian source studies indicate a mix of Valle Grande and Cerro Toledo obsidian in the Early and Middle Coalition period roomblock assemblages and mostly Cerro Toledo in the Late Coalition period roomblock assemblages. Overall, the amount of obsidian increases through time, with relatively more present at the Classic period plaza pueblo site of Tsirege. This pattern could reflect the increasing importance of regional exchange networks during the Classic period. In contrast, obsidian pebbles were locally available in Rendija Canyon and were used by the inhabitants of the fieldhouses. The retouched tools in the Ceramic period assemblages are dominated by informal retouched flakes, with a larger relative proportion of utilized debitage. This reflects the importance of expedient flake tools in these later assemblages. The ground stone tools include one- and two-hand manos with slab metates and grinding slabs. Although there is a slight increase in the relative frequency of two-hand manos in the Late Coalition period assemblages, one-hand manos clearly dominate most of the ground stone assemblages.

The Jicarilla Apache lithic assemblage appears to be intermediate to Archaic and Ceramic period assemblages. It primarily contains obsidian that was derived from the nearby caldera like the Early Archaic site; however, it also contains significantly more core flakes and angular debris like the Ceramic period sites. Nonetheless, the proportion of biface flakes is intermediate to the Archaic and Ceramic period assemblages. Therefore, the use of high-quality obsidian was important to the site occupants for both core reduction and tool production/maintenance activities. The only ground stone recovered consisted of a one-hand mano, a millingstone, and a polishing stone.

CHAPTER 61
SOURCE PROVENANCE OF OBSIDIAN AND BASALT ARTIFACTS FROM THE LAND CONVEYANCE AND TRANSFER PROJECT DATA RECOVERY PROGRAM, LOS ALAMOS NATIONAL LABORATORY

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INTRODUCTION

This study is focused on the source provenance of obsidian artifacts submitted by Los Alamos National Laboratory (LANL) from the Land Conveyance and Transfer Project Data Recovery Program between 2002 and 2005. All obsidian artifacts analyzed were produced from obsidian procured in the Jemez Mountains, Cerro Toledo Rhyolite, Valle Grande Rhyolite, and El Rechuelos. The dacite samples that could be assigned to source were procured from the Cerros del Rio dacite source on Bandelier National Monument or one of the two dacite sources in the Taos Plateau Volcanic Field.

ANALYSIS AND INSTRUMENTAL CONDITIONS

All archaeological samples are analyzed whole. The results presented here are quantitative in that they are derived from "filtered" intensity values ratioed to the appropriate X-ray continuum regions through a least squares fitting formula rather than plotting the proportions of the net intensities in a ternary system (McCarthy and Schamber 1981; Schamber 1977). Or more essentially, these data through the analysis of international rock standards, allow for inter-instrument comparison with a predictable degree of certainty (Hampel 1984).

The trace element analyses were performed in the Archaeological XRF Laboratory, Department of Earth and Planetary Sciences, University of California, Berkeley, using a Spectrace/ThermoNoran^{TM} *QuanX* energy dispersive X-ray fluorescence spectrometer. The spectrometer is equipped with an air-cooled Cu X-ray target with a 125-micron Be window, an X-ray generator that operates from 4 to 50 kV/0.02 to 2.0 mA at 0.02 increments, using an IBM PC based microprocessor and WinTraceTM reduction software. The X-ray tube is operated at 30 kV, 0.14 mA, using a 0.05-mm (medium) Pd primary beam filter in an air path at 200 seconds livetime to generate X-ray intensity Kα-line data for elements titanium (Ti), manganese (Mn), iron (as FeT), thorium (Th) using Lα line, rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), and niobium (Nb). Trace element intensities were converted to concentration estimates by employing a least-squares calibration line established for each element from the analysis of international rock standards certified by the National Institute of Standards and Technology (NIST), the US Geological Survey (USGS), Canadian Centre for Mineral and Energy Technology, and the Centre de Recherches Pétrographiques et Géochimiques in France (Govindaraju 1994). Line fitting is linear (XML) for all elements but Fe where a derivative fitting is used to improve the fit for the high concentrations of iron and thus for all the other elements. Further details concerning the petrological choice of these elements in Southwest obsidian is available in Shackley (1988, 1990, 1992, 1995; also Mahood and Stimac 1991; and Hughes and Smith 1993). Specific standards used for the best fit regression calibration for elements Ti through Nb include G-2 (basalt), AGV-1 (andesite), GSP-1, SY-2 (syenite), BHVO-1 (hawaiite), STM-1 (syenite), QLO-1 (quartz latite), RGM-1 (obsidian), W-2 (diabase), BIR-1 (basalt), SDC-1 (mica schist), TLM-1 (tonalite), SCO-1 (shale), all USGS standards, BR-N (basalt) from the Centre de Recherches Pétrographiques et Géochimiques in France, and JR-1 and JR-2 (obsidian) from the Geological Survey of Japan (Govindaraju 1994). In addition to the reported values here, Ni, Cu, Zn, and Ga were measured, but these are rarely useful in discriminating glass sources and are not generally reported.

The data from the WinTrace software were translated directly into Excel for Windows software for manipulation and on into SPSS for Windows for statistical analyses. In order to evaluate these quantitative determinations, machine data were compared to measurements of known standards during each run. RGM-1 is analyzed during each sample run for obsidian artifacts to check machine calibration and is included in Table 10.1. Source assignment was made by comparison to regional source standards at Berkeley (see Shackley 1995, 2002, 2005a).

DISCUSSION

Obsidian Sample

While it is not surprising that the obsidian used to produce these tools and the resultant debitage is from the nearest sources in the Jemez Mountains, the proportion of these sources does deserve some discussion (see Tables 61.1 and 61.2; Figures 61.1 and 61.2). As noted in Chapter 10 (Volume 1), while all the major sources in the Jemez have eroded into the Rio Grande system, Valles Rhyolite (Cerro del Medio), a result of the last caldera collapse, has not eroded outside the caldera (see also Shackley 2005a). The Valles Rhyolite obsidian is the most common in the overall assemblage (56.25%) and was likely procured directly from Cerro del Medio or the erosional slopes into the caldera floor (Figure 61.1). El Rechuelos erodes from the small domes north and west of Polvadera Peak into the Rio Chama and has been found in secondary deposits as far south as the Cochiti Reservoir area in nodules up to about 49 mm in diameter. Cerro Toledo Rhyolite obsidian is available in various areas throughout the Pajarito Plateau as a result of the Rabbit Mountain ash flow eruptive event, including along the Rio Grande at Cerros del Rio (see Chapter 10, Volume 1; Shackley 2005a).

Table 61.1. Elemental concentrations and source assignment for archaeological specimens. All measurements in parts per million (ppm).

Site/Sample	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Source
127627-93	927	488	5784	153	11	18	72	42	El Rechuelos
127634-19	911	456	5698	151	6	27	69	46	El Rechuelos
127634-8	919	583	9162	201	7	59	173	94	Cerro Toledo Rhy
127634-99	1009	482	9180	166	11	42	172	55	Valles Rhyolite
127635-103	1153	453	9740	168	9	38	179	56	Valles Rhyolite
127635-43	882	466	7547	184	9	56	159	94	Cerro Toledo Rhy

Site/Sample	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Source
127635-6	932	423	8154	156	10	44	163	55	Valles Rhyolite
128804-224	1468	480	8919	157	7	42	154	53	Valles Rhyolite
128804-230	998	535	8334	181	5	58	156	91	Cerro Toledo Rhy
135290-1018	966	457	9080	160	11	39	161	60	Valle Grande Rhy
135290-1055	967	455	8082	140	11	40	160	55	Valle Grande Rhy
135290-1255	984	445	8525	150	14	36	160	51	Valle Grande Rhy
135290-1293	766	6206	3323	3	17	-3	9	-1	not obsidian
135290-1385	1004	449	8728	152	10	40	168	55	Valle Grande Rhy
135290-1470	846	562	8851	198	6	66	172	106	Cerro Toledo Rhy
135290-2141	947	401	8142	149	10	43	154	56	Valle Grande Rhy
135290-2142	1012	451	8883	156	13	42	156	59	Valle Grande Rhy
135290-2174	1007	425	8902	155	7	42	171	61	Valle Grande Rhy
135290-240	901	443	8548	149	7	43	163	55	Valle Grande Rhy
135290-7004	975	473	9570	154	12	45	167	52	Valle Grande Rhy
135292-20	853	521	8373	178	5	58	155	92	Cerro Toledo Rhy
135292-30	877	485	7914	169	10	55	151	94	Cerro Toledo Rhy
135292-33	950	460	9404	166	13	40	165	55	Valles Rhyolite
135292-39	895	479	5854	146	7	23	67	49	El Rechuelos
135292-63	925	448	8697	152	9	43	152	56	Valles Rhyolite
135292-66	890	594	8551	185	6	61	158	91	Cerro Toledo Rhy
135292-73	803	493	6789	151	5	45	135	85	Cerro Toledo Rhy
135292-89	920	496	5825	143	10	18	75	42	El Rechuelos
139418-104	857	421	8699	148	9	38	164	59	Valle Grande Rhy
139418-109	990	433	9153	161	17	34	164	55	Valle Grande Rhy
139418-111	835	534	8479	190	7	60	167	96	Cerro Toledo Rhy
139418-116	1017	449	9628	150	9	46	166	65	Valle Grande Rhy
139418-146	958	465	9504	159	14	40	171	66	Valle Grande Rhy
139418-149	1157	501	8486	137	11	39	179	61	Valle Grande Rhy
139418-155	703	472	9204	153	0	45	156	54	Valle Grande Rhy
139418-184	975	446	8213	150	13	40	159	54	Valle Grande Rhy
139418-192	916	456	5671	145	11	22	71	52	El Rechuelos
139418-259	964	564	8867	191	14	57	161	91	Cerro Toledo Rhy
139418-26	1029	445	9420	156	14	42	164	55	Valle Grande Rhy
139418-4	903	405	8860	157	8	37	169	47	Valle Grande Rhy
139418-53	829	535	8960	189	6	61	163	101	Cerro Toledo Rhy
4618-236	763	401	8496	146	13	39	166	50	Valle Grande Rhy
4618-250	1066	455	8392	138	11	44	152	42	Valle Grande Rhy
4618-273.07	1283	257	6072	110	7	7	142	33	unknown[1]
4618-326	1008	443	8460	148	11	42	163	56	Valle Grande Rhy
4618-371	1060	418	7761	141	6	42	146	51	Valle Grande Rhy
4618-379	927	386	7701	140	18	37	148	47	Valle Grande Rhy
4618-393-1	830	577	8643	192	10	61	165	103	Cerro Toledo Rhy
4618-393-2	981	394	7548	139	6	40	154	49	Valle Grande Rhy
4618-443	904	451	8270	147	15	46	157	42	Valle Grande Rhy

Site/Sample	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Source
4618-547	923	523	8053	183	5	53	160	89	Cerro Toledo Rhy
4618-703	1605	277	6647	114	5	35	111	42	unknown
85404-30	1004	474	8743	147	7	51	160	47	Valles Rhyolite
85404-6	946	462	8957	159	8	40	163	59	Valles Rhyolite
85404-79	952	480	8788	152	8	42	167	58	Valles Rhyolite
85407-215	1024	406	8488	149	11	43	162	61	Valles Rhyolite
85407-380	974	544	6098	160	12	25	70	46	El Rechuelos
85407-401	884	496	8539	192	8	67	161	92	Cerro Toledo Rhy
85407-445	859	527	8356	185	5	56	168	97	Cerro Toledo Rhy
85407-451	885	614	8513	186	6	61	162	99	Cerro Toledo Rhy
85407-477	878	611	9082	193	5	59	172	92	Cerro Toledo Rhy
85407-493	897	573	8791	199	11	59	179	98	Cerro Toledo Rhy
85407-501	899	448	8507	149	5	50	157	64	Valles Rhyolite
85407-516	942	669	9618	213	5	64	173	93	Cerro Toledo Rhy
85407-596	1019	560	6096	153	5	12	66	53	El Rechuelos
85408-45	838	508	7711	171	9	53	141	90	Cerro Toledo Rhy
85408-63	863	538	8649	199	5	62	171	107	Cerro Toledo Rhy
85408-78	726	458	7170	160	5	49	133	79	Valles Rhyolite
85411-106	986	670	10128	221	7	72	180	111	Cerro Toledo Rhy
85411-145	1039	596	8918	194	7	65	173	104	Cerro Toledo Rhy
85411-148	831	628	8972	206	5	65	173	109	Cerro Toledo Rhy
85411-163	943	417	8076	141	5	39	157	52	Valles Rhyolite
85411-24	961	432	9027	159	10	43	164	59	Valles Rhyolite
85411-44	976	410	8532	156	7	44	165	51	Valles Rhyolite
85411-6	846	638	9388	209	9	68	170	108	Cerro Toledo Rhy
85411-84	1049	656	10701	222	11	60	191	117	Cerro Toledo Rhy
85411-91	964	499	9208	162	8	46	170	54	Valles Rhyolite
85411-93	1021	432	9185	149	10	39	169	50	Valles Rhyolite
85413-147	897	622	9305	214	6	61	176	109	Cerro Toledo Rhy
85413-151	870	557	8448	184	5	61	163	112	Cerro Toledo Rhy
85413-155	868	586	8891	193	7	57	169	106	Cerro Toledo Rhy
85413-157	994	700	10144	216	5	69	177	110	Cerro Toledo Rhy
85413-49	981	544	8715	197	8	62	172	89	Cerro Toledo Rhy
85413-539	1272	742	12247	217	6	62	184	113	Cerro Toledo Rhy
85413-55	860	589	8132	184	6	64	165	94	Cerro Toledo Rhy
85413-59	1011	604	8970	206	9	62	169	96	Cerro Toledo Rhy
85413-74	802	681	9317	204	5	64	175	104	Cerro Toledo Rhy
85413-91	848	516	8128	187	9	54	159	95	Cerro Toledo Rhy
85414-23	1053	579	8942	193	9	67	169	84	Cerro Toledo Rhy
85414-34	887	469	5729	149	10	23	71	49	El Rechuelos
85414-35	827	545	8531	197	7	63	169	101	Cerro Toledo Rhy
85414-36	945	561	8805	190	6	64	176	91	Cerro Toledo Rhy
85414-55	812	535	7407	164	5	56	142	89	Cerro Toledo Rhy
85859-109	1036	439	9031	150	14	48	162	58	Valle Grande Rhy

Site/Sample	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Source
85859-118	970	366	8484	142	12	38	157	62	Valle Grande Rhy
85859-144-1	953	441	9119	153	10	42	163	53	Valle Grande Rhy
85859-144-2	877	464	8973	153	16	42	166	52	Valle Grande Rhy
85859-147	844	421	8268	144	10	37	141	49	Valle Grande Rhy
85859-148	903	343	8129	135	7	28	150	44	Valle Grande Rhy
85859-166	964	408	8677	152	12	38	165	58	Valle Grande Rhy
85859-169-1	878	438	8988	148	9	43	165	56	Valle Grande Rhy
85859-169-2	893	458	9036	163	11	42	163	58	Valle Grande Rhy
85859-172	1015	447	9443	157	8	44	170	59	Valle Grande Rhy
85859-235	1001	429	8501	148	12	40	161	54	Valle Grande Rhy
85859-257	992	451	8901	159	7	45	171	54	Valle Grande Rhy
85859-285	908	411	8746	154	9	35	159	62	Valle Grande Rhy
85859-30	1003	424	8957	154	16	43	170	49	Valle Grande Rhy
85859-38	895	433	8988	152	12	42	163	47	Valle Grande Rhy
85859-40	994	472	8990	155	9	42	161	62	Valle Grande Rhy
85861-1	1209	426	8504	142	12	36	159	61	Valles Rhyolite
85861-175	976	450	8762	157	5	42	164	59	Valles Rhyolite
85861-225	959	459	10156	171	9	41	179	70	Valles Rhyolite
85861-3	953	466	9277	163	11	39	173	58	Valles Rhyolite
85861-5	951	371	8311	149	13	37	162	45	Valles Rhyolite
85861-59	928	524	8495	191	7	63	169	101	Cerro Toledo Rhy
85861-78	929	397	8353	150	11	40	160	56	Valles Rhyolite
85861-79	939	573	8726	193	6	62	167	102	Cerro Toledo Rhy
85861-8	928	516	9269	161	6	40	166	63	Valles Rhyolite
85861-87	939	417	8589	153	8	45	164	55	Valles Rhyolite
85867-23	993	669	9609	206	6	63	183	103	Cerro Toledo Rhy
85867-35	846	554	8373	193	8	64	156	100	Cerro Toledo Rhy
85867-39	918	514	8203	197	5	59	176	98	Cerro Toledo Rhy
85869-160	898	427	8512	148	12	38	158	55	Valle Grande Rhy
85869-184	1198	466	9837	149	10	40	172	54	Valle Grande Rhy
85869-202	807	401	8673	136	16	47	149	50	Valle Grande Rhy
85869-265	933	483	8766	160	13	41	167	61	Valle Grande Rhy
85869-266	942	421	8746	154	11	46	156	48	Valle Grande Rhy
85869-267	894	492	8820	154	12	42	157	58	Valle Grande Rhy
85869-277	954	449	8758	148	10	39	162	55	Valle Grande Rhy
85869-322	945	402	8665	147	14	38	143	57	Valle Grande Rhy
85869-324	888	444	8414	151	14	41	164	59	Valle Grande Rhy
85869-75	898	542	8806	190	6	64	177	100	Cerro Toledo Rhy
86605-1	1264	489	8444	146	13	19	70	42	El Rechuelos
86605-27	840	557	8619	204	8	70	164	92	Cerro Toledo Rhy
86605-41	946	363	8354	147	11	41	169	50	Valles Rhyolite
86605-59	1007	452	9028	161	13	41	162	52	Valles Rhyolite
86606-47	1016	394	5938	124	16	48	118	59	Bear Springs Pk
86606-73	797	596	8938	201	5	64	174	101	Cerro Toledo Rhy

Site/Sample	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Source
87430-107	876	436	8052	146	12	45	161	50	Valles Rhyolite
87430-127	951	422	8781	154	10	37	169	63	Valles Rhyolite
87430-131	984	610	8915	192	7	64	178	93	Cerro Toledo Rhy
87430-145-1	961	464	9537	168	13	50	178	51	Valles Rhyolite
87430-69	918	465	8548	153	10	40	165	53	Valles Rhyolite
99396-117	846	432	8821	152	9	45	158	55	Valle Grande Rhy
99396-126	938	562	8994	198	8	60	166	94	Cerro Toledo Rhy
99396-184	950	565	9533	199	10	62	176	103	Cerro Toledo Rhy
99396-186	971	389	8322	149	13	40	154	55	Valle Grande Rhy
99396-189	981	423	5655	130	13	17	62	47	El Rechuelos
99396-201	843	512	8303	183	6	67	163	101	Cerro Toledo Rhy
99396-229	1100	447	9294	166	14	44	167	44	Valle Grande Rhy
99396-240	955	474	9150	161	17	44	166	58	Valle Grande Rhy
99396-289	1280	467	9417	143	13	35	145	40	Valle Grande Rhy
99396-318	936	460	6132	149	12	24	66	59	El Rechuelos
99396-354	988	558	9753	197	8	58	171	98	Cerro Toledo Rhy
99396-376	938	452	8420	181	8	53	161	92	Cerro Toledo Rhy
99396-385	926	431	5531	147	12	22	66	51	El Rechuelos
99396-397	997	401	9076	150	7	38	163	58	Valle Grande Rhy
99396-402	997	484	7746	161	11	54	143	84	unknown
99396-430	894	439	5650	150	9	18	79	48	El Rechuelos
99396-474	863	579	8589	184	6	57	168	96	Cerro Toledo Rhy
99396-48	814	547	9061	189	8	63	167	86	Cerro Toledo Rhy
99396-501	996	438	8745	151	12	47	161	54	Valle Grande Rhy
99396-54	983	420	9088	156	11	46	170	55	Valle Grande Rhy
99396-546	910	514	5929	146	9	19	67	53	El Rechuelos
99396-568	1140	581	8696	181	7	56	163	102	Cerro Toledo Rhy
99396-695	584	560	8764	198	0	70	165	101	Cerro Toledo Rhy
99396-84	911	373	7708	135	11	37	152	56	Valle Grande Rhy
99397-12	949	451	8623	153	12	42	167	55	Valle Grande Rhy
99397-32	901	399	8480	150	13	36	166	54	Valle Grande Rhy
99397-43	977	442	9361	162	13	42	167	55	Valle Grande Rhy
99397-5	896	440	8932	156	7	47	160	53	Valle Grande Rhy
99397-50	924	417	8579	147	11	32	163	54	Valle Grande Rhy
99397-60	974	461	8987	159	9	43	171	56	Valle Grande Rhy
99397-66	997	444	8863	152	10	44	162	61	Valle Grande Rhy
99397-67	999	448	9141	162	10	40	166	49	Valle Grande Rhy
99397-76	1019	441	8962	154	11	38	169	65	Valle Grande Rhy
99397-77	988	441	9471	160	12	46	163	54	Valle Grande Rhy
RGM1-S1	1658	309	13259	145	112	22	218	8	standard
RGM1-S1	1640	304	13207	152	112	21	217	9	standard
RGM1-S1	1490	318	13355	149	116	20	226	12	standard
RGM1-S1	1532	297	13255	150	112	22	219	11	standard
RGM1-S1	1539	310	13301	149	111	24	217	0	standard

Site/Sample	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Source
RGM-SI	1731	297	13009	154	109	20	222	14	standard
RGM1-S3	1600	271	13029	150	108	19	225	9	standard
RGM1-S3	1518	321	13447	151	112	22	222	7	standard
RGM1-S3	1541	312	13456	152	113	18	229	11	standard
RGM1-S3	1678	309	13297	153	116	21	223	9	standard
RGM1-S3	1574	359	13303	154	111	19	230	11	standard

[1]It is possible that these relatively small samples are from one of the Jemez Mountains sources, but are outside the elemental concentrations for those sources, or they could be legitimately from, as yet unlocated sources (Davis et al. 1998).

Table 61.2. Cross-tabulation of site by obsidian source provenance.

		Source				Total
		Cerro Toledo	El Rechuelos	Unknown	Valles Rhyolite	
LA 4618	Count	2	0	2	7	11
	% w/in site	18.2	0	18.2	63.6	100
	% w/in source	3.4	0	50.0	7.1	6.3
	% of total	1.1	0	1.1	4.0	6.3
LA 85404	Count	0	0	0	3	3
	% w/in site	0	0	0	100	100
	% w/in source	0	0	0	3.0	1.7
	% of total	0	0	0	1.7	1.7
LA 85407	Count	6	2	0	2	10
	% w/in site	60.0	20.0	0	20.0	100
	% w/in source	10.2	14.3	0	2.0	5.7
	% of total	3.4	1.1	0	1.1	5.7
LA 85408	Count	3	0	0	0	3
	% w/in site	100	0	0	0	100
	% w/in source	16.9	0	0	0	5.7
	% of total	5.7	0	0	0	5.7
LA 85411	Count	5	0	0	5	10
	% w/in site	50.0	0	0	50.0	100
	% w/in source	8.5	0	0	5.1	5.7
	% of total	2.8	0	0	2.8	5.7
LA 85413	Count	10	0	0	0	10
	% w/in site	100.0	0	0	0	100
	% w/in source	16.9	0	0	0	5.7
	% of total	5.7	0	0	0	5.7
LA 85414	Count	4	1	0	0	5
	% w/in site	80.0	20.0	0	0	100
	% w/in source	6.8	7.1	0	0	2.8
	% of total	2.3	0.6	0	0	2.8
LA 85859	Count	0	0	0	16	16

		Source				Total
		Cerro Toledo	El Rechuelos	Unknown	Valles Rhyolite	
	% w/in site	0	0	0	100.0	100
	% w/in source	0	0	0	16.2	9.1
	% of total	0	0	0	9.1	9.1
LA 85861	Count	2	0	0	8	10
	% w/in site	20.0	0	0	80.0	100
	% w/in source	3.4	0	0	8.1	5.7
	% of total	1.1	0	0	4.5	5.7
LA 85867	Count	3	0	0	0	3
	% w/in site	100.0	0	0	0	100
	% w/in source	5.1	0	0	0	1.7
	% of total	1.7	0	0	0	1.7
LA 85869	Count	1	0	0	9	10
	% w/in site	10.0	0	0	90.0	100
	% w/in source	1.7	0	0	9.1	5.7
	% of total	0.6	0	0	5.1	5.7
LA 86605	Count	1	1	0	2	4
	% w/in site	25.0	25.0	0	50.0	100
	% w/in source	1.7	7.1	0	2.0	2.3
	% of total	0.6	0.6	0	1.1	2.3
LA 86606	Count	1	0	1	0	2
	% w/in site	50.0	0	50.0	0	100
	% w/in source	1.7	0	25.0	0	1.1
	% of total	0.6	0	0.6	0	1.1
LA 87430	Count	1	0	0	4	5
	% w/in site	20.0	0	0	80.0	100
	% w/in source	1.7	0	0	4.0	2.8
	% of total	0.6	0	0	2.3	2.8
LA 99396	Count	9	5	1	9	24
	% w/in site	37.5	20.8	4.2	37.5	100
	% w/in source	15.3	35.7	25.0	9.1	13.6
	% of total	5.1	2.8	0.6	5.1	13.6
LA 99397	Count	0	0	0	10	10
	% w/in site	0	0	0	100.0	100
	% w/in source	0	0	0	10.0	5.7
	% of total	0	0	0	5.7	5.7
LA 127627	Count	0	1	0	0	1
	% w/in site	0	100.0	0	0	100
	% w/in source	0	7.1	0	0	0.6
	% of total	0	0.6	0	0	0.6
LA 127634	Count	1	1	0	1	3
	% w/in site	33.3	33.3	0	33.3	100
	% w/in source	1.7	7.1	0	1.0	1.7

		Source				Total
		Cerro Toledo	El Rechuelos	Unknown	Valles Rhyolite	
	% of total	0.6	0.6	0	0.6	1.7
LA 127635	Count	1	0	0	2	3
	% w/in site	33.0	0	0	66.7	100
	% w/in source	1.7	0	0	2.0	1.7
	% of total	0.6	0	0	1.1	1.7
LA 128804	Count	1	0	0	1	2
	% w/in site	50.0	0	0	50.0	100
	% w/in source	1.7	0	0	1.0	1.1
	% of total	0.6	0	0	0.6	1.1
LA 135290	Count	1	0	0	9	10
	% w/in site	10.0	0	0	90.0	100
	% w/in source	1.7	0	0	9.1	5.7
	% of total	0.6	0	0	5.1	5.7
LA 135292	Count	4	2	0	2	8
	% w/in site	50.0	25.0	0	25.0	100
	% w/in source	6.8	14.3	0	2.0	4.5
	% of total	2.4	1.1	0	1.1	4.5
LA 139418	Count	3	1	0	9	13
	% w/in site	23.1	7.7	0	69.2	100
	% w/in source	5.1	7.1	0	91.	7.4
	% of total	1.7	0.6	0	5.1	7.4
TOTAL	Count	59	14	4	99	176
	% w/in site	33.5	8.0	2.3	56.3	100
	% w/in source	100.0	100.0	100.0	100.0	100
	% of total	33.5	8.0	2.3	56.3	100

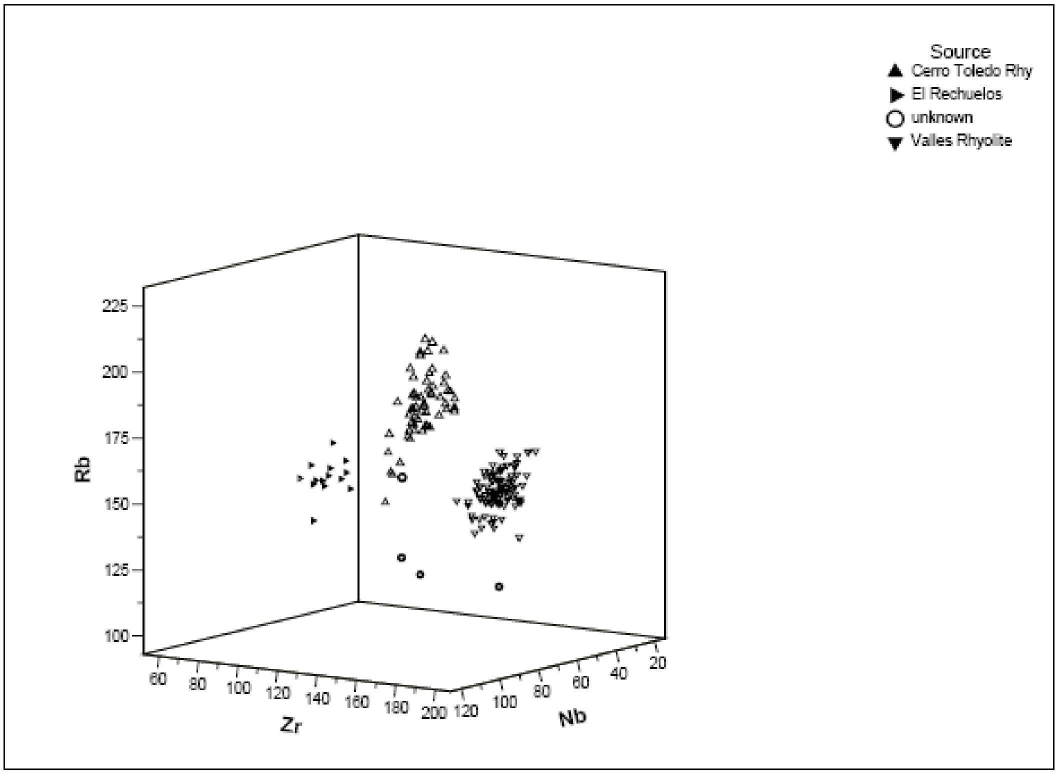


Figure 61.1. Rb, Zr, Nb three-dimensional plot of obsidian source provenance for all sites.

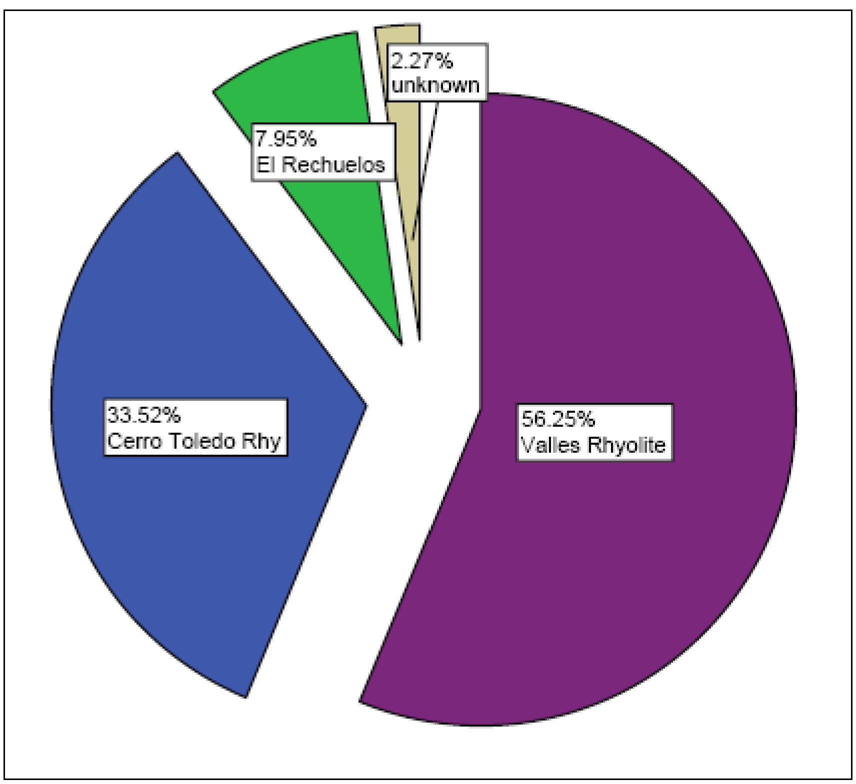


Figure 61.2. Distribution of obsidian source provenance from all sites.

Volcanic Rock Sample

Perhaps more interesting than the obsidian data from a source provenance standpoint, is the volcanic rock artifact sample (Table 61.3). While the artifacts produced from obsidian were produced from local sources, some of the other volcanic raw materials used to produce artifacts came from the Taos Plateau Volcanic Field, specifically San Antonio Mountain and the Newman Dome. It is possible that at least some of these artifacts were scavenged from Archaic period sites on the plateau, where artifacts produced from these sources are common, but it is not clear from this sample (see Shackley 2005b; Vierra et al. 2005). The "unknowns" in this assemblage are probably mafic or intermediate rocks found more locally, such as the mafic rocks in the Cerros de Rio Volcanic Field to the west.

Table 61.3. Elemental concentrations for volcanic rock artifact samples. All measurements in parts per million (ppm).

Site/Sample	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Source
LA85403-FS44	3312	625	33357	43	867	22	209	11	Cerros del Rio
LA85403-FS30	1065	26010	3920	3	33	3	16	0	unknown
LA85403-FS22	844	16838	4847	3	41	12	21	13	unknown
LA85404-FS58	3790	765	34030	45	857	12	214	15	Cerros del Rio
LA87430-FS145 #2	4092	849	43423	62	208	21	79	26	Newman Dome
LA127627-FS23	3021	863	26547	160	345	26	242	20	unknown
LA127634FS88	3576	704	33983	45	848	21	209	14	Cerros del Rio
LA127635FS47	3375	637	32729	47	861	12	212	20	Cerros del Rio
LA135292FS71	3586	674	36559	59	616	20	253	18	Cerros del Rio
LA85408FS12	683	9537	3310	3	207	0	12	5	unknown
LA85408FS30	777	29577	3863	3	253	3	8	16	unknown
LA85411FS59	3554	728	34370	44	852	21	210	30	Cerros del Rio
LA85411FS158	4846	858	43402	59	235	19	97	12	Newman Dome
LA85414FS18	2518	484	21782	51	591	14	150	13	San Antonio Mtn
LA85861FS97	3648	637	33390	45	864	15	203	30	Cerros del Rio
LA86606FS6	4565	1231	42959	82	737	28	252	7	unknown
LA85867FS20	4244	843	36215	52	797	30	188	15	Cerros del Rio
LA85867FS14	4218	919	33362	46	730	23	165	18	Cerros del Rio
LA85867FS13	3987	516	33814	89	659	19	232	8	unknown
LA135290FS2060	3424	747	34026	49	875	12	216	29	Cerros del Rio
LA135290FS252	3319	645	31963	46	835	16	203	25	Cerros del Rio
LA135290FS224	2132	381	21539	30	623	7	162	19	unknown
LA135290FS1901	3053	585	30447	38	812	17	206	31	Cerros del Rio
LA86605-FS91	3318	581	31014	47	822	22	206	18	Cerros del Rio
LA86605-FS89A	4026	1124	45013	55	612	31	160	4	San Antonio Mtn
LA127634-FS80	4474	224	41483	131	63	34	225	17	unknown

CHAPTER 62
DIET AND SUBSISTENCE ON THE PAJARITO PLATEAU: EVIDENCE FROM FLOTATION AND VEGETAL SAMPLE ANALYSIS

Pamela J. McBride

INTRODUCTION

The Land Conveyance and Transfer (C&T) Project completed the excavation or testing of over 40 sites where flotation (489) and vegetal (324) samples were collected for analysis (Table 62.1). Situated primarily in two vegetative zones (piñon-juniper woodland and ponderosa pine forest), the C&T Project sites provide evidence for occupation of the Pajarito Plateau in the Archaic, Coalition, and Classic periods. Although 51 Archaic sites have been identified at Los Alamos National Laboratory (LANL) as a whole (Vierra and Foxx 2002), the Archaic signature on C&T Project land is sparse and consists of four lithic scatters and three lithic/ceramic scatters with Archaic components. The sites are in locations that seem to have been equally attractive to those who succeeded the hunter/gatherers; with the exception of the Early Archaic lithic scatter (LA 85859), artifact scatters are located downslope of Coalition cavate (LA 117883), one-room structure (LA 99396), or roomblock sites (LA 12587, Area 8) or Classic period fieldhouses (LA 99397 and LA 86637). Flotation and vegetal samples were not taken from LA 86533, a Late Archaic/Coalition lithic/ceramic scatter. Sites where hunters could make tools, gather wild plants, and track game that came to drink at washes or streams would offer future farmers a source of water for crops as well as an opportunity to hunt.

Samples from three roomblocks and four fieldhouses were analyzed from the Coalition period. Two of the roomblocks (LA 86534 and LA 135290) are on the Los Alamos Town Site Mesa at 2152 m (7050 ft) and 2164 m (7100 ft), respectively, while the third (LA 12587) is near the modern town of White Rock in piñon-juniper woodland about 600 feet lower in elevation. The roomblocks are associated with sandy loam soils (primarily Hackroy) that are usually good for agriculture (Nyhan et al. 1978). These deposits, however, are fairly thin at the tip of the Town Site Mesa where LA 86534 is located. The mesa tops were most suited for dryland farming, offering expanses of open and level areas for fields or grid gardens. Given above normal precipitation rates during the Coalition and Classic periods (AD 1024–1398; Allen 2004:48), farmers had less reason to move off the mesa tops to more well-watered locales. Most Coalition period fieldhouses are located near habitation sites in the piñon-juniper zone, but the four C&T Project fieldhouses from this period are in Rendija Canyon at elevations ranging from 2090 m (6860 ft) to 2145 m (7040 ft) in the piñon-juniper/ponderosa pine ecotone. Three of these fieldhouses date to the Late Coalition when the location of fieldhouses points to a broadening choice of soil types and landforms for farming. Garden plots were not only situated on mesa tops, but in canyon bottoms, near the base of mesas to take advantage of run-off, and in well-watered spots near springs or seeps. The transition to the Classic period is marked by increasing agricultural production coupled with aggregation (Hill et al. 1996; Kohler 1989; Powers and Orcutt 1999a; cited in Vierra 2002:6-44) and competition for land, presumably due to internal population growth or immigration. Burned rooms (at LA 12587 and Airport 2) and a fieldhouse burned to the ground (LA 85417) during this time period could be direct evidence of competition.

Table 62.1. List of C&T Project site numbers, tracts, number and type of samples analyzed, and period of occupation.

Site Type	LA Number	Tract	N/Type of Sample	Period of Occupation
Roomblock	12587	White Rock	125F, 109V	Late Coalition/Classic
Roomblock	86534	Airport	54F, 66V	Middle Coalition
Roomblock	135290	Airport	79F, 64V	Middle Coalition
Lithic/ceramic scatter	12587, Area 8	White Rock	3F, 2V	Late Archaic/ Late Coalition
Lithic/ceramic scatter	86637	White Rock	4F	Late Archaic, Late Coalition, Early Classic
Lithic/ceramic scatter	127625	White Rock	2F	Middle Classic
Lithic scatter	85859	Rendija	20F, 4V	Early Archaic
Lithic/ceramic scatter	99397	Rendija	7F, 6V	Late Archaic?
Lithic/ceramic scatter	86531	Technical Area (TA) 74 Testing	2F, 2V	Coalition-Historic
Lithic scatter	117883	TA-74 Testing	2V	Archaic
Lithic/ceramic scatter	61034	White Rock Testing	2F, 3V	Classic-Historic?
Lithic/ceramic scatter	61035	White Rock Testing	2F, 6V	Classic
Grid garden	128803	White Rock	12F	Classic
Grid garden	139418	Airport	6F, 7V	Classic
Grid garden	21596B, 21596C	TA-74 Testing	12F	Coalition/Classic
Check dam	128804	White Rock	4F	Historic
Fieldhouse	127631	White Rock	9F	Early Classic
Fieldhouse	128805	White Rock	19F, 25V	Middle Classic
Fieldhouse	141505	Airport	3F, 4V	Classic
Fieldhouse	15116	Rendija	3F	Middle Classic
Fieldhouse	70025	Rendija	3F	Early-Middle Classic
Fieldhouse	85403	Rendija	6F	Classic
Fieldhouse	85404	Rendija	5F	Early-Middle Classic
Fieldhouse	86605	Rendija	3F	Late Classic
Fieldhouse	87430	Rendija	12F	Middle Classic
Fieldhouse; Lithic scatter	99396	Rendija	6F, 3V	Coalition/Archaic
Fieldhouse	127627	Rendija	3F	Middle Classic
Fieldhouse	127633	Rendija	4F	Ancestral Pueblo

Site Type	LA Number	Tract	N/Type of Sample	Period of Occupation
Fieldhouse	127634	Rendija	14F	Middle Classic
Fieldhouse	127635	Rendija	10F	Early Classic
Fieldhouse	135291	Rendija	2F	Early Classic
Fieldhouse	135292	Rendija	3F	Early Classic
Fieldhouse	85408	Rendija	3F	Middle Classic
Fieldhouse	85411	Rendija	10F, 1V	Early-Middle Classic
Fieldhouse	85413	Rendija	2F	Early Classic
Fieldhouse	85414	Rendija	2F	Middle Classic
Fieldhouse	85417	Rendija	5F	Late Coalition
Fieldhouse	85861	Rendija	4F	Late Coalition
Fieldhouse	85867	Rendija	2F	Early Classic
Fieldhouse/rock feature	86606	Rendija	3F	Coalition/Classic
Fieldhouse	86607	Rendija	1F	Coalition
Fieldhouse	110126	TA-74 Testing	2F, 4V	Late Classic
Fieldhouse	110130	TA-74 Testing	5F	Classic
Tipi ring; Jicarilla Apache	85864	Rendija	5F, 3V	Turn-of-the-century
Tipi ring; Jicarilla Apache	85869	Rendija	7F, 4V	Turn-of-the-century
Rockshelter	86528	TA-74 Testing	1F, 4V	Classic/Historic?
Homestead	85407	Rendija	8F, 3V	Early 20th Century

F = flotation sample, V = vegetal sample.

With three exceptions, unmixed Classic sites consist entirely of fieldhouses located in Rendija Canyon at slightly higher elevations than the preceding Coalition period. A grid garden (LA 139418) on the Los Alamos Town Site Mesa is most likely contemporaneous with a nearby fieldhouse (LA 141505), as there was a correlation between soil profiles at the two sites (see Chapter 57, this volume). A Middle Classic lithic/ceramic scatter (LA 127625) is in a flat area just east of the mouth of Cañada del Buey and consists of redeposited material apparently originating from nearby slopes and mesa top sites (see Volume 2, Chapter 17). A Classic lithic/ceramic scatter (LA 61035) that was tested in the White Rock Tract is on the south side of the first bench adjacent to the Los Alamos Canyon drainage channel.

The Classic period is characterized by continuing population aggregation into large pueblos and intensification of maize agriculture. Within the confines of the C&T Project, the only Classic period habitation sites are Otowi (LA 169), the associated cavate complex (LA 127673) to the north, and a single roomblock at LA 12605. Otowi straddles the ridge between Bayo and Pueblo canyons over the best-watered and flat canyon bottomland in the area. The largest expanse of rock-lined garden plots is in this area (Masse and Vierra 2000) and spans several time periods. In general, fieldhouses in the Classic period tend to follow the pattern described above for those found during the C&T Project. That is, they are at slightly higher elevations than in preceding periods, which may be a factor of climactic conditions or simply that, with a peak in population, more diverse arable land was utilized. Three out of four of the most unfavorable periods for dryland farming occurred in the Classic period (AD 1440–1525, 1400–1440, and 1525–1600; Orcutt 1999: Figure 5.8, cited in Kohler 2004). In fact, the whole period from AD 1399–1790 was unusually dry (Allen 2004). Garden plots were not only increasingly located at higher elevations to take advantage of higher precipitation rates (about 19 inches of rain a year compared to lower elevations in the piñon-juniper zone near White Rock with approximately 13.5 inches a year [Foxx 2006:33]), but near springs or seeps. For instance, the gardens at LA 12701, associated with the Classic pueblo of Tsirege, were watered by a canal served by the Pajarito Springs (Steen 1977).

The Serna Homestead (LA 85407), located on a gently sloping bench immediately north of Rendija Canyon, was patented in 1922 by Andres Martinez and subsequently sold to José and Fidel Serna who farmed the land until the US government took possession of the property in 1942. The homestead, along with two turn of the century (circa 1890s) Jicarilla Apache tipi rings and a historic period check dam, comprise the historic sites excavated on C&T Project land. A few lithic/ceramic scatters have an historic trash element as well (LA 86637, LA 86528, LA 86531, and LA 61034).

Wild plant resources identified from throughout the C&T Project area include at least 11 weedy annuals, three grasses, and eight perennial genera (Table 62.2). Wood charcoal was primarily coniferous, but a diverse array of shrubs was present, as well as representatives from the riparian community (box elder, cottonwood/willow, and New Mexico locust). Specimens of the three most important domesticates (maize, beans, and possibly squash) were present in samples from LA 12587, LA 135290, and LA 127634, while maize and/or possible squash were identified at 20 of the remaining 45 sites. The hearth inside one of the Jicarilla Apache tipi rings (LA 85864) produced a possible wheat grain (very eroded), while evidence for other European cultivars (peach and possibly grape) was present at the early 20th century Serna Homestead (LA 85407).

Table 62.2. Charred plant taxa recovered from C&T Project flotation and macrobotanical samples.

Scientific Name	Common Name	Plant Part
Annuals		
Amaranthus	Pigweed	Seed
Chenopodiaceae	Goosefoot family	Seed
Chenopodium	Goosefoot	Seed
Chenopodium berlandieri	Pitseed goosefoot	Seed
Chenopodium/Amaranthus	Cheno-am	Seed
Cleome	Beeweed	Embryo, seed
Corispermum	Bugseed	Seed
Cycloloma	Winged pigweed	Seed
Helianthus	Sunflower	Achene
Kochia scoparia	Summer cypress	Seed
Lappula	Stickseed	Seed

Scientific Name	Common Name	Plant Part
Nicotiana	Tobacco	Seed
Portulaca	Purslane	Seed
Cultivars		
Phaseolus	Bean	Cotyledon
Prunus persica (uncharred)	Peach	Stone
Triticum	Wheat	Caryopsis
Vitis	Grape	Seed
Zea mays	Maize	Cob, cupule, cupule segment, embryo, glume, kernel, shank, stalk
Grasses		
Gramineae	Grass family	Caryopsis, culm
Achnatherum hymenoides	Ricegrass	Caryopsis
Sporobolus	Dropseed grass	Caryopsis
Other		
Compositae	Sunflower family	Achene
Croton	Doveweed	Seed
Cucurbita	Squash/coyote gourd	Rind
Cyperaceae	Sedge family	Seed
Labiatae	Mint family	Seed
Monocotyledonae	Monocot	Stem
Oenothera	Evening primrose	Seed
Physalis	Groundcherry	Seed
Plantago	Plantain	Seed
Polygonaceae	Knotweed family	Seed
Portulacaceae	Purslane family	Seed
Salvia	Sage	Seed
Indeterminate	Indeterminate	Embryo, seed, unknown plant part
Unknown #1	Unknown #1	Embryo, seed, stem, unknown plant part
Unknown #2	Unknown #2	Seed
Verbena	Vervain	Seed
Perennials		
Acer negundo	Box elder	Wood
Artemisia	Sagebrush	Wood
Atriplex canescens	Four-wing saltbush	Fruit, seed
Atriplex/Sarcobatus	Saltbush/greasewood	Wood
Cercocarpus	Mountain mahogany	Wood
Chrysothamnus	Rabbitbrush	Wood
Echinocereus	Hedgehog cactus	Seed
Foresteria	Desert olive	Wood
Gymnospermae	Unknown conifer	Wood
Juniperus	Juniper	Female cone, seed, twig, twigscale, wood

Scientific Name	Common Name	Plant Part
Lycium	Wolfberry	Wood
Mammillaria	Pincushion cactus	Seed
Pinus	Pine	Bark scale, cone scale, male cone, needle, seed, umbo, wood
Pinus edulis	Piñon	Needle, nutshell, twig, wood
Pinus ponderosa	Ponderosa pine	Fascicle, needle, wood
Platyopuntia	Prickly pear cactus	Embryo, seed
Populus/Salix	Cottonwood/willow	Wood
Pseudotsuga menziesii	Douglas fir	Needle, wood
Quercus	Oak	Wood
Rhus	Sumac	Wood
Robinia	New Mexico locust	Wood
Rosaceae	Rose family	Wood
Rumex	Dock	Seed
Unknown non-conifer	Unknown non-conifer	Wood
Yucca baccata	Banana yucca	Seed

The archaeobotanical assemblage reflects the gathering of grasses and perennials common in the juniper savanna and piñon-juniper woodland plant communities (Foxx and Tierney 1985). Tree and shrub species were procured from at least four of the five major vegetation cover types at LANL (juniper savanna, piñon-juniper woodland, ponderosa pine forest, mixed conifer forest, and spruce-fir forest; Foxx 2006:35). Riparian and wetland zones provided a source for cottonwood, willow, and plants in the sedge family. Coyote tobacco (*Nicotiana attenuata*) could have been found growing in sandy soils alongside streams and washes (Foxx and Tierney 1985). Annuals were collected from a variety of naturally and culturally disturbed areas.

Although evidence of deliberate setting of fires is lacking, fire could have been used by prehistoric peoples to enhance the density and vigor of certain species like sunflower and bugseed (Bohrer 1983, cited in Foxx 2006:61). Alternatively, people could simply have taken advantage of the results of natural fires in the region. Allen (2004) suggests that there were frequent surface fires during the Coalition and Classic period occupations of the Pajarito Plateau, either from lightning strikes or possibly human ignition. Wild onion, pigweed, goosefoot, and gooseberry are a few of the plants that benefit from the regenerative effects of fire (Foxx 2006:Table 3.9). Shrubs (such as oak) sprout almost immediately after fire, attracting browsing animals like deer and elk (Foxx 2001).

If the prehistoric occupants were managing certain resources with fire, it may be no accident that oak, mountain mahogany, and saltbush/greasewood were the most common non-conifer taxa in flotation and vegetal samples. Four-wing saltbush, although "not very tolerant of fire, may sprout to some degree if fire intensity is not too severe" (Ogle et al. 2005). Stand-replacing fires encourage oak (Dick-Peddie 1993: 69); it is one of the many early succession shrubs and trees that sprout after a fire (Foxx 2006:63). *Quercus gambelii* is a fire-adapted species with a well-developed root system that allows it to draw moisture from a large volume of soil resulting in rapid resprouting after fire (Simonin 2000). After fire, mountain mahogany will recolonize a site through root crown or rhizome sprouts (Cronquist et al. 1997).

Today, the average annual precipitation at both the Airport Tract and the White Rock Tract is 12 to 14 inches (Foxx 2003:35) while that in Rendija Canyon is about 19 to 20 inches. Based on historic data, the growing season ranges from 133 to 246 days (Bowen 1990). The amount of rainfall in an average year, soil conditions, and growing season length would have been sufficient to produce successful crops of several native Southwest maize varieties (Muenchrath and Salvador 1995). These include chapolote (flowers in about 50 days after planting; LAMP 1991:691–692), Cochiti (matures in 90 days; Native Seeds/SEARCH 1992), and Hopi flour corn (matures in about 75 days after sowing; Seeds of Change 1990). Using a variety of agricultural techniques and maize varieties with short maturation periods could have resulted in fairly successful crop yields from dryland farming in the Los Alamos and White Rock areas.

The method followed and results obtained from archaeobotanical analysis of flotation and vegetal samples are presented in this chapter. The goals of this report are to 1) describe plant taxa exploited by prehistoric populations, 2) compare resource use patterns with other archaeobotanical analysis results from sites in the region, and 3) address research questions such as season of occupation, diet, and subsistence practices.

METHODS

Archaeobotanical analysis of material from the project involved vegetal sample analysis, flotation processing, full sort analysis, and quantification as described below. Identification was aided by the use of a modern comparative collection and comparison to photographs in seed identification manuals (Delroit 1970; Martin and Barkley 1961). Scientific nomenclature and common names followed those presented in Martin and Hutchins (1980). Identifications were made to different taxonomic levels: families (e.g., Gymnospermae), genus (e.g., *Chenopodium*), species (e.g., *Pinus edulis*), and non-Linnaean categories (e.g., cheno-am). The cheno-am category refers to seeds that could be either in the genus *Chenopodium* or *Amaranthus*. This category is used when the condition of a seed prohibits a more specific identification.

Table 62.2 lists the Latin and common name, plant part, and plant category (e.g., annuals, perennials) of all charred plants recovered from the project. For ease of reporting, taxa in all other tables are recorded using the common name only. Plant remains designated as “unknown” indicate remains that might be identified later using a more extensive comparative collection. “Indeterminate” plant remains are unidentifiable due to erosion or fragmentation.

Vegetal Sample Analysis

Macrobotanical field samples are fortuitous plant specimens collected as they are encountered in the field either during excavation or the screening of fill and are not associated with an exact provenience. In spite of this, vegetal specimens can offer further insight into the diet and subsistence of prehistoric populations. Vegetal specimens are identified, counted and weighed, and placed in protective containers such as film canisters or polypropylene vials, depending on specimen size. The taxon, plant part, confidence of the identification, condition, count, and weight of the specimen were recorded along with any observations that may be important in the interpretation of the material.

Flotation Samples: Flotation Processing

LANL uses a standard decant flotation system as described by Hammett and McBride (1993). The 489 flotation samples ranged in volume from 0.2 to 6.7 liters. Each flotation sample was poured into a bucket of water, agitated gently until the botanical material floated to the surface, and then decanted onto a clean piece of chiffon material. The squares of fabric were laid flat on coarse mesh screen trays until the recovered material had dried. The residue at the bottom of the bucket (called the heavy fraction) was rinsed to eliminate soil matrix, dried, and examined to recover lithic and bone material.

Full Sort Analysis

The floated material was passed through a series of graduated screens (US Standard Sieves with 4-mm, 2-mm, 1-mm, and 0.5-mm mesh sizes). The material from each screen size was then examined using a binocular microscope at a magnification of 7x to 45x. Charred reproductive plant parts like seeds and fruits were identified and counted. Charred non-reproductive plant parts (bark, needles, etc.) and uncharred plant parts were also identified and quantified as an estimate of abundance/liter.

If more than 20 pieces of wood charcoal were present in a sample, then 20 pieces (selected randomly from the 4-mm and 2-mm screens) were identified, separated by taxon, counted, and weighed. Then the remainder of each fraction was scanned to identify any taxa that might have been missed. Otherwise, all identifiable wood charcoal from a sample was analyzed.

Several problems that arise consistently during wood identification in the southwest are addressed by placing specimens in more general categories. The identification of unknown conifer is used when a specimen is too fragmentary or the presence of root holes precludes differentiation between juniper and other conifers such as piñon or fir. Pine is designated when resin ducts are present, but the fragmentary nature of a specimen prevents identification to species. Several species of shrubs that are in the Chenopodiaceae (goosefoot) family have morphological characteristics that are essentially identical (four-wing saltbush, greasewood, winterfat, etc.). For this reason, identification to species is not possible and specimens are placed in the combined saltbush/greasewood taxon. Finally, small-diameter twigs of cottonwood and willow are nearly impossible to distinguish, so specimens are designated as *Populus/Salix*.

All wood and reproductive plant parts that were counted and identified from each sample were placed in polypropylene capsules or plastic bags and labeled for future reference. An example of each uncharred or non-reproductive charred plant part encountered during analysis was also separated and placed in a polypropylene capsule or plastic bag. Non-cultural remains such as roots and insect parts observed during flotation analysis were also recorded. These observations are reported along with sample volumes (before flotation) and sample weights (after flotation) in Appendix S.

QUANTIFICATION

Three forms of quantification were used during flotation analysis: abundance, ubiquity, and minimal number of individuals (MNI). Each of these is described below.

Abundance

To determine the estimated abundance of charred non-reproductive plant parts and uncharred taxa present in a sample, an estimate of the number of these materials per liter of soil is recorded. This allows for an approximate quantification of non-reproductive plant parts and an estimation of the degree of contamination.

Ubiquity

Many factors can affect the number and type of taxa recovered from flotation samples including differential preservation of plant remains, plant processing techniques, and archaeological sampling strategies. Seeds and nuts with hard testa will preserve, while tubers and leafy greens rarely, if ever, preserve. Plants that were parched during processing are more likely to preserve due to "kitchen accidents" than those that do not require this step during food preparation. A 5-liter flotation sample has a greater probability of yielding a diverse number of plant taxa than a 1-liter sample.

When the first two factors are considered, it can be difficult or impossible to determine the exact composition of the prehistoric diet or the degree of dependence on one plant as compared to another. The latter problem of differential sample size can be resolved by standardizing flotation sample volumes or by applying statistical analyses to determine the effects of sample size on archaeobotanical analysis results. Ubiquity is a quantification method used by archaeobotanists to identify possible trends or patterns that can lead to the identification of plant processing or storage loci or changes in plant exploitation through time.

To determine which plant remains were most common in samples, ubiquity tables were created for non-wood plant taxa recovered from the project. Ubiquity tallies the presence or absence of a taxon in each sample. The number of remains of a particular taxon found in a sample is not reported in this method of quantification. Presence is recorded for one specimen of a taxon or 200. Therefore, ubiquity measures the frequency of occurrence of taxa as opposed to absolute counts that measure abundance. The flotation analysis results are reported in ubiquity tables as a count (the number of samples in which the taxon is present) and percent presence (the number of samples in which the taxon is present expressed as a percentage of the total number of samples) as Popper (1988) describes. For example, if goosefoot occurs in two samples out of ten the count would be two and the percent presence would be 20 percent.

Absolute Counts and MNI

Absolute counts measure the absolute abundance of taxa in a sample and become especially useful in situations where the absolute abundance of taxa changes over time, but the frequency of those taxa does not. During full-sort analysis, absolute counts and MNI were recorded for charred seeds, other reproductive plant parts, and unknown plant parts. Absolute counts and MNI were recorded for charred and uncharred reproductive plant parts during vegetal sample analysis. The absolute count includes fragments and whole reproductive plant parts. The MNI count was used effectively by Hammett and McBride (1993) on the Transwestern Pipeline Project. This is a quantification measure borrowed from faunal analysts and osteologists, which allows the archaeobotanist to clearly distinguish between the presence of whole or fragmented remains when reporting results. In tables, there are two numbers for reproductive or unknown plant parts. The first number is the total number including fragments encountered in a sample, while the number in parentheses represents the MNI value. An MNI value of 1 was given to a seed or fruit if more than one half of that reproductive unit was present.

MAIZE AND BEAN MEASUREMENTS

Maize specimens were measured using digital calipers, following parameters detailed in Bird (1994) and Toll and Huckell (1996). To be considered measurable, cob fragments needed to possess a full circumference, and kernels needed to be complete in all of the three possible dimensions (length, width, and thickness). Kernel measurements are reported in Appendix V. Two carbonized bean cotyledons and one whole bean were measured as to length, width, and thickness with digital calipers, to the nearest 0.1 mm.

RESULTS OF FLOTATION AND VEGETAL ANALYSIS

The following sections describe the results of analysis of charred and uncharred plant remains, as well as wood, from flotation and vegetal samples. In addition to taxon, plant part, and quantity, the confidence of the identification (positive, fairly certain, resembles taxon) and condition of the plant part (charred, partially charred, or uncharred) were recorded by field specimen (FS) number (Appendices T and U). Vegetal sample analysis results are also itemized by FS number in Appendices T and U. Flotation plant remains in tables are seeds unless otherwise indicated and cultural plant material is charred or partially charred and non-cultural material is uncharred.

Uncharred Plant Remains from Flotation Samples

Archaeobotanists have struggled with the interpretation of uncharred seeds recovered from subsurface samples. The uncertainty as to whether uncharred seeds were deposited because of cultural activity, from rodent and insect activity, or from seed rain precludes their clear interpretation. Minnis (1981) discussed problems inherent in interpreting uncharred seeds recovered from open-air sites. He tested a modern facsimile of an archaeological site to compare the presence of taxa known to have been used (called "economic taxa") to the number of contaminants. Three economic taxa were recovered, as well as 16 taxa that had been deposited by non-human processes such as seed rain or rodent movement. Because of these kinds of questions about the origins of uncharred seeds found in open-air sites, this report will focus on charred plant remains. Therefore, when present, uncharred remains were recorded during full sort analyses, but were considered intrusive and not associated with the prehistoric use of the site.

The most common plant remains of the 46 or so uncharred taxa (Table 62.3) observed in flotation samples were goosefoot, juniper, purslane, and spurge seeds along with juniper twigs piñon nutshell, and piñon needles. Goosefoot, spurge, and purslane are weedy taxa that are part of a wide variety of plants that are defined as agrestals and/or ruderals. Agrestals are plants that are adapted to agricultural pursuits and are often associated with a particular crop. Ruderals are plants that occur in areas of irregular or inadvertent disturbance such as roadsides (Stuckey and Barkley 2000). Although goosefoot and pigweed are frequently found in association with maize, these taxa are also found in virtually any disturbance situation. Conifer duff like juniper twigs and pine needles are part of the background vegetation, unavoidably included in flotation samples. Cactus seeds, sunflower seeds, and groundcherry seeds may have been introduced into site deposits as part of rodent meals. The high number of unburned intrusive taxa in project samples is not surprising in an environment where there are thick layers of detritus and rodents thrive.

Table 62.3. Ubiquity of flotation sample uncharred plant remains from the C&T Project.

Common Name/Plant Part	Count*	%**
Bean family seed	4	1
Beeweed seed	6	1
Big sagebrush leaf	3	1
Buffalo burr seed	31	7
Bulrush seed	3	1
Bursage achene	1	<1
Cactus family areola	2	<1
Cheno-am seed	2	<1
Cholla seed	1	<1
Dicot leaf	4	1
Dock seed	6	1
Douglas fir needle	1	<1
Doveweed seed	4	1
Dropseed grass caryopsis	65	15
Evening primrose seed	9	2
Fiddlehead seed	1	<1
Globemallow seed	3	1
Goosefoot seed	291	68
Grass family caryopsis	27	6
Grass family culm	2	<1

Common Name/Plant Part	Count*	%**
Grass family floret	10	2
Grass family leaf	6	1
Grass family rhizome	1	<1
Grass family whole plant	1	<1
Groundcherry seed	41	10
Hedgehog cactus seed	18	4
Juniper female cone	22	5
Juniper male cone	13	3
Juniper seed	125	29
Juniper twig	185	43
Knotweed family seed	4	1
Mustard seed	1	<1
Oak leaf	1	<1
Pigweed seed	29	7
Pincushion cactus seed	1	<1
Pine bark scale	14	3
Pine cone scale	1	<1
Pine female cone	3	1
Pine male cone	24	6
Pine needle spindle gall	15	4
Pine seed	2	<1
Pine twig	22	5
Pine umbo	45	11
Piñon needle	243	57
Piñon nut	4	1
Piñon nutshell	95	22
Piñon twig	1	<1
Pitseed goosefoot seed	4	1
Ponderosa pine bark scale	2	<1
Ponderosa pine fascicle	2	<1
Ponderosa pine needle	79	19
Prickly pear cactus embryo	50	12
Prickly pear cactus seed	52	12
Purslane seed	127	30
Raspberry/thimbleberry seed	1	<1
Ricegrass caryopsis	1	<1
Russian olive seed	2	<1
Sage seed	6	1
Snow on the mountain seed	3	1
Spurge fruit	6	1
Spurge seed	113	27
Stickleaf seed	3	1
Stickseed seed	10	2
Sumac seed	2	<1

Common Name/Plant Part	Count*	%**
Sunflower achene	19	4
Sunflower family achene	25	6
Sweet clover	4	1
Tarweed achene	1	<1
Tobacco seed	16	4
Unknown # 1 seed	2	<1
Vervain seed	2	<1
Wild lettuce achene	1	<1

*Count: Number of samples with common name/plant part present. **%: Number of samples with common name/plant part divided by total number of flotation samples with uncharred remains (426) × 100.

Charred Plant Remains from Flotation Samples

Maize cupules had the highest percent presence of all charred plant remains recovered from project samples, followed by maize kernels and goosefoot seeds (Table 62.4). Beans and possible squash, along with one instance of wheat were other cultivars that were identified. In addition to goosefoot, annual taxa included bugseed, pigweed, pitseed goosefoot, purslane, sunflower, and tobacco. Identified grass genera were limited to dropseed and ricegrass and perennials consisted of banana yucca, dock, four-wing saltbush, hedgehog cactus, juniper, pincushion cactus, piñon, ponderosa pine, and prickly pear cactus.

Table 62.4. Ubiquity of flotation sample carbonized plant remains from the C&T Project.

Common Name/Plant part	Count*	%**
Banana yucca seed	1	<1
Bean cotyledon	8	2
Beeweed embryo	1	<1
Beeweed seed	26	7
Bugseed seed	8	2
Cheno-am seed	73	19
Dock seed	1	<1
Doveweed seed	1	<1
Dropseed grass caryopsis	22	6
Evening primrose seed	2	<1
Four-wing saltbush fruit	10	3
Four-wing saltbush seed	1	<1
Goosefoot family seed	2	<1
Goosefoot seed	119	32
Grass family caryopsis	15	4
Grass family culm	12	3
Groundcherry seed	15	4
Hedgehog cactus seed	4	1
Juniper female cone	3	<1
Juniper seed	4	1

Common Name/Plant part	Count*	%**
Juniper twig	15	4
Juniper twigscale	1	<1
Knotweed family seed	1	<1
Maize cob	5	1
Maize cupule	259	69
Maize cupule segment	22	6
Maize embryo	31	8
Maize glume	20	5
Maize kernel	109	29
Maize shank	1	<1
Maize stalk	1	<1
Mint family seed	14	4
Monocot stem	3	<1
Pigweed seed	40	11
Pincushion cactus seed	2	<1
Pine bark scale	48	13
Pine cone scale	1	<1
Pine male cone	1	<1
Pine needle	3	<1
Pine seed	1	<1
Pine umbo	20	5
Piñon needle	91	24
Piñon nutshell	14	4
Piñon twig	1	<1
Pitseed goosefoot seed	2	<1
Plantain seed	1	<1
Ponderosa pine fascicle	5	1
Ponderosa pine needle	133	35
Prickly pear cactus embryo	1	<1
Prickly pear cactus seed	1	<1
Purslane seed	59	16
Ricegrass caryopsis	2	<1
Sage seed	2	<1
Sedge family seed	2	<1
Stickseed seed	1	<1
Squash/coyote gourd rind	11	3
Summer cypress seed	1	<1
Sunflower achene	1	<1
Sunflower family achene	6	2
Tobacco seed	16	4
Unidentifiable embryo	3	<1
Unidentifiable seed	19	5
Unidentifiable plant part	64	17
Unknown bark	2	<1

Common Name/Plant part	Count*	%**
Unknown #1 embryo	1	<1
Unknown #1 seed	2	<1
Unknown #2 seed	1	<1
Unknown #1 stem	1	<1
Unknown #1 plant part	4	1
Unknown #3 plant part	1	<1
Vervain seed	1	<1
Wheat caryopsis	1	<1
Winged pigweed	1	<1

*Count: Number of samples with common name/plant part present. **%: Number of samples with common name/plant part divided by total number of flotation samples with charred remains (376) × 100.

Despite the diversity of the archaeobotanical assemblage (at least 37 taxa), the majority of taxa occurred in less than 10 percent of samples. Most of these plants have documented economic uses, but their low frequency presents interpretation problems. Whether the plant parts are included in the archaeobotanical record unintentionally (deposited by wind, on clothing, or by rodents) or as part of the firewood debris (four-wing saltbush fruit still adhering to branches), or are kitchen accidents from processing plants for food or medicine is impossible to determine.

Beans rarely show up in open-air site contexts except when rare conditions (usually a smothering burn) allow for bean preservation. Durable corncobs preserve much more consistently than beans especially since cobs were used as fuel. Cob fragments and cupules show up in a greater number of contexts because of their ubiquitous association with fire pit debris. Beans have a thin, fragile seed coat that breaks easily, leaving the endosperm exposed to environmental factors that cause deterioration (Gasser and Adams 1981). Other seeds with tougher seed coats have a distinct preservation advantage. At Walpi, Gasser and Adams (1981) recovered 509 beans compared to 24,746 watermelon seeds.

Possible squash rind was scarce and was present in only four samples from LA 12587, two from LA 86534 and LA 135290, and one from LA 127631, LA 127634, and LA 127635. Like beans, squash parts seem to have taphonomic problems that inhibit their reliable recovery. Most archaeological cucurbit rind found in significant quantities comes from well- preserved dry sites, with very few specimens showing signs of charring. C*ucurbita* rind recovered from this project follows the pattern at the majority of open-air sites: carbonized rind fragments were miniscule, few in number, and measured less than 1 mm in thickness. As cited by King (1985:91), the average rind thickness of coyote gourd is 0.7 mm, with a maximum thickness of 2.0 mm. King also states that the measurements of wild gourd and domestic squash overlap. The measurements of rind fragments recovered in flotation samples from the current project fall within this overlap and a differentiation between wild gourd (*Cucurbita foetidissima*) and domesticated squash such as *Cucurbita pepo* cannot be made. Therefore, *Cucurbita* sp. rind has been placed in a combined category of squash/coyote gourd.

Grasses may have been used in a limited way because the domesticated grass, maize, replaced the small-seeded dropseed and ricegrass that is larger, but far from comparable in size to maize.

LA 12587 was the only site where ricegrass was recovered, while dropseed grass showed up in 13 samples from LA 12587, one sample from LA 85407, and six samples from LA 135290.

The majority of perennial plant remains probably became part of the archaeobotanical record as a direct result of firewood use. Needles, twigs, bark, and cones could have been used as tinder or were burned along with branches. The presence of cactus seeds indicates processing of the fruits. Ethnographically, the fruits of prickly pear and hedgehog cactus were eaten raw, boiled, or dried (Castetter 1935:26, 35–36). The fall-ripening piñon nut crop is a valuable wild food resource, especially given its nearby availability. The nuts are distinguished by a particularly high energy value (635 calories per 100 grams, higher than most other plant and animal foods used prehistorically, including corn; Ford 1968:158,160). However, piñon nut remains are rarely abundant at open-air sites except at the occasional catastrophically burned site where cachepots are preserved with their contents. Piñon may not be showing up in flotation samples because the whole nut including the shell was consumed and therefore evidence would only be present in coprolites. Though piñon nutshell appears to be highly lignified, it is rarely preserved in open sites unless it is carbonized. Infrequent archaeological recovery may occur only if nutshell was spit out into the fire or a kitchen accident happened during roasting of the nuts.

In Minnis's study (1989) and overview of coprolite analyses in the Four Corners region, piñon showed up consistently in Basketmaker III samples, but was uncommon in Pueblo III samples. This suggested either a decrease in protein consumption or deforestation of woodlands to clear land for fields during Pueblo III times. It would be interesting to know how the occupation of sites included in the study corresponds to periods of drought and to calculate the effects of the erratic nature of piñon crops (the interval between optimal mast abundance is 4 to 7 years and is dependent on ample spring rains; Ford 1968).

Wood charcoal from the project was predominately coniferous; unknown conifer and ponderosa pine were the most common taxa recovered (Table 62.5). Significant quantities of juniper, pine, and piñon were also identified. Douglas fir, a tree that grows at elevations of 1981 m (6500 ft) to nearly tree line (Foxx and Tierney 1985:99) on canyon sides, canyon bottoms, and in mixed conifer forest, was identified at LA 12587, LA 86534, LA 135290, and LA 141505. Riparian species are represented by cottonwood/willow and New Mexico locust. The most common non-conifers were oak and saltbush/greasewood. Other shrubby taxa that were present included desert olive, mountain mahogany, rabbitbrush, rose family, sagebrush, and sumac.

Table 62.5. Ubiquity of flotation sample wood charcoal taxa from the C&T Project.

Common Name	Count*	%**
Cottonwood/willow	39	10
Desert olive	9	2
Douglas fir	16	4
Juniper	157	39
Mountain mahogany	55	14
New Mexico locust	2	1
Oak	92	23
Pine	148	37

Common Name	Count*	%**
Piñon	151	38
Ponderosa pine	202	51
Rabbitbrush	1	<1
Rose family	9	2
Sagebrush	39	10
Saltbush/greasewood	87	22
Sumac	1	<1
Unknown conifer	271	68
Unknown non-conifer	31	32

*Count: Number of samples with wood taxon present. **%: Number of samples with wood taxon present divided by total number of flotation samples with wood charcoal (398) × 100.

The wood charcoal assemblage from vegetal samples is similar to that from flotation except that the percent presence of juniper, ponderosa pine, and cottonwood/willow is much greater in vegetal samples (Table 62.6). Large diameter ponderosa pine trunks or cottonwood branches were often the preferred material used for roof beams or latillas (e.g., Chaco Canyon: Windes and Ford 1996). It could be that larger specimens collected as vegetal samples in the field were from construction material. The percent presence of other wood taxa that occur in both sample types are equal or nearly so, lending support to this argument. In addition, two vegetal samples from LA 12587, one a beam fragment and the other labeled as a possible dendro sample were both juniper, and a partially charred beam fragment from LA 135290 was identified as ponderosa pine. Box elder, a species that prefers moist conditions, and wolfberry were two shrubby taxa present that were not identified in flotation samples.

Table 62.6. Ubiquity of vegetal sample wood charcoal taxa from the C&T Project.

Common Name	Count*	%**
Box elder	3	1
Cottonwood/willow	85	32
Desert olive	16	6
Douglas fir	32	12
Juniper	172	64
Mountain mahogany	57	21
New Mexico locust	2	1
Oak	92	34
Pine	149	55
Piñon	197	73
Ponderosa pine	234	87
Rabbitbrush	6	2
Rose family	5	2
Sagebrush	28	10
Saltbush/greasewood	74	28
Unknown	1	<1
Unknown conifer	197	73
Unknown non-conifer	37	14

Common Name	Count*	%**
Wolfberry	7	3

*Count: Number of samples with wood taxon present. **%: Number of samples with wood taxon present divided by total number of flotation samples with wood charcoal (269) × 100.

White Rock Tract

LA 12587 (Late Coalition Period Roomblocks and Classic Period Fieldhouse)

The Coalition period at LA 12587 is characterized by the predominance of maize, with a few instances of possible squash and beans to round out the traditional triad of domesticated plants (Table 62.7). Annual seeds were the next most common plant remains, easily procured in cultivated fields and other disturbed areas. Annual taxa included bugseed, goosefoot (the most common annual taxon, found in 24% of samples), pigweed, and purslane. Pitseed goosefoot, sunflower, and tobacco were less common annual taxa, found in less than 5 percent of samples. Perennial taxa were primarily those associated with firewood use like conifer needles, bark, and twigs, but cactus seeds and piñon nutshell indicate cactus fruits and piñon nuts were gathered and eaten. Four-wing saltbush fruits could be firewood debris or evidence for their use as food or for their salty flavor. Grass taxa diversity and abundance is low with grass family and dropseed grass occurring in less than 4 percent of samples and ricegrass occurring in 12 percent of samples.

Table 62.7. Ubiquity of flotation sample carbonized plant remains from LA 12587.

Common Name/Plant Part	Count*	%**
Bean cotyledon	2	2
Bugseed seed	6	5
Cheno-am seed	20	18
Dropseed grass caryopsis	13	12
Four-wing saltbush fruit	4	4
Goosefoot seed	27	24
Grass family caryopsis	5	4
Grass family culm	2	2
Groundcherry seed	11	10
Hedgehog cactus seed	3	3
Juniper seed	1	1
Juniper twig	2	2
Maize cob	3	3
Maize cupule	106	95
Maize cupule segment	11	10
Maize embryo	16	14
Maize glume	4	4
Maize kernel	58	52
Mint family seed	2	2
Monocot stem	1	1

Common Name/Plant Part	Count*	%**
Pigweed seed	16	14
Pine bark scale	3	3
Pine cone scale	1	1
Piñon needle	15	13
Piñon nutshell	3	3
Ponderosa pine needle	3	3
Prickly pear cactus embryo	1	1
Prickly pear cactus seed	1	1
Purslane seed	18	16
Ricegrass caryopsis	2	2
Squash/coyote gourd rind	4	4
Sunflower achene	1	1
Tobacco seed	4	4
Unidentifiable embryo	1	1
Unidentifiable seed	3	3
Unidentifiable plant part	8	7
Unknown #1 embryo	1	1
Unknown #1 plant part	1	1
Unknown #3 plant part	1	1

*Count: Number of samples with common name/plant part present. **%: Number of samples with common name/plant part divided by total number of flotation samples with charred remains (112) × 100.

Wood from flotation samples is dominated by juniper and unknown conifer (Table 62.8). Other conifers included Douglas fir, piñon, and ponderosa pine. Although non-conifers were diverse, saltbush/greasewood was the only one that was present in significant quantities. Desert olive, cottonwood/willow, mountain mahogany, oak, rabbitbrush, rose family, sagebrush, and sumac complete the list of non-conifer taxa identified at the site. There were no remarkable differences in wood taxa from back rooms versus front rooms and wood from both thermal and non-thermal contexts was primarily juniper and unknown conifer.

Table 62.8. Ubiquity of flotation sample wood charcoal taxa from LA 12587.

Common Name	Count*	%**
Cottonwood/willow	20	18
Desert olive	9	8
Douglas fir	12	11
Juniper	92	82
Mountain mahogany	3	3
Oak	23	21
Pine	44	39
Piñon	41	37
Ponderosa pine	26	23
Rabbitbrush	1	1
Rose family	7	6

Common Name	Count*	%**
Sagebrush	30	27
Saltbush/greasewood	64	57
Sumac	1	1
Unknown conifer	75	67
Unknown non-conifer	18	16

*Count: Number of samples with wood taxon present. **%: Number of samples with wood taxon present divided by total number of flotation samples with wood charcoal (112) × 100.

Vegetal Samples. Ubiquity of wood from LA 12587 vegetal samples is close to that of flotation charcoal with the exception of ponderosa and cottonwood/willow (Table 62.9). In flotation samples, ubiquity of cottonwood/willow was 18 percent and that of ponderosa 23 percent. In vegetal samples the percent presence of cottonwood/willow (43%) and ponderosa pine (46%) is double that found in flotation samples. This appears to be an example of a bias toward larger diameter specimens when collecting vegetal samples in the field. Box elder, New Mexico locust, and wolfberry wood were identified in vegetal samples, taxa that were absent from flotation samples. Two beam fragments from Room 2 were identified as juniper; a ceremonial bundle was apparently secured to one of these (see Chapter 14, Volume 2).

Table 62.9. Ubiquity of vegetal sample wood charcoal from LA 12587.

Common Name/Plant Part	Count*	%**
Box elder wood	2	2
Cottonwood/willow wood	42	44
Desert olive wood	15	16
Douglas fir wood	9	9
Juniper wood	78	81
Mountain mahogany wood	11	11
New Mexico locust wood	2	2
Oak wood	25	26
Pine wood	47	49
Piñon wood	52	54
Ponderosa pine wood	45	47
Rabbitbrush wood	1	1
Rose family wood	3	3
Sagebrush wood	28	29
Saltbush/greasewood wood	40	42
Unknown conifer wood	60	63
Unknown non-conifer wood	23	24
Wolfberry wood	5	5

*Count: Number of samples with common name/wood present. **%: Number of samples with common name/wood divided by total number of vegetal samples with wood charcoal (96) × 100.

Six percent (330) of the incredibly large number of whole kernels (*n* = 5264) recovered in flotation and vegetal samples was measured (Appendix V). The average height of the sub-sampled kernels was 7.3 mm, average width was 6.6 mm, and average thickness was 4.0 mm

(Figure 62.1). Kernels from two sites also on Mesita del Buey (four from LA 4624, an Early Coalition pueblo, and nine from LA 4618, another Late Coalition site) and 122 kernels from LA 135290, a Middle Coalition roomblock on the Los Alamos Town Site Mesa will be compared with those from LA 12587 later in the discussion section.

Figure 62.1. Example of measured *Zea mays* kernels from LA 12587.

The average row number of 20 maize cobs from LA 12587 was 10 and rows were straight in appearance (Table 62.10; Figure 62.2). The average rachis segment length was 3.4 mm, average cob diameter was 10.3 mm, and average cupule width was 5.2 mm. Environmental stress such as high temperatures and water or nutrient deficiencies during various early developmental stages of a maize plant can lead to ears that are partially or completely barren (Muenchrath and Salvador 1995:316). Only one cob with an undeveloped row may have been a product of this kind of environmental stress. Five cobs from LA 86534, 17 from LA 135290, and 20 from LA 4618 will also be compared to cobs from LA 12587 in the discussion section later.

Table 62.10. *Zea mays* cob morphometrics (in mm) from LA 12587.

FS No.	Row #	Type	Length	Rachis Segment Length	Cob Diameter	Cupule Width
965	12	ST	27.7	2.9	14.2	6.4
1094	12	ST, U	18.4	3.4	11.6	5.8
1306	8	ST	12.8	2.9	5.6	4.1
1401	8	ST	12.9	2.6	6.9	4.4

FS No.	Row #	Type	Length	Rachis Segment Length	Cob Diameter	Cupule Width
1567	12	ST	26.0	3.9	13.5	5.3
1939	10	ST	18.9	2.5	7.5	3.7
2555	10	ST	19.7	3.8	14.3	7.0
2555	12	ST, T	22.9	3.1	10.5	4.0
2639	8	ST	14.5	4.0	12.1	7.0
2639	8	ST	17.7	3.4	9.1	6.9
2831	8*	ST	19.5	4.0	8.6	7.5
2831	12	ST	13.8	3.4	9.1	4.1
2831	12	ST	10.8	3.5	8.7	3.7
2831	10	ST	21.1	3.8	10.7	5.8
2831	12	ST	22.5	4.2	12.6	5.2
2832	12	ST	16.6	3.1	10.2	3.9
2832	10	ST	41.9	3.6	14.7	6.6
2888	12	ST	13.1	3.1	9.5	4.0
2888	8	ST	14.5	3.4	7.3	3.8
5141	10	ST	20.2	2.8	10.0	5.5
Averages	10	All straight	19.3	3.4	10.3	5.2

Two rows of cob have kernels. T = tip, U = undeveloped row present.

Other charred non-wood plant parts were limited to pine bark scales and cone umbos. These are probably part of the record as a result of firewood use. An uncharred grape seed was recovered in FS 1029 from Room 1 (Stratum 1) that is described as a loose surface deposit with some artifacts and vegetal material. The context and the uncharred state of the seed suggest it is non-cultural or modern in origin.

Roomblock 1

The majority of samples were collected from Roomblock 1 (Rooms 1 to 9; only 15% were from Roomblock 3) and focused on the hearths in the front Rooms 2, 4/5, and 7. Rooms 4/5 and 7 may have been primarily used for food preparation, while Room 2 served as a location for both food preparation and storage. Fused masses of kernels that were found in Room 2 indicate that stacks of cobs were stored on the floor or on top of the roof. Most of the cobs holding the kernels were burned to ash, leaving kernels still fused in alignment (Figure 62.3). Several thousand loose kernels were also recovered in Room 2, primarily from post-occupational fill and rooffall (1563 kernel fragments, 2771 whole), but also from floor, fill above the floor, and hearth contexts.

Figure 62.2. Example of measured *Zea mays* cobs from LA 12587.

Figure 62.3. Fused *Zea mays* kernel masses from Roomblock 1 at LA 12587.

There were two hearths in Room 2; Feature 4 was a plastered, collared hearth associated with the Late Coalition occupation of the site and Feature 20 was the oldest feature at the site, with an archaeomagnetic date placing it in the early part of the Late Coalition (AD 1200). Maize is the most common taxon in both hearths; weedy annual seeds and dropseed grass were recovered from both features. Possible squash/coyote gourd rind was identified in the older hearth, while groundcherry, mint family, and hedgehog seeds were restricted to Feature 4. This indicates that the diets of earlier and later site occupants were probably not considerably different, especially when sample bias is taken into account (four samples were analyzed from Feature 20 versus 10 from Feature 4). Given that rodent burrowing was fairly extensive throughout Feature 20, the likelihood that some or all of the remains from the feature are associated with activities that took place after the abandonment of the hearth cannot be ruled out. A possible extramural storage cist constructed on the east wall of Room 2 contained annual seeds, maize, and piñon needles along with at least five wood taxa, indicating a trashy fill signature, and thus obfuscating any clues about the contents of the cist.

The recovery of three of four tobacco seeds from the site in the lower and general hearth fill of Room 7, along with the presence of a deflector and ash box that do not occur in other rooms, indicates the room might have had a ceremonial function. A bean cotyledon and three cotyledon fragments were also recovered from the Room 7 hearth. In Hopi tradition, beans also have ritual significance. Beans (usually tepary) were the first salted dish a priest could eat after a fast (Whiting 1966:40). Perhaps the inhabitants of LA 12587 used beans for a similar purpose. A fourth tobacco seed was found in the Room 4/5 hearth, suggesting ritual activities were not restricted to Room 7.

Diversity of taxa from the back rooms (1, 6, and 8) is very low and evidence of their use as storage rooms is not apparent in the macrobotanical assemblage. Taxonomic diversity was also low in Room 9, the largest of the back rooms. The back rooms could have been cleaned out before abandonment or the macrobotanical assemblage may be biased by sample size differences, as 15 flotation samples were analyzed from back rooms compared to 76 from front rooms. The heavy focus on front room sampling is a function of the paucity of features in backrooms, extensive rodent disturbance, and a lack of the concentrated deposits of plant material (i.e., piles of maize) found in the front rooms.

Room 3. Flotation and vegetal samples were taken from post-occupational fill and wallfall from the Classic period fieldhouse (Room 3) superimposed over Roomblock 1. Charred plant material consisted of maize embryo and kernel fragments, as well as cupules, and piñon needles. Cottonwood/willow, juniper, mountain mahogany, oak, piñon, ponderosa, sagebrush, saltbush/greasewood, unknown conifer, unknown non-conifer, and wolfberry wood were also identified. Piñon needles may be part of firewood debris and maize parts probably represent a combination of cooking accidents and the use of cobs for fuel. However, whether these reflect refuse from the Classic period occupation or Coalition period room fill incorporated into the fieldhouse during its construction or as post-abandonment fill is impossible to determine.

Roomblock 3

Roomblock 3 was only partially excavated and in most cases only a basal course of masonry existed to define room outlines. A lack of wallfall in many of the 13 rooms indicates that construction of rooms may never have been completed. Carbonized plant material consisted of cheno-am, goosefoot, groundcherry, and grass seeds, grass stems, maize cupules and kernels, conifer cone scales, twigs, and needles, four coniferous woods, and nine non-conifers. Uncharred plant material was abundant and included Russian olive seeds, an obvious intrusive species. Occupants of this roomblock utilized disturbance-loving plants and grasses, grew maize, and collected local wood species for fuel and construction material.

Extramural Features. Flotation samples from a midden to the east of Roomblock 1 contained annual seeds, maize cupules, cupule segments, and kernels, groundcherry seeds, piñon nutshell and needles, along with juniper, piñon, sagebrush, saltbush/greasewood, and unknown conifer wood. The fill around Burial 2 that was found in the midden contained similar plant material, indicating that although the individual was placed in a natural niche in the bedrock and may have been covered with a tuff slab (see Chapter 14, Volume 2), plant material from the sample derives from midden deposits.

Maize and juniper, piñon, and saltbush/greasewood wood were recovered from an ashy area east and southeast of Roomblock 1 (Feature 3). This feature may be a deflated hearth, representing an extramural area where maize may have been prepared. Another ash/charcoal stain (Feature 21) in an extension of the middle wall of Roomblock 1 with an associated floor surface produced maize, possible squash, and purslane seeds along with juniper, pine, and oak wood and could represent cooking accidents from additional extramural activities.

Because of its proximity in time and space to LA 12587, data from LA 4618 provide good comparative material. LA 4618 is a 13-room masonry pueblo that included two kivas (Schmidt 2006). The number of taxa recovered from the two sites is nearly equal (21 from LA 4618 and 19 from LA 12587). Taxonomic diversity is low in back rooms at both sites, with front rooms (and the kivas at LA 4618) exhibiting much greater taxonomic richness. Cheno-ams, pigweed, purslane, and goosefoot were the most commonly encountered weedy annuals at both sites. Pigweed and purslane, however, occur at LA 4618 in more than double the number of samples in which they were found at LA 12587. Maize cupules were by far the most frequently recovered plant parts, present in 95 percent of samples with carbonized plant remains at LA 12587 and 100 percent of samples at LA 4618. There is a significant disparity in maize kernel presence (52% at LA 12587 versus 23% at LA 4618). The few intact kernel specimens from LA 4618 are unusual in that they are extremely diminutive and would ordinarily be the size of kernels near the tip of cobs. Only one kernel was of "normal" size. Beans and possible squash rind round out the cultivars recovered at the two sites.

Carbonized tobacco was found at both sites, although clear evidence for its ritual use was restricted to LA 4618. Along with charred specimens, uncharred tobacco seeds were also present in kivas at LA 4618 together with pipes containing daub. One of the components of the daub was Solanaceae pollen (the same family as tobacco; S. Smith 2006a), leaving little doubt that tobacco was used ceremonially.

Aside from firewood debris, evidence of perennial use consisted of very low percentages of piñon nutshell, hedgehog cactus and prickly pear cactus seeds, and banana yucca seeds (only at LA 4618). Dropseed grass and grass family seeds were identified in less than 20 percent of samples at each site while ricegrass was recovered from an even smaller percentage of samples at LA 12587.

The wood assemblages from LA 4618 and LA 12587 display a marked difference in occurrences of juniper and ponderosa pine. Juniper occurs in 85 percent of vegetal and flotation samples at LA 12587 and in only 27 percent of samples at LA 4618. Ponderosa is reversed, recovered in only 34 percent of samples from LA 12587 versus 97 percent of samples from LA 4618. This could indicate some deforestation of lower-elevation conifers in the Late Coalition and a focus on procuring higher-elevation taxa for roofing material (for more details see the Coalition period wood charcoal discussion).

The occupants of LA 12587 were obviously successful farmers as evidenced by the large number of cobs and kernels stored in front rooms or on the roof of Roomblock 1 that were destroyed in a fire as opposed to the lack of evidence for maize storage at LA 4618. A similar dichotomy was found between two Middle Coalition sites where very few kernels were found at one site (LA 86534), versus several masses of kernels and 99 loose kernels that were recovered at a neighboring site (LA 135290). Whether this suggests sharing of resources or competition that resulted in arson (at least at LA 12587) is difficult to say. Annual plants formed a high percentage of the wild resources used by site occupants, while perennials and grasses may have comprised a much smaller part of the diet. Trees and shrubs of the surrounding piñon-juniper woodland were utilized for fuel and construction along with ponderosa pine found in canyons or elevations above 2134 m (7000 ft), Douglas fir from the mixed conifer zone, and several species from the riparian community.

LA 12587 (Area 8, Late Archaic Lithic Scatter)

Goosefoot and pitseed goosefoot seeds comprised the only carbonized floral remains from test pits in Area 8 (Table 62.11). Non-cultural material was primarily conifer duff along with goosefoot, spurge, and prickly pear cactus seeds. Fragments of juniper and unknown conifer charcoal were recovered in flotation samples. Vegetal samples from Test Pits 1 and 3 yielded five specimens of piñon wood. Soils adjacent to the lithic scatter were tested and found to be weakly developed and that the surface is actively eroding "with minimal potential for preserving an intact archaeological record" (Chapter 15, Volume 2). If the plant remains identified from Area 8 do in fact represent remains from the Archaic component and not material washed in from the Coalition midden just to the north, the most that can be said is that weedy annual seeds may have been used for food and locally available conifers for fuel.

Table 62.11. Flotation sample plant remains from Late Archaic contexts at LA 12587.

FS No.	**8876**	**8877**	**8888**
Feature	Test Pit 3	Test Pit 4	Test Pit 1
Cultural Annuals			
Goosefoot	3(3)	3(3)	
Pitseed goosefoot	1(1)	1(1)	
Non-Cultural Annuals			
Goosefoot	+		
Spurge		+	+
Perennials			
Juniper		twig +	+, twig +
Pine			umbo +
Piñon			needle +
Prickly pear cactus		+	

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter.

LA 86637 (Late Archaic, Coalition, and Early Classic Period Lithic and Ceramic Scatter)

One unidentifiable plant part fragment was the sole cultural plant remain recovered from LA 86637 (Table 62.12). The balance of the floral assemblage was unburned conifer duff including twigs, needles, cones, and bark. The site consists of artifacts from the Late Archaic, Coalition, and Classic periods in secondary deposits, much of which has washed down from a Classic period fieldhouse upslope from the scatter (see Chapter 16, Volume 2). The possibility of any carbonized material being related to activities here is remote at best.

Table 62.12. Flotation sample plant remains from Test Pits 1 and 2 at LA 86637.

Feature	**Test Pit 1 108N/137E**		**Test Pit 2 103N/79E**	
	Stratum 2, level 2	Stratum 3, level 2	Stratum 1, level 1	Stratum 2, level 4
Cultural Other				
Unidentifiable		pp 1(0)		
Non-Cultural Perennials				
Juniper	twig +	twig +	♀ cone +, twig +	twig +
Pine	♂ cone +	bs +	♂ cone +	
Piñon	needle +	needle +	needle +	needle +
Ponderosa pine	needle +			

Cultural plant remains are charred, non-cultural plant remains are uncharred; + 1-10/liter, bs barkscale, cf. compares favorably.

LA 127625 (Middle Coalition Lithic and Ceramic Scatter)

A single charred goosefoot seed was recovered from Test Pit 1 (Table 62.13) and a fragment of unknown conifer charcoal from Test Pit 2. Other floral material consisted of unburned goosefoot, purslane, and spurge seeds and conifer duff. The presence of unburned plant material is not surprising considering that samples were taken from Stratum 1 that was a thin layer of silty sand along with a lot of duff and other detritus. The recovery of the charred floral material is somewhat unexpected and problematical. With no thermal feature present, it is likely that it was deposited in "runoff episodes from nearby slopes and mesa top sites" (see Chapter 17, Volume 2), as it was determined the cultural material recovered at the site was not in its original context.

Table 62.13. Flotation sample plant remains from LA 127625.

Context	Test Pit 1, Stratum 1, level 1	Test Pit 2, Stratum 1, level 1
FS Number	67	68
Cultural Annuals		
Goosefoot	1(1)	
Non-Cultural Annuals		
Goosefoot		+
Purslane	+	
Spurge		+
Perennials		
Juniper		+, twig +
Pine	♂ cone	
Piñon	needle +	needle +

All plant remains are seeds unless indicated otherwise; Cultural plant remains are charred, non-cultural plant remains are uncharred; + 1-10/liter.

LA 127631 (Early Classic Period Fieldhouse)

One sample (from room fill) of the nine flotation samples from LA 127631 yielded cultural plant remains. These consisted of maize cupules, a maize embryo fragment, and possible squash/coyote gourd rind (Table 62.14). Non-cultural plant remains consisted of conifer duff, cactus seeds, weedy annual seeds, grass, a raspberry or thimbleberry seed, a possible sumac seed, and a Russian olive seed. The uncharred seeds from perennial plants are all from fruits and may represent the remains of a meal consumed by a rodent or bird.

Table 62.14. Flotation sample plant remains from LA 127631.

Feature	Post-Occupational fill (FS 15)	Room fill, Stratum 2, level 1 (FS 29, 32)		Room fill, Stratum 2, level 2 (FS 17, 28, 53)			Strat. 3 (FS 42)	Outside fieldhouse, Stratum 5 (FS 51, 55)	
Grid	104N/103E	103N/102E		102N/ 103E	104N/ 102E	103N/ 101E	108N/ 104E	108N/ 104E	102N/ 103E
Cultural Cultivars									
Maize			cupule 6(0), e 1(0) pc						
Other: possible			rind +						

Feature	Post-Occupational fill (FS 15)	Room fill, Stratum 2, level 1 (FS 29, 32)		Room fill, Stratum 2, level 2 (FS 17, 28, 53)			Strat. 3 (FS 42)	Outside fieldhouse, Stratum 5 (FS 51, 55)	
Squash/ Coyote gourd									
Non-Cultural Annuals									
Goosefoot			+	+	+	+			+
Pigweed	+		+						
Pitseed Goosefoot						+			+
Purslane				+	+	+			
Spurge	fruit +		fruit +	+, fruit +		+, fruit +			+
Sunflower	+					+			
cf. Tarweed	+			+					
Grasses									
Grass family	wp +								
Perennials									
Cholla	+								
Juniper	+, ♂ cone, twig +	twig +	twig +	+, ♂ cone, twig +	+, twig +	+, twig +	twig +	twig +	+, twig +
Pine	bs +, nsg +, umbo +	bs +	bs +	bs +, umbo +	bs +, nsg +	bs +	twig +	♂ cone	
Piñon	needle +, nutshell +	needle +	needle +	needle +	needle +	needle +	needle +	needle +	needle +
Ponderosa pine		needle +							
Prickly pear cactus	+, embryo +		embryo +	+	embryo +				embryo +
Raspberry/ Thimbleberry						+			
Russian olive	+								
cf. Sumac									+

All plant remains are seeds unless indicated otherwise; Cultural plant remains are charred, non-cultural plant remains are uncharred; + 1-10/liter, bs barkscale, e embryo, nsg needle spindle gall, pc partially charred, wp whole plant.

Nine pieces of juniper and two of unknown conifer charcoal were also recovered in flotation samples (Table 62.15). Vegetal samples yielded a fragment of unburned, unknown wood and small pieces of juniper, pine, possible rabbitbrush, and saltbush/greasewood charcoal (Table 62.16). The carbonized maize and possible squash rind suggest the occupants may have been enjoying the fruits of their labor, while wood charcoal demonstrates use of local conifers and shrubs for fuel.

Table 62.15. Flotation sample wood charcoal taxa by count and weight in grams from LA 127631.

FS No.	15	28	29	32
Context	Post-occup. fill	Room fill, Stratum 2, level 2	Room fill, Stratum 2, level 1	
Conifers				
Juniper		1/<0.1 g		8/0.1 g
Unknown conifer	1/<0.1 g		1/<0.1 g	

Table 62.16. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 127631.

FS No.	19	22	27	38	44	56
Context	102N/103E, Stratum 2, level 2	104N/103E, Stratum 2, level 2	103N/103E, Stratum 2, level 3	103N/102E, Stratum 2, level 1	104N/102E, Stratum 2, level 2	101N/103E, Stratum 2, level 1
Conifers						
Juniper				3/0.8 g	1/<0.1 g	
Pine			2/0.2 g			
Unknown conifer						1/<0.1 g
Non-Conifers						
cf. Rabbitbrush		1/0.4 g				
Saltbush/ greasewood					2/0.2 g	
Unknown Non-Conifer					1/<0.1 g	
Unknown	1/<0.1 g u					

cf. compares favorably, u uncharred.

LA 128803 (Classic Period Grid Garden)

Situated at the mouth of Cañada del Buey, farmers who used these grid gardens were taking advantage of run-off from the uplands and the rock borders of the gardens served to capture nutrient-rich sediment. Carbonized corn cupules and goosefoot and cheno-am seeds were identified from three of 10 samples collected from within the grid garden borders (Table 62.17). A corn cupule fragment was also recovered from Stratum 3 of the test pit that was to the south of the grid gardens (FS 14).

Table 62.17. Flotation sample plant remains from LA 128803.

FS No.	9	14	16	18	21	24
Feature	**15.99N/8.1E**	**94N/107E Stratum 3**	**94N/107E Stratum 4**	**14.5N/8.99E**	**13.5N/9E**	**12.7N/ 8.85E**
Cultural Annuals						
Goosefoot						1(0)
Cultivars						
Maize		cupule 1(0)			cupule 2(0)	cupule 4(0)
Non-Cultural Annuals						
Goosefoot					+	
Purslane				+		+
Spurge	fruit +					
Grasses						
Grass family				floret +, leaf +		
Other						
Composite family						+
Unknown				+		
Perennials						
Juniper	twig +	twig +		twig +	twig +	+, ♀ cone, twig +
Pine	bs +, twig +				umbo +	
Piñon	needle +, nut +	needle +	needle +	needle +	needle +	needle +

Table 62.17 (continued). Flotation sample plant remains from LA 128803.

FS No.	25	28	29	30	32	33
Feature	**12.2N/ 8.99E**	**11N/ 8.7E**	**14.5N/ 11.65E**	**13.33N/ 11.95E**	**11.85N/ 11.2E**	**11.3N/ 11.3E**
Cultural Annuals						
Cheno-Am	1(1)					
Cultivars						
Maize	cupule 1(0)					
Non-Cultural Annuals						
Goosefoot	+					
Purslane	+	+				+
Spurge	fruit +	+				
Sunflower	+					
Grasses						
Grass family	leaf +		leaf +			

FS No.	25	28	29	30	32	33
Other						
Groundcherry			+			
Perennials						
Juniper	+, twig +	+, twig +	+, twig +	+, ♀ cone, ♂ cone +, twig +	+, ♀ cone, twig +	+, ♀ cone, twig +
Pine	♂ cone +, nsg +, umbo +	twig +, umbo +	bs +, cs +, ♂ cone +, nsg +, umbo +	♂ cone +, twig +, umbo +	nsg +, twig +	
Piñon	needle +	needle +	needle +, nut +	needle +	needle +	needle +, twig +
Ponderosa pine	needle +					needle +
Prickly pear cactus			+	+		

All plant remains are seeds unless indicated otherwise; Cultural plant remains are charred, non-cultural plant remains are uncharred; + 1-10/liter, bs barkscale, cs conescale, nsg needle spindle gall.

Unknown conifer, oak, rose family, and saltbush/greasewood charcoal (Table 62.18) were also present.

Table 62.18. Flotation sample wood charcoal taxa by count and weight in grams from LA 128803.

FS No.	21	24	25
Feature	**13.5N/9E**	**12.7N/ 8.85E**	**12.2N/ 8.99E**
Conifers			
Unknown conifer		1/<0.1 g	
Non-Conifers			
Oak		1/<0.1 g	2/<0.1 g
Rose family		2/<0.1 g	
Saltbush/greasewood	1/<0.1 g		

Nearby thermal features were not recorded so it is curious how charred plant remains came to be deposited. Cushing (1974) describes in detail the process of creating a run-off field at the mouth of an arroyo at Zuni. The first year the farmer piles soil up to make an outline of the field boundary and marks the corners with columnar stones. Vegetation is cut away and placed in the center of the field where it is burned. A brush fence is also constructed and strategically placed to catch eolian sediment that results in a fine loam deposit over the field.

Brandt (1995) states that burning brush and the collection of nutrient-laden sediment are the only references to fertilizing fields found in the ethnographic literature. Along with the collection of sediment behind garden borders, it is possible that shelled corncobs and brush were burned to clear or fertilize grid gardens in a similar manner described by Cushing (1974).

LA 128804 (Historic Period Check Dam)

Non-cultural debris in flotation samples from upslope and downslope of the check dam included spurge seeds, juniper twigs, and piñon needles (Table 62.19). Cultural plant remains were absent from samples, which is not remarkable considering the context and that the dam has been partially breached by an incised channel.

Table 62.19. Flotation sample plant remains from LA 128804.

FS No.	**213**	**215**	**219**	**222**
Feature	**Test Pit 1**			
	Stratum 1, level 1		**Stratum 1, level 2**	
Non-Cultural				
Annuals				
Spurge	+			
Perennials				
Juniper	twig +	+, twig +	twig +	twig +
Piñon	needle +	needle +	needle +	

+ 1-10/liter

LA 128805 (Classic Period Fieldhouse)

Cultural floral remains consisted of an unidentifiable plant part and a maize glume, cupule, and kernel fragments. Unburned intrusive plant parts included weedy annual seeds, grass stems, dropseed grass seeds, prickly pear cactus seeds, and conifer duff (Table 62.20).

Table 62.20. Room fill flotation sample plant remains from LA 128805.

FS No.	**161**	**162**	**176**	**185**	**199**	**211**
Grid	**105.2N/ 104.8E**	**103N/ 104E**	**103N/ 106E**	**104.9N/ 104.3E**	**104N/ 104E**	**105N/ 106E**
Cultural						
Cultivars						
Maize						cf. glume 1(1)
Other						
Unidentifiable		pp 1(0)				
Non-Cultural						
Annuals						
Goosefoot		+	+	+	+	+
Pitseed goosefoot						+
Spurge			+	+	+	
Grasses						
Grass family	culm +					
Other						
Dicot		leaf +				

FS No.	**161**	**162**	**176**	**185**	**199**	**211**
Grid	**105.2N/ 104.8E**	**103N/ 104E**	**103N/ 106E**	**104.9N/ 104.3E**	**104N/ 104E**	**105N/ 106E**
Perennials						
Juniper	twig +	♀ cone +, twig +	♀ cone +, twig +	+, ♀ cone +, twig +	+, ♀ cone +, twig +	♀ cone +, twig +
Pine	twig +	twig +	nsg +, twig +		twig +	bs +
Piñon	needle +	needle +	needle +, nutshell +	needle +	needle +	needle +
Ponderosa pine					needle +	needle +
Prickly pear cactus			+	+, embryo +		+

Table 62.20 (continued). Room fill flotation sample plant remains from LA 128805.

FS No.	**210**	**225**	**246**	**248**
Grid	**102N/106E**	**105.2N/105.7E**	**104.3N/106.4E**	**103N/104E**
Cultural				
Cultivars				
Maize		cupule 2(0), cf. kernel 1(0)		
Non-Cultural				
Annuals				
Goosefoot		+	+	+
Pitseed goosefoot				
Spurge	+		+	+
Grasses				
Dropseed grass		+		
Perennials				
Juniper	twig +	twig +	+, twig +	twig +
Pine	twig +	bs +	bs +	twig +
Piñon	needle +, nutshell +		needle +	needle +
Ponderosa pine			needle +	

+ 1-10/liter, bs barkscale, cf. compares favorably, nsg needle spindle gall, pp plant part.

Flotation wood charcoal included pine, piñon, and saltbush/greasewood (Table 62.21). Vegetal samples from room fill yielded a maize kernel and kernel fragments and cupules (Table 62.22). Piñon was the most common wood by weight in vegetal samples, followed by ponderosa and cf. rabbitbrush. Two fragments of cf. wolfberry were also identified, along with several pieces of oak, pine, unknown conifer, saltbush/greasewood, and unknown non-conifer.

Table 62.21. Room fill flotation sample wood charcoal taxa by count and weight in grams from LA 128805.

FS No.	199	211	246	248
Grid	**104N/104E**	**105N/106E**	**104.3N/106.4E**	**103N/104E**
Stratum	**2, Level 2**		**3, Level 3**	
Conifers				
Pine	1/<0.1 g			
Piñon		3/<0.1 g		
Unknown conifer		3/<0.1 g	2/<0.1 g	
Non-Conifers				
Saltbush/greasewood		1/<0.1 g		2/<0.1 g
Unknown Non-Conifer				1/<0.1 g

Table 62.22. Room fill, vegetal sample carbonized plant remains, by count and weight in grams from LA 128805.

FS No.	152	153	155	160	164	173	178	189
Grid	**105N/105E**		**103N/ 105E**	**104N/ 105E**	**103N104E**	**105N/ 104E**	**103N/ 106E**	**104N/ 106E**
Stratum	**2, Level 2**							
Non-Wood								
Cultivars								
Maize	kernel 1(1)/0.1 g		cf. kernel 8(0)/<0.1 g		cupule 1(0)/<0.1 g		poss. kernel 7(0)/<0.1 g	
Wood								
Conifers								
Pine								1/<0.1 g
Piñon		3/0.3 g		4/0.1 g	4/0.1 g			
Ponderosa pine			1/<0.1 g	1/<0.1 g	1/<0.1 g	3/0.2 g		
Unknown conifer		1/<0.1 g						
Non-Conifers								
Oak					1/<0.1 g			1/<0.1 g
cf. Rabbitbrush				2/0.1 g			1/<0.1 g	6/0.7 g
Saltbush/ greasewood				2/<0.1 g	3/0.1 g			
cf. Wolfberry				2/0.4 g				
Totals	-	4/0.3 g	1/<0.1 g	11/0.6 g	9/0.2 g	3/0.2 g	1/<0.1 g	8/0.7 g

Table 62.22 (continued). Room fill, vegetal sample carbonized plant remains, by count and weight in grams from LA 128805.

FS No.	192	195	198	216	220	233	230	234
Grid	103N/ 106E	104N/ 106E	104N/ 104E	105N/106E		102N/ 104E	105N/105E	105N/ 104E
Stratum	2, level 2						3, level 3	
Non-Wood								
Cultivars								
Maize		cupule 1(1)/<0.1 g					kernel 1(1)/<0.1 g	
Wood								
Conifers								
Pine			2/0.1 g		1/<0.1 g		1/<0.1 g	
Piñon							6/1.0 g	1/0.1 g
Ponderosa pine			2/<0.1 g	2/0.8 g			3/0.1 g	
Unknown conifer	1/<0.1 g							
Non-Conifers								
Oak			1/<0.1 g				1/<0.1 g	
cf. Rabbitbrush			5/0.2 g					
Saltbush/ greasewood			1/<0.1 g			1/0.1 g		
Unknown Non-Conifer							1/<0.1 g	
Totals	1/<0.1 g	-	11/0.3 g	2/0.8 g	1/<0.1 g	1/0.1 g	12/1.1 g	1/0.1 g

Table 62.22 (continued). Room fill, vegetal sample carbonized plant remains, by count and weight in grams from LA 128805.

FS No.	238	241	249	Total Wood	
Grid	105N/ 106E	104N/ 104E	103N/ 104E	Weight	%
Stratum	3, level 3				
Conifers					
Pine	4/0.2 g	1/0.2 g	1/0.1 g	0.6 g	12
Piñon				1.6 g	33
Ponderosa pine	1/<0.1 g			1.1 g	22
Unknown conifer				<0.1 g	<1
Non-Conifers					
Oak				<0.1 g	<1
cf. Rabbitbrush				1.0 g	20
Saltbush/greasewood				0.2 g	4
Unknown Non-Conifer				<0.1 g	<1
cf. Wolfberry				0.4 g	8
Totals	5/0.2 g	1/0.2 g	1/0.1 g	4.9 g	100

Since maize was the only identifiable non-wood plant recovered, it might be safe to say that tending maize fields was the primary focus of fieldhouse occupants. Despite the absence of a formal thermal feature, the presence of maize and wood charcoal indicates maize was processed inside the structure and that a variety of locally available conifers and shrubs were used for fuel or construction material.

Airport Tract

LA 86534 (Middle Coalition Period Roomblock)

Maize cupules were the most frequently recovered plant remains at LA 86534, followed by goosefoot seeds (Table 62.23). The only other plant parts that occurred with a percent presence over 20 percent were pine bark scales, piñon and ponderosa needles, and purslane seeds. Maize kernels were present in 15 percent of the samples, yet the percent presence of maize cupules was 94 percent. Kernel absolute counts were extremely low, totaling only 15 in flotation and vegetal samples, with a mere three intact specimens. Several possible explanations come to mind: 1) maize was grown at or near the site, but shelled corn was taken elsewhere for consumption or storage, 2) unlike at LA 135290 where maize was probably stored either on the roof or in back rooms, maize was stored in a room or pits that were covered by the construction of New Mexico Highway 502, or 3) rooms were cleaned out before abandonment. Differential preservation is probably not a factor because preservation seems to be fairly good at LA 86534 with 14 taxa present and more occurrences of the elusive piñon nutshell than at LA 135290. Possible squash (rind was recovered in the kiva hearth and on the floor of Room 4) was the only other cultivar identified at the site.

Table 62.23. Ubiquity of flotation sample carbonized plant remains from LA 86534.

Common Name/Plant Part	Count*	Percent**
Cheno-am seed	6	11
Evening primrose seed	1	2
Four-wing saltbush fruit	6	11
Four-wing saltbush seed	1	2
Goosefoot family seed	2	4
Goosefoot seed	34	64
Grass family caryopsis	1	2
Grass family culm	1	2
Groundcherry seed	1	2
Juniper female cone	1	2
Juniper twig	1	2
Maize cupule	50	94
Maize cupule segment	1	2
Maize embryo	1	2
Maize glume	2	4
Maize kernel	8	15

Common Name/Plant Part	Count*	Percent**
Mint family seed	1	2
Monocot stem	1	2
Pigweed seed	7	13
Pine bark scale	15	28
Pine needle	1	2
Pine umbo	5	9
Piñon needle	23	43
Piñon nutshell	8	15
Piñon twig	1	2
Ponderosa pine needle	21	40
Purslane seed	12	23
Squash/coyote gourd rind	2	4
Sunflower family achene	1	2
Unidentifiable seed	2	4
Unidentifiable plant part	8	15
Unknown # 1 stem	1	2
Unknown # 1 plant part	3	6

*Count: Number of samples with common name/plant part present. **%: Number of samples with common name/plant part divided by total number of flotation samples with charred remains (53) × 100.

Aside from piñon nutshell, perennial floral material possibly unrelated to fuel use was restricted to four-wing saltbush fruit. Juniper twigs and cones and pine bark, needles, and twigs are probably firewood debris. Grass family stems and seeds, found in the Room 1 and Room 9 (kiva) hearths, were the sole representatives from this plant category.

Ponderosa pine was the most common wood taxon identified in flotation samples (Table 62.24). Oak and mountain mahogany occur in nearly the same frequency as juniper. Cottonwood/willow, present in 23 percent of flotation samples at nearby LA 135290, is absent from the flotation wood assemblage at LA 86534. Another riparian type, New Mexico locust (found in river bottoms, along streams, and in canyons at 1371 to 2743 m [4500 to 9000 ft; Carter 1997:440]), was present, but only in two samples. Mountain mahogany was found at LA 86534 in slightly more than double the number of samples from LA 135290.

Table 62.24. Ubiquity of flotation sample wood charcoal taxa from LA 86534.

Common Name	Count*	Percent**
Juniper	14	26
Mountain mahogany	13	25
New Mexico locust	2	4
Oak	15	28
Pine	41	77
Piñon	31	58
Ponderosa pine	37	70
Rose family	1	2
Saltbush/greasewood	10	19

Unknown conifer	52	98
Unknown non-conifer	2	4

*Count: Number of samples with wood taxon present. **%: Number of samples with wood taxon present divided by total number of flotation samples with wood charcoal (53) × 100.

Vegetal Samples. The greatest difference between flotation and vegetal sample wood taxa from LA 86534 is the ubiquity of juniper, present in 51 percent of vegetal samples versus 26 percent of flotation samples (Table 62.25). Like the wood assemblage from flotation samples, ponderosa pine and unknown conifer were the most common taxa present. Box elder, cottonwood/willow, Douglas fir, and wolfberry were identified wood taxa that were not present in flotation samples. Any differences in flotation and vegetal sample wood taxa may be a function of context. The majority of vegetal samples with wood were from post-occupational fill and rooffall, while flotation samples were primarily from thermal features.

Table 62.25. Ubiquity of vegetal sample wood charcoal from LA 86534.

Common Name/Plant Part	Count*	Percent**
Box elder wood	1	2
Cottonwood/willow wood	5	8
Douglas fir wood	8	13
Juniper wood	31	51
Mountain mahogany wood	23	38
Oak wood	23	38
Pine wood	38	46
Piñon wood	48	79
Ponderosa pine wood	58	95
Rose family wood	2	3
Saltbush/greasewood wood	15	25
Unknown conifer wood	51	84
Unknown non-conifer wood	3	5
Wolfberry wood	1	2

*Count: Number of samples with common name/wood present. **%: Number of samples with common name/wood divided by total number of vegetal samples with wood charcoal (61) × 100.

Maize cupule segments and cupules were plant remains most frequently encountered in vegetal samples from LA 86534 (Table 62.26). The percent presence of kernels is only 11 percent at LA 86534 as opposed to 72 percent in vegetal samples from LA 135290. Measurements of five cobs from LA 86534 (Table 62.27), one 12-rowed and four 10-rowed, suggest they are considerably less robust than those from LA 135290, but with such a small sample, it is impossible to know if the cobs from LA 86534 are representative or not (Figure 62.4).

The only other carbonized non-wood plant parts were pine cone umbos, most likely firewood debris. An uncharred cholla bud was recovered from Feature 1 in Room 5, Stratum 1. This Stratum is described as loose post-occupational fill with areas of high organic content from juniper and piñon duff and the room as a whole was highly disturbed by bioturbation (see Chapter 24, Volume 2), so the bud most likely represents modern surface debris.

Table 62.26. Ubiquity of vegetal sample charred plant remains from LA 86534.

Common Name/Plant Part	Count*	Percent**
Maize cob	4	21
Maize cupule	10	53
Maize cupule segment	11	58
Maize kernel	2	11
Maize shank	1	5
Pine twig	1	5
Pine umbo	3	16
Unidentifiable plant part	1	5

*Count: Number of samples with common name/plant part present. **%: Number of samples with common name/plant part divided by total number of vegetal samples with carbonized plant remains (19) × 100.

Figure 62.4. *Zea mays* cobs from LA 86534.

Table 62.27. *Zea mays* cob morphometrics (in mm) from LA 86534.

FS No.	Row #	Type	Length	Rachis Segment Length	Cob Diameter	Cupule Width
1677	12	ST	14.5	3.4	8.3	4.2
1866	10	ST	13.1	3.4	8.7	4.0
1869	10	ST	36.5	3.3	12.8	6.4

FS No.	Row #	Type	Length	Rachis Segment Length	Cob Diameter	Cupule Width
1869	10	ST	17.6	2.7	7.8	4.5
1869	10	ST	25.5	3.4	9.7	5.0
Averages	10	All straight	21.4	3.2	9.5	4.8

Rooms. Front and back rooms were distinguished by low densities of plant remains as well as low taxonomic diversity. Maize cupules, annual seeds, and conifer needles were recovered from both sets of rooms. Despite the disparity in the number of samples analyzed (8 from back rooms versus 20 from front rooms), differences in assemblages between front and back rooms were not remarkable. A four-wing saltbush fruit fragment and squash/coyote gourd rind were recovered from the back rooms, while evening primrose and grass seeds, piñon nutshell, and a wider variety of conifer detritus were recovered in front rooms. This is logical, as hearths were exclusive to front rooms where food preparation took place and a greater percentage of fuelwood debris would be expected. Rather than questioning the interpretation of back rooms as storage spaces, the paucity of plant material from back rooms could indicate they were cleared out before abandonment. Juniper, piñon, ponderosa, mountain mahogany, and saltbush/greasewood wood occurred in both front and back rooms; oak and New Mexico locust were found only in front rooms and rose family wood was identified only in back rooms. Flotation wood from thermal features and non-thermal contexts was undifferentiated. Ponderosa was by far the most common taxon identified.

Front Room Hearths and Room 6 Features

Plant remains were quite different from primary- and secondary-use deposits of the hearth in Room 1. Ponderosa pine and unknown conifer charcoal were identified in both deposits, but the similarity ends there. Annual and grass family seeds were identified in the primary-use deposits together with juniper wood, while maize parts and ponderosa pine needles were present in secondary-use deposits along with mountain mahogany, saltbush/greasewood, piñon, and pine wood. The hearth fill (Feature 2) of Room 2 produced goosefoot seeds, maize parts, and piñon nutshell. The pine cone scales that were also identified in the hearth could be evidence for home-based processing of nuts for storage or consumption. Ethnographic accounts of piñon processing refer to nuts "gathered in the cone," with the cone later "burned off the nuts near where gathered or after the return home" (Reagan 1928:146–147; see also Murphey 1959:23). Other accounts note how roasting the nuts benefits both flavor and preservation (Castetter 1935:42; Robbins et al. 1916:41; M. Stevenson 1993:36; Swank 1932:61). Tobacco was also identified in Feature 2 fill, but because it was uncharred it may merely indicate that tobacco grew near the site and the seeds were deposited by insects or other vectors. However, uncharred tobacco seeds were identified from back rooms as well (the milling bin in Room 6 and the floor of Room 4), suggesting tobacco plants could have been stored in back rooms and may be the source of the seeds in Room 2. The milling bin in Room 6 also contained maize cupules and juniper, ponderosa pine, saltbush/greasewood, and unknown conifer wood. The lined pit in Room 6 yielded four-wing saltbush fruit, piñon needles, maize cupules, and four wood taxa. The array of taxa from both features suggests mixed fill and that the contents cannot be directly related to the use of features.

Room 9 (Kiva)

The kiva, in contrast to the roomblock, yielded a higher diversity of taxa (11) and several taxa were only found in kiva contexts including groundcherry, mint family, sunflower family, and most significantly, tobacco. The majority of maize kernels were recovered in the kiva hearth and ash pit, including two of the three measurable specimens from the site. Along with tobacco, several members of the sunflower family were used ceremonially by the Zuni (M. Stevenson 1993). Interpretation of room function often separates food preparation activities from ritual practices. Cushing (1974) describes songs and dances that accompany corn grinding; in other words, food preparation was a sacred endeavor and perhaps not necessarily conducted strictly in habitation rooms. Maize was also part of ceremonies like one described by Stevenson (1993:65–66) at Zuni where maize ears with kernels of a variety of colors were placed around a medicine bowl on an altar, representing the four cardinal directions and above and below. The kiva was most likely a center for processing plants as well as ceremonial activities. Wood taxa, with the exception of New Mexico locust, were the same as those identified in front rooms.

Of the two sites excavated on the Los Alamos Town Site Mesa dating to the Middle Coalition period (LA 86534 and LA 135290), only LA 86534 appears to have had a formal underground ceremonial room. Perhaps this served as a center for ritual activities for both habitations, and agricultural products and subsistence activities were shared. Primary storage facilities could have been located at LA 135290, offering a possible explanation for the scarcity of maize kernels at LA 86534. Evidence for exploitation of at least three annual, two perennial, and two cultivated taxa was present. A variety of high- and lower-elevation conifers, riparian trees, and local shrubby species were used for firewood and construction material.

LA 135290 (Middle Coalition Period Roomblock)

Evidence for the triad of maize, beans, and squash was present in flotation samples. As at LA 86534, maize cupules were the most common plant remains recovered, followed by goosefoot and cheno-am seeds (Table 62.28). Maize kernels, on the other hand, were present in a much higher percentage of samples (41%) than at LA 86534.

Table 62.28. Ubiquity of flotation sample carbonized plant remains from LA 135290.

Common Name/Plant Part	Count*	Percent**
Bean cotyledon	4	5
Beeweed embryo	1	1
Cheno-am seed	37	49
Dropseed grass caryopsis	8	11
Evening primrose seed	1	1
Goosefoot seed	39	52
Grass family caryopsis	4	5
Grass family culm	5	7
Juniper female cone	1	1
Juniper seed	2	3

Common Name/Plant Part	Count*	Percent**
Juniper twig	3	4
Juniper twigscale	1	1
Knotweed family seed	1	1
Maize cob	2	3
Maize cupule	61	81
Maize cupule segment	8	11
Maize embryo	5	7
Maize glume	13	17
Maize kernel	31	41
Maize shank	1	1
Mint family seed	10	13
Pigweed seed	14	19
Pincushion cactus seed	2	3
Pine bark scale	10	13
Pine umbo	4	5
Piñon pine needle	21	28
Piñon pine nutshell	1	1
Plantain seed	1	1
Ponderosa pine needle	29	39
Purslane family seed	2	3
Purslane seed	21	28
Squash/coyote gourd rind	2	3
Sunflower family achene	5	7
Tobacco seed	5	7
Unidentifiable embryo	1	1
Unidentifiable seed	7	9
Unidentifiable plant part	14	19
Unknown # 1 seed	1	1
Unknown # 2 seed	1	1
Winged pigweed seed	1	1

*Count: Number of samples with common name/plant part present. **%: Number of samples with common name/plant part divided by total number of flotation samples with charred remains (75) × 100.

Maize cupules were found everywhere except floor matrix and Floor 2 contexts and although present in every room, they were the most common in Rooms 1 and 2. Kernels were also encountered most often in Room 2. Beans were found on the floor of Room 1, in Room 2 rooffall, and in the fill of Features 4 and 11 in Room 2. Possible squash rind occurred on the floor surface of the doorway between Rooms 4 and 5. Squash pollen identified on the floor of Room 1 confirms the identity of the rind also encountered from this context as squash.

Grasses had a low percent presence; dropseed grass occurred in 11 percent and grass family seeds in 5 percent of flotation samples. The only perennial genera with a percent presence above 10 are those that are most likely an artifact of fuelwood use like piñon and ponderosa pine needles. Piñon nutshell in particular is extremely scarce, limited to one sample only.

Ponderosa pine was the most common wood taxon encountered in flotation samples (Table 62.29), found in 12 percent more flotation samples than at the neighboring site LA 86534. Piñon and unknown conifer were the next most prevalent taxa. Riparian resources were represented by cottonwood/willow. A few of the same shrubby species found at LA 86534 were identified at LA 135290 and included mountain mahogany, oak, and saltbush/greasewood. Douglas fir, recovered in a single sample, is generally from slightly higher elevations or canyon slopes and could have been brought from Pueblo Canyon or DP Canyon.

Table 62.29. Ubiquity of flotation sample wood charcoal taxa from LA 135290.

Common Name/Plant Part	Count*	Percent**
Cottonwood/willow wood	16	23
Douglas fir wood	1	1
Juniper wood	34	48
Mountain mahogany wood	6	8
Oak wood	27	38
Pine wood	23	32
Piñon pine wood	43	61
Ponderosa pine wood	58	82
Saltbush/greasewood wood	9	13
Unknown conifer wood	41	58
Unknown non-conifer wood	5	7

*Count: Number of samples with common name/plant part present. **%: Number of samples with common name/plant part divided by total number of flotation samples with charred remains (71) × 100.

Vegetal Samples. Maize kernels had the highest percent presence of non-wood plant remains in vegetal samples (Table 62.30). Although maize kernels were found in every room except 8 and 9A, the majority of kernels were from the fill of Rooms 1 and 6. Three kernel masses were also found in the room fill from Room 6 (Figure 62.5). The kernels could be part of rooffall debris that is indistinguishable from the general room fill. Although excavators in many cases could distinguish between upper and lower room fill layers (lower sections contained more charcoal, botanical remains, artifacts and roof casts; see Chapter 25, Volume 2), these were not always discernable.

Table 62.30. Ubiquity of vegetal sample carbonized plant remains from LA 135290.

Common Name	Count*	Percent**
Bean cotyledon	6	17
Bean seed	1	3
Beeweed stem	1	3
Maize cob	10	28
Maize cupule	3	8
Maize cupule segment	10	28
Maize fused kernel mass	1	3
Maize kernel	26	72
Maize shank	2	6

Common Name	Count*	Percent**
Pine bark scale	1	3

*Count: Number of samples with common name/plant part present. **%: Number of samples with common name/plant part divided by total number of vegetal samples with carbonized non-wood plant remains (36) × 100.

Maize cobs (17) from Rooms 1, 2, 3, and 5 were measured and had an average cob diameter of 11.9 mm and an average cupule width of 5.6 mm (Table 62.31; Figure 62.6). The average row number was 11.4. Comparison with cobs from LA 12587 and LA 86534 will follow in the discussion section.

Figure 62.5. Fused *Zea mays* kernel masses from LA 135290.

Figure 62.6. Example of measured *Zea mays* cobs from LA 135290.

Table 62.31. *Zea mays* cob morphometrics (in mm) from LA 135290.

FS No.	Room	Row #	Type	Length	Rachis Segment Length	Cob Diameter	Cupule Width
869	1	10	ST	7.3	3.0	6.8	4.6
874	1	12	ST	39.0	3.0	15.8	6.3
970	1	12	ST	67.1	3.9	15.8	7.3
1047	1	14	ST	38.3	3.4	13.7	6.0
1065	1	14	ST	27.9	3.7	17.6	6.2
1324	1	12	ST	31.0	3.7	10.0	5.5
1559	1	8?**	ST	24.7	3.2	12.2	7.1
1703	2	12	ST	19.0	3.7	12.2	5.9
1703	2	12	ST	13.1	3.7	13.0	5.7
1703	2	12	ST	25.1	3.2	11.7	5.5
1898	2	8	ST	7.3	3.0	6.8	4.6
2099	2	10	ST	7.8	0.6	6.2	2.5
1752	3	12	ST, F	11.6	3.5	11.4	4.5

FS No.	Room	Row #	Type	Length	Rachis Segment Length	Cob Diameter	Cupule Width
1752	3	10	ST	18.5	3.8	12.1	6.6
1752	3	12	ST, F	37.1	2.9	10.7	5.1
912	5	14	ST	24.4	3.4	13.6	4.9
912	5	10 ?	IR	16.8	3.8	9.1	5.5
Averages		11.4	6% IR 94% ST	25.8	3.3	11.9	5.6

** a few kernels present. F flattened, IR irregular, ST straight.

Beans were fairly widespread and were found in Rooms 1, 5, 6, 7, and 9A, primarily in room fill. Two beans were measurable from the site: one whole bean from a vegetal sample (FS 1201) that was 11.6 mm in height, 6.5 mm in width, and 4.9 mm thick and a single cotyledon from flotation sample FS 2353 that had a height of 10.8 mm, a width of 6.2 mm, and a thickness of 2.6 mm (Figure 62.7). Height and width measurements fall around the middle of the range given by Kaplan (1956: Table III) for *Phaseolus vulgaris,* or common bean. These also fit in the range of dimensions given for tepary beans, but the shape of the two species is quite different.

A possible beeweed stem (in vegetal sample from Room 1 lower fill, FS 1450) and embryo (in a flotation sample from Room 2 possible rooffall, FS 1897) mark the only archaeobotanical evidence for the potential use of this resource for the site.

As in flotation samples, ponderosa pine was the most common wood taxon in vegetal samples (Table 62.32). A partially burned roof beam fragment compared favorably to ponderosa pine. Cottonwood/willow, pine, and piñon occur in nearly equal percentages of samples (40% to 45%), while juniper was found in 29 percent of samples. Douglas fir is slightly more abundant than in flotation samples, present in 5 of the 55 samples containing charcoal. The same shrubby species encountered in flotation samples (mountain mahogany, saltbush/greasewood, and oak) were identified in vegetal samples.

Table 62.32. Ubiquity of vegetal sample wood charcoal from LA 135290.

Common Name	Count*	Percent**
Cottonwood/willow	22	40
Douglas fir	5	9
Juniper	16	29
Mountain mahogany	12	22
Oak	12	22
Pine	25	45
Piñon pine	22	40
Ponderosa pine	53	96
Saltbush/greasewood	2	4
Unknown conifer	18	33
Unknown non-conifer	2	4

*Count: Number of samples with wood taxon present. **%: Number of samples with wood taxon divided by total number of vegetal samples with wood charcoal (55) × 100.

Figure 62.7. *Phaseolus* (common bean) specimen from LA 135290.

Back Rooms. Thirteen taxa were recovered from back rooms at LA 135290 including pincushion cactus and evening primrose, two taxa that were not found in front rooms. Cheno-am seeds were the most common plant materials recovered, followed by goosefoot seeds and maize cupules. Room 6 was the only back room where notable quantities of plant material were recovered and may indicate storage of corn either on the roof or on the floor. Three masses of kernels and 99 loose kernels were recovered from rooffall and room fill. Ponderosa pine was present in all but four of the 16 flotation samples with wood charcoal and was by far the most frequently encountered taxon, both in rooffall vegetal samples and all other samples.

Front Rooms. Fifty-five flotation samples were analyzed from front rooms, slightly more than three times the number analyzed from back rooms (17). Analysis documented the presence of 16 taxa. Beans, dropseed grass, piñon, plantain, tobacco, and winged pigweed were taxa recovered from front rooms that were not identified in back rooms. Maize cupules and kernels and goosefoot and cheno-am seeds were the predominant plant parts in samples. Features were present in Rooms 1, 2, and 8. Plant remains from two adobe-lined pits in Room 1 were restricted to maize cupules. The complex of features composed of a collared hearth (Feature 1) and three adobe-lined pits (Features 3, 4, and 6) in Room 2 all contained similar taxa including weedy annuals, mint family, and maize. The hearth that was attached to Pit 3 was the last floor feature in Room 2 to be constructed and displays no signs of burning. Consequently, it may never have been used as a thermal feature. The similarity of plant remains from the complex of features indicates the contents represent room fill, confirming the excavator's observation that the fill of these pits was quite similar to the Stratum 4 sediments surrounding them.

Two superimposed hearths were located just southeast of Feature 1 in Room 2. Feature 16 may have been cleaned out before the construction of the upper hearth (Feature 11); there was a layer of sandy fill between it and Floor 1. Feature 16 was also partially destroyed when the upper hearth was built. These two factors probably account for the paucity of floral material recovered that was limited to goosefoot seeds and maize cupules. The fill of Feature 11 was described as quite distinct from that encountered in the other pit features. The sides of the pit were burned and the fill was very ashy with lots of adobe and charcoal mixed with the clay loam soil (see Chapter 25, Volume 2). Feature 11 was also capped with an ash lens. Plant remains from the upper and lower fill did not differ greatly. Tobacco was the most intriguing taxon found in both the upper and lower fill, indicating sequestered use of this important ceremonial plant. Annual seeds, grass family seeds, and maize cob parts and kernels were repetitive of taxa found elsewhere in the room. Beans, dropseed grass, and mint family were recovered only from upper fill while winged pigweed was recovered exclusively from lower fill.

Patches of burned sediment or adobe and charcoal on the floor of Rooms 2 and 3 were presumed to be rooffall material. However, plant remains were not significantly different from those found in Features 1 and 4 or the upper fill of Feature 11, suggesting that distinguishing rooffall from room or feature fill is not possible. The number of features located in Room 2 was the highest, more being added as time progressed. The bulk of the maize remains from the site (135 whole kernels and 12 of 17 cobs) were recovered from Rooms 1 and 2. Taxonomic diversity was also high (n = 14) in Room 2 compared to other rooms with the exception of Room 5, which yielded 12 taxa. Not only were tobacco seeds found solely in Room 2 contexts, but plantain, beeweed, piñon nutshell, and winged pigweed were also found exclusively in Room 2. Of these, like tobacco, beeweed and winged pigweed have ritual associations. Beeweed pigment made from boiling down large quantities of the plant and allowing it to thicken (Robbins et al. 1916:59) was used to paint pottery or ritual items (Adams et al. 2002) and the stems (found in Room 1) were used by the Hopi to make prayer sticks (Voth 1901:78). Winged pigweed medicine is associated with the grandmother of the Gods of War in Zuni stories. She gave it to them, instructing them that when they were near the enemy they should chew the blossoms of the plant and spit the masses into their hands and rub them together. This resulted in a yellow light that spread over the world, obscuring their enemy's ability to aim their arrows surely (M. Stevenson 1993:50). These factors indicate that Room 1 and especially Room 2 were probably the center of food preparation activities and Room 2 was also the focus of ritual activity.

Despite the collection of nine samples from the hearth (Feature 9) in Room 8, taxonomic diversity was low; cheno-am, goosefoot, and purslane seeds were identified together with maize cupules, glumes, and kernels. Rooms 9A and 9B had extremely low densities of plant material and taxonomic diversity; cheno-ams, goosefoot, mint family, and purslane seeds were recovered along with maize cupules. The east wall of room 9A was never a standing wall and it is unclear whether any of the walls of Room 9B were ever completed, thus any plant-related activities that took place in the rooms may have been chiefly obliterated from exposure to the elements.

Wood from hearths and non-thermal features in front rooms was predominately ponderosa pine, piñon, and juniper. Cottonwood/willow, often associated with roofing material, was actually more common in hearth samples than from non-thermal contexts. Ponderosa pine, oak, and unknown conifer were the most frequently identified woods in flotation and vegetal rooffall samples from front rooms. Corn, beans, and squash were probably grown nearby and weedy annuals that either volunteered in agricultural fields or thrived in the disturbed ground around the site were harvested for their seeds and edible greens. At least two grass taxa, beeweed, pincushion cactus, knotweed family, evening primrose, and piñon could have been used for food, dye, or medicine. The recovery of tobacco suggests this plant was part of the ceremonial life of the people who inhabited LA 135290 during the Coalition period. Wood for construction and fuel was harvested from local sources.

LA 139418 (Classic Period Grid Garden)

Flotation samples from two of the three garden grids at LA 139418 produced unburned non-cultural plant remains, all representative of herbaceous plants or trees growing in the immediate vicinity of the site today, including goosefoot seeds and conifer duff (Table 62.33). A fragment of pine and another of unknown conifer charcoal were recovered from the rock concentration in the northwest corner of Grid 3. Vegetal sample charcoal was primarily pine (75% by weight), and cf. piñon, cf. ponderosa pine, unknown conifer, and saltbush/greasewood were also present (Table 62.34). The presence of charcoal in the grid garden could be a product of burning brush to clear or fertilize the fields as described in the discussion of grid gardens at LA 128803 in Chapter 19 (Volume 2). On the other hand, it could also represent natural slope wash into the grids. A radiocarbon sample consisting of several fragments of piñon pine charcoal from Stratum 2 within Grid 1 yielded an intercept date of AD 690, much earlier than the ceramics and geomorphologic context indicate. The charcoal was most likely surface material washed into the grid at its open northern end (see Chapter 23, Volume 2).

Table 62.33. Flotation sample plant remains from LA 139418.

FS No.	**318**	**363**	**341**	**367**
Feature	**Grid 2**		**Grid 3 (Stratum 2, level 1)**	
	Stratum 2, Level 1	**Stratum 5, Level 1**	**83.9N/105.9E**	**from rock concentration in NW corner**
Non-Cultural				
Annuals				
Goosefoot	+		+	+
Perennials				
Juniper	twig +		+, twig +	+, twig +
Pine	umbo +		♂ cone +, umbo +	umbo +
Piñon	needle +, nutshell +	needle +	needle +	needle +
Ponderosa pine	needle +		needle +	needle +

Table 62.34. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 139418.

FS No.	344	347	325	332	333	334	354	Totals	
Feature	Grid 1		Grid 2				Grid 3	Weight	%
	Stratum 3, level 1	Stratum 3, level 2	Stratum 2, level 1	Stratum 3, level 1	Stratum 2, level 2	Stratum 2, level 2	Stratum 3, level 2		
Conifers									
Pine	5/0.3 g	3 pc/9.3 g						9.6 g	75
cf. Piñon						3/0.3 g		0.3 g	2
cf. Ponderosa pine			3/0.8 g	3/0.5 g	5/1.1 g		3/0.3 g	2.7 g	21
Unknown conifer				3/0.2 g				0.2 g	2
Non-Conifers									
Saltbush/ greasewood	1/<0.1 g							<0.1 g	<1
Totals	6/0.3 g	3/9.3 g	3/0.8 g	6/0.7 g	5/1.1 g	3/0.3 g	3/0.3 g	12.8 g	100

LA 141505 (Classic Period Fieldhouse)

A possible corn cupule fragment from the northwestern corner of the Room 2 floor was the only cultural plant part recovered from flotation samples besides wood charcoal (Table 62.35). Modern intrusive material comprised the balance of the flotation plant record: uncarbonized weedy annual seeds, juniper twigs, pine umbos, and piñon needles.

Table 62.35. Flotation sample plant remains from LA 141505.

FS No.	22	74	82
Feature	Room 1 fill, SE corner	Room 1 floor	Room 2 floor, NW corner
Cultural Cultigens			
Maize			Possible 1(0) c
Non-Cultural Annuals			
Goosefoot	+		+
Other			
Purslane family			+
Perennials			
Juniper		+, twig +	twig +
Pine		umbo +	
Piñon		needle +	needle +

+1-10/liter.

Mountain mahogany and possible Douglas fir charcoal were found on the floor of Room 1 while pine and unknown conifer were identified from the Room 2 floor (Table 62.36).

Table 62.36. Flotation sample wood charcoal taxa by count and weight in grams from LA 141505.

FS No.	74	82
Context	**Room 1 floor**	**Room 2 floor, NW corner**
Conifers		
cf. Douglas fir	6/<0.1 g	
Pine		1/<0.1 g
Unknown conifer		6/<0.1 g
Non-Conifers		
Mountain mahogany	14/0.4 g	
Totals	20/0.4 g	7/<0.1 g

A sample from the fill of a rodent hole was taken as a control sample and, indeed, this sample was quite different from others, resembling a cache of rodent edibles that included large numbers of unburned juniper seeds and twigs, pine umbos, piñon seeds, and prickly pear cactus seeds (absent in all other samples; Table 62.37). Vegetal sample wood was similar to flotation with possible Douglas fir, mountain mahogany, and unknown conifer identified in the fill and floor of Room 1.

Table 62.37. Vegetal sample plant remains, by count and weight in grams from LA 141505.

FS No.	44	73	77	81
Feature	**Rodent hole fill control sample**	**Room 1 fill**	**Room 1 floor, south**	**Room 1 floor, west**
Cultural				
Conifers				
cf. Douglas fir			12/1.2 g	6/0.6 g
Unknown conifer		9/0.2 g	9/1.1 g	
Non-Conifers				
Mountain mahogany		3/0.2 g	7/1.2 g	
Non-Cultural				
Perennials				
Juniper	99(93)/2.3 g, 2(0) t/<0.1 g			
Pine	8(8) u/0.2 g			
Piñon	17(12)/2.5 g			
Prickly pear cactus	9(8)/<0.1 g			
Total Wood	-	12/0.4 g	28/3.5 g	6/0.6 g

+ 1-10/liter, t twig, u umbo.

The possible cupule fragment on the Room 2 floor could indicate corn was processed or burned for fuel in the room. Pine and mountain mahogany are readily available today at LA 141505, but Douglas fir may have come from Pueblo Canyon to the north or DP Canyon to the south. It is also possible that while the site was occupied Douglas fir grew closer, as this species has a range of 1981 m (6500 ft) to nearly tree line and the site is at an elevation of 2164 m (7100 ft).

Rendija Tract

LA 15116 (Classic Period Fieldhouse)

The majority of plant remains from this one-room fieldhouse associated with the Late Classic period consisted of burned and unburned conifer needles (Table 62.38). Aside from the piñon and ponderosa pine needles, cultural material was limited to single occurrences of burned seeds that compare favorably to dock along with grass family seeds and unidentifiable plant parts. The conifer needles are probably part of conifer fuel wood residue. Although young dock leaves can be eaten like spinach (H. Harrington 1967:90), basing use of the plant on the recovery of a single seed is dubious. Unburned seeds of this taxon were recovered from all three samples as well, making it even more difficult to say with any certainty that the seed represents economic use.

Table 62.38. Flotation sample plant remains, count, and abundance from LA 15116.

FS No.	**31**	**59**	**60**
Feature	**Fill on top of Living surface**	**Living surface**	**Living surface**
Cultural			
Grasses			
cf. Grass family	1(1)		
Other			
Unidentifiable	1(0) pp		1(0) pp
Perennials			
cf. Dock	1(1)		
Piñon	+ needle		
Ponderosa pine	+ needle	+ needle	+ needle
Non-Cultural			
Annuals			
Goosefoot		+	
Grasses			
Grass family	+ floret		
Other			
Composite family	+		
Perennials			
cf. Dock	+	+	+
Piñon	+ needle		+ needle
Ponderosa pine	+ needle		

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter, cf. compares favorably, pp plant part.

Ponderosa pine dominated the wood assemblage, but oak, piñon, sagebrush, and unknown conifer were also present (Table 62.39). The most that can be said about subsistence at LA 15116 is that local wood resources were used for fuel or construction.

Table 62.39. Flotation sample wood charcoal by count and weight from LA 15116.

FS No.	31	59	60
Feature	**Fill on top of living surface**	**Living surface**	**Living surface**
Conifers			
Piñon	3/0.1 g		
Ponderosa pine	4/0.1 g	2/<0.1 g	3/<0.1 g
Unknown conifer		3/<0.1 g	
Non-Conifers			
Mountain mahogany			2/<0.1 g
Totals	7/0.2 g	5/<0.1 g	5/<0.1 g

LA 70025 (Early-Middle Classic Period Fieldhouse)

LA 70025, which was located on a ridge near the mouth of Cabra Canyon, yielded very little in the way of non-wood cultural plant remains (Table 62.40). Charred grass stems from inside a pot base were the only possible materials associated with the occupation of the site. Unburned grass stems, sunflower seeds, and ponderosa pine needles were recovered as well, but have no cultural affiliation.

Table 62.40. Flotation sample plant remains, count and abundance per liter from LA 70025.

FS No.	24	43
Feature	**Inside pot base**	**Floor surface**
Cultural		
Grasses		
Grass family	+ stem	
Non-Cultural		
Annuals		
Sunflower		+
Grasses		
Grass family		+ stem
Perennials		
Ponderosa pine		+ needle

+ 1-10/liter

Ponderosa pine was the primary wood charcoal taxon identified; mountain mahogany and unknown conifer were also present (Table 62.41). The grass stems could have been used as a cushion for the pot or as tinder and local wood resources were used for fuel or construction.

Table 62.41. Flotation sample wood charcoal by count and weight in grams from LA 70025.

FS No.	21	24	43
Feature	**Post-occupational fill**	**Inside pot base**	**Floor surface**
Conifers			
Ponderosa pine	8/0.1 g	8/0.5 g	1/<0.1 g
Unknown conifer		2/<0.1 g	3/0.1 g
Non-Conifers			
Mountain mahogany		4/0.1 g	
Totals	8/0.1 g	14/0.6 g	4/0.1 g

LA 85403 (Classic Period Fieldhouse)

Maize cupules, a possible goosefoot seed fragment, a purslane seed, pine bark, and an unidentifiable plant part comprised the cultural plant material recovered from this one-room masonry fieldhouse (Table 62.42). Maize could have been grown near the fieldhouse that was located on a relatively flat, open area along the south side of Rendija Canyon. Pine bark is most likely part of the firewood residue. The goosefoot seed fragment and purslane seed may indicate use of these weedy annual plants that proliferate in agricultural fields. Local woods were used as fuel and included oak, ponderosa pine, and unknown conifer (Table 62.43).

Table 62.42. Flotation plant remains, count and abundance per liter from LA 85403.

FS No.	18	23	24	27	53
Feature	**Ash/charcoal area in fill**	**Room 1 westernmost portion, floor**		**Ash/charcoal area**	**Fea. 1, Pit fill**
Cultural					
Annuals					
cf. Goosefoot		1(0)			
Purslane		1(1)			
Cultivars					
Maize			1(0) cf. c		5(0) c
Other					
Unidentifiable					1(0) pp
Perennials					
Pine				+ barkscale	
Non-Cultural					
Annuals					
Goosefoot	+			+	+
Purslane	+				
Grasses					
Dropseed grass				+	
Grass family				+	
Other					

FS No.	18	23	24	27	53
Composite family				+	
Groundcherry					+
Spurge				+	
Perennials					
cf. Dock	+			+	
Hedgehog cactus					+
Pine				+	
Ponderosa pine	+ needle			+ fascicle, + needle	

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + = 1-10/liter, c = cupule, cf. = compares favorably, pp = plant part.

Table 62.43. Flotation sample wood charcoal by count and weight in grams from LA 85403.

FS No.	23	24	27	49	53
Feature	**Room 1 westernmost portion, floor**		**Ash/ charcoal area**	**Far NE corner, Room 1, floor**	**Fea. 1, Pit fill**
Conifers					
Ponderosa pine			1/<0.1 g	3/0.1 g	6/0.1 g
Unknown conifer	1/<0.1 g	1/<0.1 g			4/0.1 g
Non-Conifers					
Oak		1/<0.1 g	3/0.1 g		
Totals	1/<0.1 g	2/<0.1 g	4/0.1 g	3/0.1 g	10/0.2 g

LA 85404 (Early-Middle Classic Period Fieldhouse)

Charred goosefoot and groundcherry seeds found on the floor of the structure, and two corn cupule fragments from the northwest corner, were the only cultural plant remains aside from conifer duff that were recovered at LA 85404 (Table 62.44). A possible pine seed and ponderosa pine needles comprised the unburned, probably non-cultural material from flotation samples. Uncharred tobacco seeds were recovered from both burned floor samples. These could be residue from plants brought into the structure for ceremonial use, although because the seeds are unburned the verdict is uncertain. Goosefoot seeds could have been ground into meal, groundcherry fruits may have been boiled or eaten raw, and corncobs were probably used for fuel along with piñon, ponderosa pine, oak, sagebrush, and possible Douglas fir wood (Table 62.45).

Table 62.44. Flotation plant remains, count and abundance per liter from LA 85404.

FS No.	68	72	93	94	106
Feature	NW corner	Post-occupational fill, Stratum 2, Level 3	Burned floor 104.33N/ 102.14E	Burned floor 104.56N/ 103.25E	NW corner, charcoal area
Cultural					
Annuals					
Goosefoot				3(3)	
Cultivars					
Maize	2(0) c				
Other					
Groundcherry				1(0)	
Perennials					
Pine		+ barkscale, + umbo			
Piñon	+ needle	+ needle	+ needle	+ needle	+ needle
Ponderosa pine	+ fascicle, + needle	+ fascicle, + needle	+ needle	+ needle	+ needle
Possibly Cultural					
Annuals					
Tobacco			+	+	
Non-Cultural					
Perennials					
Pine		cf. +			
Ponderosa pine		+ needle		+ needle	+ needle

All plant remains are seeds unless indicated otherwise. Cultural plant remains are charred, non-cultural plant remains are uncharred. + 1-10/liter, c cupule, cf. compares favorably.

Table 62.45. Flotation sample wood charcoal by count and weight in grams from LA 85404.

FS No.	68	72	93	94	106
Feature	NW corner	Post-occupational fill, Strat 2, Level 3	Burned floor 104.33N/ 102.14E	Burned floor 104.56N/ 103.25E	NW corner, char-coal area
Conifers					
poss. Douglas fir			8/0.6 g		
Pine	2/0.3 g	2/0.1 g		3/0.2 g	
Piñon	6/0.3 g	1/<0.1 g		8/0.2 g	

FS No.	68	72	93	94	106
Ponderosa pine	9/0.3 g	11/0.6 g	5/0.7 g	4/0.1 g	3/0.3 g
Unknown conifer	3/0.1 g	5/<0.1 g	5/0.1 g	4/<0.1 g	17/1.2 g
Non-Conifers					
Oak			2/0.2 g		
cf. Sagebrush		1/<0.1 g		1/<0.1 g	
Totals	20/1.0 g	20/0.7 g	20/1.6 g	20/0.5 g	20/1.5 g

LA 85859 (Early Archaic Lithic Scatter)

The majority of flotation and vegetal samples were from the center of the main activity area (90N/190E) from strata that yielded the highest number of lithic artifacts. One of these samples produced a goosefoot seed fragment. The remaining assemblage consisted of burned and unburned conifer duff including pine cone fragments, piñon and ponderosa needles, and juniper twigs (Table 62.46). Samples from that part of the site along the upper western margin (FS 353) and from the northeastern portion of the site (FS 310) also contained unburned weed seeds of goosefoot, spurge, bean family, composite family, and the knotweed family.

Table 62.46. Flotation sample plant remains from LA 85859.

FS No.	108	123	136	143	310	31	34
Feature	**90.9N/109.7 Stratum 3a, level 3**	**90.95/109.7 Stratum 3b, level 4**	**90.95/109.8 Stratum 3c, level 5**	**90.95/109.85 Stratum 3c, level 6**	**92/114 Stratum 1**	**92/114 Stratum 2**	**90/112 Stratum 3a**
Cultural							
Annuals							
Goosefoot				1(0)			
Perennials							
Juniper					twig +		
Pine					poss. ♂ cone +, umbo +	umbo +	
Ponderosa pine	needle + pc		needle +		needle +	needle +	
Non-Cultural							
Annuals							
Goosefoot					+		
Spurge					+		
Other							
Bean					+		

family							
Composite family					+		
Perennials							
Juniper		twig +			+, twig +	twig +	
Pine					umbo +		
Piñon		needle +			nutshell +		
Ponderosa pine	needle +	needle +	needle +		needle +	needle +	needle +

Table 62.46 (continued). Flotation sample plant remains from LA 85859.

FS No.	**351**	**353**	**354**	**355**
Feature	**90N/E112, Stratum 4**	**90N/107E Stratum 3a, level 3**	**90N/107E Stratum 3b, level 4**	**90N/107E Stratum 3c, level 5**
Perennials				
Pine		umbo +		
Ponderosa pine		needle +		
Non-Cultural				
Annuals				
Goosefoot		+		
Spurge		+		
Other				
Composite family		+		
Knotweed family		+		
Perennials				
Pine		umbo +		
Ponderosa pine	needle +	needle +	needle +	needle +

+ 1-10/liter, pc partially charred

Wood charcoal at LA 85859 was entirely coniferous and piñon was the only taxon identified as charcoal was very fragmented and sparse (Tables 62.47 and 62.48). Unknown conifer and undifferentiated pine were also part of the record. The archaeobotanical remains from LA 85859 could be remnants of vegetation that burned during the Cerro Grande fire, especially those from Strata 1 and 2. Strata 4 and 5 displayed frequent rodent burrows indicating floral material from the fire could have been deposited by bioturbation.

Table 62.47. Flotation sample wood charcoal taxa by count and weight in grams from LA 85859.

FS No.	**108**	**310**	**311**	**315**	**348**
Context	**90.9N/109.7 Stratum 3a, level 3**	**92N/114E Stratum 1**	**92N/114E Stratum 2**	**92N/114E sand**	**90N/112E Stratum 3a**
Conifers					

FS No.	**108**	**310**	**311**	**315**	**348**
Piñon		1/<0.1 g, 1 pc/<0.1 g			
Unknown conifer	1/<0.1 g		1/<0.1 g	1/<0.1 g	2/<0.1 g
Totals	1/<0.1 g	2/<0.1 g	1/<0.1 g	1/<0.1 g	2/<0.1 g

Table 62.48. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 85859.

FS No.	**138**	**361**	**362**	**363**
Feature	**90N/109.95E Stratum 3c, level 5**	**90N/119E Stratum 3b**	**87.8N/112.4E Stratum 3c**	**89.6N/112.4E Stratum 3bc**
Conifers				
Pine	12/0.2 g			
Piñon		1/<0.1 g	1/<0.1 g	
Unknown conifer				1/<0.1 g
Totals	12/0.2 g	1/<0.1 g	1/<0.1 g	1/<0.1 g

LA 85864 (Jicarilla Apache Rock Ring)

The sample from the base of the informal central hearth in the tipi ring produced charred conifer duff (juniper twigs, pine needles and bark) along with an unusual find: a badly eroded possible wheat caryopsis (or seed). The caryopsis appeared to have two attributes characteristic of wheat: a crease running longitudinally for the length of the grain and the germ. The distal end of the seed was the most eroded and the general condition of the seed led to a tentative identification. As wheat had been around a long time before the occupation of LA 85864, it would not be unusual for it to have been part of the Jicarilla Apache diet. The Mescalero Apache would obtain wheat from raids in Mexico or from early settlers; wheat was planted in sandy loam, harvested by beating it with a stick, and subsequently used to make bread (Castetter and Opler 1936). Aside from wood, the remainder of the archaeobotanical assemblage consisted of unburned goosefoot seeds and burned and unburned conifer duff (Table 62.49).

Table 62.49. Flotation samples plant remains from LA 85864.

FS No.	**4**	**5**	**6**	**10**	**14**
Feature	**2 Hearth, Stratum 2, level 3**			**2 Hearth, Stratum 3, level 4**	**1 Tipi ring**
	100.5N/ 104.35E	**100.65N/ 104.5E**	**100.9N/ 104.4E**	**100.6N/104.4E**	**Stratum 2, level 3**
Cultural					
Cultigens					
possible wheat				1(1)	
Perennials					
Juniper		twig +			

Pine	bark +			bark +	
Ponderosa pine		needle +			
Non-Cultural					
Annuals					
Goosefoot	+				
Perennials					
Juniper	+	twig +		twig +	twig +
Pine	bark +		umbo +		
Piñon	needle +	needle +	needle +	needle +	needle +
Ponderosa pine					needle +

+ 1-10/liter

Flotation and vegetal sample wood charcoal was primarily piñon, present in 84 percent and 89 percent, respectively, by weight (Tables 62.50 and 62.51). Juniper, pine, cf. ponderosa pine, and unknown conifer were also recovered. The occupants of LA 85864 were probably incorporating the Old World grain wheat into their diet and burning local conifers for fuel.

Table 62.50. Flotation sample wood charcoal taxa by count and weight from LA 85864.

FS No.	**4**	**5**	**6**	**10**	**Totals**	
Feature	**2 Hearth, Stratum 2, level 3**			**2 Hearth, Stratum 3, level 4**	**Weight**	**%**
	100.5N/ 104.35E	**100.65N/ 104.5E**	**100.9N/ 104.4E**	**100.6N/104.4E**		
Conifers						
Juniper				4/0.2 g	0.2 g	11
Pine		2/<0.1 g			<0.1 g	<1
Piñon	20/0.5 g	18/0.5 g	13/0.1 g	14/0.5 g	1.6 g	84
Unknown conifer			1/<0.1 g	2/0.1 g	0.1 g	5
Totals	20/0.5 g	18/0.5 g	14/0.1 g	20/0.8 g	1.9 g	100

Table 62.51. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 85864.

FS No.	**7**	**9**	**12**	**Totals**	
Feature	**1 Tipi ring Stratum2, level 3**	**2 Hearth**	**2 Hearth**	**Weight**	**%**
		100.76N/104.4E Stratum3, level 4	**100N/104E Stratum2, level 3**		
Conifers					
Juniper	1/<0.1 g	7/0.5 g		0.5 g	7
Piñon	10/0.5 g	50/4.8 g	19/1.5 g	6.8 g	89
cf. Ponderosa pine	3/<0.1 g	4/0.3 g		0.3 g	4
Totals	14/0.5 g	61/5.6 g	19/1.5 g	7.6 g	100

cf. compares favorably

LA 85869 (Jicarilla Apache Rock Rings)

Two Jicarilla Apache tipi rings and a ring of cobbles were sampled for floral material at LA 85869. A charcoal concentration in the center of the Feature 4 tipi ring was the only context where carbonized plant material that was not associated with firewood use was recovered, represented by a single goosefoot seed (Table 62.52). The balance of the recognizable plant remains consisted of charred and uncharred conifer duff. Aside from conifer twigs, needles, and cone parts, non-cultural plant material included weedy annual, dock, sweet clover, and hedgehog cactus seeds, as well as unknown dicot and oak leaves. Rodent activity was especially evident in the vegetal sample from Stratum 1, level 1 of the Feature 4 tipi ring, where sample taxa and rodent feces suggested the remains of a rodent nest (unburned juniper twigs and seeds, pine cone parts, and piñon needles). Rodent feces were also present in FS 297 from the Feature 6 cobble ring.

Table 62.52. Flotation sample plant remains from LA 85869.

FS No.	**272**	**283**	**288**	**295**	**296**	**297**	**318**
Feature	**8 Charcoal concentration in center of F. 4 tipi ring**	**2 Eastern tipi ring**		**6 Ring of cobbles**			**9 Heating feature in F. 2 tipi ring**
		Stratum 1, level 1	**Stratum 2, level 2**				
Cultural							
Annuals							
Goosefoot	1(1)						
Other							
Unidentifiable					2(0) pp	1(0) pp	
Perennials							
Juniper				twig +	twig +	twig +	
Pine						umbo +	
Piñon		needle +			needle +	needle +	
Ponderosa pine				cf. needle +		needle +	
Non-Cultural							
Annuals							
Cheno-Am			+				
Goosefoot		+					
Spurge						+	
Other							
Composite family					+	+	
Dicot	leaf +						
Purslane			+		+	+	

FS No.	272	283	288	295	296	297	318
family							
Sweet clover	+	+	+		+		
Perennials							
Dock						+	
Hedgehog cactus				+	+	+	
Juniper	♂ cone +, twig +	+, twig +		♀ cone +, twig +	♀ cone +, ♂ cone +, twig +	♀ cone +, ♂ cone +, twig +	twig +
Oak							leaf +
Pine		twig +, umbo +		umbo +	umbo +	♂ cone +, twig +, umbo +	
Piñon		+, needle +	needle +	needle +	needle ++	nsg +, needle +	needle +, nutshell +
Ponderosa pine					needle +	needle +	

+ 1-10/liter, ++ 11-25/liter, cf. compares favorably, nsg needle spindle gall, pp plant part.

Wood from flotation and vegetal samples was entirely coniferous, with the most significant amount of charcoal (piñon 1.4 g and unknown conifer 0.1 g) occurring in the Feature 8 charcoal concentration (Tables 62.53 and 62.54). The site occupants were using locally available wood for fuel and kindling and possibly processing goosefoot seeds as food. However, it is unknown if the goosefoot seed represents accidental charring from food processing or of a wind blown seed.

Table 62.53. Flotation sample wood charcoal taxa by count and weight in grams from LA 85869.

FS No.	272	295	296	297
Feature	**8 Charcoal concentration in center of F. 4 tipi ring**	**6 Ring of cobbles**		
Conifers				
Juniper			1/<0.1 g	
Pine				4/<0.1 g
Piñon	17/1.4 g	2/<0.1 g	2/<0.1 g	
Unknown conifer	3/0.1 g			4/<0.1 g
Totals	20/1.5 g	2/<0.1 g	3/<0.1 g	8/<0.1 g

Table 62.54. Vegetal sample taxa, by count and weight in grams from LA 85869.

FS No.	237	247	244	278
Feature	2 Eastern tipi ring		4 Tipi ring	
	Stratum 2, level 2	Stratum 1, level 1	Stratum 3, level 2	Stratum 1, level 1
Cultural				
Conifer Wood				
Juniper			2/<0.1 g	
Piñon	1/<0.1 g			
Non-Cultural				
Perennials				
Juniper				+ seed , + twig
Pine				+ umbo
Piñon				+ needle
Prickly pear cactus		1 seed/<0.1 g		
Totals	1/<0.1 g	1/<0.1 g	2/<0.1 g	-

LA 86605 (Classic Period Fieldhouse)

Corn cupules, a grass seed fragment, and ponderosa pine needles were recovered from the two samples analyzed from under a tuff block on the fieldhouse floor and post-occupational fill (Table 62.55). With the exception of four fragments of ponderosa pine charcoal (Table 62.56), the sample from the lower living surface contained only unburned plant material. In comparison, the wood assemblage from post-occupational fill was quite diverse, including piñon, ponderosa pine, cottonwood/willow, mountain mahogany, and sagebrush.

Table 62.55. Flotation plant remains, count and abundance per liter from LA 86605.

FS No.	77	94	107
Feature	Under tuff block in center of room	Stratum 2 Post-occupational fill	Lower living surface
Cultural			
Cultivars			
Maize	1(0) c	1(0) c	
Grasses			
cf. Grass family		1(0)	
Other			
Unidentifiable	2(0) pp		
Perennials			
Ponderosa pine	+ needle	+ needle	
Non-Cultural			
Annuals			

FS No.	**77**	**94**	**107**
Feature	**Under tuff block in center of room**	**Stratum 2 Post-occupational fill**	**Lower living surface**
Goosefoot	+	+	
Sunflower		+	
Grasses			
Grass family		+	
Other			
Groundcherry		+	
Purslane family	+		+
Perennials			
Hedgehog cactus	+		+
Ponderosa pine	+ needle		

+ 1-10/liter, c cupule, cf. compares favorably, pp plant part

Table 62.56. Flotation sample wood charcoal by count and weight in grams from LA 86605.

FS No.	**77**	**94**	**107**
Feature	**Floor matrix**	**Stratum 2 Post-occupational fill**	**Wallfall on lower living surface**
Conifers			
Piñon	1/0.2 g		
Ponderosa pine	5/0.2 g	4/0.1 g	4/0.3 g
Unknown conifer	14/0.3 g	3/<0.1 g	
Non-Conifers			
Cottonwood/willow		1/<0.1 g	
Mountain mahogany		3/0.1 g	
cf. Sagebrush		1/<0.1 g	
Totals	20/0.7 g	12/0.2 g	4/0.3 g

LA 87430 (Classic Period Fieldhouse)

Burned pine needles were the most common plant materials recovered from this Classic period fieldhouse, followed by corn parts (Table 62.57). Besides corn, samples from the hearth yielded charred goosefoot, purslane, and beeweed seeds. A seed that compares favorably to beeweed was also identified from the charcoal concentration in Room 1. Young beeweed plants were used as greens, eaten much like spinach. The seeds were also dried, ground, and mixed with cornmeal. The leaves of older plants were cooked down until they formed a paste, sun-dried, and made into cakes that could later be eaten with cornmeal mush or fried with fat. Another, more unusual and important use of the reconstituted cakes was as a black pigment for decorating pottery and baskets (Dunmire and Tierney 1995:182–184).

Table 62.57. Flotation plant remains, count and abundance per liter from LA 87430.

FS No.	26	122	138	139	170
Feature	Room 1, post-occupational fill, Stratum 2, level 3	Oxidized soil under charcoal concentration	Charcoal concentration	Charcoal concentration from Hearth	Hearth fill 104.8N/102.5E
Cultural					
Annuals					
Beeweed			cf. 1(1)		1(1)
Cultivars					
Maize				1(0) c, 1(1) k	1(0) cf. e
Grasses					
cf. Grass family		+ stem			
Perennials					
Piñon					+ needle
Ponderosa pine	+ needle	+ needle	+ needle	+ needle	+ needle
Non-Cultural					
Annuals					
Goosefoot	+			+	
Grasses					
Grass family	+				
Perennials					
cf. Dock	+				
Ponderosa pine	+ needle				

Table 62.57 (continued). Flotation plant remains, count and abundance per liter from LA 87430.

FS No.	171	172	173	175	176	177
Feature	Hearth fill 104.7N/102.57E			Hearth fill 104.85N/102.5E		
Cultural						
Annuals						
cf. Beeweed				2(2)		
Goosefoot						1(1)
Purslane		2(2)		1(1)		1(1)
Cultivars						
Maize	1(0) poss. stalk		1(0) c, 1(0) k			
Other						
Unidentifiable			1(0) pp	4(0) pp	1(0) pp	
Perennials						
cf. Douglas fir				+ needle	+ needle	

FS No.	171	172	173	175	176	177
Feature	**Hearth fill 104.7N/102.57E**			**Hearth fill 104.85N/102.5E**		
Piñon			+ needle		+ needle	
Ponderosa pine	+ needle		+ needle	+ needle	+ needle	+ needle
Non-Cultural						
Annuals						
Goosefoot		+			+	
Perennials						
Ponderosa pine		+ needle	+ needle		+ needle	+ needle

+ 1-10/liter, c cupule, cf. compares favorably, e embryo, k kernel, pp plant part

Piñon and ponderosa pine dominated the wood assemblage, while mountain mahogany was the most common non-conifer with small amounts of sagebrush and oak also occurring (Table 62.58). Corn, grown in nearby fields, was probably cooked on the hearth, possibly along with goosefoot, purslane, and beeweed. Locally available woods were used as fuel.

Table 62.58. Flotation sample wood charcoal by count and weight in grams from LA 87430.

FS No.	26	122	138	139	143
Feature	**Room 1, post-occupational fill, Stratum 2, level 3**	**Oxidized soil under charcoal concentration**	**Charcoal concentration**	**Charcoal concentration from Hearth**	**Char-coal lens in hearth**
Conifers					
Pine				2/<0.1 g	
Piñon					4/0.3 g
Ponderosa pine	6/0.7 g				2/1.3 g
Unknown conifer	1/0.1 g		6/0.1 g	2/<0.1 g	11/0.3 g
Non-Conifers					
Oak		11/0.2 g			
Totals	7/0.8 g	11/0.2 g	6/0.1 g	4/<0.1 g	17/1.9 g

Table 62.58 (continued). Flotation sample wood charcoal by count and weight in grams from LA 87430.

FS No.	170	171	172	173	175	176	177
Feature	**Hearth fill 104.8N/102.5E**	**Hearth fill 104.7N/102.57E**			**Hearth fill 104.85N/102.5E**		
Conifers							
Pine		2/<0.1 g	3/0.2 g	1/<0.1 g			
Ponderosa pine	7/0.5 g	9/0.2 g		3/0.1 g	9/0.1 g	8/0.2 g	13/0.4 g
Unknown conifer	6/0.7 g	3/<0.1 g	17/0.8 g	14/0.5 g	6/0.1 g	5/0.1 g	
Non-Conifers							

FS No.	170	171	172	173	175	176	177
Feature	Hearth fill 104.8N/102.5E	Hearth fill 104.7N/102.57E			Hearth fill 104.85N/102.5E		
Mountain mahogany	1/<0.1 g	2/<0.1 g		1/<0.1 g	1/<0.1 g		2/<0.1 g
Oak		4/<0.1 g					
cf. Sagebrush	1/<0.1 g						
Totals	15/1.2 g	20/0.2 g	20/1.0g	19/0.6 g	16/0.2 g	13/0.3 g	15/0.4 g

LA 99396 (Archaic Period Lithic Scatter/Coalition Period Fieldhouse)

Evidence from the use of the one-room structure, an extramural hearth, and the central hearth of the structure consisted of pine bark, piñon and ponderosa pine needles, an unidentifiable plant part, and one purslane seed (Table 62.59). Non-cultural plant material included weedy annual and dropseed grass seeds and juniper duff. The charred bark and needles are probably artifacts of firewood use. Piñon dominated the wood assemblage (present in 70% of samples by weight; Table 62.60). Small amounts of juniper, unknown conifer, and unknown non-conifer were also present. The post fragment from the structure was most likely piñon (Table 62.61). Economic activity at the site is reflected in the use of locally available wood taxa for fuel and building materials and the possible use of purslane for food although one charred seed could have been burned in the exterior hearth after being deposited there by vectors other than humans. Samples were not taken from the Archaic component.

Table 62.59. Flotation sample plant remains from LA 99396.

FS No.	438	493	608	712	753	758
Feature	1 Cobbles of structure walls		5 Extramural north of structure	2 Subterranean portion of one-room structure	7 hearth in structure	
Cultural						
Annuals						
Purslane			1(1)			
Other						
Unidentifiable		1(0) pp				
Perennials						
Pine			bark +	bark +	needle +	
cf. Piñon					needle +	needle +
Ponderosa pine						
Non-Cultural						
Annuals						
Amaranth			+			
Goosefoot	+	+	+	+		
Grasses						
Dropseed grass			+			
Grass family			+	floret +		

FS No.	438	493	608	712	753	758
Feature	**1 Cobbles of structure walls**		**5 Extramural north of structure**	**2 Subterranean portion of one-room structure**	**7 hearth in structure**	
Other						
Composite family				+		
Purslane	+	+				
Purslane family	+	+				
Perennials						
Juniper			♂ cone +, twig			

+ 1-10/liter, cf. compares favorably, pp plant part

Table 62.60. Flotation sample wood charcoal taxa by count and weight in grams from LA 99396.

FS No.	438	493	608	712	753	758	Totals	
Feature	**1 Cobbles of structure walls**		**5 Extramural hearth north of structure**	**2 Subterranean portion of one-room structure**	**7 hearth in structure**		**Weight**	**%**
	Stratum 1, level 1	**Stratum 2, level 2**						
Conifers								
Juniper	1/<0.1 g		3/0.1 g				0.1 g	5
Piñon		5/0.3 g	11/0.6 g	15/0.3 g	7/0.1 g	5/0.1 g	1.4 g	70
Unknown conifer	3/<0.1 g	2/<0.1 g	6/0.4 g	5/0.1 g	2/<0.1 g		0.5 g	25
Non-Conifers								
Unknown non-conifer					1/<0.1 g		<0.1g	<1
Totals	4/<0.1 g	7/0.3 g	20/1.1 g	20/0.4 g	10/0.1 g	5/0.1 g	2.0 g	100

Table 62.61. Vegetal sample wood charcoal taxa, by count and weight (g) from LA 99396.

FS No.	472	774	775
Feature	**4 Post fragment**	**110N/123E**	**84.7N/114E**
Conifers			
Juniper		1/<0.1 g	1/<0.1 g
Pine	20/3.5 g		
cf. Piñon	77/46.3 g		
Unknown conifer	5/0.6 g		
Non-Conifers			
Mountain mahogany	6/0.3 g		
Totals	108/50.7 g	1/<0.1 g	1/<0.1 g

LA 99397 (Late Archaic? Lithic Scatter)

Very little wood charcoal or other charred macrobotanical remains were found at LA 99397 and none of the remains could be linked to cultural activities. The entire assemblage at LA 99397 appears to be in a reworked context, either through bioturbation or erosional activities. Although the central portion of the site was unburned, the northern and northwestern periphery of the site was badly burned by the Cerro Grande fire. Charred plant remains were limited to ponderosa pine needles, most likely part of the ponderosa tree that burned at the 100N/106.20E grid locus (Table 62.62). Hedgehog cactus, goosefoot, composite family, groundcherry, and purslane family seeds along with grass leaves and rhizomes, and juniper and pine duff comprised the unburned material. One flotation sample yielded two fragments of piñon wood and vegetal samples produced largely ponderosa pine (FS 282 was from the stump of the ponderosa tree) and piñon (found in 38% of samples) and small amounts of unknown conifer (Table 62.63).

Table 62.62. Flotation sample plant remains from LA 99397.

FS No.	**301**	**302**	**313**	**314**	**315**	**316**	**331**
Grid	**98.99N/129.5E**		**100N/101.4E**	**100N/101.5E**			**98N/ 129.6E**
	Stratum 1, level 1	**Stratum 2, level 2**		**Stratum 2, level 2**	**Stratum 3, level 3**	**Stratum 4, level 4**	
Charred Perennials							
Ponderosa		needle +					needle+
Uncharred Annuals							
Goosefoot			+				
Grasses							
Grass family			leaf +	leaf, rhizome +		leaf +	
Other							
Composite family	+		+				
Dicot			leaf +				
Groundcherry			+				
Purslane family	+						
Perennials							
Hedgehog cactus		+	+	+			
Juniper	twig +		+, ♂ cone +, twig +	twig +		twig +	twig +
Pine	umbo +		umbo +				
Piñon	needle +		needle +	needle +	needle +		needle +
Ponderosa							needle+

+ 1-10/liter

Table 62.63. Vegetal sample wood charcoal taxa, by count and weight in grams from LA 99397.

FS No.	211	214	282	283	291	292	Totals	
Grid	Stratum 3		100N/ 106.42E Ponderosa stump	100.07N/ 106.12E	98N/129E Stratum 2, level 2		Weight	%
	100N/ 95E	91N/ 100E						
Conifers								
Piñon	3/0.1 g	30/4.0 g					4.1 g	38
cf. Ponderosa pine			5/1.7 g	3/3.8 g		1/0.7 g	6.2 g	57
Unknown conifer		4/0.4 g			2/0.1 g		0.5 g	5
Totals	3/0.1 g	34/4.4 g	5/1.7 g	3/3.8 g	2/0.1 g	1/0.7 g	10.8 g	100

LA 127627 (Classic Period Fieldhouse)

Cultural plant material consisted of conifer duff, unknown seeds and plant parts, corn cupules, and a goosefoot seed fragment (Table 62.64). More conifer duff was recovered unburned, along with annual seeds and grass parts.

Table 62.64. Flotation plant remains, count and abundance per liter from LA 127627.

FS No.	9	31	52
Feature	**Living surface**	**Occupational fill**	**Under stone in NW corner**
Cultural			
Annuals			
Cheno-Am	1(0)		
Cultivars			
Maize	2(1) c	2(1) c, 1(1) cs	1(0) c
Other			
Unidentifiable	1(0), 5(0) pp	1(0), 2(0) pp	3(2) pp
Unknown #1			1(1)
Perennials			
Juniper			+ twig
Pine	+ umbo		cf. 1(1), + barkscale, + umbo
Piñon	+ needle		+ needle
Ponderosa pine	+ needle	+ needle	+ fascicle, + needle
Non-Cultural			
Annuals			
Amaranth	+		
Goosefoot			+

FS No.	9	31	52
Feature	**Living surface**	**Occupational fill**	**Under stone in NW corner**
Purslane			+
Other			
Spurge			+
cf. Wild lettuce			+
Grasses			
Grass family			+ floret, + stem
Ricegrass			+
Perennials			
cf. Douglas fir			+ needle
Juniper			+ twig
Pine			+ umbo
Piñon			+, + needle
Ponderosa pine		+ needle	+ needle

+ 1-10/liter, c cupule, cf. compares favorably, cs cupule segment, pp plant part

Coniferous woods dominated the wood assemblage; two fragments of oak identified in occupational fill were the only representatives of non-conifer wood (Table 62.65). Ponderosa and pine were the most abundant wood taxa, but may not be cultural in origin as the site area was heavily burned in the Cerro Grande fire. A single fragment of juniper was recovered from under the stone in the northwest corner of the structure. Corncobs and possibly local woods were used for fuel and site occupants may have consumed goosefoot (but considering only a fragment was recovered and the condition of the site, this is equivocal at best).

Table 62.65. Flotation sample wood charcoal by count and weight in grams from LA 127627.

FS No.	9	31	52
Feature	**Living surface**	**Occupational fill**	**Under stone in NW corner**
Conifers			
Juniper			1/<0.1 g
Pine	2/<0.1 g	3/0.1 g	1/0.4 g
Ponderosa pine	3/<0.1 g	3/0.2 g	2/0.1 g
Unknown conifer	5/0.1 g	2/<0.1 g	1/<0.1 g
Non-Conifers			
Oak		2/<0.1 g	
Totals	10/0.1 g	10/0.3 g	5/0.5 g

LA 127633 (Ancestral Pueblo Fieldhouse)

Contexts associated with a rectangular feature (possible storage bin or cist?) produced carbonized goosefoot seeds, ponderosa pine needles, and unidentifiable plant parts (Table 62.66). The site was extremely compromised, the southern and eastern sides of the site having eroded downslope. Wood taxa were limited to ponderosa pine and unknown conifer (Table 62.67). Considering the poor condition of the site, the charred plant remains are most likely non-cultural.

Table 62.66. Flotation plant remains, count and abundance per liter from LA 127633.

FS No.	4	6	10	14
Feature	**West end next to No. slab**	**East end next to No. slab**	**Post-occupational fill**	**NE ¼ of Feature against upright**
		Cultural		
Annuals				
Goosefoot		1(1)		
Other				
Unidentifiable		4(0) pp		1(0) pp
Perennials				
Ponderosa pine		+ needle, + needle pc	+ needle	
		Non-Cultural		
Annuals				
Goosefoot	+			
Perennials				
Ponderosa pine	+ needle			+ needle

+ 1-10/liter, pc partially charred, pp plant part

Table 62.67. Flotation sample wood charcoal by count and weight in grams from LA 127633.

FS No.	4	6	10	14
Feature	**West end next to No. slab**	**East end next to No. slab**	**Post-occupational fill**	**NE ¼ of Feature against upright**
		Conifers		
Ponderosa pine	1/<0.1 g	4/0.1 g	1/<0.1 g	2/0.1 g
Unknown conifer			1/<0.1 g	
Totals	1/<0.1 g	4/0.1 g	2/<0.1 g	2/0.1 g

LA 127634 (Classic Period Fieldhouse)

Aside from charred conifer duff, beeweed and corn were the most common taxa identified in flotation samples (Table 62.68). Banana yucca, beans, and tobacco seeds were found in samples from the hearth, while bugseed and possible squash rind were present in floor contexts near the hearth. This is quite a remarkable floral assemblage from a one-room fieldhouse. Carbonized tobacco indicates ritual activities may have taken place here that may have included using beeweed pigment to paint pottery or ritual items (Adams et al. 2002). Beeweed was of course also used extensively as a potherb and the seeds were ground into a meal for flour or gruel (see V. Jones 1931 or Lange 1968a) and its presence may have more to do with food preparation rather than pigment manufacture.

Table 62.68. Flotation plant remains, count and abundance per liter from LA 127634.

FS No.	39	84	105	106	107	108
Feature	**Room 1, post-occupational fill, Stratum 2**	**Floor surface**	**Hearth fill 104N/104E**			
Cultural						
Annuals						
cf. Beeweed				1(1)	7(6)	2(2)
Tobacco						1(1)
Cultivars						
Bean				cf. 5(0) cot	5(0) cot	
Maize	6(2) c	1(0) cf. c	1(0) c, 1(1) e	3(0) c		2(0) c, 1(0) e pc
Other						
Unidentifiable				2(0) pp	2(0) pp	
Perennials						
Piñon	+ needle					
Ponderosa pine	+ needle	+ needle		+ needle		
Non-Cultural						
Annuals						
Goosefoot	+	+		+		
Perennials						
Juniper					+ twig	
Piñon	+ needle			+ needle	+needle	
Ponderosa pine	+ needle		+ needle	+ needle	+needle	+ needle

Table 62.68 (continued). Flotation plant remains, count, and abundance per liter from LA 127634.

FS No.	109	110	111	112
Feature	**Hearth fill 104N/104E**			**Hearth fill 103N/104E**
Cultural				
Annuals				
cf. Beeweed	7(7), 1(0) pc	3(0)	1(1)	1(1)
Cultivars				
Maize	1(0) c, 2(0) cf. e pc			
Perennials				
Piñon				+ needle

FS No.	109	110	111	112
Feature	**Hearth fill 104N/104E**			**Hearth fill 103N/104E**
Ponderosa pine	+ needle	+ needle	+ needle	+ needle
Banana yucca				1(1)
Non-Cultural				
Annuals				
Goosefoot				
Perennials				
Piñon				

Table 62.68 (continued). Flotation plant remains, count and abundance per liter from LA 127634

FS No.	117	120	121	122
Feature	**Floor matrix, level 4**	**Floor matrix W of hearth**	**Floor matrix N of hearth**	**Floor matrix NW of hearth**
Cultural				
Annuals				
cf. Beeweed			1(1) pc	
Bugseed			1(1)	
Cultivars				
Maize		2(0) c, 1(0) k	1(0) c	1(1) c
Other				
poss. Coyote gourd/Squash				+ rind
Perennials				
Juniper			+ twig	
Pine		+ barkscale	+ barkscale	+ barkscale
Piñon		+ needle	+ needle	+ needle
Ponderosa pine	+ needle	+ needle	+ needle	+ needle
Non-Cultural				
Annuals				
Goosefoot	+		+	
Perennials				
Piñon	+ needle		+ needle	+ needle
Ponderosa pine			+ needle	

+ 1-10/liter, c cupule, cf. compares favorably, cot cotyledon, e embryo, k kernel, pc partially charred, pp plant part

The wood assemblage was composed of ponderosa pine, piñon, cottonwood/willow, mountain mahogany, oak, and sagebrush (Table 62.69). Site occupants probably used corncobs for fuel and the presence of kernels and embryos points to processing of maize. Compared to other fieldhouses on C&T Project land, LA 127634 and LA 127635 yielded the greatest number of wild and domesticated taxa including ritual plants, indicating that perhaps these sites were in use over a longer period of time.

Table 62.69. Flotation sample wood charcoal by count and weight in grams from LA 127634.

FS No.	39	84	105	106	107	108	109
Feature	**Room 1, post-occupational fill, Stratum 2**	**Top of floor**	**Hearth fill 104N/104E**				
Conifers							
Pine	2/0.2 g	3/<0.1 g	4/0.1 g	1/<0.1 g		1/<0.1 g	6/0.1 g
Ponderosa pine	13/0.6 g	11/0.7 g		1/<0.1 g		15/0.7 g	
Unknown conifer		1/<0.1 g	7/0.2 g	5/0.1 g	9/0.3 g	3/<0.1 g	5/0.1 g
Non-Conifers							
Cottonwood/ Willow		1/<0.1 g					
Mountain mahogany		1/<0.1 g				1/<0.1 g	
Oak	3/<0.1 g		4/<0.1 g				
Sagebrush	2/0.1 g						
Unknown Non-conifer					2/<0.1 g		
Totals	20/0.9 g	17/0.7 g	15/0.3 g	7/0.1 g	11/0.3 g	20/0.7 g	11/0.2 g

Table 62.69 (continued). Flotation sample wood charcoal by count and weight in grams from LA 127634.

FS No.	110	111	112	117	120	121	122
Feature	**Hearth fill 104N/104E**				**Floor matrix W of hearth**	**Floor matrix N of hearth**	**Floor matrix NW of hearth**
Conifers							
Pine	1/<0.1 g	3/0.2 g		6/0.6 g		5/0.2 g	
Piñon				3/0.5 g	2/0.9 g		
Ponderosa pine	5/0.4 g	3/<0.1 g	2/<0.1 g	5/0.2 g	16/1.4 g	8/0.1 g	
Unknown conifer	2/<0.1 g		2/<0.1 g	2/<0.1 g		7/0.1 g	3/<0.1 g
Non-Conifers							
Mountain mahogany			2/<0.1 g				2/0.1 g
Oak				1/<0.1 g	2/<0.1 g		
Sagebrush				3/0.1 g			

FS No.	110	111	112	117	120	121	122
Feature	Hearth fill 104N/104E				Floor matrix W of hearth	Floor matrix N of hearth	Floor matrix NW of hearth
Totals	8/0.4 g	6/0.2 g	6/<0.1 g	20/1.4 g	20/2.3 g	20/0.4 g	5/0.1 g

LA 127635 (Classic Period Fieldhouse)

Floral remains from this fieldhouse resemble those from the neighboring fieldhouse, LA 127634, to the east. Beeweed and maize were the most common taxa from both fieldhouses. While tobacco was found in hearths at both sites, only one sample out of 14 at LA 127634 yielded tobacco, whereas tobacco was present in 56 percent of samples from LA 127635. Beans were present at LA 127634 and not at LA 127635. Aside from conifer needles and bark, evidence for perennial plant use was represented by a hedgehog cactus seed fragment from the upper fill of the hearth, while at LA 127634, a banana yucca seed in the hearth was the only non-conifer perennial plant part recovered. Possible squash rind was identified from both structures.

LA 127635 floor scrape and floor samples (FS 116 and FS 141) yielded very similar taxa to those encountered in post-occupational fill samples (FS 45 and FS 53) including corn cupules and charred conifer duff (Table 62.70). The exception was possible squash rind identified in the general fill sample. Only unburned material was recovered from under the patterned rock concentration (Feature 1). Lower and upper fill of the hearth (Feature 2) yielded cheno-ams, tobacco, beeweed, maize, and conifer duff; bugseed and hedgehog cactus seeds were restricted to the upper fill. One sample from the upper fill of the hearth consisted almost entirely of kernel fragments. In general, much higher concentrations of maize kernels were present at LA 127635 than at LA 127634. The sample taken from under the concentration of tuff rocks adjacent to the south wall of the structure (Feature 1) contained only unburned plant material. It has been suggested that this rock concentration may represent the deliberate walling up of the entrance to the structure (see Chapter 52, Volume 2). Two ceramic sherds and two chipped stone artifacts were found in the fill under Feature 1 and it was determined that this was post-occupational fill. However, if this were the case, the sample would be more likely to contain similar remains to those found in FS 45 that included conifer needles, bark, and charcoal.

Table 62.70. Flotation plant remains, count and abundance per liter from LA 127635.

FS No.	45	53	105	116	123
Feature	N ½ unit inside room above living surface	Ash stain west of F. 1	Hearth, lower ½	Floor	Hearth, upper fill
Cultural					
Annuals					
cf. Beeweed			3(1)		3(2)
cf. Bugseed					1(0)
Cheno-Am			2(2)		
Tobacco			1(1)		5(5)

FS No.	**45**	**53**	**105**	**116**	**123**
Feature	**N ½ unit inside room above living surface**	**Ash stain west of F. 1**	**Hearth, lower ½**	**Floor**	**Hearth, upper fill**
Cultivars					
Maize		1(0) c, 1(0) poss. c	1(0) cf. c, 2(2) e, 3(2) e pc, 26(0) cf. k		16(11) e, 50(1) k
Other					
cf. Coyote gourd/Squash		+ rind			
Unidentifiable				1(0) pp	
Perennials					
Pine	+ barkscale		+ barkscale		
Piñon	+ needle			+ needle	
Ponderosa pine	+ fascicle, + needle	+ needle			+ needle
Non-Cultural					
Annuals					
Goosefoot	+	+		+	+
Perennials					
Piñon	+ needle				
Ponderosa pine	+ fascicle, + needle			+ needle	+ needle

Table 62.70 (continued). Flotation plant remains, count and abundance per liter from LA 127635.

FS No.	**124**	**125**	**126**	**135**	**141**
Feature	**Hearth, upper fill**			**Under F. 1 and above floor**	**Floor scrape**
Cultural					
Annuals					
Beeweed	4(3), 1(0) pc	4(3)	1(1), cf. 1(0)		
Cheno-Am		1(1)			
Tobacco	6(6)	3(3)	5(5)		
Cultivars					
Maize	5(3) e, 16(0) k	5(3) e, 37(0) k	1(0) c, 5(4) e, 17(0)k		2(0) c
Other					
Unidentifiable					1(0) pp
Perennials					
Hedgehog cactus		1(0)			

FS No.	124	125	126	135	141
Feature	**Hearth, upper fill**			**Under F. 1 and above floor**	**Floor scrape**
Pine		+ barkscale			
Ponderosa pine	+ needle pc	+ needle			+ needle
Non-Cultural					
Annuals					
Goosefoot	+			+	+
Perennials					
Piñon	+ needle				
Ponderosa pine	+ needle	+ needle	+ needle	+ needle	+ needle

+ 1-10/liter, c cupule, cf. compares favorably, e embryo, k kernel, pc partially charred, pp plant part.

Wood charcoal from the floor scrape was very different from the floor sample; ponderosa pine was the only wood type identified in the floor scrape sample, while pine, piñon, and mountain mahogany were identified in the floor sample (Table 62.71). Charcoal from the two general fill samples was also very different. Fill above the living surface produced only coniferous woods, while the majority of charcoal from the general fill sample was mountain mahogany with a small amount of unknown conifer. The Feature 2 wood assemblage was much more diverse than other contexts, yielding coniferous (including juniper) as well as cottonwood/willow, mountain mahogany, oak, and sagebrush.

Table 62.71. Flotation sample wood charcoal by count and weight in grams from LA 127635.

FS No.	45	53	105	116	123	124	125
Feature	**N ½ unit inside room above living surface**	**Ash stain west of F. 1**	**Hearth, lower ½**	**Floor**	**Hearth, upper fill**		
Conifers							
cf. Juniper						5/0.1 g	
Pine	3/0.1 g			3/0.2 g			
Piñon			4/0.2 g	8/0.4 g			
Ponderosa pine	4/0.1 g		3/0.1 g			6/0.1 g	3/0.1 g
Unknown conifer	1/<0.1 g	2/0.1 g	3/<0.1 g	7/0.3 g	1/<0.1 g	2/<0.1 g	4/<0.1 g
Non-Conifers							
cf. Cottonwood/ Willow							1/<0.1 g
Mountain mahogany		18/0.6 g	1/<0.1 g	2/<0.1 g		7/<0.1 g	

FS No.	45	53	105	116	123	124	125
Feature	N ½ unit inside room above living surface	Ash stain west of F. 1	Hearth, lower ½	Floor	Hearth, upper fill		
Oak			4/<0.1 g				
cf. Sagebrush			2<0.1 g				
Totals	8/0.2 g	20/0.7 g	17/0.2 g	20/0.9 g	1/<0.1 g	20/0.2 g	8/0.1 g

Table 62.71 (continued). Flotation sample wood charcoal by count and weight in grams from LA 127635.

FS No.	126	141
Feature	Hearth, upper fill	Floor scrape
Conifers		
cf. Juniper	1/<0.1 g	
Pine	1/<0.1 g	
Ponderosa pine	2/<0.1 g	20/0.3 g
Unknown conifer	2/<0.1 g	
Non-Conifers		
Oak	2/<0.1 g	
Totals	8/<0.1 g	20/0.3 g

Feature 2 was the best-preserved hearth that was excavated in Rendija Canyon (Lockard, personal communication), and the preservation of plant material certainly confirms this observation. Plant remains indicate occupants of LA 127635 were utilizing several annual species (including ritual use of tobacco), hedgehog cactus, maize, and possibly squash and wood species from the riparian, mountain foothills, and ponderosa pine forest zones.

LA 135291 (Classic Period Fieldhouse)

Maize cupules from the ash concentration found outside the structure just to the east were the only plant remains hinting at the agricultural activities that took place near the fieldhouse (Table 62.72). Juniper twigs and ponderosa pine and piñon needles could be related to fuelwood use or represent residue from the Cerro Grande fire. Unburned juniper twigs, ponderosa pine needles, hedgehog cactus seeds, and weedy annual seeds most likely represent modern intrusives, transported into the site by wind or rodents.

Table 62.72. Flotation plant remains, count and abundance per liter from LA 135291.

FS No.	30	32	58	59	61	69
Feature	Under rock inside structure next to wall	Post-occupational fill	F. 1 (possible pot rest) fill		F. 2 Exterior ash concentration fill	Floor
Cultural						

FS No.	**30**	**32**	**58**	**59**	**61**	**69**
Feature	**Under rock inside structure next to wall**	**Post-occupational fill**	**F. 1 (possible pot rest) fill**		**F. 2 Exterior ash concentration fill**	**Floor**
Cultivars						
Maize					2(2) cupule	
Other						
Unidentifiable					3(0) plant part	
Perennials						
Juniper	+ twig		+ twig	+ twig		+ twig
Piñon			+ needle			
Ponderosa pine	+ fascicle, + needle	+ needle	+ needle	+needle	+ needle	+ needle
Non-Cultural						
Annuals						
Amaranth	+		+	+		
Goosefoot	+	+	+	+	+	+
Purslane	+	+	+		+	+
Spurge			+			
Sunflower		+				
Other						
Bean family		+				
Composite family	+	+	+		+	
Knotweed family			+			
Perennials						
Hedgehog cactus	+					
Juniper	+ twig	+ twig	+ twig	+ twig	+ twig	+ twig
Ponderosa pine	+ needle	+ needle	+ needle	+ needle	+ needle	

+ 1-10/liter

Wood charcoal from inside the structure consisted of pine, ponderosa pine, and unknown conifer (Table 62.73). The wood may also be the result of the Cerro Grande fire. The site is located in a ponderosa pine forest that was severely burned during the fire and two burned juniper trees were found directly inside the feature. In contrast, the wood assemblage from the possible discard pile outside the structure was quite different in composition, including possible Douglas fir, mountain mahogany, and oak. The presence of maize in this feature along with this unique wood assemblage suggests a discrete dumping episode that may be the only intact evidence at the site of fuel use.

Table 62.73. Flotation sample wood charcoal by count and weight in grams from LA 135291.

FS No.	30	32	58	59	61	69
Feature	Under rock inside structure next to wall	Post-occupational fill	F. 1 (possible pot rest) fill		F. 2 Exterior ash concentration fill	Floor
Conifers						
cf. Douglas fir					1/<0.1 g	
Pine	1/<0.1 g				6/0.2 g	1/<0.1 g
Ponderosa pine	7/<0.1 g	2/<0.1 g	1/<0.1 g			cf. 5/0.1 g
Unknown conifer	5/0.1 g	2/<0.1 g	1/<0.1 g	3/<0.1 g		13/0.7 g
Non-Conifers						
cf. mountain mahogany					9/0.3 g	1/<0.1 g
cf. Oak					4/0.2 g	
Totals	13/0.1 g	4/<0.1 g	2/<0.1 g	3/<0.1 g	20/0.7 g	

cf. = compares favorably

LA 135292 (Classic Period Fieldhouse)

Another Classic period fieldhouse, LA 135292, was also severely affected by the Cerro Grande fire and all but the southwest corner of the room was destroyed by modern machinery. The sample from room fill contained a charred cheno-am seed, ponderosa pine needles, and a possible cupule fragment (Table 62.74). Unidentifiable plant parts were recovered from the area of burned earth that may represent what remains of the living surface. Modern uncharred grass, annual, and groundcherry seeds were all that was recovered from the sample just inside the room's west wall.

Table 62.74. Flotation plant remains, count and abundance per liter from LA 135292.

FS No.	77	83	87
Feature	Post-occupational fill, Stratum 2, level 3	Burned earth	Stratum 2, level 4, just E of W wall of Rm. 1
Cultural			
Annuals			
Cheno-Am	1(1)		
Cultivars			
Maize	1(0) cf. c		
Other			
Unidentifiable		1(0), 1(1)	

FS No.	77	83	87
Feature	Post-occupational fill, Stratum 2, level 3	Burned earth	Stratum 2, level 4, just E of W wall of Rm. 1
		pc	
Perennials			
Ponderosa pine	+ needle		
Non-Cultural			
Annuals			
Amaranth	+	+	+
Goosefoot	+	+	+
Purslane	+		+
Sunflower		+	
Grasses			
Dropseed grass		+	
Grass family	+	+	+
Other			
Evening primrose		+	
Groundcherry	+	+	+

+ 1-10/liter, c cupule, cf. compares favorably, pc partially charred

The wood assemblage was much more diverse than that present at LA 135291, including juniper, ponderosa pine, and mountain mahogany (Table 62.75). Possible Douglas fir and oak were identified in the sample from the burned earth, wood taxa that were absent from general fill samples. Excavators noted that burned wood resulting from the Cerro Grande fire could not be distinguished from possible prehistoric charcoal (Lockard, Chapter 54). Therefore, the cultural origin of wood from flotation samples is doubtful.

Table 62.75. Flotation sample wood charcoal by count and weight in grams from LA 135292.

FS No.	77	83	87
Feature	Post-occupational fill, Stratum 2, level 3	Burned earth	Stratum 2, level 4, just E of W wall of Rm. 1
Conifers			
cf. Douglas fir		1/<0.1 g	
Juniper	2/0.1 g	1/<0.1 g	
Pine	1/<0.1 g		
Ponderosa pine		5/0.1 g	8/0.4 g
Unknown conifer	2/<0.1 g	2/<0.1 g	1/<0.1 g
Non-Conifers			
Mountain mahogany	3/<0.1 g	10/0.2 g	1/<0.1 g
Oak		1/<0.1 g	
Totals	8/0.1 g	20/0.3 g	10/0.4 g

LA 85407 (Serna Homestead).

The contents of samples from post-occupational fill in the log cabin, a test pit in the corral, and an area of burned soil and charcoal in the shed produced a similar assemblage of burned conifer duff, native annual seeds, grass seeds, grass stems, and other disturbance-loving plants like groundcherry and vervain (Table 62.76). Burned sedge family seeds from the cabin and the shed together with unburned bulrush seeds from the corral attest to the proximity of the homestead to the creek just below in Rendija Canyon. Burned seeds that resembled summer cypress were recovered from the corral. Summer cypress is a weed introduced from Eurasia that is widespread in New Mexico and flourishes in waste places and open fields. The corral and some of the cabin burned during the Cerro Grande fire. Because of this and the similarity of the wild plant assemblages, the majority of wild floral remains probably represent weeds burned in the conflagration rather than debris from food preparation or animal feed.

Evidence for domesticates was restricted to the inside of the cabin and included maize cupules and one burned and one unburned grape seed. Interviews with Annie Lujan, the daughter of José María Serna, owner of the homestead, reported that crops grown included pinto beans, corn, wheat, pumpkins, and other "soft vegetables" (see Chapter 32, Volume 2). There is no mention of grapes or vineyards, but two peach pit fragments were identified in the vegetal sample from Room 1 post-occupational fill and Ms. Lujan did not mention that they grew peaches at the homestead either. Measurements of the whole burned seed indicate the specimen is from canyon grape (*Vitis arizonica*), although charring does diminish seed size, making it difficult to determine with certainty. Wild grapes grow on canyon walls, in canyon bottoms, and piñon/juniper woodland (Foxx et al. 1998:40). While there are no gnaw marks on the specimens, the possibility that rodents deposited them (especially the unburned fragment) cannot be ruled out. The grape seeds and peach pits could also be remnants of fruit "brought up from the Pojoaque-Española Valley orchards and vineyards" (Foxx and Tierney 1999:22) or orchards were present on the homestead, but were either not mentioned by Ms. Lujan or by Lockard (Chapter 32, Volume 2).

A broken bean cotyledon from the same context and a piece of ponderosa pine wood were also identified in vegetal samples (Table 62.77). Interviews with residents or descendants of residents of the area document beans as the primary cash crop that was grown on the Pajarito Plateau (Tierney 1999c:15–23). With only one fragment recovered, it seems difficult to fathom the huge volume of beans grown on the Pajarito Plateau by homesteaders. One informant said that in 1915, he harvested about 2100 pounds of beans (Tierney and Foxx 1999:10) and this was not unusual before the drought of the late 1930s. The paucity of physical evidence is related to the fragility of beans and threshing and preparation methods. Beans may be removed from the pods elsewhere than the house interior and preparation does not usually involve parching or frying. Beans have no protective seed coat, as the pod acts as a container before harvest, leaving them vulnerable to consumption by animals or insects.

Table 62.76. Flotation sample plant remains, count and abundance per liter from LA 85407.

FS No.	269	298	301	331	352
Context	**Post-occup. fill in SE corner, Room 1**	**Post-occup. fill in SW corner, Room 1**	**Post-occup. fill, S ½, Room 2**	**Test pit NW corner, corral**	
Cultural					
Annuals					
Beeweed	1(1)	4(4)			
Goosefoot		68(67)	31(31)	143(1	1(1)
Pigweed		2(2)			
Stickseed			1(1)		
cf. Summer cypress				19(1	
Cultivars					
Grape		1(1), 1(0) u			
Maize	2(1) c	3(0) c			
Grasses					
Dropseed grass				1(1)	
Grass family	1(1) pc	1(1), culm +	2(2)		
Other					
Groundcherry			1(1)		
Sage		4(4), 3(2) pc			
Unidentifiable		1(0)			
Vervain		3(3)			
Perennials					
Juniper			twig + pc		
Pine	bark +	bark +, needle +	bark +		cf. umbo +
Piñon				needle +	needle +
Ponderosa pine				needle +	needle +
Sedge family		1(1)			
Non-Cultural					
Annuals					
Beeweed	+	+	+	+	+
Goosefoot	+++	+++	+++	++++	+++
Pigweed	++	+	+	+++	++
Purslane	+++	+++	+	++++	+++
Stickseed	+		+	+	
Sunflower	+	+	+		+
Grasses					

FS No.	269	298	301	331	352
Context	Post-occup. fill in SE corner, Room 1	Post-occup. fill in SW corner, Room 1	Post-occup. fill, S ½, Room 2	Test pit NW corner, corral	
Dropseed grass	+	+	+	+	+
Grass family	+	+	+	+	+
Other: Doveweed	+	+			+
Groundcherry	+	+	+	+	+
Knotweed family					+
Purslane family				+	
Sage	+	+	+		
Stickleaf		+	+		+
Sunflower family	+	+	+	++++	+
Unknown				+	

Table 62.76 (continued). Flotation sample plant remains, count and abundance per liter from LA 85407.

FS No.	269	298	301	331	352
Context	Post-occup. fill in SE corner, Room 1	Post-occup. fill in SW corner, Room 1	Post-occup. fill, S ½, Room 2	Test pit NW corner, corral	
Non-Cultural					
Other					
Vervain	+	+			
Perennials					
Bulrush				+	+
Globemallow		+	+		
Hedgehog cactus			+		
Juniper				+	+
Pine				♂ cone +,	
Piñon	nutshell +			needle +, nutshell +	needle +, nutshell +
Ponderosa pine	needle +			needle +	needle +

+ 1-10/liter, ++ 11-25/liter, +++ 25-10/liter, ++++ >100/liter, c cupule, pc partially charred, u uncharred

Table 62.76 (continued). Flotation sample plant remains from LA 85407.

FS No.	**357**	**408**	**499**
Context	**Near base of horno**	**Charcoal concentration, NE corner, horno**	**Burned soil/charcoal in shed**
Cultural			
Annuals			
Beeweed			2(2), 1(0) pc
Cheno-Am			3(3)
Croton			1(1)
Goosefoot		1(1)	56(56)
Other			
Groundcherry			2(2)
Unident.		1(0)	11(11) e, 1(0) pp
Perennials			
Pine		bark +	
Sedge family			3(3)
Non-Cultural			
Annuals			
Beeweed			+
Goosefoot	+	+++	+++
Pigweed		+	+
Purslane	+	+++	+++
cf. Russian thistle			+
Stickseed			+
Sunflower		+	
Grasses			
Dropseed gr.	+	+	+
Grass family			+
Other			
Doveweed			+
Groundcherry	+	+	+
Purslane family			+
Sage		+	+
Sunflower		+	
Perennials			
Bulrush			+
Hedgehog cactus			+
Juniper			♀ cone +
Piñon			needle +, nutshell +

+ 1-10/liter, +++ 25-10/liter, e embryo, pc partially charred, pp plant part

Table 62.77. Room 1, post-occupational fill vegetal sample plant remains from LA 85407.

FS No.	41	64	95
Cultivars			
Bean	1(0)/<0.1 g		
Peach			2(0) u/2.1 g
Wood			
Ponderosa pine		1/<0.1 g	

Wood charcoal from the majority of contexts at LA 85407 is overwhelmingly ponderosa pine (Table 62.78). Exceptions are the samples from inside the horno and the burned soil/charcoal concentration in the shed. Fuel used for cooking seems to have been primarily juniper, although piñon and ponderosa were also present. Wood from the shed context is a mixture of juniper, piñon, and ponderosa, but here ponderosa was the most common wood identified. This could reflect the use of ponderosa for construction and juniper for fuel in the horno.

Table 62.78. Flotation sample wood charcoal by count and weight (g) from LA 85407.

FS No.	269	298	301	331	352	357
Context	**Post-occup. fill in SE corner, Room 1**	**Post-occup. fill in SW corner, Room 1**	**Post-occup. fill, S ½, Room 2**	**Test pit NW corner, corral**		**Near base of horno**
Conifers						
Ponderosa pine	19/1.7 g	20/1.3 g	20/2.9 g	8/0.5 g	1/0.1 g	1/<0.1 g
Unknown conifer						1/<0.1 g
Non-Conifers						
Unknown non-conifer	1/0.1 g					
Totals	20/1.8 g	20/1.3 g	20/2.9 g	8/0.5 g	1/0.1 g	2/<0.1 g

Table 62.78 (continued). Flotation sample wood charcoal by count and weight (g) from LA 85407.

FS No.	408	499	Totals	
Context	**Charcoal concentration, NE corner, horno**	**Burned soil/charcoal in shed**	**Weight**	**%**
Conifers				
Juniper	12/1.8 g	4/0.1 g	1.9 g	19
Piñon	3/0.8 g	1/<0.1 g	0.8 g	8
Ponderosa pine	2/0.3 g	15/0.2 g	7.0 g	72
Unknown conifer			<0.1 g	<1

FS No.	408	499	Totals	
Context	Charcoal concentration, NE corner, horno	Burned soil/charcoal in shed	Weight	%
Non-Conifers				
Unknown non-conifer			0.1 g	1
Totals	17/2.9 g	20/0.3 g	9.8 g	100

The Serna family grew corn and beans among other crops documented in interviews and the Homestead Entry Survey. The family traveled to the homestead three times a year by wagon and stayed for about two weeks during each visit. The burned beeweed, goosefoot, pigweed, and groundcherry seeds could be evidence that the family ate the fruits of groundcherry and encouraged and collected annual greens from the fields, a practice documented in several interviews of Spanish residents of the region (Tierney 1999c:15–23). However, these plants all thrive in disturbed ground and are part of the early successional stage after site abandonment (Foxx 1999) and are more likely to represent weeds that burned in the Cerro Grande fire. Although some of the wood charcoal may also derive from the fire, excavators noted that the cabin fill was extremely rich in charcoal and that most if not all of the charcoal probably derived from the beams and boards that formed the cabin's walls and floor (Chapter 32, Volume 2). Charcoal from the horno indicates juniper was a primary fuel resource and wood from the cabin suggests ponderosa was used for construction.

LA 85408 (Classic Period Fieldhouse)

Possible piñon nutshell was the only cultural plant material not directly related with firewood use that was found in the fieldhouse (Table 62.79). A total of five pieces of unknown conifer wood, four from the middle fill of the pit and one from post-occupational fill were also recovered. Modern debris included unburned goosefoot, prickly pear, and sedge seeds, grass florets, piñon nutshell, and conifer twigs and needles.

Table 62.79. Flotation plant remains, count and abundance per liter from LA 85408.

FS No.	41	42	57
Context	Middle fill, round pit	Lower fill, round pit	Post-occup. fill, Room 1
Cultural			
Perennials			
Piñon			needle +, cf. nutshell +
Ponderosa pine	needle +	needle +	needle +
Non-Cultural			
Annuals			
Goosefoot			+
Grasses			
Grass family			floret +
Perennials			

FS No.	41	42	57
Context	Middle fill, round pit	Lower fill, round pit	Post-occup. fill, Room 1
Juniper	twig +		twig +
Piñon			needle +, nutshell +
Ponderosa pine			needle +
Prickly pear cactus			+
cf. Sedge			+

+ 1-10/liter, cf. compares favorably

LA 85411 (Classic Period Fieldhouse)

Tobacco was found in the small pit hearth (Feature 2) in Room 2 along with pigweed and purslane seeds (in upper and middle fill) and the ever present conifer needles and cone fragments (Table 62.80). Unlike the hearth in Room 2, it was only the lower fill of the Feature 1 hearth in Room 1 that yielded floral remains unrelated to wood use (maize and one goosefoot seed). Ponderosa pine and mountain mahogany were the two most frequently encountered wood taxa (Table 62.81). Unknown conifer, pine, and oak were also present. A single vegetal sample from post-occupational fill just outside Room 1 contained a pine umbo and six pieces of ponderosa pine weighing a tenth of a gram.

Table 62.80. Flotation plant remains, count and abundance per liter from LA 85411.

FS No.	76	77	78	111	112	118
Context	F. 1 Hearth, N ½			F. 1 Hearth, S ½		
	Upper fill	Middle fill	Lower fill	Upper fill	Middle fill	Lower fill
Cultural						
Annuals						
Goosefoot			1(1)			
Cultivars						
Maize			poss. 2(0) c			cf. 1(0) k
Other						
Unidentifiable	1(0) pp			1(0) pp		
Perennials						
Pine			needle +			
Piñon	needle +			needle +		needle +
Ponderosa pine	needle +	needle +		needle +	needle +	
Non-Cultural						
Annuals						
Goosefoot	+			+		+
Spurge				+		
Grasses						
Grass family						floret +
Sunflower				+		

FS No.	76	77	78	111	112	118
Context	F. 1 Hearth, N ½			F. 1 Hearth, S ½		
	Upper fill	Middle fill	Lower fill	Upper fill	Middle fill	Lower fill
family						
Perennials						
Piñon				needle +		needle +

+ 1-10/liter, c cupule, cf. compares favorably, k kernel, pp plant part

Table 62.80 (continued). Flotation plant remains, count and abundance per liter from LA 85411.

FS No.	136	137	138	178
Context	F. 2 Hearth, N ½			F. 2 Hearth
	Upper fill	Middle fill	Lower fill	S ½
Cultural				
Annuals				
Pigweed	1(1)			
Purslane	1(1)	1(1)		
Tobacco		1(1)		
Other				
Unidentifiable	1(0) pp	1(0) pp		1(0) pp
Perennials				
Pine		umbo +		umbo +
Piñon				needle +
Ponderosa pine	needle +	needle +	needle +	needle +
Non-Cultural				
Annuals				
Purslane		+		
Grasses				
Grass family				floret +
Perennials				
Piñon			needle +	
Ponderosa pine				needle +

+ 1-10/liter, pp plant part

Table 62.81. Flotation wood charcoal by count and weight in grams from LA 85411.

FS No.	76	77	78	111	112	118	136
Context	F. 1 Hearth, N ½			F. 1 Hearth, S ½			F. 2 Hearth, N ½
	Upper fill	Middle fill	Lower fill	Upper fill	Middle fill	Lower fill	Upper fill
Conifers							
Pine						10/0.3 g	
Ponderosa pine	3/0.1 g		1/<0.1 g	2/<0.1 g	1/<0.1 g		1/<0.1 g

FS No.	76	77	78	111	112	118	136
Context	F. 1 Hearth, N ½			F. 1 Hearth, S ½			F. 2 Hearth, N ½
	Upper fill	Middle fill	Lower fill	Upper fill	Middle fill	Lower fill	Upper fill
Unknown conifer				2/0.3 g	2/<0.1 g	4/0.2 g	
Non-Conifers							
Mountain mahogany	1/<0.1 g			1/<0.1 g	12/0.3 g	2/0.1 g	1/<0.1 g
Oak	1/<0.1 g	1/<0.1 g	1/<0.1 g				
Totals	5/0.1 g	1/<0.1 g	2/<0.1 g	5/0.3 g	15/0.3 g	16/0.6 g	2/<0.1 g

Table 62.81 (continued). Flotation wood charcoal by count and weight in grams from LA 85411.

FS No.	137	138	178	Totals	
Context	F. 2 Hearth, N ½, middle fill	F. 2 Hearth, N ½, lower fill	F. 2 Hearth, S ½	Weight	%
Conifers					
Pine				0.3 g	15
Ponderosa pine	2/0.1 g	8/0.1 g	7/0.3 g	0.6 g	30
Unknown conifer	3/0.1 g			0.6 g	30
Non-Conifers					
Mountain mahogany		1/<0.1 g	4/<0.1 g	0.4 g	20
Oak		4/0.1 g	1/<0.1 g	0.1 g	5
Totals	5/0.2 g	13/0.2 g	12/0.3 g	2.0 g	100

LA 85413 (Classic Period Fieldhouse)

Cultural plant remains consisted of one goosefoot seed and one possible maize cupule fragment (Table 62.82). Charred and partially charred plant part fragments could not be identified and conifer needles are probably a product of firewood use. Wood charcoal was primarily mountain mahogany and unidentified pine with piñon, ponderosa pine, oak, and unknown conifer occurring in smaller numbers (Table 62.83).

Table 62.82. Flotation plant remains, count and abundance from LA 85413.

FS No.	149	224
Context	Ash/charcoal deposit on floor	Room 1, burned floor, east corner
Cultural		
Annuals		
Goosefoot		1(1)

FS No.	149	224
Context	**Ash/charcoal deposit on floor**	**Room 1, burned floor, east corner**
Cultivars		
Maize	cf. 1(0) c	
Other		
Unidentifiable	1(0) pp	1(0) pp, 1 (0) pp pc
Perennials		
Piñon	needle +	
Ponderosa pine	needle +	needle +
Non-Cultural		
Annuals		
Goosefoot	+	+
Perennials		
Juniper	+, twig +	twig +
Piñon	needle +, nutshell +	

+ 1-10/liter, c cupule, cf. compares favorably, pc partially charred, pp plant part

Table 62.83. Wood charcoal taxa by count and weight in grams from LA 85413.

FS No.	149	224
Context	**Ash/charcoal deposit on floor**	**Room 1, burned floor, east corner**
Conifers		
Pine	11/0.4 g	
Piñon		4/0.1 g
Ponderosa pine	1/<0.1 g	
Unknown conifer		3/<0.1 g
Non-Conifers		
Mountain mahogany	8/0.2 g	1/<0.1 g
Oak		4/0.2 g
Totals	20/0.6 g	12/0.3 g

LA 85414 (Classic Period Fieldhouse)

Piñon needles were the only non-wood plant materials recovered from the fieldhouse and most likely relate to fuelwood use (Table 62.84). Wood charcoal was limited to five pieces of pine recovered from the southeast corner of the living surface.

Table 62.84. Flotation plant remains, count and abundance from LA 85414.

FS No.	57	58
Context	**Room 1, living surface, SE corner**	**Room 1, living surface, SW corner**
Cultural		
Perennials		
Piñon		needle +
Non-Cultural		

FS No.	57	58
Context	**Room 1, living surface, SE corner**	**Room 1, living surface, SW corner**
Grasses		
Grass family	floret +	floret +
Perennials		
Juniper	twig +	
Piñon	needle +	
Ponderosa pine	needle +	

+ 1-10/liter

LA 85417 (Late Coalition Period Fieldhouse)

Cheno-am seeds were identified in the south half of the ash pit fill and in the ash/charcoal deposit on the floor of the structure (Table 62.85). Piñon seeds (immature, so identification is tentative), a juniper cone fragment, and unidentifiable plant parts were also recovered in the south half of the ash pit. Non-cultural material included annual seeds, cactus seeds, and conifer needles. Wood charcoal was entirely coniferous, with ponderosa pine and unknown conifer the most common taxa, followed by pine and juniper (Table 62.86).

Table 62.85. Flotation plant remains, count and abundance from LA 85417.

FS No.	71	72	114	142
Context	**F. 1 Ash pit fill, S ½**		**F. 1 Ash pit fill, N ½**	**Room 1 floor, ash/charcoal south of NW corner**
Cultural				
Annuals				
Cheno-Am	1(1)			1(1)
Other				
Unidentifiable	3(0) pp			
Perennials				
Juniper	cf. 1 (0) ♀ cone			
Piñon	cf. 2(2)			
Non-Cultural				
Annuals				
goosefoot	+		+	
Purslane	+	+	+	
Perennials				
Hedgehog cactus	+			
Piñon				needle +
Ponderosa pine	needle +			

+ 1-10/liter, cf. compares favorably, pp plant part

Table 62.86. Wood charcoal taxa by count and weight in grams from LA 85417.

FS No.	71	72	114	141	142
Context	F. 1 Ash pit fill, S ½		F. 1 Ash pit fill, N ½	Room 1 floor, Ash/charcoal, NW corner	Room 1 floor, ash/charcoal south of NW corner
Conifers					
Juniper					2/0.2 g
Pine		2/<0.1 g		3/0.3 g	
Ponderosa pine		2/<0.1 g	1/<0.1 g	15/1.8 g	12/1.3 g
Unknown conifer	1/<0.1 g		3/0.1 g	2/<0.1 g	6/0.1 g
Totals	1/<0.1 g	4/<0.1 g	4/0.1 g	20/2.1 g	20/1.6 g

LA 85861 (Late Coalition Period Fieldhouse)

In comparison with the three other fieldhouses from this time period, LA 85861 stands out with greater taxonomic diversity, including the recovery of beeweed seeds from the hearth, reminiscent of LA 127634 and LA 127635, two Classic period fieldhouses where beeweed was a significant element in the floral assemblages. A cheno-am seed fragment, a mint family seed, an unidentifiable plant part fragment, piñon needles, and two maize cupules comprise the balance of the cultural plant material recovered (Table 62.87). Unburned piñon needles were the only modern plant parts present. Small quantities of pine, piñon, ponderosa pine, and unknown conifer charcoal were also identified (Table 62.88).

Table 62.87. Hearth fill, flotation plant remains, count and abundance from Feature 1 at LA 85861.

FS No.	191	192	193	194
Cultural				
Annuals				
Beeweed	3(3), 2(2) pc	6(5)		
Cheno-Am		1(0)		
Cultivars				
Maize			2(2) c	
Other				
cf. Mint family		1(1)		
Unidentifiable	1(0) pp			
Perennials				
Piñon				needle +
Non-Cultural				
Perennials				
Piñon				needle +

+ 1-10/liter, c cupule, cf. compares favorably, pc partially charred, pp plant part

Table 62.88. Hearth fill, wood charcoal taxa by count and weight in grams from Feature 1 at LA 85861.

FS No.	191	192	193	194
Conifers				
Pine		2/<0.1 g		
Piñon	1/<0.1 g		1/<0.1 g	
Ponderosa pine				1/<0.1 g
Unknown conifer	2/<0.1 g	2/<0.1 g		
Totals	3/<0.1 g	4/<0.1 g	1/<0.1 g	1/<0.1 g

LA 85867 (Classic Period Fieldhouse)

Two samples from the living surface of this one-room fieldhouse yielded charred ponderosa pine needles and uncharred hedgehog cactus seeds. Fourteen pieces of ponderosa pine and 12 pieces of unknown conifer, weighing 0.5 g round out the cultural plant material recovered.

LA 86606 (Coalition Period Fieldhouse and Classic Period Extramural Feature)

Carbonized purslane seeds, grass stems, conifer duff, and unidentifiable plant parts were found on a well-preserved patch of the living surface in the southwest corner of the fieldhouse (Table 62.89). An unidentifiable plant part and ponderosa pine needles were recovered from the fill between three rocks that may have been the remnants of a Classic period exterior hearth or pot rest next to a hearth. Ashy sediment found south of the three rocks yielded ponderosa pine needles. Ponderosa pine was the only wood taxon identified from the structure living surface, possibly indicating the identity of a ceiling or wall element. Mountain mahogany was the dominant wood taxon in the ashy sediment and the possible hearth (Table 62.90). Logically, the ashy sediment (possible dump from the hearth) was the most diverse, containing ponderosa pine, piñon, mountain mahogany, and oak.

Table 62.89. Flotation plant remains, count and abundance from LA 86606.

Period	**Coalition**	**Classic**	
FS No.	**85**	**91**	**92**
Context	**Room 1 floor, SW corner**	**Ashy sediment south of the 3 rocks in Area 2**	**Fill between 3 rocks east of possible windbreak in Area 2**
Cultural			
Annuals			
Purslane	1(1)		
Grasses			
Grass family	culm +		
Other			
Unidentifiable	2(0) pp		1(0) pp
Perennials			
Pine	umbo +		
Ponderosa	needle +	needle +	needle +

Period	Coalition	Classic	
FS No.	85	91	92
pine			
Non-Cultural			
Annuals			
Goosefoot	+	+	
Grasses			
Dropseed grass	+		

+ 1-10/liter, pp plant part

Table 62.90. Wood charcoal taxa by count and weight in grams from LA 86606.

Period	Coalition	Classic	
FS No.	85	91	92
Context	Room 1 floor, SW corner	Ashy sediment	Fill between 3 rocks east of wall
Conifers			
Pine			1/<0.1 g
Piñon		2/0.2 g	
Ponderosa pine	20/0.8 g	7/0.6 g	
Unknown conifer			4/0.1 g
Non-Conifers			
Mountain mahogany		10/0.6 g	12/0.2 g
Oak		1/0.1 g	3/0.1 g
Totals	20/0.8 g	20/1.5 g	20/0.4 g

LA 86607 (Coalition Period Fieldhouse)

One fragment of ponderosa pine charcoal weighing less than a tenth of a gram was the sole floral material from post-occupational fill in the structure. The paucity of remains is not surprising considering the impact of trail building (Pajarito Trail #286 passes through the site); some of the rocks that were originally part of the structure walls were probably used to construct the trail and rock alignments that cross the trail, built to control erosion.

TA-74 Testing

LA 21596B and LA 21596C (Coalition/Classic Period Grid Gardens)

The grid gardens are located at the base of a colluvial slope adjoining floodplains or fluvial terraces in the bottom of Pueblo Canyon (see Chapter 55, Volume 2). Non-cultural unburned conifer twigs, cone parts, and needles formed the primary constituents of the plant assemblage from the two grid gardens. One maize cupule fragment was recovered from LA 21596C and five from LA 21596B. Fragments of piñon nutshell were also recovered from LA 21596C. Small fragments of unknown conifer wood were found in both grid gardens.

The same process described in the discussion of LA 128803 whereby debris is burned to fertilize or clear gardens may have taken place at these two, leaving charred evidence of the procedure. Another possibility is that these remains represent trash washed downslope from Otowi Pueblo, a Classic period large multi-room habitation site, located on the second bench upslope from the gardens. "There is a continuous scatter of artifacts down from Otowi including approximately 200 to 300 items on the first bench near the site" (Chapter 55, Volume 2). This pattern along with 273 artifacts (mostly ceramics) recorded near LA 21596A, 44 at LA 21596B, and 91 more at LA 21596C, suggest the latter possibility is more likely.

LA 86528 (Classic/Historic Period Rockshelter)

A partially charred juniper seed and unknown bark were the sole possibly cultural plant materials recovered from Test Pit 1. Test Pit 1 was excavated to sample a charcoal stain at the edge of the overhang of the rockshelter. The stain may represent a pit excavated into the Pleistocene soil horizon or the remains of a natural fire and the shelter itself may never have been occupied. The recovery of maize pollen from the same context suggests the former.

LA 86531 (Coalition/Historic Period Lithic and Ceramic Scatter)

This is an eroded site on a Pleistocene terrace about 30 m above the floor of Pueblo Canyon. Level 1 of the test pit yielded two maize cupule fragments, five possible kernel fragments, pine bark, and ponderosa pine needles. Cultigens were not recovered from Level 2 of the test pit. Piñon, juniper, ponderosa, mountain mahogany, and oak charcoal were also identified. Site occupants could have been farming on the bottomlands of the canyon. They were certainly using locally available shrubs and conifers for fuel.

LA 110126 (Classic Period Fieldhouse)

Slightly downslope from where the structure was located, samples from a shovel test yielded carbonized pine bark, grass stems, and one fragment each of unknown conifer, mountain mahogany, and unknown non-conifer charcoal. Macrobotanical wood sample taxa included the same three found in flotation samples with the addition of wood that compared favorably to rabbitbrush. The paucity of plant material is not surprising considering that the only recognizable remnant of the site was an alignment of four tuff rocks.

LA 110130 (Classic Period Fieldhouse)

LA 110130 is situated on a terrace above the floodplain of Pueblo Canyon. A burned amaranth seed was recovered from Stratum 2 in Test Unit 1 from inside the structure. A cupule and a cupule segment were identified from a charcoal stain encountered in Test Unit 2, excavated into a rubble pile in the southeastern portion of the structure. Wood charcoal consisted of 17 pieces of sagebrush identified in the charcoal stain and one fragment of oak from Test Unit 1. Farmers at LA 110130 could have cultivated crops in the floodplain of Pueblo Canyon and collected seeds of annual plants like amaranth that thrive in the disturbed ground of agricultural fields.

LA 117883 (Archaic Lithic Scatter)

Macrobotanical wood charcoal was collected from two test pits and included piñon, oak, and unknown conifer. The Pueblo Canyon drainage flows around the site that is situated on a sandbar. Charcoal could have been washed in or deposited downslope from a large Coalition cavate site above.

LA 61034 (Classic-Historic Period Lithic/Ceramic Scatter)

A single fragment of unknown conifer wood was the sole charred plant part from the flotation sample. Macrobotanical wood charcoal consisted of three pieces of pine and one of oak.

LA 61035 (Classic Period Lithic/Ceramic Scatter)

A fragment of an unknown plant part was recovered from the flotation sample along with a piece of pine wood and another of unknown conifer. The six macrobotanical samples were more productive, yielding juniper, piñon, and unknown conifer charcoal for a count of 23 and a total weight of 2.1 g.

DISCUSSION: THE C&T PROJECT PREHISTORIC DATA IN A REGIONAL PERSPECTIVE

Plant Remains from Flotation

Coalition Period

Carbonized plant remains from LA 12587, LA 86534, and LA 135290 are compared with other Coalition period sites on the Pajarito Plateau in Table 62.91. Data from LA 4624, a 25-room pueblo, come from three of the 10 rooms excavated in 1993 by LANL. LA 60372 (Burnt Mesa Pueblo) is a multi-room pueblo with a plaza. Area 2 of the site was occupied during the Early Coalition. Samples were analyzed from rooffall, an ash pit, extramural contexts, and hearths in Rooms 2 and 8. LA 29746, LA 21432, and LA 21422 were all part of the University of California's Pajarito Archaeological Research Project (PARP) and samples were taken from excavations in middens associated with the three pueblos. With the exception of LA 21422 and LA 21432, the number of flotation samples analyzed from the current project far outstrip the number from any of the other projects, so comparison largely emphasizes how much richer our picture of subsistence can be when an extensive database is available.

Maize fragments and goosefoot, pigweed, and purslane seeds are widespread in the sites compared in Table 62.91, emphasizing the important dietary role played by these key species during the Coalition period. Annuals like pigweed, goosefoot, and purslane that readily volunteer in agricultural fields were likely encouraged (Medsger 1939). Bye (1981) has documented the encouragement and harvest of goosefoot, pigweed, mustard, and purslane in the modern cultivated fields of the Tarahumara of northern Mexico. The leaves provide a welcome source of greens early in the growing season and, later, the seeds can be collected, parched, and added to corn meal to make bread, cakes, mush, or gruel (Harrington 1967). Other domesticates recovered in flotation samples include possible squash rind at four out of six sites and beans at three sites. In addition to the sites compared in Table 62.91, Matthews (1989) analyzed two flotation samples from Casa del Rito (LA 3852, an Early Coalition site) and found a small fragment of *Cucurbita* rind and three maize cupules, while eight cob fragments were also identified in vegetal samples. Kohler and Root (2004:148), however, consider it likely that the squash rind and some of the maize remains may postdate the habitation of the site.

The diversity and abundance of grasses is low. Unidentified grasses occur at five out of six sites and perhaps when archaeobotanists become more adept at identifying this class of plants to genus or species, diversity of assemblages will expand. Groundcherry, evening primrose, and mint family seeds were recovered from the current project. After Spanish contact, the mashed fruits of groundcherry were used by the Zuni in a salsa along with onions, chile, and coriander. The Rio Grande pueblos ate the fruit either boiled or fresh (Castetter 1935:39–40). Members of the mint family like horsemint (*Monarda menthaefolia*) and mint (*Mentha canadensis*) were used as seasonings (Castetter 1935:33–34). The leaves, roots, and shoots of evening primrose are edible and the Navajo use many species for medicine. The Hopi also smoked *Oenothera albicaulis* as a tobacco (Dunmire and Tierney 1997:240–241).

Table 62.91. Comparison of carbonized plant remains from Coalition period sites on the Pajarito Plateau.

Site	**LA 4624**[1]	**LA 60372**[2] **Area 2**	**LA 29746**[3]	**LA 21432**[3]	**LA 86534**	**LA 135290**	**LA 12587**	**LA 21422**[3]	**LA 4618**[4]
Phase	**Early**				**Middle**		**Late**		
Number of flotation samples analyzed with charred remains	5	8	27	39	53	75	112	52	60
Annuals									
Beeweed			+			+			+
Bugseed							+		+
Cheno-am	+				+	+	+		+
Goosefoot	+		+	+	+	+	+	+	+
Goosefoot family					+				+
Pigweed	+		+	+	+	+	+	+	+
Purslane	+		+	+	+	+	+	+	+
Purslane family						+			
Sunflower							+		
Sunflower family					+	+			
Tobacco						+	+		+
Winged pigweed						+			
Cultigens									
Bean				+		+	+	+	+
Maize	+	+	+	+	+	+	+	+	+
cf. Squash					+ rind	+ rind	+ rind		+ rind
Grasses									
Dropseed	+					+	+		+
Grass family		+ florets			+	+	+		+
Ricegrass				+			+	+	
Other									

Site	LA 4624[1]	LA 60372[2] Area 2	LA 29746[3]	LA 21432[3]	LA 86534	LA 135290	LA 12587	LA 21422[3]	LA 4618[4]
Evening primrose					+	+			+
Groundcherry					+		+	+	+
Knotweed family						+			
Mint family					+	+	+		+
Plantain						+			
Spurge			+	+				+	+
Perennials									
Banana yucca									+
Bullrush			+	+				+	
Chokecherry								+	
Four-wing saltbush	+				+		+	+	+
Globemallow	+								
Hedgehog cactus	+		+				+	+	
Juniper			+	+	+	+	+	+	
Pincushion cactus						+			
Piñon	+ nutshell				+nutshell	+ nutshell	+nutshell	+ nutshell	+ nutshell
Prickly pear cactus				+			+	+	+
Sage									+
Total Taxa	9	2*	9	10	14	20	19	15	21

+ present; * charred pine cone scales and conifer needles also present; [1]McBride and Smith 2002; [2]Matthews 1989; [3]Trierweiler 1990; [4]McBride 2006

Cacti comprise a large proportion of the perennial plants utilized on the Pajarito Plateau. Cactus fruits were among the very few sweets available to pre-contact southwesterners and may have been sought after not only for the taste, but as a source of protein, vitamin C, potassium, and calcium (Dunmire and Tierney 1997:234). Piñon was the most frequently encountered perennial taxon at sites in Los Alamos, but was absent from sites in Bandelier National Monument. Banana yucca, sage, and globemallow had singular appearances in the record. Banana yucca is listed as not common on the Pajarito Plateau by Foxx and Tierney (1985:89), which explains the paucity of evidence for its' use. However, one species of sage (*Salvia reflexa*) is locally common in disturbed soils of the area. The most common use of sage is to soak the whole unprocessed seeds in water to make a refreshing, mucilaginous drink (Kirk 1970:85; Russell 1908:77) and may be the reason for the scanty appearance of this taxon in the record. One species of globemallow (*Sphaeralcea fendleri*) is listed as widespread in New Mexico at elevations from 1646 to 2438 m (5400 to 8000 ft) (Martin and Hutchins1980:1262) so it is hard to explain why this perennial resource is not more widely represented in archaeobotanical assemblages from the Pajarito Plateau. Juniper cones and seeds and four-wing saltbush fruits may be residue from firewood use or could have been used as seasoning or emergency foods.

Four Coalition fieldhouses from the C&T Project were not included for comparison, but warrant some discussion. The meager non-wood cultural plant material from three of the fieldhouses consisted of burned cheno-am and purslane seeds, grass stems, and immature piñon seeds (from LA 85417). Although lacking the diversity of taxa from Classic period fieldhouses, the assemblage from the fourth fieldhouse (LA 85861) resembles those of several Classic period fieldhouses in that beeweed seeds were recovered in two samples from the hearth. This may indicate that in the Classic period, fieldhouses were occupied for a longer part of the growing season, or that differential preservation is a factor.

Classic Period

The 21 C&T Project Classic fieldhouses produced a much more diverse array of cultural plant remains than those of the previous period and many more taxa than the multi-room Classic period pueblos compared in Table 62.92. In particular, LA 87430, LA 87411, LA 127634, and LA 127635 were remarkable in that tobacco was recovered along with the only beeweed, bugseed, beans, squash, and banana yucca seeds (from LA 127634) from Classic period sites. Compared to plant assemblages from the Classic period pueblos in Bandelier, LA 5173 is the only one that comes close. This is probably due to vast sample size differences since the pueblos presumably represent much longer occupational sequences.

Shohakka is a horseshoe-shaped pueblo with three kivas in the central plaza and a midden to the south. Samples were taken from the use surface of Room 1, room fill, wall/rooffall, and hearth fill in Room 2, the center of Kiva 3 and wall/rooffall from the kiva, and from a trench in the midden area. Tyuonyi Annex was a pueblo of about 50 ground floor rooms with second-story rooms in some parts of the roomblock. Samples were collected from four levels of secondarily deposited cultural fill in a test unit and post-occupational fill of two rooms. Finally, LA 5137 is another PARP site where midden samples were collected and analyzed.

Table 62.92. Comparison of carbonized plant remains from Classic period sites on the Pajarito Plateau.

Site	**LA 3840 Shohakka Pueblo[1]**	**LA 60550 Tyuonyi Annex[2]**	**LA 5137[3]**	**C&T Project Fieldhouses***
Number of flotation samples analyzed with charred remains	10	6	7	90
Annuals				
Beeweed				+
Bugseed				+
Cheno-am		+		+
Goosefoot	+	+	+	+
Pigweed		+	+	+
Purslane		+	+	+
Tobacco		+		+
Cultigens				
Bean				+
Maize	+	+	+	+
cf. Squash				+ rind
Grasses				
Grass family	+	+, + culm		+, + culm
Common reedgrass	+ culm			
Other				
Mallow family	+			
Groundcherry			+	
Spurge			+	
Perennials				
Banana yucca				+
Bulrush			+	
Cactus family	+			
Chokecherry			+	
cf. Dock				+
Hedgehog cactus			+	+
Pincushion cactus		+		
Piñon			+nutshell	+nutshell
Prickly pear cactus			+	
Total Taxa	**6**	**8 (7)**	**11**	**15 (14)**

+ present, V vegetal. *Includes LA 128805, LA 141505, LA 15116, LA 85403, LA 85404, LA 86605, LA 87430, LA 127627, LA 127634, LA 127635, LA 135291, LA 135292, LA 85408, LA 85411, LA 85413, LA 85414, LA 85867, LA 86606, LA 110126, and LA 110130. [1]Matthews 1993; [2]Matthews 1989 [3]Trierweiler 1990

Like Coalition period assemblages, maize, goosefoot, pigweed, and purslane are still the most commonly encountered taxa from Classic period contexts. Grass diversity is also low at this time and the perennial assemblage is quite similar to the previous period, with more species of cacti than any other plant group. Possible dock seeds that were recovered at one of the Rendija fieldhouses (LA 15116) represent the only taxon found exclusively in the Classic period. Dock seeds were ground into a meal, while the young leaves were cooked as a potherb. The seeds were also used as a substitute for tobacco or in combination with it (Harrington 1967:92). In contrast to the preceding period, where beans and squash were found at more than 40 percent of sites, in the Classic period only fieldhouses produced all three cultivars. The large variety of annual taxa present at the majority of sites in the Coalition period was restricted to Classic period fieldhouses as well.

Summary of Plant Remains from Flotation over Time

The percentages of plant classes remain fairly stable throughout the occupational sequence of the Pajarito Plateau (Figure 62.8). Early Coalition period sites include LA 4624 and LA 60372 (Area 2), Middle Coalition period sites include LA 86534 and LA 135290, Late Coalition period sites include LA 12587, LA 4618, LA 85417, and LA 85861, and Classic period sites include LA 3840, LA 6550, LA 15116, LA 85403, LA 85404, LA 85411, LA 85413, LA 87430, LA 110130, LA 127627, LA 127631, LA 127634, LA 127635, LA 128805, LA 135291, LA 135292, and LA 141505.

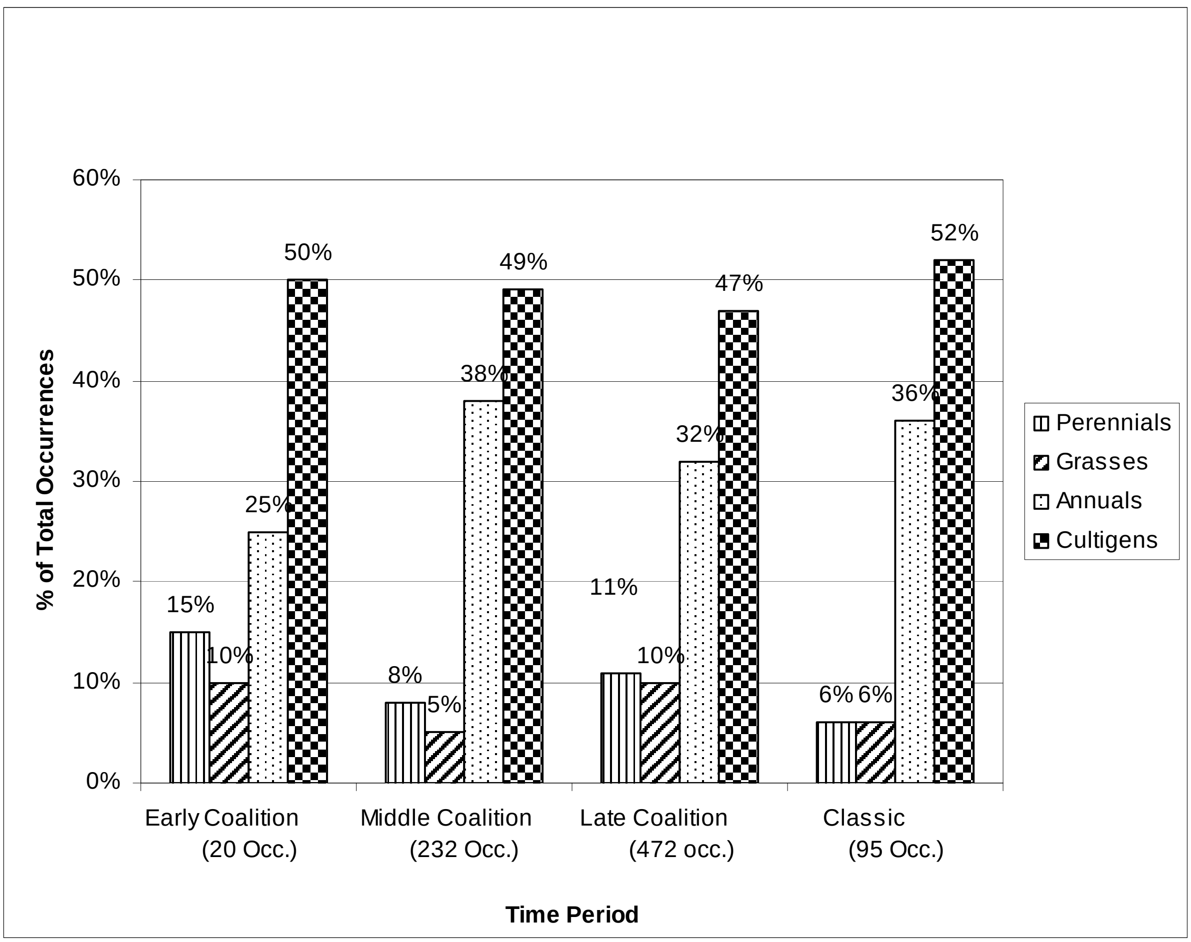


Figure 62.8. Comparison of plant classes from sites on the Pajarito Plateau.

Originally Figure 62.8 included data from two Bandelier sites dating to the transitional Coalition/Classic period together with all the sites used in comparison tables, but for reasons described below, the PARP data have been eliminated. Midden material from LA 174 (Trierweiler 1990) was the primary source of data for the Coalition/Classic period (of the 154 total occurrences, 144 were recorded for LA 174). There is something very different about this site where perennials, annuals, and cultigens were identified in a nearly equal number of samples. Trierweiler (1990) identified piñon nutshell in all but six of the 48 samples analyzed. This is in marked contrast to the current project where piñon was identified in only 14 samples out of 489. Matthews (1898, 1993) found no burned piñon nut remains from the Coalition and Classic period samples that she analyzed for the Bandelier Archaeological Project. Chokecherry seeds had never been identified before in Pajarito Plateau assemblages and Trierweiler recovered the seeds at three of the five sites he analyzed. Furthermore, *Opuntia* seeds were also identified at three of the five sites, whereas only two of the C&T Project samples contained evidence of prickly pear cactus seeds. These differences beg the question of whether midden samples provide evidence strictly of food preparation or whether they contain debris from activities more encompassing in nature and, thus, presenting a comparability issue.

Without the data from LA 174 there was insufficient data, precluding the inclusion of the Coalition/Classic period in Figure 62.8. The percentage of annuals compared to cultigens is closest in the Middle Coalition. This may indicate agricultural intensification during this period with an increase in the annual plants that abound in the disturbed ground of cultivated fields. If weedy annuals were encouraged in or near agricultural fields as suggested by Matthews (1985) and Bye (1981), then with a spike in cultivation, one could expect a concomitant spike in annuals. Multi-cropping is also implied whereby farmers would harvest annual greens early in the season and the small, nutritious seeds later in the summer along with green corn, and then finally the mature domesticated crops. After the initial increase in annuals in the Middle Coalition, ubiquity remains fairly steady for the duration of the occupation. Maize ubiquity also remains steady, with only slight dips in the Middle and Late Coalition period, to its highest percentage in the Classic period. It should be noted that any interpretation including the comparatively tiny database of the Early Coalition is tentative at best.

Wood Charcoal

Coalition Period

Wood assemblages from Coalition period sites are primarily coniferous, dominated by juniper, piñon, or ponderosa pine, depending perhaps to some extent on which resource was most expedient (Table 62.93). Ubiquity of juniper, ponderosa, and piñon is nearly equal during the earlier occupations of LA 4624 and LA 60372. The same is true of juniper and piñon at LA 3852; the lower percentage of ponderosa may reflect less use as a direct effect of distance from the resource. LA 3852 and LA 12587 are close in elevation and with the exception of piñon, very similar in the number of samples in which coniferous taxa occur. The percentage of undifferentiated pine from LA 12587 doubles the percentage from LA 3852. Some of the wood identified as pine could be piñon, thereby accounting for at least some of the difference in ubiquity. Saltbush/greasewood is much more abundant at LA 12587 and the diversity of taxa is also much greater, possibly indicating that a wider catchment area was exploited in the Late Coalition period as preferred wood resources were depleted or that wood procurement changed with new social and religious practices.

Table 62.93. Comparison of wood taxa from Coalition period sites on the Pajarito Plateau (percentage of samples with taxon).

Site	**LA 4624[1]**	**LA 60372[2] Area 2**	**LA 3852[3]**	**LA 86534**	**LA 135290**	**LA 12587**	**LA 4618[4]**
Phase	Early			Middle		Late	
Elevation (feet)	6760	7054	6496	7050	7100	6500	6760
Samples with wood	5F, 87V	13F, 35V	2F, 40V	49F, 61V	69F, 55V	112F, 96V	62F, 67V
Conifers							
Douglas fir				7%	5%	10%	17%
Juniper	77%	69%	95%	38%	40%	82%	27%
Pine	35%	6%	21%	69%	39%	44%	44%
Pine family		27%	10%				
Piñon	66%	83%	83%	67%	52%	45%	45%
Ponderosa	72%	67%	40%	84%	90%	34%	97%
Unknown conifer	23%	25%	7%	90%	48%	65%	50%
Non-Conifers							
cf. Ash			7%				
Aspen/cottonwood		19%	5%				
Box elder				1%		1%	
Chokecherry	2%						4%
Chokecherry family		2%					
Cottonwood/willow	20%	6%		5%	31%	30%	24%
Desert olive						12%	
Mountain mahogany	24%	8%	7%	33%	15%	7%	15%
New Mexico locust				1%		1%	
Oak	22%	27%	43%	33%	31%	23%	52%
Rabbitbrush	1%					1%	
Rose family	5%	2%		3%		5%	
Sagebrush						28%	11%
Saltbush/ greasewood	9%	2%	40%	22%	9%	50%	38%
Sumac	1%	2%				<1%	
Unknown non-conifer	8%	17%	7%	4%	6%	20%	12%
Wolfberry				1%		2%	
Total Samples	92	48	42	110	124	208	129

Site	**LA 4624[1]**	**LA 60372[2] Area 2**	**LA 3852[3]**	**LA 86534**	**LA 135290**	**LA 12587**	**LA 4618[4]**
Phase	Early			Middle		Late	
Elevation (feet)	6760	7054	6496	7050	7100	6500	6760
Samples with wood	5F, 87V	13F, 35V	2F, 40V	49F, 61V	69F, 55V	112F, 96V	62F, 67V
Total Taxa	14 (10)	16 (9)	12 (8)	15 (11)	11 (8)	19 (15)	13 (10)

F flotation, V vegetal. [1]McBride and Smith 2002; [2]Matthews 1989, 1990, 1992; [3]Matthews 1989, 1992, 1993; [4]McBride 2006

The case of LA 4618 reveals some important issues of context. Viewed alongside LA 12587 (also on Mesita del Buey and at a similar elevation), we see wood assemblages with wildly different occurrences of juniper and ponderosa (Table 62.93). Given general similarity in environmental and cultural factors, we look instead at sample context (Table 62.94). Sites (like LA 4618) with a preponderance of samples from rooffall and features display an increase through time in the use of high-elevation conifers like Douglas fir and ponderosa. At sites (like LA 12587) where post-occupational fill or room fill were heavily sampled, wood is more likely to reflect a mixture of redeposited construction and fuelwood debris. These remains seem to reflect wood resources collected close at hand. The former pattern may indicate some deforestation of lower-elevation conifers in the Late Coalition period and a focus on procuring higher-elevation taxa for roofing material.

Table 62.94. Contexts of Coalition period wood charcoal (number of samples per context).

Contexts	**PO* fill, PO fill w/rooffall**	**Floor, Floor fill, Sub-floor, Surface**	**Wallfall/Rooffall**	**Rooffall**	**Features**	**Room fill**	**Wallfall**	**Midden**	**Other**
LA 4624	43	12	25	4	2		5		1
LA 60372		5		17	18	7			1
LA 3852		15		3	8	13			3
LA 86534	17	14		29	32	14	4		
LA 135290	5	30			33	52		2	2
LA 12587	89	38		1	46		5	8	21
LA 4618	13	26		33	34		18		5

*PO = post-occupational

Classic Period

Wood taxa recovered from Classic period pueblos at Bandelier are compared to the wood assemblage from C&T Project Classic fieldhouses in Table 62.95. Juniper, piñon, and ponderosa are the most common conifer wood taxa recovered at the two pueblos and the Cavate M77. LA 3840 also has relatively high percentages of cottonwood/willow, mountain mahogany, and oak, although the percent presence of oak is similar at all three sites. The high percentage of riparian taxa at LA 3840 compared to all other sites may be explained by the site's location in a canyon bottom near Capulin Creek, which is a perennial stream. This was also the only site where *Phragmites* (common reedgrass) was recovered. Common reedgrass grows in wet ground at 1067 to 1828 m (3500 to 6000 ft) (Martin and Hutchins 1980:177). Clearly, inhabitants were exploiting species that were close at hand, a pattern that is reflected in other areas such as LA 4624 on the Pajarito Plateau (McBride and Smith 2002), at Bandelier (Matthews 1989 and 1990), on the Colorado Plateau along the lower Chaco River (M. Toll 1983), and in Santa Fe (McBride and Toll 2001).

Table 62.95. Comparison of wood taxa from Classic period sites on the Pajarito Plateau (percentage of sample with taxon).

Site	**LA 3840 Shohakka Pueblo[1]**	**LA 50972 Cavate M77[2]**	**LA 60550 Tyuonyi Annex[2]**	**Field-houses***
Elevation (ft)	6168	6201	6102	6410 to 7100
Total Samples	11F, 29V	7V	11F, 14V	92F, 29V
Conifers				
Douglas fir				4%
Juniper	73%	57%	44%	5%
Pine	33%	14%		35%
Pine family	20%		20%	
Piñon	80%	43%	72%	14%
Ponderosa	63%	43%	68%	64%
Unknown conifer	8%		12%	69%
Non-Conifers				
cf. Ash	3%			
Aspen/cottonwood		14%	20%	
Chokecherry		14%		
Cottonwood/willow	50%			2%
Mountain mahogany	65%	14%	4%	27%
Oak	38%	43%	32%	20%
Rabbitbrush			4%	4%
Rose family			4%	
Sagebrush				20%
Saltbush/ greasewood	15%		12%	6%
Unknown non-conifer	18%	43%	40%	5%
Willow	5%		4%	
Wolfberry			4%	1%

Site	LA 3840 Shohakka Pueblo[1]	LA 50972 Cavate M77[2]	LA 60550 Tyuonyi Annex[2]	Field-houses*
Elevation (ft)	6168	6201	6102	6410 to 7100
Total Samples	11F, 29V	7V	11F, 14V	92F, 29V
Total Samples	40	7	25	121
Total Taxa	13 (9)	9 (7)	14 (10)	14 (11)

F flotation, V vegetal. *Includes LA 15116, LA 70025, LA 85403, LA 85404, LA 85408, LA 85411, LA 85413, LA 85414, LA 85867, LA 86605, LA 87430, LA 110126, LA 110130, LA 127627, LA 127631, LA 127634, LA 127635, LA 128805, LA 135291, LA 135292, and LA 141505. [1]Matthews 1993; [2]Matthews 1989

The fieldhouse wood assemblage is dominated by ponderosa pine, but the nearly equal percentage of unknown conifer may include specimens of unidentifiable juniper or piñon. Mountain mahogany and oak are the most common non-conifers. The majority of the fieldhouse wood charcoal was from room fill, floor, and hearth samples. Samples from LA 3840 were collected primarily from room fill and rooffall/wallfall. The cavate samples came from post-occupational fill and storage features, while LA 60550 charcoal was from secondarily deposited cultural fill and post-occupational fill. The fieldhouse wood assemblage may be more representative of fuelwood use, and charcoal from LA 3840 may be remnants of construction wood. The wood from the cavate and LA 60550 is probably a mixture of fuel and construction wood.

Summary of Wood Charcoal over Time

Figure 62.9 illustrates the distribution of hardwoods, shrubs, and conifers through time on the Pajarito Plateau.

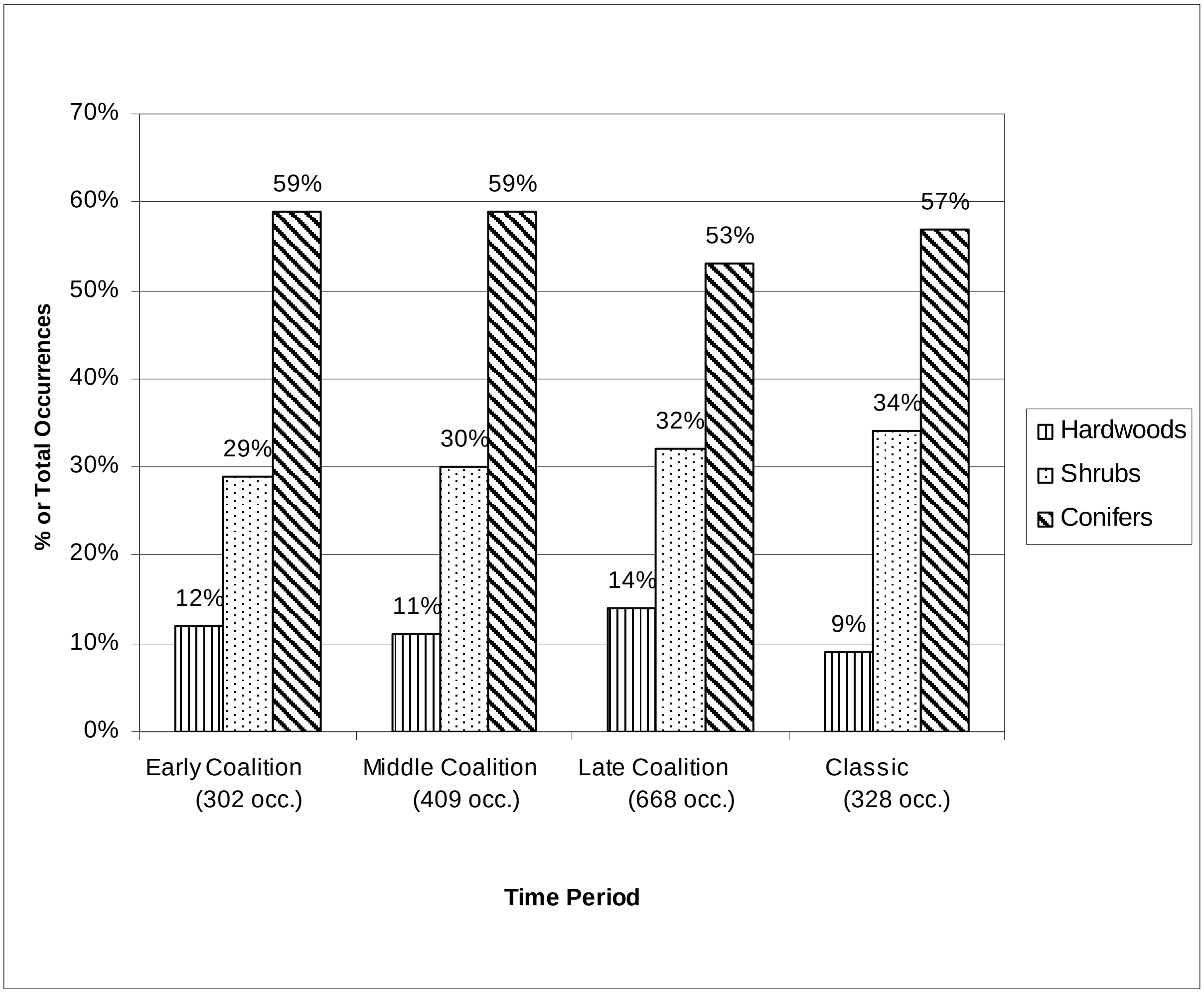


Figure 62.9. Comparison of wood classes from sites on the Pajarito Plateau.

This type of distribution study is simply an attempt to detect any broad patterning in wood class use through time and does not take site location into account. The total occurrence of each wood class was divided by the total number of occurrences of all classes for each time period. The percentages of wood classes do not change significantly through time, indicating a consistent emphasis on conifers for all occupations on the plateau. A similar pattern of fuelwood use for the Coalition and Classic periods is demonstrated in the distribution of wood classes found in hearths (Figure 62.10).

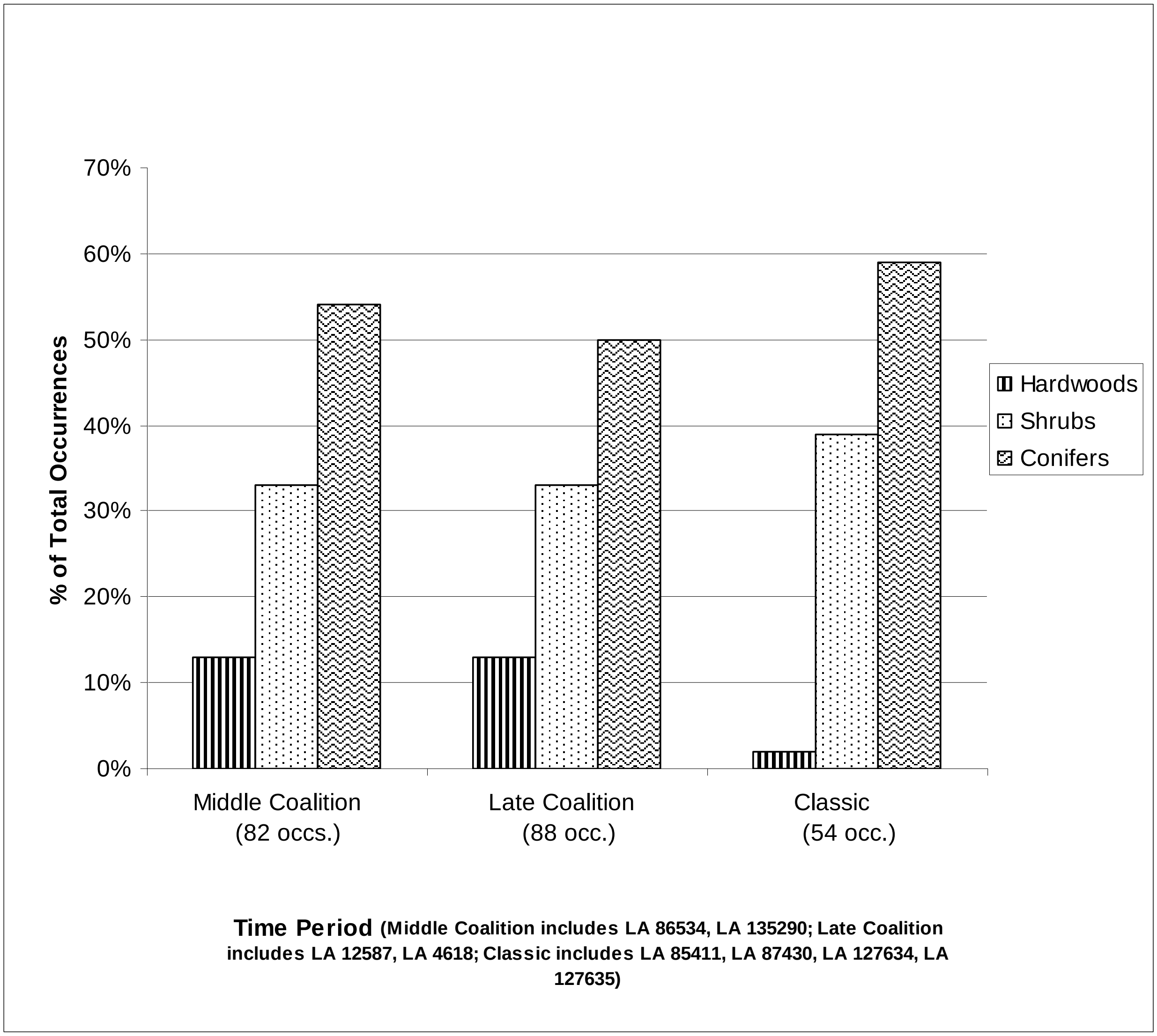


Figure 62.10. Comparison of wood classes from hearths at Coalition and Classic sites.

At LA 86534, LA 135290, and LA 4618, the presence of conifer needles, bark, and low levels of cone scales throughout the occupation suggests access to either living or recently dead pine wood with attached branches. Presence of these same conifer parts is extremely low at LA 12587, perhaps indicating less access to pine and may explain in part the heavier reliance on saltbush/greasewood. Juniper twigs do not occur at any of the sites with frequencies above 4 percent, suggesting that branches may have been removed before use for construction or fuel. There may have been some deforestation, especially of the mesa tops, resulting in an environment advantageous for herbaceous vegetation over trees of the piñon-juniper woodlands and ponderosa pine forests of the lower elevations as Allen (2004:66) suggests. However, widespread depletion of conifer woods through time is not apparent in the archaeobotanical assemblage, although there is some evidence that lower-elevation conifers (juniper in particular) may have been depleted and higher-elevation woods became the primary resource for construction material in the Late Coalition. People of the Pajarito Plateau may have avoided cutting piñon trees for the reasons given below.

Although deforestation by prehistoric inhabitants has been suggested in several areas of the southwest such as Chaco Canyon (Betancourt and Van Devender 1981; Betancourt et al. 1983; Samuels and Betancourt 1982), Mesa Verde (Wyckoff 1977), and the Dolores area (Kohler and Matthews 1988), others (Windes and Ford 1996) have suggested otherwise. Windes and Ford found evidence for the practice of silviculture until late in the occupation of Chaco Canyon. Chacoans preserved nearby stands of piñon for nut collecting until the trees were beyond the prime productivity age (between 75 and 100 years of age Evans 1988:11; cited in Windes and Ford 1996:306). Deforestation of piñon in particular is counter to traditional harvesting practices documented by Ford (1968) at San Juan Pueblo where piñon is important both dietetically and for fuelwood. Piñon is their preferred firewood, so they gather any dead limbs from trees and by doing so maintain the health of the tree. Ford cites F. Phillips (1909:220) as asserting that if dead limbs are removed within two years after dying, the tree will be more productive and remain healthy. By collecting dead limbs and not cutting down trees for firewood, they preserve stands of piñon for nut collection and as a future source of dead limbs for fuel. With increasing importance of wild turkeys for either feathers or food (see Chapter 64, this volume), it would have been to the advantage of Pajaritans to preserve piñon trees for their nuts since "piñon nut crops are the turkey's 'corn' of the southwestern forest" (American Ornithologists' Union 1957).

Maize

Kernels

Six percent of the kernels recovered from LA 12587 were measured and the average height, width, and thickness are compared with kernels from LA 4624, LA 135290, and from the Airport 2 site in Table 62.96.

Table 62.96. Comparison of average *Zea mays* kernel measurements (in mm) from Los Alamos area sites.

Site	Number of specimens	Height	Width	Thickness
LA 12587	330	7.3	6.6	4.0
LA 4624	4	8.5	8.4	4.9
LA 135290	122	7.6	7.2	4.4
Airport 2	50	7.4	6.6	4.1
LA 4618	9	3.9	3.5	2.6

For a complete list of all kernel measurements see Appendix V. The kernels from Airport 2 were recovered by Frederick Worman in 1951 (Steen 1977) from Room 3 of the nine-room pueblo. At first glance, the kernels from LA 4624 seem like they are far more robust than those from the other three sites, but herein lies the danger in comparing such disparate data. It is impossible to know whether the four kernels from LA 4624 are representative of the entire population or not. In fact there are kernels from the other three sites that have similar measurements to the four kernels from LA 4624, but they are not a representative sample of the whole. As discussed earlier, morphometrics of the small sample of kernels from LA 4618, a Late Coalition site on Mesita del Buey, are half the size or less than those from other sites compared in Table 62.97 (see McBride 2006). Kernels were from either one of two kivas (Rooms 10 and 11) or from Room 13, a front room that had comparatively high taxonomic richness considering its poor condition. Why such diminutive kernels comprised the majority of the assemblage from the site is unknown.

The average width of kernels from LA 12587 and Airport 2 are identical, and average height and thickness are nearly so, suggesting a similar source of maize and preparation technique. King (1987) discusses the relationship between processing techniques and kernel distortion. From experimental replication, she found that kernels that had been boiled or treated with alkali before carbonization displayed a greater change in size, but less distortion than unprocessed kernels. Boiled or treated kernels do not pop or split and extrude their contents and were the only specimens from her study that did not become so misshapen that they were immeasurable. King goes on to say further that the increase in width and height, together with a usually missing embryo results in a crescentic shape, resembling many of the archaeological kernels examined from eastern North America. Goette et al. (1994) found that archaeological kernels most closely matched kernels that were experimentally boiled with wood ash and then charred. These kernels lacked a pericarp, the point of attachment was frequently missing, and embryos were occasionally missing.

Experiments by Steen (1982:44) suggest additional processing techniques. He tested white material on two-hand manos from two other sites on Mesita del Buey (LA 4627 and LA 4629) as well as deposits on six sherds from the base of a large corrugated jar found at LA 4716 on Mesita de los Alamos (all apparently Coalition period roomblocks). Raymond N. Rogers of the Laboratory staff determined the material was anhydrous lime. Steen concludes that the lime was added to corn and boiled to produce hominy.

Moderate kernel swelling was noted in 25 percent of the kernels from LA 12587 and loss of embryos in 37 percent. Thirty-six percent of the kernels were swollen at the Airport 2 site and loss of embryos occurred in only 10 percent of the specimens. Gross swelling was rarely observed at LA 12587, but kernels from the Airport site were very distorted and endosperm was often extruded, indicating the kernels were unprocessed and burned at a very high temperature and/or the moisture content of the kernels was fairly high (King 1987:145). The kernels from LA 135290 are slightly thicker and wider than those from LA 12587 and the Airport site and may have been treated with lime or had a higher moisture content when burned, causing slightly more swelling and loss of embryos (King 1987; Stewart and Robertson 1971). Thirty percent of the kernels were swollen and 47 percent lacked embryos. The condition of the kernels from LA 135290 suggests boiling and/or treatment with alkali. This type of treatment (supported somewhat by the indirect evidence found by Steen) could have been part of processing before storage and carbonization.

Several masses of kernels were present in collections from both LA 12587 and the Airport 2 site and the regular arrangement of the kernels of many masses indicates maize was stored on the cob and stacked in very orderly rows, multiple layers high. The cob rachis was burned away and ears were probably husked before storage (kernels were fused "head to head," with no husk remnants between and no space where a husk might have been). Several questions come to mind: 1) what burn conditions (temperature, oxygen content) would produce this condition? (intact kernels, fused ear-to-ear, but rachis consumed), and 2) what combination of desiccation and burn conditions would create this kind of maize specimen? These questions might be answered by conducting experimental burns of kernels at measured temperatures. Groups of kernels could be burned at varying intervals after harvest (i.e., one month, three months, etc.).

Finally, a disparity in the ratio of burned kernels to cupules could suggest a shift in maize processing (Adams and Bowyer 2002). A shift from parching or roasting to boiling might decrease opportunities for accidental kernel charring, and therefore the ratio of kernels to cupules would decrease. Looking at these ratios for Middle and Late Coalition C&T Project sites reveals an extremely low kernel to cupule ratio at LA 86534 and LA 4618 both in all proveniences and in thermal features (Table 62.97). This could indicate a greater proportion of kernels were boiled at the two sites, kernels were stored in features that were not discovered or sampled during excavation, or rooms were cleared out before abandonment. Another possibility is that we're seeing functional differences between sites with kivas and those without. Those with kivas could have been the focus of ceremonial activities while activities at those without formal ceremonial structures could have focused on agricultural pursuits.

Table 62.97. Percent presence of kernels and cupules from C&T Project Coalition period sites.

Site	All Contexts		Thermal Features	
	Kernels	Cupules	Kernels	Cupules
LA 86534	15%	94%	8%	19%
LA 135290	41%	81%	12%	19%
LA 12587	52%	95%	23%	35%
LA 4618	14%	100%	7%	9%

Cobs

Comparison of average cob diameter, cupule width, and row number from LA 86534, LA 135290, LA 12587, and LA 4618 (Table 62.98) indicates the cobs from LA 135290 are slightly more robust, with wider cupules, more rows, and larger diameters. Fourteen-rowed cobs, present at LA 135290 and LA 4618, are absent from the other two cob assemblages. However, the percentages of 12-row cobs are nearly equal in LA 12587 and LA 135290 cob assemblages (45% and 47%, respectively) and the distribution of 12- and 14-row cobs are equal in LA 4618 and LA 135290 assemblages. The lack of 14-rowed cobs at LA 12587 and LA 86534 may be a factor of sampling vagaries. Until larger sample sizes from equally well-dated sites can be obtained, it cannot be determined with any degree of certainty if the differences noted here can be attributed to natural variation within a population or if different maize varieties were grown on the Pajarito Plateau. Nickerson (1953:99) states that: "Within any race, many cobs possess characters the measurements of which lie well within the range of variation of the same measurements from several other races." In other words, the prospect of classifying races of maize in the archaeological record is dim.

Table 62.98. C&T Project comparison of average *Zea mays* cob measurements.

Site	No. of Cobs	Cob Diameter (in mm)	Cupule Width (in mm)	Row #	Distribution of Row #			
					8	10	12	14 +
LA 86534	5	9.5	4.8	10.4		4	1	-
LA 135290	17	11.9	5.6	11.4	2	4	8	3
LA 12587	20	10.3	5.2	10.0	6	5	9	-
LA 4618	20	9.8	4.9	11.1	3	6	8	3
Classic cobs	19	19.0	8.4	11.8	2	1	14	2

Numerous cobs have been collected during surveys that have been conducted over the years at LANL and four were directly dated for this project. The four unburned cobs dated to the Middle Classic period. One cob from Room 11 at LA 4628 dated to AD 1500, one that was an isolated occurrence in the TA-74 Tract dated to AD 1440, while the remaining two (one from Camp Hamilton Trail also in the TA-74 Tract and the other from the TA-39 Tract) dated to AD 1480. It is assumed that other cobs from LA 4628 and Camp Hamilton Trail date to the same general period and have been included in Table 62.99 (see Figures 62.11, 62.12, and 62.13). Because these cobs are all unburned, it is not possible to compare actual measurements with those of the C&T Project cobs. However, it is interesting to note that the distribution of row numbers as well as average row numbers for the LA 135290 (a Middle Coalition site) and the Classic period cobs are similar. The bulk of the cobs are 12-rowed, 14-rowed cobs and above are present, and there is a low number of 10- and 8-rowed cobs.

Table 62.99. LA 4628, Isolated Occurrence (IO) 6, TA-39, and Camp Hamilton Trail *Zea mays* cob morphometrics (in mm).

Site	Row #	Type	Length	Rachis Segment Length	Cob Diameter	Shank Diameter	Cupule Width
LA 4628	12	ST	57.9	3.4	15.2		6.6
	12	ST	110.5	3.7	20.1		8.9
	12	ST	161.1	4.5	20.4		9.5
	12	ST	147.0	3.7	19.3	18.2	8.4
	12	ST	81.2	3.0	19.1		8.6
	8	ST	93.8	4.3	15.9		9.0
	12	ST	71.5	4.4	18.4		8.2
	12	ST	51.5	3.7	17.0		7.1
	12	ST	99.9	3.8	21.5		9.5
Camp Hamilton Trail	12	ST	129.1	3.9	20.0		9.0
	12	ST	110.8	5.2	21.3		9.0
	12	ST	118.8	4.6	18.4		7.7
	12	ST	85.1	3.9	21.3		8.4
	12	UD	109.9	4.6	19.7		9.2

Site	Row #	Type	Length	Rachis Segment Length	Cob Diameter	Shank Diameter	Cupule Width
	14	IR, UD	55.0	3.4	21.5		9.3
	12	ST	45.0	3.9	17.1		9.0
	8	ST	107.1	4.5	15.3		9.3
TA-74, IO6	10	ST	64.1	4.9	16.9	9.1	7.6
TA-39	16	ST	167.0	3.5	22.0		6.2
Averages	2 8-row, 1 10-row, 14 12-row, 1 14-row, 1 16-row	17 ST, 2 UD, 1 IR	98.2	4.0	19.0	-	8.4

Figure 62.11. Classic *Zea mays* cobs from LA 4624.

Figure 62.12. Camp Hamilton Trail classic *Zea mays* cobs.

Figure 62.13. TA-74 IO6 and TA-39 classic *Zea mays* cobs.

Agriculture on the Pajarito Plateau

Puebloan farmers manipulated the land and water sources to increase their chances of success. Dryland farming techniques included several methods of water harvesting, diversion, or increasing water retention of the soil. Water could be managed by building check dams across minor drainage channels such as those described by Steen (1982:43) to control erosion, slow run-off waters, and trap their alluvial deposits. This strategy replenished soils and spread water across fields slightly downslope. Grid gardens such as those documented in Bayo Canyon near Otowi (LA 21592), in White Rock Canyon (LA 12701), and at LA 139418 and LA 128803 have also been found in the Chama Valley, the Pot Creek area of Taos, and the Galisteo Basin. Grid gardens had partially or fully enclosing borders of cobbles that served to “catch and retain soil, block erosion from above or within the field, slow water movement across the planting bed, and conserve snow melt and water derived from direct rainfall” (Lang 1995:52). According to Lightfoot (1990:52–53), the use of cobble borders would by increasing surface roughness, create a more turbulent airflow over the plots and decrease daytime temperature of the soil. The decrease in the maximum daytime soil temperature would decrease moisture loss to evaporation.

Agricultural pursuits on the Pajarito Plateau change through time from a focus on farming mesa tops near habitations to more varied locations associated with fieldhouses at some distance from the aggregated pueblos of the Classic period. Complexes of cobble-bordered gardens such as those in the area of Otowi Pueblo attest to the use of water-conserving techniques. The placement of Classic period agricultural features on top of collapsed Coalition roomblocks (as at LA 12587 and in Bandelier, Gauthier and Herhahn 2005) affirms the ingenuity of Classic period farmers in their search for fertile agricultural land. Possible Classic period irrigation ditches were present at the White Rock Canyon site of LA 12701. One of these ditches was partially excavated and revealed the feature to be 2 m wide and about 40 cm deep, and lined with basalt slabs (Steen 1977:34). Irrigation canals or ditches have been documented in west-central New Mexico (Neely 1995), Pot Creek (J. Moore 1995), Zuni (Zuni Cultural Resource Enterprise 2000), and the Galisteo Basin (Lang 1995).

The question arises: were Classic period farmers maximizing efficiency and reducing risk by having multiple small fields in a range of topographical situations or were they specializing in the production of certain crops like tobacco for trade as proposed by Kohler (2004:263)? The presence of charred tobacco seeds at three of the C&T Project Classic period fieldhouses provides intriguing evidence that could support Kohler’s argument. On the other hand, their presence could signify the growing importance of tobacco as part of the ritual life of Pajaritans, such that its use was not restricted to ceremonial or circumscribed events.

Seasonality

Inferences concerning seasonality should be made using a combination of data from faunal, pollen, macrobotanical, and archaeological analysis results. Indeed, Brandt (1992) states:

> Inferring seasonality of site occupation based solely on the presence of plant remains is difficult for several reasons. First, certain plants do not follow calendric cycles. Second, climate may affect the production of seed and fruit by influencing abundance; flowering and fruiting can be delayed or stimulated. Finally, seeds and nuts may be stored through several seasons.

This chapter incorporates data from vegetal and flotation sample analysis only. For a discussion integrating these and data mentioned above please see Chapters 63 and 64 (this volume).

The wild plant assemblage from the project consists of taxa with seeds, leaves, or fruits that could have been gathered during the spring and fall, although the short list of taxa that set seed in spring were either absent or very scarce in the floral assemblage. Mustard, one of the earliest herbaceous plants to bloom and ripen, was not present and Indian ricegrass, another early arrival, was identified in less than one percent of samples. While the young leaves of tansy mustard and goosefoot can be collected in early April and those of beeweed in early summer, such fragile plant parts do not preserve in open-air sites. We are left with a wild plant assemblage that consists of plants with seeds or fruits that could only have been gathered during late summer and into the fall (Knight 1982). The seeds of goosefoot, pigweed, and purslane mature in mid to late summer, while cactus fruit, yucca fruit, and piñon nuts can be collected as late as October or November. A continuum of plant utilization from late spring through the fall can be inferred from the archaeobotanical assemblage. It is reasonable to assume that the larger habitation sites were occupied most or all of the year and fieldhouses were inhabited at least from spring, before the sowing of maize through harvest time.

THE C&T PROJECT HISTORIC DATA IN A REGIONAL PERSPECTIVE

LA 85407 (Serna Homestead), patented in 1922, was one of many homesteading ventures on the Pajarito Plateau that began in 1893 and ended when land was confiscated for the creation of LANL in 1942. Seasonal land use was frequently practiced by families who grazed livestock or farmed homesteads in the late spring through the fall, and then moved down to homes in the Pojoaque-Española Valley for the winter months. The previously investigated Romero Cabin and the adjacent McDougall and Roybal homesteads on Pajarito Mesa offer archaeological data from similar seasonal habitations (McGehee et al. 2006). Copious numbers of charred or uncharred weedy annuals like pigweed, goosefoot, beeweed, and purslane were present along with other seeds (e.g., doveweed and stickseed) that “colonize or invade waste areas and especially old fields on the plateau” (Tierney 1999a:49). Summer cypress, a weedy introduction from Eurasia that flourishes in waste places and open fields, was recovered at both the Serna and McDougall/Roybal Homesteads. Foxx and Tierney (1999) recorded all these plants growing in the Romero Cabin complex and an adjacent control plot. Remains of these prolific seed producers from all three sites are interpreted here to be natural seed rain or the result of burns (lightning strikes or field clearing). Therefore, the only plant material compared in Table 62.100 is that of cultigens and wild fruits. The Romero Cabin was more extensively sampled than the other two homesteads, particularly the McDougall/Roybal homestead where the house had burned down, leaving only a cistern and a root cellar for excavators to sample.

Table 62.100. Comparison of plant material from historic homesteads on the Pajarito Plateau.

Site	Serna Homestead	Romero Cabin	McDougall/Roybal Homestead
Cultigens			
Apricot		13 u	
Bean	1(0)		
Cherry		30 u	
Cushaw squash		2 u	
Grape	1(1), 1(0) u		1(1) u
Maize	5(1) cupule	11 cobs, 3 tassels u	
Peach	2(0) u	330 u	2(1) u
Peach leaf plum		4 u	
Plum		3 u	
Summer squash		11 u	
Winter squash		2 u	
Watermelon		11 u	
Perennials			
Perennials: Chokecherry		2 u	
Wild plum		8 u	

u uncharred

Summary of Historic Plant Remains on the Pajarito Plateau

Peaches were found at all three homestead sites (Table 62.100). At the Romero Cabin, Tierney (1999b) determined that two types of peaches were represented and were about half the size of commercial varieties, but resembled those of surviving heirloom varieties grown in the Rio Grande Valley that are hardy in New Mexico winters. These peaches are likely of local origin, either from trees grown on the homesteads or brought up from the Pojoaque-Española Valley. There is no mention in written records of vineyards at either of the two homesteads where grapes were found, neither are they listed in interviews with residents and descendants of residents (Tierney 1999c) as fruits that were grown on the plateau. The seed from LA 85407 measures 4.2 mm in length, 2.7 mm wide, and 2.2 mm thick. The uncharred specimen from the McDougall Roybal homestead is 4.0 mm long, 3.4 mm wide, and 2.4 mm thick. Measurements of a domestic variety (uncharred) were 2.0 to 2.2 mm longer, 0.9 to 1.6 mm wider, and 0.4 to 0.6 mm thicker. Charring could account for much of the differences between the seed from LA 85407 and the modern specimens, but the seed from the McDougall/Roybal homestead is most likely from the wild canyon grape (*Vitis arizonica*). Beans, referred to by past residents as the primary cash crop grown on the plateau, were only found at the Serna Homestead. Low recovery of bean remains is related to the fragility of beans and threshing and preparation methods. Beans may be removed from the pods outside the house and preparation does not usually involve parching or frying. The thin, brittle seed coat of beans leaves them vulnerable to consumption by animals or insects.

Apricots, maize, zucchini squash, pumpkins, and cherries were listed among the crops grown on the plateau and were in evidence in the Romero Cabin samples. Plum pits identified at the Romero Cabin included those of the domesticated plum (a tree was found still living near the cistern on the homestead), a native wild plum, and a flowering plum. Squash seeds were from pumpkin, summer, or winter squash varieties. Although watermelon is not mentioned in interviews with settlers of European descent, San Ildefonso Indians told J. P. Harrington that watermelons were once grown in Sandia Canyon (aptly named by the Spanish; cited in Tierney 1999b). By all accounts, it appears that homesteaders on the Pajarito Plateau were successfully growing a variety of fruits and vegetables, especially beans, which were shipped out by the train load (Chambers 1974: cited in Foxx and Tierney 1999).

Wood from the McDougall/Roybal and Serna Homesteads was analyzed and ponderosa, recovered in every flotation and vegetal sample with charcoal present, was most likely the preferred construction material. The sawmill in the little town of Buckman, New Mexico, was probably where trees from the Pajarito Plateau were cut into boards and subsequently brought back to the plateau where they were used in floors, while the unmilled beams were used for the infrastructure. Small amounts of juniper, piñon, and oak were recovered and may have been used for firewood or smaller construction elements.

At LA 85864, another historic site not listed in Table 62.100, a seed that closely resembled a wheat grain was recovered, possibly documenting the use of this European domesticate by Jicarilla Apache at the turn of the century.

SUMMARY AND CONCLUSIONS

Maize agriculture appears to have been the backbone of the prehistoric subsistence regime on the Pajarito Plateau. Much lower ubiquities of beans and possible squash are probably more factors of preservation biases than a measure of their importance in the diet. Maize cobs from Coalition period roomblocks were predominately 12-rowed, with the exception of the five cobs from LA 86534, where 10-rowed cobs were most common. The majority of cobs collected from Classic period sites during survey at LANL were also 12-rowed, indicating a continuing trend toward selection of 12-rowed varieties adapted to high-elevation growing conditions.

Weedy annual taxa were the most commonly encountered category of wild plant remains and included beeweed, bugseed, goosefoot, pigweed, purslane, sunflower, tobacco, and winged pigweed. Grasses and perennial taxa were less diverse than annuals; two grass taxa (dropseed grass and ricegrass) were identified and six perennials (banana yucca, dock, hedgehog cactus, globemallow, pincushion cactus, piñon, and prickly pear cactus) that were not related to fuel use.

The wood assemblage is predominately coniferous with juniper, piñon, and ponderosa pine most common in flotation and vegetal samples. Saltbush/greasewood, mountain mahogany, and oak were non-conifer woods most often identified in flotation and vegetal samples. There is some evidence that access to piñon and ponderosa at LA 12587 was limited and may have caused a heavy reliance on juniper and shrubs like saltbush and sagebrush.

Comparison to other sites in the Pajarito Plateau region suggests a similar subsistence regime of maize agriculture, with beans and squash in evidence from all time periods except the Early Coalition when squash is absent from the record. Annual plant use is focused on goosefoot, pigweed, and purslane that readily volunteer in agricultural fields. Tobacco is found at sites dating from the Middle Coalition through the Classic period, found at roomblocks as well as Classic period fieldhouses, suggesting a continuum of ritual activity. The comparatively scarce occurrence of perennial and grass taxa at C&T Project sites is mirrored in the assemblages from other sites on the Pajarito Plateau. Wood procurement is focused on conifers, with very light use of the riparian corridor throughout the occupation. Although historic accounts of homesteading on the Pajarito Plateau in the early 20th century focus on beans as the primary cash crop, little evidence of bean farming has survived. Watermelon seeds and the stony pits of fruits such as peaches and plums preserved well and of course maize, the enduring mainstay of the southwest, was present and accounted for.

CHAPTER 63
POLLENS' EYE VIEW OF ARCHAEOLOGY ON THE PAJARITO PLATEAU

Susan J. Smith

INTRODUCTION

The pollen research component for the Los Alamos National Laboratory (LANL) Land Conveyance and Transfer (C&T) Project is an ambitious investigation of 478 archaeological samples from 38 sites dating primarily to the Coalition through Classic periods, complemented by two supporting studies of natural pollen representation from 39 surface and subsurface samples (Table 63.1). Another 117 pollen samples from 11 archaeological sites on Los Alamos lands have also been documented (see Previous Research section below).

Table 63.1. Number of C&T Project pollen samples analyzed by land tract and for special studies.

Tracts	Sites or Stations (Geology and Modern Pollen)	Number of Samples
White Rock	6	159
Airport	4	154
Otowi North	1	11
Rendija	27	154
Archaeological Component Totals	**38**	**478**
Modern pollen study (Smith 2007a)	20	20
Geology soil pits study[a]	5	19
Special Studies totals	**25**	**39**

[a]An additional 23 geology samples collected during site excavations are included under the archaeological component (see Table 63.2).

The majority of sites were 100 percent excavated and intensively sampled during the C&T Project data recovery phase. There are three major site types represented: pueblo roomblocks, fieldhouses, and gardens. Suites of samples from all of the major contexts at each site were analyzed (Table 63.2). The numbers of pollen samples and distribution in structure floors and fill at each site comprise a remarkably complete statistical population of the archaeopollen spectra on the Pajarito Plateau. This data set allows more detailed analyses than is usually possible when only portions of sites are excavated or token numbers of samples analyzed.

The project and the pollen results are organized by the three land tracts: White Rock, Airport, and Rendija. Almost half of the C&T pollen samples come from three pueblos (Table 63.2)—a Late Coalition period site in the White Rock Tract (LA 12587) and two Middle Coalition roomblocks in the Airport Tract (LA 86534 and LA 135290). The next largest group of samples is from fieldhouses and the majority of those are in the Rendija Tract and date primarily to the Classic period. Fifty-eight samples were also collected from gardens at four of the sites.

Table 63.2. Number of C&T Project pollen samples by sites and contexts.

	LA Number	Chronology	Pueblo	Fieldhouse	Gardens	Geology Soil Pits	Other	Total Samples
White Rock Tract								
1	86637	Multi-component, Archaic-Historic	-	-	-	-	3 lithic scatter	3
2	12587	Late Coalition, Classic	101	3	18*	-	-	122
3	127631	Early Classic	-	6	-	-	-	6
4	128803	Classic	-	-	16	-	-	16
5	128804	Historic with Coalition-Classic scatter	-	-	-	-	4 historic check dam	4
6	128805	Middle Classic	-	8	-	-	-	8
Airport Tract								
7	86534	Middle Coalition	47	-	-	-	-	47
8	135290	Middle Coalition	77	-	-	6	-	83
9	139418	Classic	-	-	13	5	-	18
10	141505	Classic	-	6	-	-	-	6
Otowi North								
11	21592	Classic ?	-	-	11	-	-	11
Rendija Tract								
12	15116	Middle Classic	-	4	-	-	-	4
13	70025	Early-Middle Classic	-	2	-	-	-	2
14	85403	Classic	-	5	-	-	-	5
15	85404	Early-Middle Classic	-	5	-	-		5
16	85407	Historic	-	-	-	-	8 cabin, corral, reservoir, and horno	8
17	85408	Middle Classic	-	3	-	-	-	3
18	85411	Early-Middle Classic	-	7	-	-	-	7
19	85413	Early Classic	-	4	-	-	-	4
20	85414	Middle Classic	-	2	-	-	-	2

	LA Number	Chronology	Pueblo	Fieldhouse	Gardens	Geology Soil Pits	Other	Total Samples
21	85417	Coalition	-	3	-	-	-	3
22	85859	Early Archaic	-	-	-	12	7 soil pit profiles of lithic scatter	19
23	85861	Late Coalition	-	3	-	-	-	3
24	85864	Jicarilla Apache	-	-	-	-	2 tipi ring	2
25	85867	Early Classic	-	4	-	-	-	4
26	85869	Jicarilla Apache	-	-	-	-	13 mixed (tipi rings, modern dump?, unknown)	13
27	86605	Late Classic	-	6	-	-	-	6
28	86606	Coalition, Classic	-	4	-	-	-	4
29	86607	Coalition	-	3	-	-	-	3
30	87430	Middle Classic	-	5	-	-	-	5
31	99396	Archaic and Coalition	-	10	-	-	-	10
32	99397	Late Archaic	-	-	-	-	13 lithic ceramic scatter	13
33	127627	Middle Classic	-	6	-	-	-	6
34	127633	Ancestral Pueblo	-	-	-	-	5 storage bin	5
35	127634	Middle Classic	-	6	-	-	-	6
36	127635	Early Classic	-	5	-	-	-	5
37	135291	Early Classic	-	4	-	-	-	4
38	135292	Early Classic	-	3	-	-	-	3
		Total Samples	**225**	**117**	**58**	**23**	**55**	**478**

*Three garden samples at LA 12587 are rock piles.

The C&T Project archaeological pollen investigation was guided by the following four research questions:

1. *What subsistence resources are visible in the pollen spectra at individual sites?* This research theme was explored by comparing and contrasting samples from primary cultural contexts, such as floors and hearths, to post-occupation fill and wallfall samples. Maize pollen is almost ubiquitous at every pre-Columbian habitation site investigated, testifying to the fact that farming was the mainstay of the pueblo economy. Correlations between the abundance of maize and other cultigens with wild, native resources and comparisons between archaeological and modern surface control samples are another tool used here to unravel the native cultural resources from the environmental background pollen.

2. *Is there any information that might reflect the seasons sites were occupied or the duration of occupation?* The pueblos and fieldhouses excavated for the C&T Project were obviously occupied for different purposes. Comparisons of these two site types offer an ideal test of this research theme.

3. *Can different contexts be defined by discrete pollen signatures? Can storage rooms be differentiated from habitation rooms in the roomblocks?* The roomblocks provide a rich database of multiple samples carefully collected from almost every room and feature. This extensive data set makes it possible to investigate the distribution and abundance of economic pollen taxa by context.

4. *Are there any chronological trends or patterns in the economic pollen signatures?* The C&T Project data are particularly suited to critically examine the question of chronological changes between the Coalition and Classic periods. Most of the habitation and fieldhouse sites are single component, or with limited reuse, except for the pueblos at LA 12587. There are a few Late Archaic scatters represented in the pollen data, but the exposed environmental setting of these camps and limited activity sites combined with the age of the sites produced only ambiguous results.

PREVIOUS RESEARCH

There is an atypical wealth of environmental information concerning ecosystems, fire history, and botany on the Pajarito Plateau due to well-funded LANL programs and academic and National Park Service research conducted at Bandelier National Monument, the Valles Caldera, and the Jemez Mountains (Table 63.3). Although the history and consequences of environmental change in the Jemez Mountains are not the topic of this chapter, it is pertinent and important to acknowledge that the modern landscape is significantly changed from pre-Columbian times. Vorsila Bohrer has recognized profound historic changes in modern landscapes and the implications to archaeobotanical studies, stating that “our botanical understanding of the land could be historically nearsighted” (Bohrer 1978:11).

Within the past 200 years, the Jemez Mountains have experienced complex and at times intensive land uses (e.g., grazing, logging, and water control) that in combination with climatic cycles have initiated a cascade of environmental responses (Nabhan et al. 2004). Forest and woodland tree densities on the Pajarito Plateau have increased approximately tenfold since the pre-AD 1900s, reducing the cover and diversity of understory herbs and shrubs and increasing the incidence of catastrophic wildfire (Allen et al. 1998; Swetnam et al. 1999). The area of montane grasslands shrank by greater than 50 percent within the relatively short span of 46 years (AD 1935–1981) due to tree invasions (Allen 1998), and exotic, introduced plant species are displacing native plants at an alarming rate, especially in the increasingly limited riparian habitats. Foxx (2006:Appendix B) has documented 74 non-native plant species on the Pajarito Plateau and in the Jemez Mountains. The pre-Columbian landscapes on the Pajarito Plateau were undoubtedly richer in native plant and wildlife species with more open forests and extensive grasslands compared to modern ecosystems.

Table 63.3. Selected references to ecological and botanical research on the Pajarito Plateau.

Reference		Topic
C. Allen	1989, 1998, 2002a, 2004	Ecosystem histories, changes, consequences, and future trends in the Jemez Mountains and Bandelier National Monument
C. Allen and Breshears	1998	
C. Allen et al.	1998	
Foxx	2006	
Balice et al.	1997	Vegetation and land cover classification in Los Alamos; botany in the Jemez Mountains, Los Alamos, and Valles Caldera
Foxx and Tierney	1985	
Foxx et al.	1998	
Reif	2006	
Foxx et al.	1997	Plant succession on old fields and historical botany
Foxx and Tierney	1999	
Foxx	2006	Ethnobotany
Vierra and Foxx	2002	
Dunmire and Tierney	1995, 1997	
Towner	Volume 1	Dendrochronology and fire history
Allen	2002b	
Foxx and Potter	1984	
Allen	2004	Paleoenvironmental summaries
Anderson	2007	

In contrast to the ecological disciplines, there has been only minimal archaeobotanical investigation on the Pajarito Plateau and in the upper Rio Grande Valley—a surprising gap given the number of spectacular ruins and archaeological research in the region. Most of the inquiry into past plant use has focused on macrobotanical materials. Pollen studies were extremely rare until the late 1990s (Table 63.4).

M. Toll (1992) has reviewed the scant botanical information from regional sites dating from Late Coalition to Spanish contact. She concluded that by the late AD 1500s, pueblos were dependent on maize agriculture with use of beans and squash and a variety of wild foods, particularly weedy cheno-am annuals, such as goosefoot and pigweed. Toll (1992:51) reported that cotton macro remains are conspicuously absent from any site of strictly Puebloan association in the Rio Grande Valley; this situation has changed with the cotton pollen reported here from Coalition and Classic sites on the Pajarito Plateau and from fields along the Rio Grande near San Ildefonso.

Table 63.4. Previous pollen research from Bandelier National Monument and the Pajarito Plateau.

Pollen Study	Reference	Number of Pollen Samples	Results
Bandelier National Monument			
LA 60372 Burnt Mesa Pueblo, profile through kiva fill	Huber and Kohler 1993	15	30 samples were processed, but half were evaluated sterile; interpreted economic taxa include maize, squash, beeweed, grasses, cattail, parsley family, sunflower family, mustard, and fern spores; high conifer-low cheno-am in modern surface and low conifer-high cheno-am in fill interpreted as deforestation signal.
Six sites in and near Alamo Canyon	Fish 1982	25	Cheno-am signature in fill and floors and contrasting high conifer pollen in modern samples interpreted as evidence of cultural activities; economic taxa include maize, beeweed, *Opuntia*, and lily family.
Five sites in and near Capulin Canyon including Shohakka pueblo (LA 3840), Classic 90-room plaza pueblo; one site above Frijoles Canyon	Smith 1998a	50	Economic types: maize, squash, cholla, prickly pear, beeweed, purslane, nightshade family, parsley family, grasses, *Helianthus* type (sunflower), sedge, cattail, and possible reed grass (*Phragmites*) and dove weed (*Croton*).
Pajarito Plateau			
Modern analog pollen study, elevational transect of the Pajarito Plateau	Smith 2007a	20	Modern pollen spectra generally track local vegetation; disturbance areas characterized by weedy pollen types; riparian locales also register in soil samples with riparian pollen types.
Geology soil pits pollen study	Smith (unpublished data)	19	Strong preservation gradient destroys most conifer pollen below ca. 5 cm.
Mesita del Buey possible field areas	Bohrer 1982	14	Field pollen samples scanned for cultigens; maize, prickly pear, and cattail documented.
LA 4624, Mesita del Buey, roomblock	McBride and Smith 2002	3	Economic types: maize, cholla, prickly pear.

Pollen Study	Reference	Number of Pollen Samples	Results
LA 4618, Mesita del Buey, roomblock with two kivas	Smith 2006a	57	Economic types: cotton, squash, maize, cholla, prickly pear, beeweed, grass, sunflower family, sagebrush, evening primrose, nightshade family (includes tobacco), mustard family, a type referred to as marshelder, purslane, an unknown referred to as small sage, and another unknown probable four o'clock family.
LA 4619, Mesita del Buey, roomblock (samples from outside the pueblo)	Smith 2007b	10	LA 4619 adjacent to LA 4618; 4 soil pits dug into the sediment apron on the northeastern side of LA 4619; maize pollen recovered from 3 samples.
LA 131237, McDougall Homestead	Smith 2006b	9	No cultigens; enriched subsurface cheno-am related to ground disturbance.
LA 21596 Otowi (South) grid gardens, (13 samples); LA 61034, LA 61035, LA 86531 - three artifact scatters and LA 21150, LA 110130, LA 86528 - three small sites	Smith 2007c	24	Economic types: maize and squash in the grid gardens; maize at LA 86528 and LA 86531; grass at LA 61034 and LA 61035.

One of the landmark archaeobotanical sites in the Southwest is Jemez Cave on the west side of the Jemez Mountains and north of Jemez Springs (Alexander 1935; Ford 1975). The record encompasses a long period of human use; corn kernels recovered from the cave were recently dated to 1380–1100 BC (Vierra and Ford 2006:503). Excavations documented an array of worked stone, wood, and fiber artifacts. Sandals made from yucca and Indian hemp (*Apocynum* sp.), a variety of cords, some made from cotton, a cotton head band, two feather cloaks, and worked skins were part of the Jemez Cave assemblage, and maize and squash remains were common.

In a study of two AD 1700s medicine baskets found in a dry shelter in the Galisteo Basin, New Mexico, M. Toll and McBride (1996) documented a suite of 14 root types that included osha (*Ligusticum porteri*), iris (cf. *Iris missouriensis*.), dock (*Rumex* sp.), and possibly datura (*Datura* sp.) and gayfeather (*Liatris punctata*). Other materials in the baskets were stems and leaves of grasses and silvery scurfpea (*Psoralea argophylla*), a corn husk container, ties made from corn leaves and yucca strips, and bark pieces of corkbark fir (*Abies lasiocarpa* var. *arizonica*), ponderosa pine (*Pinus ponderosa*), and Douglas fir (*Pseudotsuga menziesii*). These assemblages preserve a remarkable perspective on a traditional tool kit of medicinal plants that are practically invisible in the archaeological record, since root resources rapidly degrade and pollen is typically not retained on these parts. The medicine baskets are also important because they date to the period when native pueblo medicinal and subsistence practices were being transformed by Spanish colonial rule.

The standard for New Mexico archaeopalynology since 1986 has been Vorsila Bohrer's study at Arroyo Hondo, near Santa Fe (Bohrer 1986). Arroyo Hondo is located several miles south of the main plaza of Santa Fe on the western margin of the foothills of the Sangre de Cristo Mountains. The pollen results from 42 pollen samples from Arroyo Hondo, the majority from a plaza, were interpreted to record evidence of agriculture (squash and corn pollen) and use of several native plants, such as buckwheat (*Eriogonum*), beeweed (*Cleome*), sunflower (*Helianthus*), cacti, cholla (*Opuntia*), prickly pear (*Opuntia*), cattail (*Typha*), and cheno-am. One pollen grain of datura (*Datura* sp.) was also recovered in a sample from a basin, which Bohrer (1986:204) suggested could be related to medicinal practices. One of the innovative approaches used by Bohrer (1986) was to test cultural pollen samples against subsurface soil samples taken from non-cultural strata.

The first pollen study in the Los Alamos region was in 1982 (Bohrer 1982). Fourteen pollen samples from possible field areas on Mesita del Buey were analyzed and maize, prickly pear, and cattail pollen identified. Bohrer (1982) evaluated the cattail pollen as natural from local sources or possibly evidence that there was a nearby prehistoric reservoir. At Bandelier National Monument, Fish (1982) conducted one of the first detailed pollen studies, which included 25 pollen samples from six sites.

The first systematic archaeological investigations were completed in the early 1980s for the Cochiti Lake flood pool in Bandelier National Monument (Hubbell and Traylor 1982) followed by the Bandelier Archaeological Project in the early 1990s (Kohler 1990; Kohler and Root 1992b). Matthews (1990, 1992) analyzed macrobotanical samples for the Bandelier Archaeological Project, and there was one limited pollen study—analysis of a profile of samples from 2.7 m of sediment filling a kiva (Room 1, Area 1) at Burnt Mesa Pueblo (Huber and Kohler 1993). Huber and Kohler (1993) reported only on 15 samples out of 30 processed; half of the pollen samples were rejected based on scan evaluations that there was insufficient pollen for statistical counts. The 15 productive samples produced a pattern typical of southwestern archaeological sites. High conifer pollen in the top surface samples is replaced by progressively higher representation of weed taxa (cheno-am and sunflower family) down through various levels of fill. Huber and Kohler (1993) interpreted the Burnt Mesa results as representing deforestation during the early stages of site occupation. This pattern is discussed in more detail using the C&T Project results presented here and is shown to be first a natural phenomenon in natural stratigraphic profiles and second a probable expression of weeds and camp followers growing on the disturbed ground around sites.

The numbers and level of detail of archaeobotany studies on the Pajarito Plateau have dramatically increased with the advent of the C&T Project and peripheral studies (see Table 63.4). One hundred and three pollen samples have been analyzed from 10 sites and another 39 samples have been completed for analog studies, all within the past five years.

The recent research on the Pajarito Plateau documents a strong agricultural tradition. Maize and squash were cultivated throughout the region, and although invisible through pollen analysis, macrobotanical studies show that beans were also part of the farming economy (Chapter 62, this volume). Cotton is another crop resolved by recent pollen studies and in the C&T Project results. Cotton may have been grown only at the larger pueblos, probably with some form of irrigation or at least pot watering. Prickly pear, cholla, and lily family are consistently recorded at sites (Table 63.4) and were undoubtedly important subsistence resources. Beeweed is another common economic plant resolved by the pollen studies.

Larger sites that were occupied longer are characterized by more diverse assemblages; LA 4618 on Mesita del Buey is one such site. LA 4618 was a Late Coalition nine-room pueblo with two kivas. The roomblock may have been hastily abandoned, as tools and artifacts still in usable condition were recovered, but there is evidence of burning in the rooms and kivas (Schmidt 2006b). The pollen record from LA 4618 is one of the best in the region because of the rich assemblages.

Summary of Pajarito Plateau Pollen Analog Studies

Two pollen analog studies were completed for the C&T Project: a study of 20 modern pollen stations (Smith 2007a) and a study of geology soil pit profiles. The results of these studies are reported in Volume 1, but a brief summary is included here because the characterization of natural pollen representation from the local landscape is an important component for the C&T Project archaeopalynology, providing critical baseline data.

The LANL modern pollen analog was constructed from the 20 stations located along an elevational transect from the piñon and juniper woodland to above the spruce fir forest (Smith 2007a). The natural pollen spectra is sensitive to the elevation and vegetation gradient and to finer-scale compositions that reflect local site histories. Piñon and juniper woodland, ponderosa pine, and high-elevation mixed conifer forests are differentiated by changing percentages of fir, pine, and juniper pollen. Cheno-am, sunflower family, and sagebrush characterize disturbed areas, such as historic fields. Cheno-am, sunflower family, and grass pollen also distinguished two meadows that were sampled. Riparian sites are scarce, but the only station where cattail was growing yielded the only cattail pollen recovered in the modern study. Other indicator pollen types are Douglas fir and limber pine (*Pinus flexilis*) from mixed conifer forests, maple and birch from mesic sites, willow from riparian environments, and sagebrush, thistle, and cf. sunflower (*Helianthus* type) from disturbed sites.

The geology pollen study consisted of analysis of 42 pollen samples collected from soil pits that were excavated as part of the C&T Project geology and geomorphology investigations (Drakos and Reneau 2003, 2004). The pollen samples were collected primarily in vertical columns from soil pit walls in order to reconstruct, if possible, any paleoenvironmental history that might complement the geomorphology research and other regional pollen studies (see Chapter 5, Volume 1).

Only 25 of the 42 geology samples contained adequate pollen to describe statistically significant pollen populations. The problem is preservation, which is evident down-profile by increasing frequencies of pollen too degraded to identify and corresponding diminishing pollen density, as estimated by pollen concentrations. Four consistent patterns were evident in the soil pit results:

1. The abundance of pollen decreases dramatically from A to B soil horizons and continues dropping with depth below surface. After approximately 10 to 20 cm depth below ground surface, pollen density is thinned by 70 percent to 90 percent of the surface concentration.

2. The decrease in pollen concentrations with depth is explained by a significant increase in the frequencies of pollen too degraded to identify.

3. The preservation gradient is also a function of differential loss of more conifer pollen than other types; 10 percent to 65 percent of the conifer pollen in surface samples is lost below A horizon levels.

4. Trends in cheno-am pollen are more variable, but generally cheno-am percentages increase with depth in soil profiles, from less than 1 percent in A horizon and surface samples to 42 percent in B horizon and deeper levels.

LIMITATIONS OF POLLEN DATA

Not every pollen type recovered in an archaeological sample is significant or related to past cultural activities. Very little is known about how pollen is moved and deposited during the various steps involved in producing and consuming food, but recent empirical data show that each plant species registers differentially in the archaeological pollen record (Geib and Smith 2007). And there is a significant component of “other” pollen types always present that hitchhike along on harvested plant materials. These other taxa represent the atmospheric pollen rain and local vegetation where plants were harvested and these can be more abundant in pollen samples than the harvested taxon (Geib and Smith 2007).

Another ecological characteristic important to understanding how pollen works in archaeological sites is that pollen signifies flowers, and with some notable exceptions (e.g., use of corn pollen), most of the plant products harvested for subsistence were well past the flowering stage. Pollen analysis is biased toward plants that leave a strong pollen record. Thus, while some plants will be missed entirely, such as root crops, others are easily detected through the pollen lens. Cholla is an example of a resource that is visible to pollen studies, because flower buds full of pollen were often the harvested resource.

The probability of recovering certain pollen taxa is also greatly influenced by pollination ecology. Most plant species can be divided into two categories—wind pollinated and insect pollinated. Wind-pollinated plants such as pine (*Pinus*), sagebrush (*Artemisia*), and grass (Poaceae) produce abundant pollen, but the insect-pollinated plants, such as herbs, forbs, and berries, produce small amounts of pollen designed to hitchhike short distances on insects or remain within the parent flower. A single pine tree may produce more than a billion wind-transported pollen grains, whereas *Plantago* (plantain) may produce fewer than 100 pollen grains (Fægri and Iversen 1989:12). Abundance of an insect-pollinated plant in archaeological contexts is thus indicative of cultural use, but can also result from other vectors, such as insects.

Identifying trends in archaeological pollen data is often a subjective and sometimes intuitive process. A theoretical model describing the pollen characteristics from the different types of archaeological contexts is summarized in Table 63.5. Unlike paleoenvironmental records from stable collecting basins such as lakes and bogs (Prentice 1985), the pollen record from archaeological sites cannot be analyzed as a steady-state phenomenon. Spikes in pollen abundance in archaeological features may reflect human activities (e.g., construction, firewood gathering, and food processing) or physical, biological, and chemical processes in site soils (e.g., bioturbation and sheetwash). As with macrobotanical analyses, archaeological pollen records contain a history of accidents, events, or unusual preservation situations. Past cultural activities can be inferred from archaeological pollen records when pollen is represented over what would be expected from natural background pollen rain, mediated by an understanding of how natural soil processes work. Another class of evidence is the repeated associations of pollen types by context (Bohrer 1981). Both avenues of inquiry are used here to identify plant resources resulting from human activities.

Table 63.5. Theoretical model of pollen taphonomy in archaeological sites.

Context	Pollen Source Areas	Time Involved	Typical Pollen Spectra and Characteristics
Floors	Natural – from natural atmospheric pollen rain and insects and wildlife coming into structure (dead and alive). Cultural – deliberate import of plant materials adds pollen from the harvested plant plus hitchhiking pollen from plants surrounding the harvested resource. This extraneous component comes in on crop materials, as well as people, tools, and fire wood. Interior pollen rain from roof thatch materials is another cultural source area.	Duration of occupation	Spiky values but tend towards lower pollen concentrations; cheno-am and other weedy taxa usually dominant; highest expression of subsistence pollen types.

Context	Pollen Source Areas	Time Involved	Typical Pollen Spectra and Characteristics
Fill	Natural – sheetwash primary source, runoff is funneled into depressions of houses, pits, and other structures. Aeolian deposition also may rework sediments. Cultural – wallfall, rooffall, trash from post-occupation use of structure depressions, and reworked trash material from site footprint.	No data. Relatively rapid, less than 50 (?) years; episodic depositional events.	Low to high pollen concentrations; cheno-am and other weedy taxa usually dominant.
Modern surface controls	Natural – there is an issue of *no modern analog comparable to prehistoric natural landscapes*; modern woodlands and forests are unnaturally dense with less understory due to historic fire suppression and over-grazing.	No data. Estimate 10 to 100 (?) years; relatively consistent accumulation rates.	In woodlands and forests, high pollen concentrations, high percentages of conifer pollen, low percentages of weedy taxa and degraded pollen.

METHODS

Two types of pollen samples were processed and analyzed—pollen washes of artifacts and bulk sediment samples.

Pollen Extraction of Sediment Samples

Subsamples (20 cc volume) from the sample bags were weighed and spiked with a known concentration of exotic spores (*Lycopodium*) to monitor any degradation from the chemical extraction procedure and to enable pollen concentration calculations. Samples were processed with the method recommended by Smith (1998b), with the addition of several timed decants as described below. Samples were pretreated with hydrochloric acid (10% solution) to dissolve caliche and sieved through 180-µm mesh screen to remove coarse material (rocks, roots, coarse charcoal, etc.). The fine fractions were mixed with warm sodium hexametaphosphate (less than 2% solution) and allowed to settle for eight hours in one-liter beakers, and then the muddy liquids were siphoned off. The timed decants were repeated using only distilled water until siphoned liquids were clear. The technique removes organic and inorganic particles lighter than pollen, and the end result is an efficient non-toxic method to concentrate pollen. After the physical treatments, samples were treated for 24 hours with hydrofluoric acid, rinsed in distilled water, and floated in lithium polytungstate (1.9 specific gravity). The heavy liquid separates pollen grains and particles lighter than 1.4 specific gravity from heavier fractions. The recovered light component was then acetolyzed, which reduces organics, and the residue was rinsed with alcohol, mixed with glycerol, and stored in vials.

Pollen Washes

Four artifacts were submitted for pollen washes: two ground stone, a ceramic sherd, and a mano. Sediment visible on the artifact surfaces was brushed off before washing. The artifact use surfaces were scrubbed with hot distilled water and 10 percent hydrochloric acid. The retained liquids were spiked with a known concentration of tracer tablets (*Lycopodium* spores), sieved through 0.18 mm mesh screen, and centrifuged. Samples were then processed with a hydrofluoric acid treatment followed by a heavy liquid gravity separation (lithium polytungstate 1.9 specific gravity) and acetolysis. The final extracted residues were rinsed with alcohol, mixed with glycerol, and stored in glass vials.

Standard Microscopy and Pollen Identifications

Pollen assemblages were documented by counting pollen on slide transects at 400x magnification to a 200-grain sum, if possible, then scanning the entire slide at 100x magnification to record additional taxa. Pollen aggregates (clumps of the same taxon) were included in the sum as one grain per occurrence. Numerous large aggregates are generally interpreted to represent flower anthers (Gish 1991), which indicate taxon presence and can reflect the season of deposition.

Pollen identifications were made to the lowest taxonomic level possible based on published keys (Kapp et al. 2000; Moore et al. 1991) and the Laboratory of Paleoecology pollen reference collection at Northern Arizona University. Sunflower family pollen was differentiated into seven distinct types: Asteraceae, sunflower family type (hi-spine); *Ambrosia*, bursage type (low-spine); chicory (Liguliflorae), broad spine Asteraceae, a distinct Asteraceae grain type recorded at only one site (LA 86637, multi-component scatter in the White Rock Tract), a long spine type that compares well with sunflower (*Helianthus*), and a type designated as cf. (compares favorably) marshelder (*Iva*). Pine grains were separated into small pine and large pine based primarily on size measurements, using 70 µm total length (body plus bladder) as the dividing criterion (Jacobs 1985a). The pine grains counted in the larger than 70 µm category are attributed primarily to ponderosa pine and the smaller grains are identified as piñon. There is significant overlap in the size gradient between small ponderosa pine grains and larger piñon pine (Martin 1963:20–21), and it is likely that there are misidentified grains in both pine categories.

Intensive Scanning Microscopy

An extended microscopy method modified from the Intensive Scanning Microscopy (ISM) technique developed by G. Dean (1998) was used in this analysis to analyze 65 agricultural samples and 22 select samples (e.g., burials and hearths). The C&T Project ISM data are documented in Appendix W. The technique, which has been used primarily to search for cultigen pollen in pre-Columbian fields, is based on scanning multiple slides at low magnification (typically 100x to 200x). If preservation is moderate, grains larger than about 30 µm can be easily identified at low magnifications, including squash, cotton, corn, agave (*Agave*), cacti, pine, and many of the herb types. The advantages of ISM are that the probability of finding cultigen pollen is maximized and the abundance or absence of large, rare types is quantified. Thus, ISM results can be used to evaluate the level of analysis and compare data from different sites.

After the conventional 400x magnification counts, multiple slides were scanned at 100x magnification until each sample (with two exceptions) was analyzed to a level equal to or less than 1.0 gr/g, called the threshold concentration. This threshold value was chosen because previous pollen studies of old fields have documented that cultigen pollen, if present, typically occurs at concentrations of 1.0 gr/g or greater (G. Dean 1991, 1994). Two samples from the C&T Project (burial sample 4112 from LA 12587 and a fieldhouse hearth, sample 95 from LA 85861) were analyzed to threshold concentrations of 1.81 and 1.38, respectively. The threshold concentration is determined by the following calculation:

> Threshold Concentration gr/g = [(hypothetical 1 grain of cultigen pollen/number of tracers counted) * tracer concentration] /sample weight

The ISM method works by determining how many tracer grains should be observed to find a pollen type occurring at a concentration of approximately 1.0 gr/g. Since the weight of each sample was different, the target tracer count varied, but generally sample weights were about 20 grams, requiring between 1700 and 2000 tracer grains to resolve a pollen type occurring at approximately 1.0 gr/g. One to 11 slides from each sample were scanned to reach the target threshold concentration. Any cultigens encountered during ISM scans were counted and concentration values calculated using total number of tracers tallied. Cotton and maize pollen were documented during standard counts, but cultigen pollen would have been missed in seven samples without examining a second (6 samples) or third (1 sample) slide.

Analytical Methods

Four parameters were calculated from the pollen counts: taxonomic richness, pollen concentrations, pollen percentages, and for sorted groups of samples—frequency. Taxonomic richness is the number of different pollen types identified in a sample and frequency is the number of samples a type occurs in. Frequency is typically converted to the percentage of samples considered. Pollen concentration was estimated by calculating the ratio of the pollen count to the tracer count and multiplying by the initial tracer concentration. Dividing this result by the sample weight yields the number of pollen grains per cubic centimeter of sample sediment, abbreviated gr/g. Pollen percentages represent the relative importance of each taxon in a sample ([pollen counted/pollen sum]*100).

Pollen percentages are used here to compare modern analog pollen to archaeological, but the interpretations of the archaeological samples are based on pollen concentration data for dominant taxa and taxa frequency for rare and low-count types. Pollen concentrations represent an extrapolated estimate of raw numbers of pollen grains and can reflect the abundance of plant material associated with a context. Generally analysts prefer to work with pollen percentages because the data are smoothed, but percentages mask differences in the absolute abundance of pollen between samples. For example, two samples with 10 percent corn could yield concentrations of 100,000 grains of corn in one sample and 10,000 grains of corn in the second. Pollen data are displayed graphically in seven figures in this chapter. The pollen graphics were generated using the Tilia View software program written by Eric Grimm (Grimm 1993).

RESULTS

All of the pollen counts are documented in appendices included in this volume (Appendices W through Y) and sample results are also reported in the site descriptions (Volume 2). This chapter first presents a summary of sterile pollen samples and a list of all of the pollen types identified. Next is an overview of how archaeological samples contrast with modern analog and surface control pollen data. A suite of economic pollen types are defined through contrasts between the modern and archaeological samples, followed by a discussion of data trends and patterns organized by results from gardens and the three land tracts.

Sterile Pollen Samples

The 200-grain pollen count has been an analytical standard for archaeopalynology since studies demonstrated that 70 percent to 85 percent of the taxa present in a pollen sample will be detected in a 200-grain count (Barkley 1934; P. Martin 1963). However, when there is no coherent pollen signal in samples due to progressive deterioration, the degraded assemblages are evaluated as sterile (Bryant and Hall 1993:283; Dimbleby 1985:8; Hall 1981, 1991).

In this analysis, 37 pollen samples were sterile or contained inadequate pollen to reliably represent the sample pollen population (Table 63.6); these sterile samples are generally excluded from summary calculations and interpretations. Another 33 samples were low-count samples with pollen sums between 85 and 150 grains, and these are considered in summary calculations.

Samples may have low counts or zero pollen grains for a variety of reasons, such as poor preservation or quantities of micro debris in the processed residues that obscure pollen on microscope slides. The two worst C&T Project contexts for unproductive pollen samples were the geology soil pits and pollen washes. Seventeen of 42 geology samples were sterile, which as discussed previously is attributed to poor preservation in soils. Two out of four pollen washes were sterile, which is not unusual for pollen washes (Geib and Smith 2007). Six of 23 samples from lithic scatters and 8 of 46 samples from hearths, ashpits, or other thermal features were sterile. Although the hearths ranked fourth in terms of contexts least likely to produce significant pollen counts, thermal contexts yielded some of the richest assemblages and highest values of economic taxa.

Table 63.6. Sterile pollen samples.

Site	Number of Pollen Samples	Number of Sterile Samples	Provenience
		White Rock Tract	
LA 12587	122	3	1 pollen wash (3159), 1 sub-hearth (4100), 1 pipe (1998)
		Airport Tract	
LA 86534	47	3	Kiva hearth (2204, 2205, and 2219)
LA 135290	77	7	1 pollen wash (2234), 1 wallfall (1635), geology soil pit samples (2276, 2277, 2278, 2279, and 2280)
LA 139418	18	1	Geology soil pit samples (408)
		Otowi North	
LA 21592	11	1	Field sample (30.1)
		Rendija	
LA 85403	5	1	Fieldhouse floor (50)
LA 85859	19	11	geology soil pit samples (107, 142, 338, 341, 357, 358); scatter (329, 334, 337)
LA 87430	5	1	Hearth, extramural (169)
LA 99396	10	1	Hearth, extramural (615)
LA 99397	13	4	Lithic scatter (311, 312, 319, 333)
LA 127627	6	2	Fieldhouse posthole (8, 67)
LA 127634	6	1	Fieldhouse hearth (104)
LA 127635	5	1	Fieldhouse floor (117)
Total	344	37	

Floor sediments are the best overall contexts for productive samples and cultural pollen evidence. Only two of 121 floor samples were sterile; both were from fieldhouses. There is also a subset of 14 floor samples that were collected in rooms from beneath artifacts and these contexts produced the highest representation of economic pollen types. For example, seven project samples yielded maize pollen concentrations of greater than 1000 gr/g and three of the seven samples were collected from under artifacts lying on room floors.

Pollen Types Identified

The 64 pollen types identified from project samples are listed in Table 63.7 by taxa and common name. They are organized into six categories to reflect the ethnobotanical and ecological spectrum from obvious cultigens to introduced plants. Aggregates or clumps of pollen were documented from 14 taxa and these are also listed. The sample frequencies for all 478 C&T Project pollen samples and for 13 modern analog control samples are also presented in Table 63.7. Pollen can usually be identified to the genus level, rarely the species level, and often a grain type can only be referred to a plant family. A list of plant taxa for especially broad pollen categories (e.g., cheno-am) is included in Table 63.7.

Table 63.7. Pollen types identified by taxa and common names with percent sample frequencies for C&T Project and modern analog samples.

Taxon Name	Common Name	All C&T Project Samples (*n* = 478) %	Piñon and Juniper and Pine Transition Modern Pollen (*n* = 13) %
Cultigens			
Gossypium	Cotton	1	0
Cucurbita	Squash	3	0
Zea mays	Maize	36	0
	Maize aggregates	8	0
Opuntia (Cylindro)	Cholla	13	0
Native Economic Resources			
Opuntia (Platy)	Prickly pear	35	46
	Prickly pear aggregates	1	0
Cactaceae	Cactus family includes hedgehog (*Echinocereus*), fishhook (*Mammillaria*), and others	1	0
	Cactus family aggregates	<1	0
Cleome	Beeweed	30	0
Liliaceae	Lily family includes yucca (*Yucca*), wild onion (*Allium*), sego lily (*Calochortus*), and others	3	0
Solanaceae	Nightshade family includes tobacco (*Nicotiana*), wolfberry (*Lycium*), and others	1	0
Apiaceae	Parsley family	1	15
cf. *Helianthus*	Sunflower type	4	8
Portulaca	Purslane	2	0
Eriogonum	Buckwheat	8	0
Onagraceae	Evening primrose	11	0

Taxon Name	Common Name	All C&T Project Samples (*n* = 478) %	Piñon and Juniper and Pine Transition Modern Pollen (*n* = 13) %
Brassicaceae	Mustard family	8	8
	Mustard aggregates	1	0
Lamiaceae	Mint family	1	0
Plantago	Plantain	1	0
Cf. *Astragalus*	Locoweed	1	0
	Cf. locoweed aggregates	<1	0
Polygala type	Milkwort	<1	0
Poaceae	Grass family	79	92
	Grass aggregates	4	0
Large Poaceae	Large grass includes Indian ricegrass (*Achnatherum*, cereal grasses (oats, *Avena*, wheat, *Triticum*, etc.), reed grass (*Phragmites*), and others	3	0
Riparian			
Populus	Cottonwood, aspen	1	0
Juglans	Walnut	1	0
Betula	Birch	1	0
Alnus	Alder	1	0
Salix	Willow	<1	15
Typha	Cattail	1	0
Cyperaceae	Sedge	1	8
Other Potential Subsistence Resources			
Cheno-Am	Cheno-am	94	100
	Cheno-am aggregates	20	0
Fabaceae	Pea family includes locust (*Robinia*), vetch (*Vicia*), golden pea (*Thermopsis*), lupine (*Lupinus*), and others	3	0
Asteraceae	Sunflower family includes rabbitbrush (*Ericameria*), snakeweed (*Gutierrezia*), aster (*Aster*), groundsel (*Senecio*), and others	92	100
	Sunflower family aggregates	3	0
Ambrosia	Ragweed, bursage	38	92
	Ragweed/bursage aggregates	<1	0
Unknown Asteraceae type (LA 86637)	Unknown sunflower family type only at site LA 86637	<1	0
Asteraceae broad spine type	Sunflower family broad spine type	3	15

Taxon Name	**Common Name**	**All C&T Project Samples (*n* = 478) %**	**Piñon and Juniper and Pine Transition Modern Pollen (*n* = 13) %**
Unknown low-spine Asteraceae type, cf. *Iva*	Unknown low-spine sunflower family, possible marshelder	3	0
Liguliflorae	Chicory tribe includes prickly lettuce (*Lactuca*), microseris (*Microseris*), hawkweed (*Hieracium*), and others	1	0
Sphaeralcea	Globemallow	3	0
	Globemallow aggregates	<1	0
Euphorbiaceae	Spurge family	45	54
Scrophulariaceae	Penstemon family	3	0
Polygonaceae	Knotweed family	<1	15
Polygonum (frilly grain, cf. *Paronychia*) type	Knotweed cf. *Paronychia* type	<1	0
Unknown cf. Brassicaceae (prolate, semi-tectate, reticulate)	Unknown mustard type	1	0
Nyctaginaceae	Four o'clock family	1	8
Unknown cf. Nyctaginaceae	Unknown cf. four o'clock family	1	0
Convolvulaceae	Morning glory family	1	0
Native Trees and Shrubs			
Pseudotsuga	Douglas fir	3	8
Picea	Spruce	8	38
Abies	Fir	23	100
Pinus	Pine	90	100
	Pine aggregates	4	0
Pinus edulis type	Piñon	89	100
Juniperus	Juniper	81	100
	Juniper aggregates	<1	0
Quercus	Oak	34	100
Rhus type	Squawbush type	1	0
Rhamnaceae	Buckthorn family	1	0
Rosaceae	Rose family includes mountain mahogany (*Cercocarpus*), chokecherry (*Prunus*), and others	21	46
Ephedra	Mormon tea	29	54
Artemisia	Sagebrush	85	92
	Sagebrush aggregates	2	0

Taxon Name	Common Name	All C&T Project Samples (*n* = 478) %	Piñon and Juniper and Pine Transition Modern Pollen (*n* = 13) %
Unknown Small *Artemisia*	Unknown small sagebrush	16	0
	Small sagebrush aggregates	<1	0
Sarcobatus	Greasewood	2	23
Fraxinus	Ash	<1	0
Exotics			
Ulmus	Elm (exotic)	<1	0
Elaeagnus	cf. Russian olive type (exotic)	<1	0
Erodium	Crane's bill (exotic)	<1	8
Carya	Pecan (exotic)	<1	0

There are six distinct unknown pollen types listed in Table 63.7, which were counted separately: a probable mustard (Brassicaceae), a member of the four o'clock family (Nyctaginaceae) characterized by a periporate grain ca. 80 µm in diameter, an Asteraceae (sunflower family) grain with broad-based spines (broad spine type), an Asteraceae grain that was identified only at LA 86637, a type referred to as "small sage," and a grain referred to as cf. marshelder (*Iva*). The small sage is an ovate to oblate grain, small (less than 30 µm diameter) with a relatively thick and tectate exine. The morphology of the pollen grain resembles sagebrush (*Artemisia*), but is smaller in size. This grain type may represent one of the weedy sages, such as carruth sage or false tarragon (*Artemisia carruthii* or *A. dracunculus*), which Foxx et al. (1997) and Foxx and Tierney (1999) have identified as diagnostic successional species on old AD 1800s fields on the Pajarito Plateau. The marshelder type is a low-spine Asteraceae grain that is similar to *Ambrosia* and *Dicoria*, but the best match is to marshelder (*Iva*), based on comparison to modern specimens of the low-spine Asteraceae taxa (*Ambrosia, Dicoria,* and *Iva*). All three genera are documented in Jemez Mountain floras (Foxx et al. 1998; Foxx and Tierney 1985).

All of the plants represented by the 64 pollen types were used by various Native American tribes in the Southwest for food, fuel, tools, medicine, ceremony, textiles, construction, and other uses (Dunmire and Tierney 1995, 1997; Foxx 2006; Moerman 1998; Rainey and Adams 2004). Dunmire and Tierney (1995) identify 304 plants known to have been subsistence resources within the Pueblo province. Vierra and Foxx (2002) showed that approximately two-thirds of these 304 species are accessible in the Jemez Mountains; most are found in the piñon and juniper woodlands, the ecosystem where most of the C&T Project sites are located. However, the occurrence of a pollen type in an archaeological sample is not enough evidence to signify cultural use (see previous section, Limitations of Pollen Data). A list of economic and subsistence resources is refined in this analysis through comparison to modern samples and associations in archaeological samples.

Modern Analog Data Compared to Archaeological Pollen

Comparison of Modern Pollen to Archaeological Spectra: The False Deforestation Signal

Modern vegetation in the White Rock and Airport Tracts is piñon and juniper woodland. The Rendija Tract is ponderosa pine with piñon and juniper because of its more mesic location in a canyon. Thirteen pollen samples collected from modern piñon and juniper communities (Smith 2007a) and five surface control samples from White Rock and Airport Tract sites were graphed with all productive floor and fill samples from roomblocks (n = 130; excluding Roomblock 3 at LA 12587), floor and fill samples (n = 24) from a select set of Rendija Tract fieldhouses, and 54 samples from garden plots (Figure 63.1). Rendija Tract fieldhouse samples included in Figure 63.1 are from archaeological sites near the two modern analog pollen sampling stations in Rendija Canyon (Stations 27 and 28 Rendija gun club; Smith 2007a). Sample pollen concentrations are shown in Figure 63.1 as well as the combined percentages from the conifers (pine, piñon, and juniper) and weedy taxa plus grass (cheno-am, sunflower family, and grass). These combinations of taxa are a common palynological device used to compare the arboreal pollen expression (AP) to non-arboreal pollen (NAP).

The pollen percentages show that modern surface control samples are dominated by AP and subsurface samples are dominated by NAP. This is the Southwestern archaeological pollen signature repeated at virtually every site located in woodland or forest where pollen samples include a modern surface control sample for comparison to archaeological samples. The other important characteristic of this classic signature is pollen concentrations, which are high in the modern control samples and plummet in the subsurface samples. Even the five surface control samples from the archaeological sites record lower pollen concentrations than the analog surface samples (Figure 63.1), suggesting that a persistent cultural imprint exists in soil samples at archaeological sites. While these trends may appear to define a clear signal of deforestation during the archaeological period (e.g., Huber and Kohler 1993), the deforestation theory does not explain the subsurface drop in pollen concentration nor why this signature is generally typical of all sites from large pueblos to seasonal fieldhouses and gardens.

Pollen samples from off-site geology soil pits compared to surface samples also produced the same signature as the archaeological samples compared to surface samples. In the soil pits there is a dramatic drop in pollen concentration and pine percentages below A horizon levels, but cheno-am and sunflower family percentages increase (see previous summary of geology soil pits). This natural preservation gradient is due to the effects of physical, chemical, and biological agents and processes in soils. These natural processes are thought to contribute to the low pollen concentration and NAP-dominant signature in the archaeological samples.

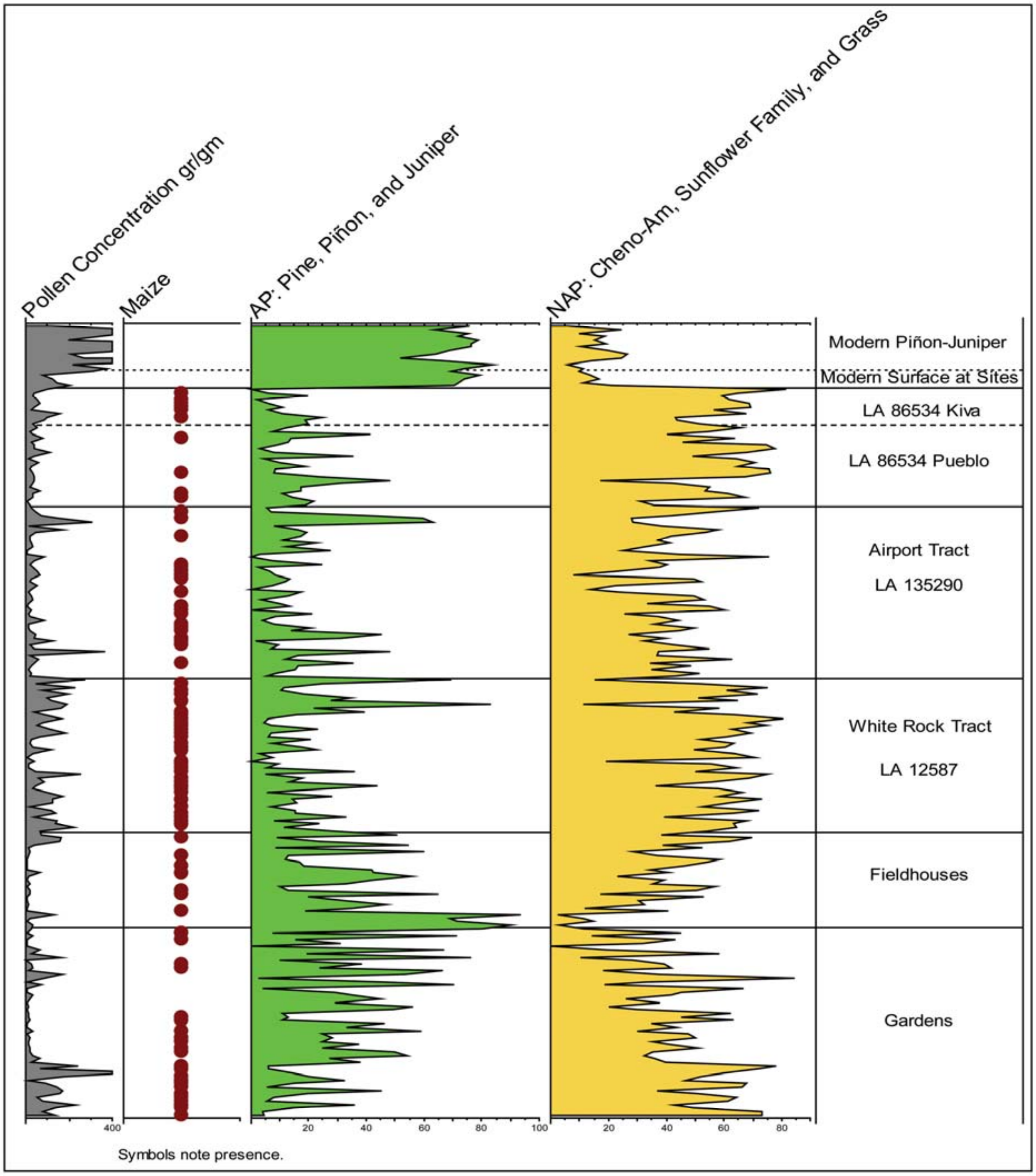


Figure 63.1. Summary percentages for arboreal pollen (AP) and non-arboreal pollen (NAP) from modern control samples, floors and fill samples from fieldhouses and pueblos (excluding Roomblock 3 at LA 12587), and gardens.

It is also true that pollen is very sensitive to local landscape changes, but the key word is *local*. Clearing a small area and constructing a pueblo can change the pollen spectra from tree dominated to weed dominated. The disturbed soils and sediments forming the site footprint are colonized by weedy taxa that dominate the pollen rain accumulating in surface sediments. There are two pairs of stations from the modern pollen analog study (Smith 2007a) that provide examples of a disturbance pollen signal overwhelming the pollen input from surrounding forest (Table 63.8). The AP and NAP percentages from these sites show that pine and juniper percentages are significantly higher in the undisturbed locations and weedy taxa characterize the disturbed areas. The wetland in Pajarito Canyon is a dramatic example of pollen sensitivity to local landscape change, as the two stations are less than 10 m apart, yet the two surface pollen samples are significantly different.

Table 63.8. Comparison of arboreal pollen (AP) and non-arboreal pollen (NAP) percentages from disturbed sites.

Modern Pollen Analog Station	Concentration gr/g	AP: Pine, Piñon, and Juniper Pollen Percentages	NAP: Cheno-Am, Sunflower Family, and Grass Pollen Percentages
25 – Natural wetland in Pajarito Canyon	48070	72	6
26 – Disturbed site (road shoulder) within 10 m of Station 25	11399	39	36
1 – Piñon and juniper south of Highway 4 west of White Rock	11626	76	6
2 – Disturbed site along Highway 4, Ancho Canyon, possible old field on first terrace; piñon and juniper woodland surrounding	12031	38	56

The dynamics of pollen movement and deposition in sediments at archaeological sites are complex and there are a number of considerations beyond the natural pollen dynamics discussed above that invalidate using archaeological pollen spectra for environmental reconstructions. The majority of pollen samples collected for the C&T Project came from roomblocks with plastered floors and adobe walls and restricted roof entry via ladders. This type of architecture limits atmospheric pollen rain to the small roof hole. After the site is abandoned, the roof drops down and seals the floor and the walls topple in on top of the rooffall. When the site is excavated, the sediment collected as pollen samples from room fill is largely composed of the rain-melted adobe materials used to construct walls and roofs. Construction debris, adobe melt, and rooffall are not adequately stable contexts to record changes in environmental pollen rain because the depositional history is too chaotic. Post-occupation sheetwash and aeolian events also contribute to mixing site sediments and to decreased pollen concentrations in subsurface sediments, as pulses of rapid sediment influx dilute ambient pollen.

The issues and considerations discussed above have been raised by other palynologists. Most analysts recognize that archaeological pollen assemblages are distorted due to cultural activities (Hall 1985; Jelinek 1966:1507). Hall (1985:116) states that,

> The cutting of timber for construction and firewood and the clearing of brush for agriculture will result in locally decreased abundance of pollen from woody plants and a corresponding increase in pollen from weeds that colonize disturbed ground.

Poor preservation in archaeological contexts is also widely acknowledged (see summary in Bryant and Hall 1993). Although the differences in the AP and NAP between modern surface and archaeological samples cannot be used to interpret environmental change during archaeological periods, the pollen data do not disprove deforestation. The best evidence for assessing human impacts during the pueblo periods is whether choices in fuel wood and construction materials changed.

Comparison of Modern and Archaeological Samples: General Trends

Figure 63.2 expands upon the previous figure to look at the individual pollen taxa that compose the AP and NAP frequencies; these data show general trends that characterize the individual sites. Cheno-am and sunflower family dominate the archaeological pollen assemblages, but sunflower family spectra behave like a background signal with no correlation to site type or context.

Pollen samples from pueblo sites have higher pollen concentrations and cheno-am percentages than fieldhouses and gardens. The maximum archaeological pollen concentrations and cheno-am percentages are from samples at LA 12587, which is the largest and longest occupied C&T Project site excavated. This site consists of two Late Coalition pueblos (Roomblock 3 was never finished), a Classic fieldhouse, and grid gardens. Fieldhouses are characterized by the smallest archaeological pollen concentrations and cheno-am percentages, with the exception of the LA 12587 garden (see below).

Pollen representation from gardens is in the middle between fieldhouses and pueblos. Cheno-am percentages from gardens are moderate and piñon and juniper values tend to be higher than structures. This pattern makes sense, as gardens were open to atmospheric pollen deposition; thus tree pollen input drives conifer percentages higher. The high pine percentages in the garden samples from Otowi (LA 21592) are also an environmental signal, as the grid garden is in a canyon, where tree density is greater than on mesa tops.

The garden sampled at LA 12587 is an exception among the gardens, with pollen concentrations and cheno-am percentages comparable to the LA 12587 roomblock. This result is interpreted in part as reflecting the fertility of the LA 12587 garden, and also the overall site history, as multi-component occupations and construction of a large site footprint may have blurred the sedimentary record.

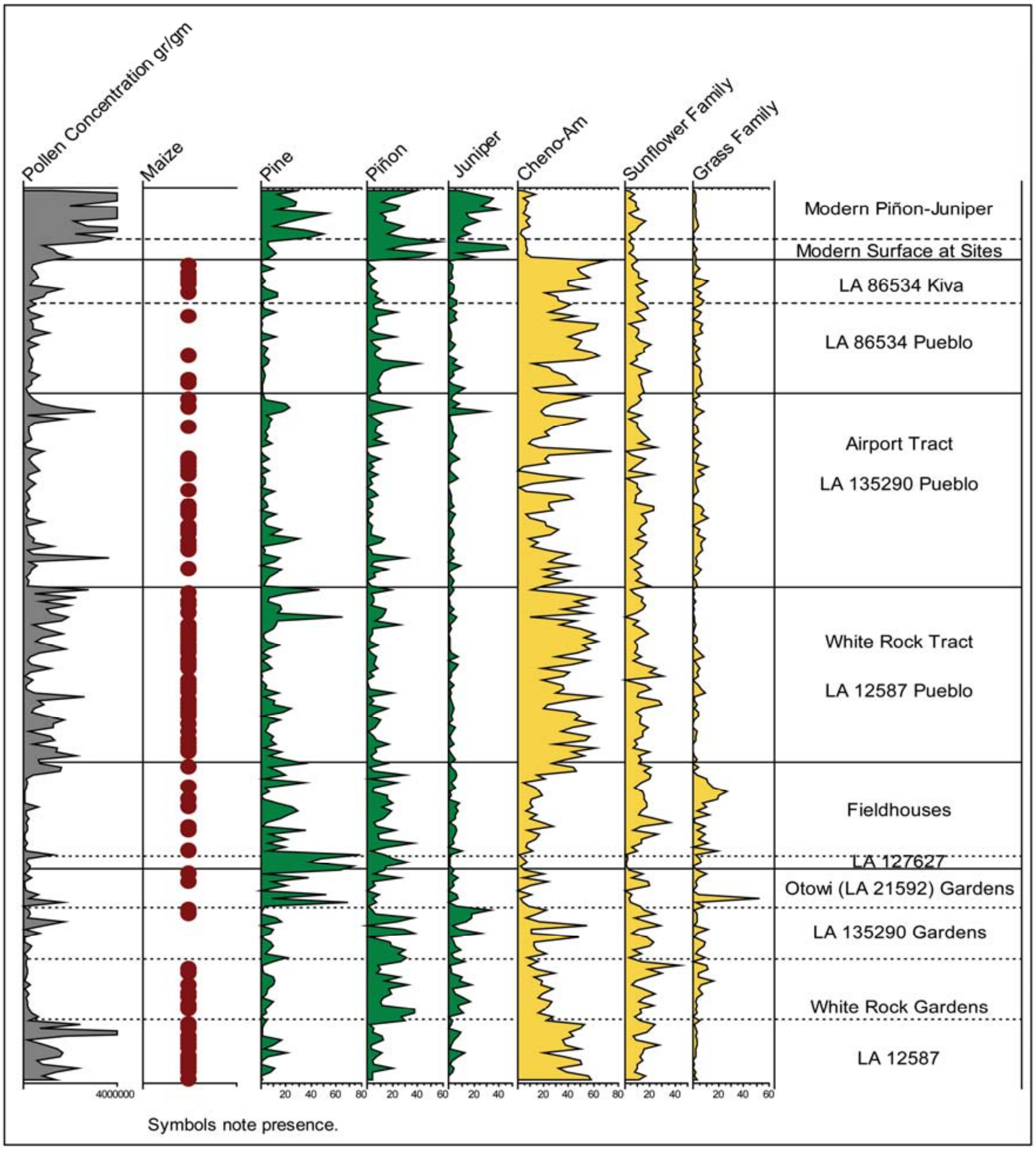


Figure 63.2. Pollen percentages from modern surface control samples, floors and fill samples from fieldhouses and pueblos (excluding Roomblock 3 at LA 12587), and gardens.

The contrasts in cheno-am between fieldhouses, gardens, and pueblos suggest that cheno-am representation is an indicator of the intensity of site use and can be used to rank the activity at sites. Cheno-am is a catch-all pollen category that encompasses the Chenopodiaceae family and *Amaranthus* genus. Common genera include saltbush (*Atriplex*) and the weed types goosefoot (*Chenopodium*), bugseed (*Corispermum hyssopifolium*), and pigweed (*Amaranthus* spp.). The introduced tumbleweed (*Salsola kali*) is another Chenopodiaceae species. Ethnographic and archaeological data show that seeds and greens from several cheno-am taxa were important staples throughout the Southwest (Dunmire and Tierney 1997; Huckell and Toll 2004; Moerman

1998; Rainey and Adams 2004). The cheno-am signature in the C&T Project pollen spectra is interpreted as a general weed signature related to intensity of site use, but it is also understood that the distinction is fuzzy between a weed and a resource. On-site and easily grown cheno-am and other "weeds" may well have been conserved, managed, or even directly cultivated for food.

There are some definite patterns in the representation of dominant pollen types by sites (Figure 63.2). Sagebrush pollen is highest at LA 135290 and cheno-am pollen percentages are noisy at this pueblo with both high and low values. There are two spikes in the pollen results shown in Figure 63.2. One is the grass pollen peak in fieldhouses, derived from floor samples at site LA 85404 in the Rendija Tract. The second is pine pollen in the post-occupation samples from LA 127627, also in the Rendija Tract. The higher pollen percentages for these taxa are interpreted to reflect floor samples versus fill; the differences in context is a theme explored in detail in the site results presented below.

Comparison of Rare Taxa between Modern and Archaeological Samples: Definition of the Economic Pollen Signature

There are several herbaceous and shrub pollen types that are absent from modern surface samples but occur in the subsurface samples, either rarely and represented by one to three grains, or more frequently but also in low numbers, usually less than 10 pollen grains. Most of these rare and low-count taxa are interpreted here as economic taxa. There are also a few types present in subsurface samples and one or more modern samples, and generally these are also considered significant, depending on the pollen abundance and context. The comparison of low count and rare pollen types between modern and archaeological samples is presented graphically in Figure 63.3. The archaeological samples include fill, floor, hearth, and posthole contexts from all of the pueblo sites, except Roomblock 3 at LA 12587, and the fill, floor, and intramural feature samples from fieldhouses. The most important economic taxa presented here are noted in Table 63.7. A few select types are emphasized below with examples from the ethnographic record.

Cultigens are the core of the C&T Project economic pollen taxa. Maize pollen is ubiquitous at all site types and from all contexts (Figure 63.3), and cotton and squash were also identified in a few samples. The occurrence of cholla pollen in the C&T Project samples is interpreted here as evidence of another important cultivated resource. Cholla does not grow in modern piñon and juniper communities in the Jemez Mountains, except at some of the larger archaeological sites, where it is restricted to the deep, well-drained substrates of collapsed walls (Foxx et al. 1998; Housely 1974). No cholla plants were documented from the 20 Los Alamos modern pollen analog stations (Smith 2007a) or in the modern vegetation near any of the excavated sites. Yet cholla pollen occurs in 63 project samples and the surface control sample from LA 12587, which likely contains some component of archaeological pollen. As noted above, surface control samples at sites appear to contain some residual archaeological signature.

All of the cacti, including cholla, are insect-pollinated plants so the pollen is not dispersed far, which means that naturally deposited cholla pollen should be uncommon in protected subsurface contexts. The cholla occurrence in the C&T Project samples is concentrated in primary contexts at the major pueblo sites (Figure 63.3; also see individual site results below) and in the garden samples, especially in the garden at LA 12587. Since cholla does not grow in the modern piñon and juniper woodland vegetation, the archaeological distribution may indicate that cholla was deliberately imported and cultivated. Housely (1974) reached the same conclusion in the western Jemez Mountains, where a species of cholla (*Opuntia imbricata*) was found growing in surface soils at certain archaeological sites outside the modern geographic and elevational range of the species.

The ethnographic history of cholla use is extensive (Curtis 1970:17, 153; Dunmire and Tierney 1995; Housely 1974:50–59; Moerman 1998; Stevenson 1915). Vegetative parts of cholla could be used throughout the year, but the most prized products are the flower buds just before opening and the fruits. The flower buds, which are gathered in the late spring around May, are prepared by steaming or roasting in pits (Greenhouse et al. 1981). Cholla flower buds are one of the few native resources that are still harvested by Indian tribes in the Southwest (Dunmire and Tierney 1995:142; Rea 1997:70). Both cholla buds and fruits could be dried and stored. Dried cholla was ground to a meal or reconstituted in soups and stews. Ceremonial and other uses are also documented in ethnographic accounts. This excerpt from Housely (1974:55) lists two of the more obscure uses.

> In Isleta, arrowheads were made from the wood, because it was thought to be infectious (Jones 1931). The coverings of thorns were eaten by warriors of Laguna and Acoma to make them strong. The stems were used like candles for a torch and the spines were used for tattooing. (Swank 1932).

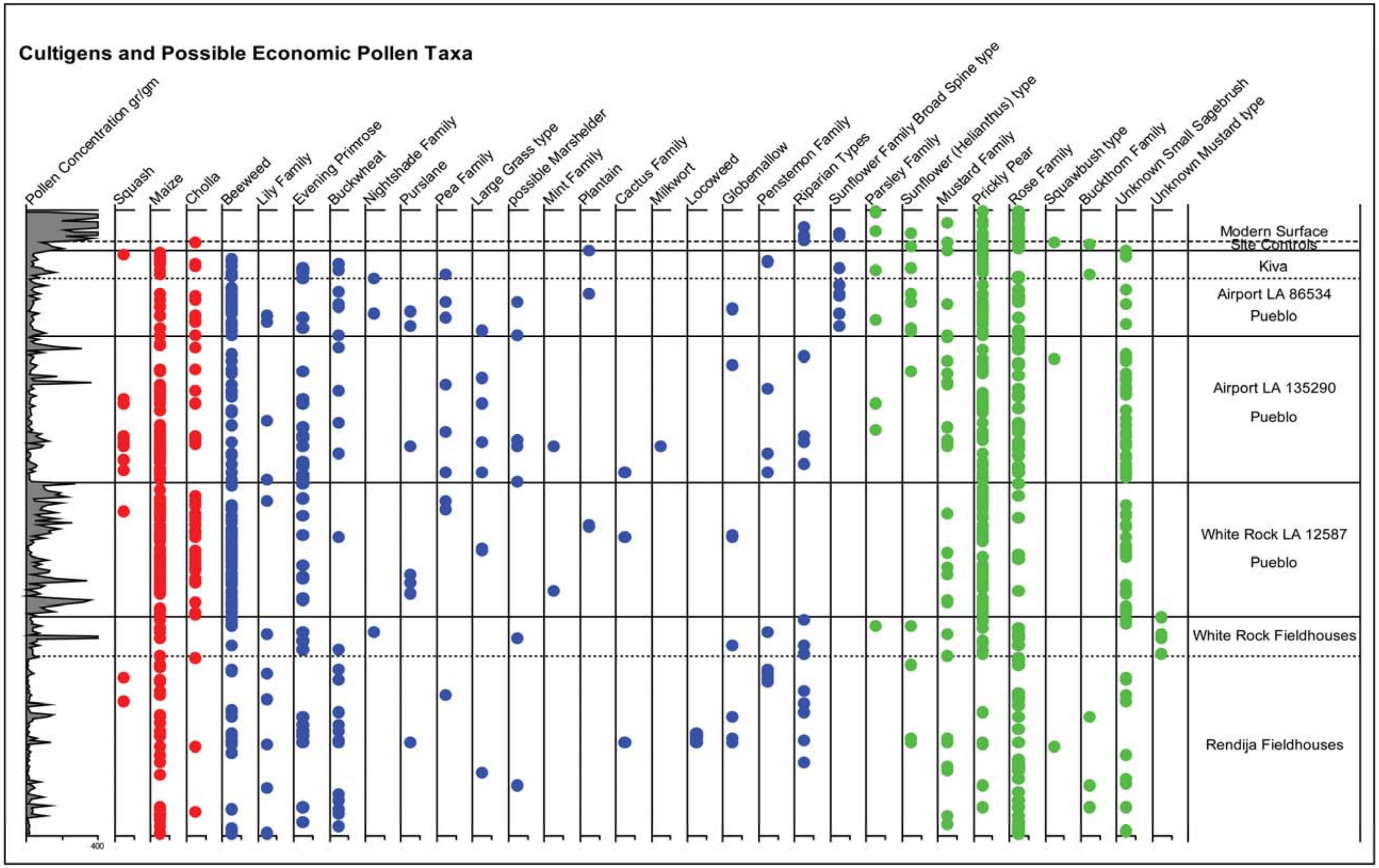


Figure 63.3. Cultigens, rare, and low-count pollen types in modern surface control samples and archaeological features.

Another cacti resource visible in the C&T Project samples is prickly pear, but the evidence for direct use is less definitive than for cholla. Several species of prickly pear are common at Los Alamos (Foxx et al. 1998) and prickly pears readily grow around archaeological sites. The pollen of prickly pear occurs in 167 of the archaeological samples and eight of the 17 modern surface samples. This cactus was undoubtedly accessible and utilized during the pueblo occupation for its sweet fruits and perhaps for its flowers (Bohrer 1986:215) and young pads, which can be boiled or baked (Dunmire and Tierney 1995:190–191). Since cholla is interpreted as a cultivated resource, it is likely that native prickly pear patches were also encouraged, managed, or directly cultivated. The cacti were too valuable a food resource not to exploit, especially since both prickly pear and cholla are easily propagated, require minimal water, and produce reliable crops year after year.

Rose family and mustard family are common pollen types in the archaeological samples that also register in modern surface samples (Figure 63.3). The rose family subsumes several shrubs that were used to make tools and implements, and chokecherry (*Prunus*) fruit, a shrub found in the wetter canyons, was widely utilized for food (Dunmire and Tierney 1995, 1997). The mustard family includes genera that were utilized for pot herbs and also for early spring greens (Moerman 1998).

Some of the other important ethnobotanical resources shown in Table 63.7 and Figure 63.3 are lily family, beeweed, evening primrose, buckwheat, purslane, and possible marshelder. Yucca is a member of the lily family that was valued as a fiber resource for making sandals, and the flowers and fruits were important food resources (Dunmire and Tierney 1995, 1997; Rainey and Adams 2004). Beeweed was used throughout the Southwest for food (greens and seeds) and medicine (Adams et al. 2002), and a superior black dye can be extracted from beeweed that is prized even today by Hopi artists. The whole beeweed plant was boiled down to a black sludge that was formed into cakes, dried, and stored (Moerman 1998). Beeweed is also an annual weed that thrives in disturbed soils and is thus another candidate for some level of cultivation or conservation around habitations. Buckwheat is an important medicinal and ceremonial plant (Moerman 1998). The Zuni used powdered buckwheat flowers for ceremonial body paint (Stevenson 1915) and the Navajo soak the whole redroot buckwheat plant (*Eriogonum racemosum*) to prepare a drink that is used for a variety of internal injuries (Mayes and Bayless Lacy 1989:133). Evening primrose pollen is common in the archaeological samples. The plant has an interesting ethnobotanical history. The roots from several evening primrose species were used for food and medicinal purposes (Moerman 1998), and an excellent fine fiber for weaving and cordage can be extracted from the plant. Marriageable Hopi women wore white flowers of evening primrose in their hair on holidays and Zuni used chewed blossoms in ceremonies (Moerman 1998:361).

The marshelder type pollen is a tentative identification, as there are two other genera with similar pollen morphology (*Ambrosia* and *Dicoria*). Marshelder, which is documented in modern floras of the Jemez Mountains (Foxx et al. 1998), is an indicator of wet ground. It is also well known as an ethnobotanical resource, especially for the seeds, and an eastern relative (*Iva annua*) was widely cultivated in the past (Doolittle 2000; Yarnell 1972).

The Palynology of Gardens on the Pajarito Plateau

Few studies of Southwest agricultural fields or features have been undertaken because farmed areas can be difficult to recognize and they lack ceramics and other material artifacts that would help date the agricultural horizons. Pollen is one of the few tools that can be used to investigate fields, but pollen evidence of agriculture is usually rare, especially from dry-farmed areas. Gardens occur near C&T Project pueblos as grids outlined with rock borders. Grid gardens at five C&T Project sites were sampled for pollen, as well as three rock piles, modern surfaces for controls, and other miscellaneous contexts (Table 63.9).

Table 63.9. Field and control samples.

Site	Number of Garden Grids Sampled	Surface Control Samples (Off Garden)	Subsurface Garden Samples	Number of Subsurface Samples with Maize Pollen (% Sample Frequency)
LA 21596 Otowi South (Smith 2007c) Grid garden	2	0	13 (5 sets of 2 to 3 samples profiling soil pits)	6 (46%)
LA 21592 Otowi North Grid garden	4	1 (plus 1 subsurface control)	9	2 (22%)
LA 139418 Airport Tract Grid garden	3	1 (average of 3 surface samples from 3 Airport Tract sites)	13 (4 sets of 3 samples profiling soil pits plus a single sample)	2 (15%)
LA 128803 White Rock Tract Grid garden	3	1	16	7 (44%)
LA 12587 White Rock Tract Uncompleted roomblock	3 (unfinished rooms)	1 (average of 5 surface samples from 2 White Rock Tract sites and a geology soil test pit)	15 from rooms and 3 surface rock piles	14 (93%)
Totals	15	4	69	31 (45%)

Maize pollen was not documented in the surface samples, but was identified in 31 of the 69 garden samples, which is a 45 percent sample frequency. Cotton pollen was documented in garden samples at two White Rock Tract sites (LA 12587 and LA 128803) and squash pollen was recovered in a single garden sample from a post-occupation Stratum at Otowi South (LA 12596).

The soil type and stratigraphic level of the samples yielding cultigen pollen provides important information that can guide archaeologists to favorable sampling locations in future investigations. Where cultigen pollen occurs can also help refine recognition of field horizons and provide information on post-occupation sediment accumulation rates. The distribution of samples with maize pollen from the garden plots is summarized in Table 63.10. The best context for recovering maize in the C&T Project grid gardens was alongside rock borders or berms, both inside and outside the grids, but not in the center. The most productive depths were in the B soil horizons or below 15 cm, which contrasts with a greater database of New Mexico field pollen studies (see Table 63.11) that shows higher cultigen pollen recovery from shallow and A horizon levels.

Table 63.10. Where maize pollen occurs in field samples.

	Number of Samples	**Number Positive Samples**	**% Frequency Positive Samples**
By Location within Grids or Other Contexts			
In center	16	4	25
Inside of a border or berm	22	11	50
Outside grid garden, but adjacent border or berm	7	4	57
Beneath berm (LA 12587)	4	3	75
Rock piles (3 samples, LA 12587)	3	3	100
Otowi South LA 12596	13	6	46
Other contexts	4	0	-
Totals	**69**	**31**	**45**
By Depth cm			
0–15 cm or A soil horizon, or at Otowi South (LA 12596), Stratum 1	23	7	30
15–47 cm or B soil horizon or at Otowi South (LA 12596) Stratum 2	33	20	61
Other sediment contexts	13	4	31

Comparisons between Garden Sites

The pollen results from Otowi South and North (LA 12596 and LA 12592), LA 139418 (Airport Tract), and LA 128803 (White Rock Tract) are presented graphically in Figure 63.4. The results between samples are generally similar, with cheno-am, sunflower family, and piñon dominant. The surface to subsurface contrasts in pollen concentrations, tree, and cheno-am pollen are the same as above. The key trait is the drop in pollen concentration from surface to subsurface contexts, which reflects the loss of surface pollen due to natural changes in pollen assemblages.

The samples from Otowi North (LA 12592) contrast with the other garden sites with higher percentages of juniper and grass in the subsurface samples compared to the modern surface. The lowest representation of maize pollen was from Otowi North and LA 139418 (only two samples at each site with maize). The low expression of maize from Otowi North is puzzling, as the grids were laid out along the north side of Bayo Canyon at the base of a talus slope, which undoubtedly delivered water from runoff percolating through the talus. Perhaps these grids were used to grow beans, which seldom leave a pollen trace. Beans are members of the legume family (Fabaceae) and tend to be self-pollinating, a syndrome characterized by minimal pollen production that stays within the flower.

The garden at LA 139418 is on top of a mesa, where soils are relatively shallow; the low maize pollen recovery at this site may reflect less productive agricultural soils compared to the other garden sites. Samples from soil pits dug into the grids at LA 139418 represent post-occupation sediment (Stratum 1), cultural fill (Stratum 2), and pre-occupation sediment (Stratum 3). There is a greater representation of prickly pear pollen in the cultural and post-occupation fill samples (Strata 1 and 2), and even more interesting is the occurrence of cattail and walnut (a riparian tree) in two separate soil pits from Stratum 2 levels. There is little pollen evidence of water indicators in any of the C&T Project samples, but this glimpse of riparian pollen may be a record of pot-watering the gardens.

The garden at LA 12587 was superimposed over an unfinished roomblock (Roomblock 3, Area 2, Rooms 19, 20, and 21). The pollen results from these grid gardens are exceptional; the highest frequency of maize pollen among the gardens comes from this site (Table 63.9). Cholla pollen was rare in garden plots, except at LA 12587, where cholla was recovered in 50 percent of the subsurface samples and one surface sample (Figure 63.4). This expression supports the interpretation presented above that cholla was imported and cultivated on the Pajarito Plateau.

Pollen concentration and cheno-am and sage percentages from LA 12587 are high, but grass and piñon frequencies are low, compared to the other garden sites. Prickly pear is another notable type. The rich representation of maize and economic cacti, especially cholla, and the greater abundance of cheno-am pollen resemble pollen assemblages recovered from collapsed pueblo rooms and features. The sediment contained within the garden grids is distinct from the underlying fill of Roomblock 3 and was probably hauled in to create the gardens. The representation of economic pollen types suggests that organic refuse was also brought in to enrich the soil or add mulch for crops. This rich economic pollen signature may reflect either an extremely productive garden or recycled economic pollen from midden or other materials added to the garden plots.

The grid gardens at LA 128803, which are downslope of LA 12587, consist of two U-shaped grids adapted from unfinished rooms to capture runoff from upslope (Drakos and Reneau 2003). The maize recovery at this site is comparable to the garden at LA 12587, but no cholla pollen was recovered and pollen concentrations and cheno-am percentages are lower.

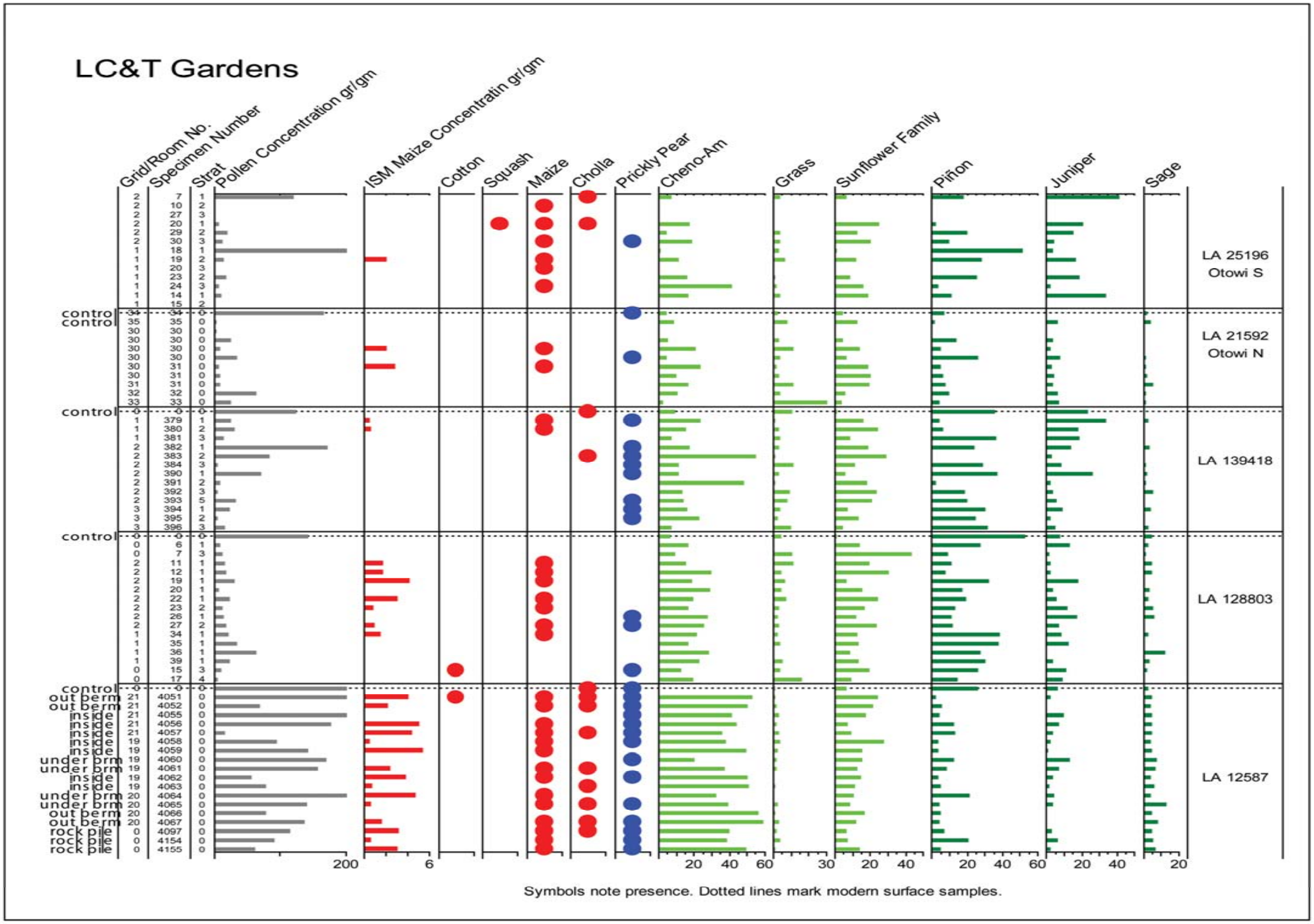


Figure 63.4. Pollen percentages from garden plots at five sites.

ISM Results and Comparison to Other Northern New Mexico Prehistoric Fields

Fifty-six of the garden samples were analyzed with the ISM procedure (see Methods Section). The 13 samples from Otowi South (LA 12596) were analyzed by conventional methods (Smith 2007b). As mentioned, the advantages of using ISM are that the abundance of cultigens can be quantified and compared between sites and regions. The ISM undertaken for the C&T Project gardens involved examining one to three slides per sample, such that each sample was analyzed to a potential cultigen concentration of less than 1.1 gr/g (range 0.25 to 1.12 gr/g). Theoretically any cultigen pollen present in the samples at concentrations of 1.1 gr/g or greater would have been detected by this level of analysis.

The ISM technique resulted in identifying maize pollen in seven garden samples that would have been missed by conventional single-slide microscopy. In the samples that produced maize, the calculated ISM concentration for maize pollen ranges from 0.4 to 5.3 gr/g (Appendix W). The C&T Project garden sites can be ranked according to field productivity by comparing the ISM maize concentrations (Figure 63.4). LA 12587 produced the most maize and other economic taxa, followed by LA 128803, which was just downhill from LA 12587. Otowi South barely ranks higher than Otowi North. Otowi South grid gardens produced a higher sample frequency of maize and cholla pollen, but higher maize concentrations were calculated from Otowi North samples. LA 139418 ranks last.

Field pollen investigations have been completed from 14 New Mexico locations (19 sites), including the C&T Project sites, and there is now a database of 340 pollen samples. The results from these studies are summarized in Table 63.11. At most sites, maize pollen was found between 0 and 20 cm, or relatively shallow, and at sample frequencies ranging from 10 percent to 70 percent (average sample frequency from 19 sites is 38%). C&T Project samples produced maize pollen from deeper soil levels (below approximately 15 cm), but the abundance and sample frequencies of maize are comparable to other New Mexico fields. LA 12587 is the exception, with the maximum maize pollen frequencies and ISM concentrations of all 19 agricultural sites (Table 63.11). This result reinforces the interpretation discussed above that garden samples from LA 12587 are different and may be incorporating trash or recycled sediment from habitation rooms.

Table 63.11. Comparison of field pollen studies in New Mexico.

Reference	Project	Sites	Description	No. of Surface Controls	No. of Subsurface Samples	Method[a]	% Samples with Corn	% Samples with Cotton	Depth cm Positive Samples	ISM Maize Conc.[b]	ISM Cotton Conc.
Smith and Hasbargen 1997	Estancia Primera Subdivision	LA 26296	5 shallow pits (18 to 27 cm deep by 2.5 to 3.2 m diam)	1	10	ISM	10	-	A1/6–13	2 gr/g	-
Dean 1998	Rio del Oso	LA 101346, LA 101348	Bordered & gridded terraces; bordered grids & step terraces	1	9	ISM	-	-	All samples in B horizon/5-15 cm)	-	-
Dean 1994	Rio del Oso	LA 71506	Bordered & gravel mulched areas, alignments, rock terraces	1	19	ISM	-	11	?/5–12	-	1 gr/g
Dean 1991	Abiquiu West	LA 75287, LA 75288	Contoured alignments & grid systems	-	9	ISM	22	22	?/5–10;10;16	1 & 3 gr/g	1 & 2 gr/g
Clary 1987	Medanales	LA 48679, LA 48680	Gravel mulched terraced gardens	1	60	Sieve	15	-	?/0–20	N/A	-
Dean 1991	Medanales	LA 48679, LA 48680	Gravel mulched terraced gardens	-	11	Sieve	-	45		N/A	-
Dean 1989a,b	Rio Chama Valley	LA 6599, LA 59659	Rock alignments	-	19	Sieve	-	-	(all samples 10 to >40)	N/A	-
Smith 1998c	El Rito	LA 111461	Grids & rock alignments	1	10	ISM	70	-	A2; A2, Bt/5–13	1–3 gr/g	-
Smith 1999	La Mesita de la Cañada Ancha		Bordered gravel mulched terraces & grids	1	19	ISM	16	-	A/5–10	1 gr/g	-
Smith 2000	Zuni		Field area with buried alignment	-	9	ISM	67	-	<1 m to >2.5 m (Zuni River alluvium)	1–4 gr/cc	-

Reference	Project	Sites	Description	No. of Surface Controls	No. of Subsurface Samples	Method[a]	% Samples with Corn	% Samples with Cotton	Depth cm Positive Samples	ISM Maize Conc.[b]	ISM Cotton Conc.
author's unpublished data	San Ildefonso	First terrace above Rio Grande floodplain	Bordered & gravel mulched areas, alignments	6	81	ISM	12	47	-	0.6–4 gr/g	0.4–9.0 gr/g
this report	Otowi South	LA 12596	Grid gardens	-	13	-	46	-	0–33	-	-
this report	Otowi North	LA 12592	Grid gardens	2	9	ISM	22	-	17 & 13	2.0–2.8 gr/g	-
this report	C&T Los Alamos, Airport Tract	LA 139418	Grid gardens	1 (average of 3)	13	ISM	15	-	Strata 1 & 2	0.4–0.6 gr/g	-
this report	C&T Los Alamos, White Rock Tract	LA 128803	Grid gardens (unfinished rooms beneath berms)	1	16	ISM	44	6	13–47	0.8–4.1 gr/g	0.7 gr/g
this report	C&T Los Alamos, White Rock Tract	LA 12587	Gardens in unfinished roomblock and 3 rock piles	1 (average of 5)	15	ISM	93	7	2 A soil horizon samples; 9 B soil horizon samples; 3 rock piles	0.5–5.3 gr/g	0.6 gr/g
TOTALS	**14 Locations**	**19 Sites**		**17**	**340**		**10–93**	**6–47**		**1–5.3 gr/g**	**<1–9 gr/g**

[a]Two methods are listed in Table 63.11: the ISM, which was used for most of the studies (see Methods), and the sieve method. The sieve method is a physical technique that concentrates large pollen grains by sieving processed samples through 45 µm mesh screen and analyzing the material captured on the screen (Gish and DeLanois 1993). The assumption is that sieving concentrates pollen grains >50 µm in size, which includes cotton, maize, squash, cacti, and other herbs. Concentrations cannot be calculated using the sieve method because tracers are smaller (ca. 30 µm) than the sieve mesh and are lost.

[b]ISM concentration is calculated from number of cultigen pollen grains and total number of tracer grains encountered during Intensive Scanning Microscopy.

Pre-Columbian Cotton in Northern New Mexico and the C&T Project Cotton Evidence

The ethnographic record of cotton in the Southwest documents use of the seeds for food (Beaglehole 1937:43; L. Huckell 1993:175–176) and the fiber for textiles (Elmore 1943:62; Robbins et al. 1916:102; Teague 1998:25; Webster 2000). Cotton was also important in ceremonies and rituals and was often used as a symbol for clouds and rain (Bohrer 1977; Huckell 1993). Cotton fibers were used on ceremonial cigarettes, prayer sticks, masks, and other ceremonial items, and the Hopi placed cotton over the faces of deceased persons as a symbol of their transformation to clouds (see Huckell 1993:177). The Hopi, Zuni, and some Rio Grande pueblo weavers made ceremonial garments out of cotton (Cushing 1974; Lewton 1912:5; Robbins et al. 1916:103).

The earliest directly dated cotton in the Southwest is from an Early Ceramic structure (Feature 68) at the Eagle Ridge site in the Roosevelt Basin, southern Arizona, where cotton seeds yielded a radiocarbon date of AD 240–390 (one-sigma standard deviation from radiocarbon date of 1725±65 BP; Elson and Lindeman 1994). The oldest indirect ages for cotton also come from southern Arizona. Cotton pollen has been recovered from San Pedro age (ca. 1200–800 BC) sites along the Santa Cruz River (Cummings and Moutoux 2000), cotton seeds were recovered from Snaketown in trash mounds dated to the Sweetwater Phase (AD 100–300; Bohrer 1970), and cotton macro remains have been documented from the Early Pioneer period (AD 480) Dairy site (AZ AA 12:285) north of Tucson (Fish et al. 1992:70). In New Mexico, the evidence of cotton has been sparse, despite the rich archaeological record and first-hand accounts from Spanish missionaries and explorers in the AD 1500s.

The earliest known cotton in New Mexico is from Tularosa Cave, where cotton cord was recovered in the pre-pottery phase (200 BC–AD 1) and the Pine Lawn phase (AD 500; Bohrer 1977). At the time of Spanish contact, active cotton fields were observed in the upper Rio Grande region in the following areas (see V. Jones 1936:51): Santa Domingo, Santa Clara, Jemez Pueblo, the Chama region, Tigeux (Tiwa Sandia and Isleta Pueblos north of Albuquerque), Acoma, and Piro (southern pueblos near Socorro). Webster's (2000:179–181) summary of the early accounts of first Spanish contacts emphasizes the widespread use of cotton clothing, especially the cotton blanket or *manta*, in the northern Rio Grande pueblos. According to Webster, "not all of the Pueblo villages grew cotton, although cotton garments were worn to some extent at all villages. The Hopi, Piro, eastern Keresan, and southern Tiwa specialized in the cultivation of cotton and the production of cotton textiles" (2000:180).

There is a faint archaeological record of cotton in the Los Alamos region. At Jemez Cave, Alexander (1935) recovered cotton string and a woven cotton head band during excavations; no ages were reported for these textiles, but all of the cultural material was recovered from the upper 10 ft of fill (Alexander 1935:99). At Bandelier National Monument, in Frijoles Canyon, there are groups of cavates (Group I and M, approximately AD 1400s) with evidence of loomholes, presumed to be associated with weaving cotton (H. Toll 1995:214–216). At Burnt Mesa Pueblo (LA 60372), early Classic Room 10 (Area 1) contained loomholes (Kohler and Root 2004:185), and Steen (1977:23) reported a pottery vessel containing cleaned cotton at a Coalition period site on the Pajarito Plateau. In White Rock Canyon, a cache of cleaned cotton bolls was recovered from a small cavate (Harlow 1965); the cotton was stored in a Sankawi black-on-cream bowl (AD 1530 to 1550) that Huckell (1993:191) suggests was a ceremonial offering. An additional 15 vessels and a basket were also discovered in other cavates near the cotton cache, and a remarkably well-preserved cotton garment folded into a bowl was found in a White Rock Canyon cavate. Photographs of the White Rock Canyon caches are shown in Figure 63.5.

Photograph from LANL Historical Society. Garment found in cavate near White Rock Canyon. Dated c. AD 1400-1500 (per Laboratory of Anthropology). Privately owned. Found by children exploring west side of the river near the lookout one mile from Bandelier National Monument. A caption on one of the photographs explains that the shirt had been washed in a washing machine.

Photograph from The Atom 1965. Pots and cotton found in a cavate in White Rock Canyon.

Figure 63.5. White Rock Canyon cotton caches.

No macro remains of cotton were recovered from any of the C&T Project sites, but surprisingly, cotton pollen was documented from 11 samples from four sites (Table 63.12). Seven of the 11 pollen samples with cotton were from LA 4618 (Smith 2006a), primarily from contexts inside kivas, which suggests a correlation to historical examples of weaving centered inside kivas. Webster states,

> Early Spanish accounts describe men as the primary textile producers in Pueblo society at the time of contact and characterize weaving as a communal male activity in extramural ceremonial structures, called estufas or kivas, during the winter or agricultural off-season (2000:181).

Table 63.12. Cotton pollen from Pajarito Plateau sites.

	Site	Context
White Rock Tract	LA 12587, Late Coalition elevation 1979 m (6500 ft)	Grid garden, sample 4051, soil horizon A, outside agricultural berms
		Room 2 sample 2123, fill above floor
	LA 128803, Classic elevation 1967 m (6462 ft)	Grid garden sample 15, outside walls, Stratum 3
Airport Tract	LA 135290, Middle Coalition elevation 2164 m (7100 ft)	Room 2, Feature 4, sample 2068. Feature 4 is an adobe-lined pit and is part of a complex of pits and hearths around a collared hearth (Feature 1)
LA 4618	LA 4618, Late Coalition elevation 2060 m (6760 ft)	Kiva Room 10 sample 447
		Kiva Room 10 sample 568, wall niche
		Kiva Room 10 sample 565, loomhole
		Kiva Room 11 sample 677, floor
		Kiva Room 11 sample 722, hearth
		Kiva Room 11 sample 716, hearth deflector
		Room 16 sample 376, rooffall

Cotton plants have an interesting pollination ecology that limits the dispersal of their pollen. Cotton flowers successively, spiraling up from lower to top branches over the course of about two months (McGregor 1976:172). One flower produces approximately 45,000 self-fertile pollen grains that are large (81 to 143 µm diameter) and coated with a sticky exudate (McGregor 1976:172). Each mature flower is receptive to pollination for only one day, opening in the morning, closing in the evening, and dropping to the ground soon after, apparently retaining most of the pollen produced within the withered flower (Hasbargen 1997:39). Cotton fibers are modified hairs that develop around the seeds inside a receptacle called a boll. When bolls are harvested, the flowers remain in the field, and it seems improbable that any cotton pollen could persist on the fruits; however, there are no experimental data to test this inference. The representation of cotton pollen in the two kivas at LA 4618 (Smith 2006a) raises the possibility that cotton *flowers* were being used ceremonially in kivas.

The cotton evidence from the Pajarito Plateau (Table 63.12) suggests that cotton was grown in the White Rock and Airport Tracts (LA 12587, LA 128803, and LA 135290) and possibly at LA 4618. Although the site elevations are all above 1970 m (6500 ft), a short growing season should not have precluded cotton agriculture. The cotton variety grown was probably the Hopi short-stapled variety (*Gossypium hirsutum* var. *hirsutum* [formerly var. *punctatum*]), which can produce a crop in less than 100 days if conditions are favorable (Wright 2000:26, 27). There is a growing body of evidence for cotton farming near Flagstaff, Arizona, at elevations above 1500 m (5000 ft; Biddiscombe 2003; Hunter 2005) from at least the AD 1100s and perhaps as early as AD 900. Cotton does require more water than maize, but apparently cotton was dry-farmed in sandy soils on the Hopi Mesas (Lewton 1912:6) and along the Rio Grande valley (see Doolittle 2000:223).

The ethnographic record and cumulative pollen evidence supports a conclusion that cotton was grown on the Pajarito Plateau. The representation, however, is low, compared to floodplain fields along the upper Rio Grande. Cotton pollen was recovered in 45 percent of the samples from a field at San Ildefonso on the first terrace above the Rio Grande floodplain and in 47 percent of samples from a field system along the Chama River (see Table 63.11).

The amount of land required to grow enough cotton for weaving a manta (blanket) is dependent on the agricultural potential of the site. Huckell (1993:172–174) discusses a model that predicts a one-acre irrigated cotton field in the prime cotton belt of southern Arizona could produce enough cotton for approximately 47 blankets; in contrast, a one-acre field on the Hopi Mesas might produce enough cotton for 3 blankets. Cotton agriculture on the dry mesa tops of the Pajarito Plateau was probably not adequate to produce enough cotton for any significant number of mantas. Weaving was likely supported by trade and import of cotton from the nearby fertile Rio Grande floodplain or irrigated fields along canyon streams, such as in Frijoles Canyon in Bandelier National Monument.

White Rock Tract

There are pollen data from six sites in the White Rock Tract: one pueblo (LA 12587), one grid garden (LA 128803), one lithic and ceramic scatter (LA 86637), two fieldhouse sites (LA 127631 and LA 128805), and a historic check dam (LA 128804). Results from the grid garden at LA 128803 are summarized in the previous Palynology of Gardens section and the results from the other sites are presented below.

LA 12587 (Late Coalition Period Pueblo and Early Classic Period Fieldhouse)

Two roomblocks were excavated at this site. Roomblock 1 was a Late Coalition pueblo with three front (Rooms 2, 4/5, 7) and back (Room 1, 6, 8) rooms and an add-on (Room 9) at the south end. A single Early Classic fieldhouse (Room 3) was built on top and about in the middle of Roomblock 1 (over portions of Rooms 7, 8, and 4/5). Roomblock 3 was Late Coalition or Early Classic and contained 13 contiguous rooms, but this pueblo was never completed. Grid gardens were superimposed on top of the Roomblock 3 fill over Rooms 19, 20, and 21. Fifteen pollen samples were collected from these gardens and the results discussed in the previous section (see Palynology of Gardens on the Pajarito Plateau).

The pollen samples were sorted by contexts (fill, floor, and features) for both roomblocks (excluding the add-on Room 9 and the Classic fieldhouse Room 3) and summary sample frequencies were calculated for the major economic taxa (Table 63.13). Average pollen concentrations by context group for maize, beeweed, and the dominant weedy and tree taxa were also generated (Table 63.14). In both tables, contextual groups are organized in the vertical order of excavation with fill at the top of the table and floor and feature sample groups at the bottom.

The sample frequencies listed in Table 63.13 show that economic pollen types are present in the modern control samples with the exception of maize. The evidence for cultural pollen taxa in surface soils indicates mixing with subsurface cultural fill sediments, which is not surprising given the amount of disturbance evident from past construction and farming.

In Roomblock 1, economic pollen taxa frequencies generally increase with depth below surface fill down to floor surfaces. Maize pollen frequencies are greatest in front room hearths and the fill just above floors, but cholla and prickly pear are higher in back room floor samples. The frequency distribution of rose and evening primrose is highest in surface fill and modern control samples, which indicates that these two types may not be cultural. This result contrasts with the other pueblo sites presented below. A striking result in the frequency table is the near absence of other economic types (Table 63.13), such as lily family and purslane. Purslane occurs in three hearth samples and lily family in one wallfall sample from a back room.

In Roomblock 3, maize frequencies are highest in the wallfall and lower fill samples, which suggests that the sediment filling the uncompleted roomblock is mixed and possibly contains midden and refuse materials.

Table 63.13. LA 12587 sample frequencies of economic taxa as a percent of samples by context.

	Number of Samples	Maize	Cholla	Prickly Pear	Rose Family	Other Types (occur in 1 to 3 samples per context group)
Modern control samples	2	0	50	50	50	Evening primrose
Surface fill samples	2	0	0	0	50	Evening primrose
Roomblock 1 (excludes Room 9 addition and Room 3 fieldhouse)						
Wallfall, front rooms	7	57	0	57	0	Plantain, evening primrose

	Number of Samples	Maize	Cholla	Prickly Pear	Rose Family	Other Types (occur in 1 to 3 samples per context group)
Wallfall, back rooms	4	50	50	75	25	Lily family
Fill above floor	3	100	67	33	0	Evening primrose
Floors, front rooms	19	79	42	37	11	Cactus family, large grass, plantain, evening primrose
Floors, back rooms	4	50	50	75	25	Buckwheat
Hearths (front rooms)	10	100	30	70	10	Mint family, purslane, evening primrose
Postholes	7	29	14	71	0	Evening primrose
Roomblock 3						
Surface fill samples	2	0	50	50	0	
Wallfall	7	71	43	57	0	
Lower fill	4	75	0	50	0	
Use surface	5	60	40	40	0	Buckwheat, evening primrose

Average pollen concentrations by contexts (Table 63.14) track slightly different patterns in the distribution of maize, compared to the sample frequencies. However, it is important to recognize that in Roomblock 1 front rooms were more intensively sampled than back rooms (19 front room floor samples versus four back room floor samples). Maize is most abundant in Roomblock 1 in the back room wallfall samples, the fill above floors, and front room floors.

Beeweed is also high in front room floors and back room wallfall, but is highest in hearths, which are all in front rooms. Among the dominant taxa, grass, sagebrush, piñon, juniper, and pine exhibit the same trend for decreasing pollen concentration with depth in the sediment fill down to floors with a rebound in values in the primary cultural contexts, especially hearths and postholes. Cheno-am shows an inverse relationship to stratigraphy with lower values in the surface and upper fill and higher concentrations from wallfall down to floors and in features. However, front room floors are an exception, with low average cheno-am concentrations comparable to the modern control sample. The highest average cheno-am is from postholes. There is no trend in the distribution of sunflower family. Sunflower family consistently registers between 1000 and 2000 gr/g regardless of context, except for a maximum average value in postholes. The same trends in pollen abundance of the dominant types in Roomblock 1 generally hold for Roomblock 3. The one exception is sagebrush, which is higher in contexts below the surface fill.

Table 63.14. Average pollen concentrations by context from LA 12587 (concentrations shown in gr/g and rounded to nearest 10).

	Number of Samples	Maize	Beeweed	Cheno-Am	Sunflower Family	Grass Family	Sagebrush	Piñon	Juniper	Pine	Total Pollen Conc.
Modern control samples (Station 14)	2	0	0	3690	1670	200	1050	10,510	1810	9024	104,600
Roomblock 1 (excludes Room 9 addition)											
Surface fill	2	0	140	3360	1410	70	1060	3060	880	6920	18600
Wallfall, front rooms	7	40	70	5090	1310	40	340	1150	360	3100	12610
Wallfall, back rooms	4	150	150	6350	1550	60	250	540	30	940	11560
Fill above floor	3	150	40	5880	1510	130	170	290	30	250	9880
Floors, front rooms	19	100	150	3020	960	170	160	300	140	470	6700
Floors, back rooms	4	30	90	5390	1580	50	260	880	260	1070	11100
Hearths, front rooms	10	50	870	4040	1150	280	490	730	180	620	9900
Postholes	7	10	220	8710	2760	180	990	1590	430	1740	19760
Roomblock 3											
Surface fill	2	0	0	2240	1000	650	130	10050	2540	4870	23950
Wallfall	7	70	130	5370	1080	80	410	1290	350	1200	11670
Lower fill	4	50	280	6430	1230	70	350	750	160	480	11360
Use surface	5	40	550	4210	1360	250	280	1150	650	940	11600

Roomblock 1

Roomblock 1 was sampled intensively and a series of samples was also taken from specific contexts to test for fine-grained changes. For example, a column of samples was collected to profile wallfall sediments in Room 4/5 and in Room 2; three remodeled floors were sampled. Pollen concentration data for dominant taxa and the presence of significant economic taxa are shown in Figure 63.6 for the majority of Roomblock 1 samples; sterile samples and special contexts, such as pollen washes, are excluded from Figure 63.6. There are several trends in the graphs that mirror the patterns described from the data in Tables 63.13 and 63.14.

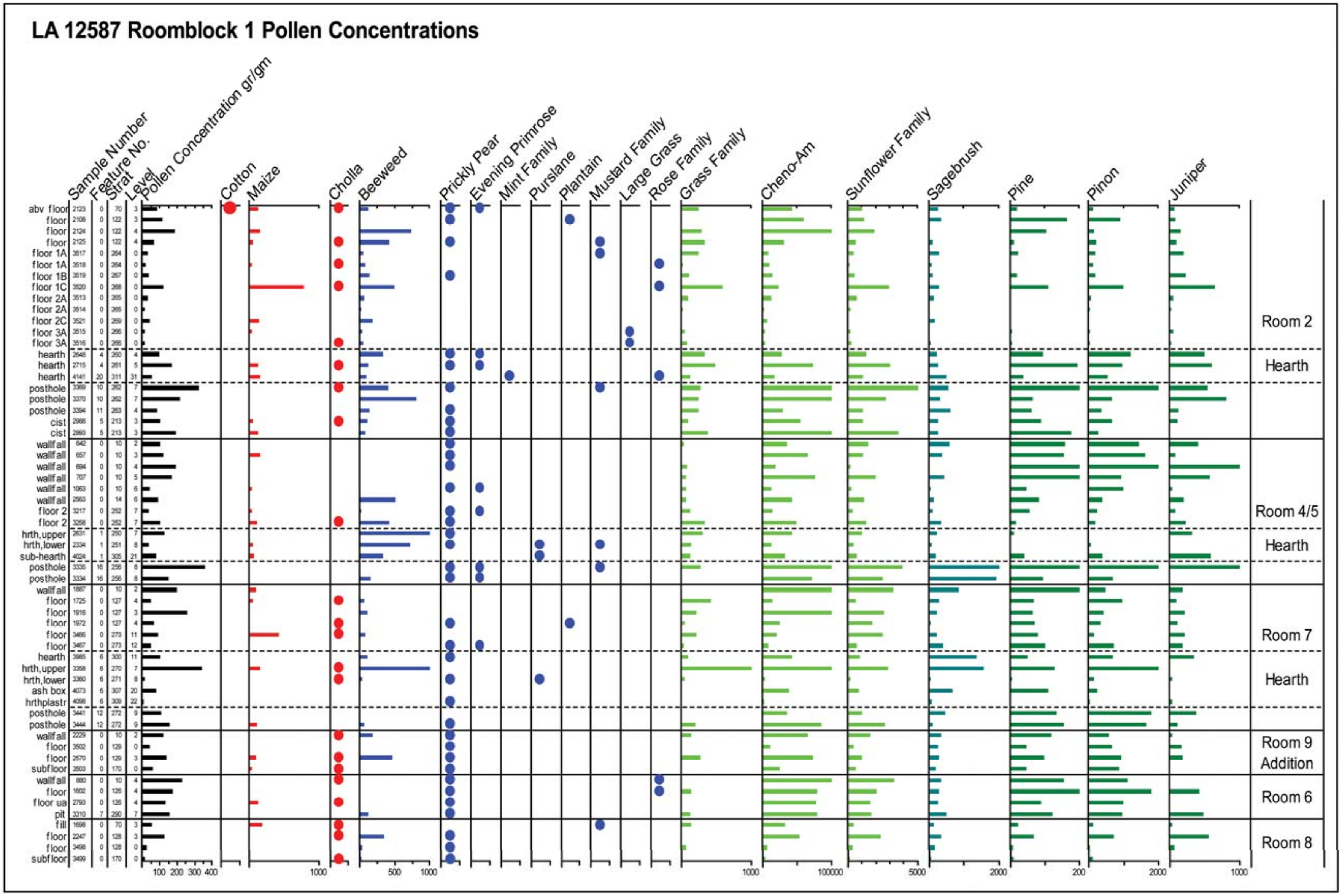


Figure 63.6. LA 12587 Roomblock 1 pollen concentration data.

One of the clear patterns shown in Figure 63.6 is that hearths and postholes produced pollen assemblages distinct from other room contexts, especially compared to floors. Room 2 is the best example of this. Three hearth and three posthole samples in Room 2 are characterized by higher pollen concentrations for all of the dominant taxa compared to floors.

Nine of the 12 floor samples analyzed from Room 2 were collected to profile three remodeled floors. There is a clear trend in the floor series of reduced pollen concentrations and economic taxa in the early floors (Floors 2 and 3). This result probably reflects better preservation in the younger Floor 1, but it is possible there is a real difference in the abundance of plant resources manipulated. If the pollen gradient is attributable to fewer plant resources, the signal might reflect shorter seasonal occupations during use of Floors 2 and 3 and a longer occupation during use of Floor 1.

Another series consists of the three hearth samples in Room 4/5, taken from the upper and lower fill of hearth Feature 1 and the sediment below the hearth. Total sample pollen concentrations in these three samples remain relatively equal, but beeweed concentrations decline sharply from upper hearth fill to sub-hearth sediment (Figure 63.6). The beeweed concentration (5467 gr/g) in the upper fill sample is the highest of all 478 C&T Project samples. The second highest project beeweed pollen concentration (1890 gr/g) comes from a hearth sample in Room 7. Data from other C&T Project sites suggest a correlation between hearth contexts and beeweed pollen abundance. Beeweed is a versatile ethnobotanical resource (Adams et al. 2002) that was widely used for food and as a dye or paint. The beeweed association with hearths suggests cooking activities, and at LA 12587 the abundance of beeweed suggests a possible specialty.

A series of six samples taken to profile wallfall in Room 4/5 show a drop in pollen concentration in the two lowest samples (level 6) and reduced values of all the dominant taxa. This trend likely reflects decreasing preservation with depth or possibly greater sediment influx in the lower samples whereby pollen is diluted. No cholla was identified in any of the wallfall samples and grass pollen concentrations are low in the wallfall compared to most other front room floor and feature samples from Roomblock 1. The lack of cholla and the decreased grass in wallfall reinforce the interpretation that these taxa are important subsistence plants. In contrast, prickly pear pollen is common in wallfall and is generally ubiquitous in site samples. Prickly pear is interpreted as both an economic resource and part of the natural pollen rain.

If all of the rooms in Roomblock 1 are considered, there is a greater representation of economic pollen types in Room 2 than other rooms, but the differences are not great. Cholla pollen is conspicuously absent from Room 4/5. Beeweed is highest in Room 2 and the hearth in Room 4/5, but low in Room 7 (except for one hearth sample). There are only two back rooms represented by a few samples from LA 12587, but the highest frequencies of prickly pear pollen are in back rooms (Figure 63.6; Table 63.13).

Burials and Miscellaneous Contexts

LA 12587 is the only site where pollen samples from human burials were analyzed. Three burials were excavated from the midden and sediment pollen samples were collected from various skeletal locations. The pollen concentrations for select taxa from the burials are compared to the average midden pollen concentrations to test whether any taxa are enhanced (Table 63.15). Grass and cholla both appear enriched in the burials. The grass pollen representation could reflect grass mats or some other grass textile. The cholla pollen might reflect offerings of flowers. Cheno-am and sunflower family pollen are more abundant in three of the burial samples than the average for the midden, and some use of these taxa may have occurred. The sunflower family encompasses several genera with showy flowers that could have been placed with the burials.

Maize pollen as single grains is not any higher in burials than middens, but aggregates of maize are higher. Maize aggregates occur in four of the five burial samples, which is the highest sample frequency by context from this site (Table 63.16). The high representation of aggregates suggests that ceremonial offering of maize pollen was part of a funerary practice.

Table 63.15. Pollen concentrations (rounded to nearest 10 gr/g) from burial samples compared to average concentrations from four midden samples at LA 12587.

	Burial 2, in Skull	Burial 2, Under Skull	Burial	Burial 3, Under Palate	Burial 3, Under Left Scapula	Midden Samples (n = 4) Average Conc.
Pollen conc. gr/g	8016	3945	41386	43613	18017	14311
Taxonomic richness	13	11	12	12	15	10
Maize	60	30	X	X	70	70
Maize aggregates	X	X	0	X	X	X (1 sample)
Cholla	30	20	X	X	X	0
Prickly pear	X	20	X	X	X	X
Beeweed	60	20	740	0	70	410
Grass family	290	20	1850	630	70	80
Pine	320	170	370	4630	540	1290
Piñon	380	360	370	2950	1360	690
Juniper	30	0	0	420	200	260
Sagebrush	160	50	740	1260	70	360
Cheno-am	4420	2170	24390	21070	9890	7312
Sunflower family	670	360	3330	3580	2300	1750

X notes presence documented during high magnification scans.

Table 63.16. LA 12587 sample frequency of maize pollen aggregates by context.

	Number of Samples	Number Samples with Maize Aggregates	Sample Frequency as Percent of Context Samples
Burials	5	4	80
Midden	4	1	25
Wallfall	4	1	25
Hearth	10	2	20
Front floors	19	3	16

Other samples analyzed from special contexts at LA 12587 include three pollen washes of artifacts from floor surfaces in Rooms 7 and 12, the plug from a clay pipe (Field Specimen [FS] 1998) recovered in Room 2 wallfall, a sample from an extramural grinding slick, three samples from a pile of dacite cobbles in Room 1 that may have functioned as a warming bin, and a sample of the wall mortar in Room 3. All of these samples were characterized by degraded assemblages and little evidence of economic types. Maize pollen occurs in one of the cobble pile samples from Room 1 (FS 1486) and prickly pear pollen was identified in the grinding slick sample. One of the pollen washes (Room 7, FS 3159) and the pipe sample (FS 1998) were sterile. The sample from wall mortar (FS 3003) and the grinding slick (FS 1258) were characterized by high pollen concentrations of 43,750 and 10,140 gr/g respectively, driven primarily by cheno-am and sunflower family. Sagebrush pollen was notable in the wall mortar sample. The combination of high concentration taxa in the wall mortar, cheno-am, sunflower family, and sagebrush could reflect a late summer seasonal signal for mixing of the mortar, as all three pollen categories encompass plants that typically flower after summer monsoons have started.

Room 3, a Classic period fieldhouse that was constructed over portions of Rooms 7, 8, and 4/5 in Roomblock 1, is represented by only three wallfall samples. The average pollen concentration from the wallfall samples is 11,570 gr/g, which is comparable to wallfall samples in the roomblock. The only economic taxa recorded are maize in one sample and prickly pear in two samples.

Summary

The main economic types identified from this site are maize, beeweed, cholla, and prickly pear. Squash pollen was recovered in the fill sample just above the floor of Room 4/5 and cotton pollen was documented in the fill sample just above the floor in Room 2. Cotton pollen was also identified in one garden sample from this site, and the results suggest that cotton was cultivated at LA 12587. Other interpreted potential economic pollen types include lily family, cactus family, the large grass type, mint family, and purslane. No riparian pollen types were identified from LA 12587, which is unusual given the level of construction and activity at the site.

High representation of grass, cholla, and aggregates of maize pollen in burial samples are interpreted to relate to funerary practices. The highest representation of economic taxa in the roomblocks is from Roomblock 1, Room 2. Some specialty product may have been prepared from beeweed in the hearth in Room 4/5.

White Rock Tract Sites (LA 86637, LA 127631, LA 128805, and LA 128804)

Three samples were analyzed from the multi-component lithic scatter at LA 86637. Only two economic pollen types were identified: purslane in FS 274 and prickly pear in FS 275, but there is a spike of an unknown sunflower family type that was identified only at this site and only in one sample (FS 276). The unknown LA 86637 sunflower family may be a glimpse of some use of a sunflower family taxon. The historic check dam samples at LA 128804 were more interesting. Two pairs of samples (one upslope and one downslope) were taken from the check dam. No maize or other cultigens were recovered from the samples, but cattail pollen was recovered in a downslope sample (FS 220), which suggests a nearby water source or ponded water at the check dam. There were no patterns in the concentrations of the dominant pollen types between upslope and downslope locations, but pollen concentration overall was low in the check dam samples, at less than 1500 gr/g.

Two fieldhouse sites were excavated in the White Rock Tract. Five pollen samples were analyzed from LA 127631, an Early Classic period fieldhouse, and eight samples were analyzed from LA 128805, a Middle Classic period site. Summary numbers by context for sample frequency and average pollen concentrations are listed in Table 63.17. There are some interesting contrasts between the two sites that may relate to both environment and occupation history.

Table 63.17. Comparison of results between fieldhouses at LA 127631 and LA 128805.

	LA 127631 Early Classic			**LA 128805 Middle Classic**		
	Surface	**Post-Occup. Fill**	**Floor**	**Post-Occup. Fill**	**Wallfall**	**Floor**
Number of samples	1	2	2	6	1	1
Sample Frequency						
Maize	0	50	50	0	0	100
Prickly pear	0	0	50	67	0	0
Beeweed	0	0	50	17	0	0
Other types	Rose family	Lily family, nightshade family, rose family	Sunflower (*Helianthus*), parsley family, rose family	Rose family	Cat-tail	Rose family
Average Pollen Concentration						
Sample pollen concentration	66820	4120	5540	3920	3600	5550

	LA 127631 Early Classic			LA 128805 Middle Classic		
	Surface	**Post-Occup. Fill**	**Floor**	**Post-Occup. Fill**	**Wallfall**	**Floor**
Grass	1750	220	430	80	110	230
Sagebrush	2920	210	30	120	220	150
Cheno-Am	5840	870	1120	830	340	1320
Sunflower family	2920	280	650	690	280	1160
Pine	8170	100	150	270	250	270
Piñon	28590	670	1060	820	1410	700
Juniper	12250	200	780	370	170	460

Maize occurs in the floor samples at both fieldhouses, but in terms of overall economic pollen diversity, LA 127631 is the richer site. The floor sample at LA 127631 produced maize, prickly pear, beeweed, sunflower type (*Helianthus*), parsley, and rose pollen. Maize and rose family are the only two economic taxa recovered from the single floor sample at LA 128805. The cattail pollen in the wallfall sample from LA 128805 is probably related to using water to mix mud for wall mortar and adobe. Rose family pollen is common at both sites from all contexts. Some member of the rose family was probably common in the native vegetation when both sites were occupied.

Both fieldhouses are characterized by comparable average pollen concentrations between dominant taxa, but there are small differences. Grass and piñon are higher at LA 127631 and cheno-am and sunflower family are higher at LA 128805. These contrasts suggest that there may have been more disturbed ground at LA 128805, which could result if a larger field area was being farmed nearby.

Airport Tract

Pollen samples were analyzed from four Airport Tract sites: two pueblos (LA 86534 and LA 135290), one fieldhouse (LA 141505), and one grid garden (LA 139418). Results from the grid garden at LA 139418 are summarized in the previous Palynology of Gardens section and the results from the other three sites are presented below.

LA 86534 (Middle Coalition Period Roomblock and Kiva)

LA 86534 is a Middle Coalition period roomblock with eight rooms and a kiva on the northeast side of the roomblock. Rooms 1, 2, 5, and 7 are front rooms and all four had hearths; Rooms 3, 4, 6, and 8 are back rooms. Forty-seven pollen samples were collected and analyzed: 15 samples from the kiva and 32 from the roomblock. There is also one modern surface control sample collected from this site as part of the modern pollen analog study (Smith 2007a). Summary data from samples grouped by contexts are presented in Tables 63.18 and 63.19.

There are differences in the distribution of economic taxa between roomblock contexts and between the kiva and rooms. In terms of sample frequencies (Table 63.18), maize pollen is most frequent in kiva wallfall and rooffall samples. Front room hearth samples rated higher than kiva hearths for cholla and prickly pear, but maize was more frequent in kiva hearth samples. The same pattern is generally true for room floors compared to kiva floor samples. Wild, native plant resources are clearly higher in room contexts. For example, lily family was recovered only from front room samples and rose family pollen is more frequent in room contexts, especially back rooms, where it occurs in 50 percent of the samples. Evening primrose is notable in kiva floor samples.

Table 63.18. LA 86534 sample frequencies of economic taxa as a percent of samples by context.

	Number of Samples	Squash	Maize	Cholla	Prickly Pear	Other Types (occur in 1 to 3 samples per context group)
LA 86534 modern pollen Station 13	1	0	0	0	100	
Kiva						
Post-occupation fill	3	33	33	0	67	Squash, mustard family
Wallfall	2	0	100	0	50	
Rooffall	2	0	100	50	50	
Floors	4	0	25	25	75	Sunflower (*Helianthus*), parsley family, evening primrose (3 samples), broad spine sunflower type
Ash pit	2	0	50	0	0	Rose family, pea family
Rooms						
Post-occupation fill	3	0	0	0	0	Nightshade, rose family, evening primrose
Wallfall	3	0	33	0	33	Sunflower (*Helianthus*), rose family, broad spine sunflower type
Rooffall	2	0	0	0	50	Broad spine sunflower type
Floors, front rooms	8	0	13	50	88	Lily, parsley and rose families, nightshade, evening primrose, pea family, broad spine sunflower type, marshelder

	Number of Samples	Squash	Maize	Cholla	Prickly Pear	Other Types (occur in 1 to 3 samples per context group)
Floors, back rooms	6	0	33	17	67	Rose family, purslane, mustard family
Hearths, front rooms only	5	0	40	20	60	Sunflower (*Helianthus*), rose family, purslane, evening primrose, broad spine sunflower type, marshelder

In terms of pollen abundance, kiva contexts rate higher than rooms, especially for maize and beeweed (Table 63.19). In the roomblock, only back room floors registered maize pollen in standard counts, producing a low average concentration of 10 gr/g. In the kiva, maize densities of less than 40 gr/g were calculated from all contexts with the highest values in wallfall and rooffall samples. Beeweed is most abundant in the kiva, especially the hearth samples. Average beeweed concentrations range from 530 gr/g in the two kiva hearth samples to hundreds in all other kiva contexts, except post-occupation fill samples, which had zero beeweed. In rooms, the average beeweed concentrations range from 120 gr/g from hearths and back room floors to less than 50 gr/g in all other context groups. And, like the kiva, no beeweed pollen was recovered from the post-occupation fill.

The highest average concentrations for the dominant sunflower family, sagebrush, piñon, juniper, and pine are all from kiva floor samples. The only room category that exceeds kiva contexts is rooffall, with two samples recording the maximum average cheno-am and grass pollen concentration. It is interesting that in room samples, the highest average concentrations for the weedy taxa are in the rooffall samples, and for the conifers (piñon, juniper, and pine), the high values are in different contexts. In the kiva, the highest average concentrations for all taxa are in floor samples, except for grass, which is highest in rooffall. Another characteristic visible in the average concentrations is a greater abundance of juniper pollen in rooms compared to kivas, with the highest juniper average from room hearths.

Table 63.19. Average pollen concentrations by context from LA 86534 (concentrations shown in gr/g and rounded to nearest 10).

	No. of Samples	Maize	Beeweed	Cheno-Am	Sunflower Family	Grass Family	Sagebrush	Piñon	Juniper	Pine	Total Pollen Conc.
LA 86534 modern pollen Station 13	1	0	0	2220	1690	350	180	8430	4260	1600	22,220
Kiva											
Post-occupation fill	3	0	0	3550	500	110	180	90	70	140	5660
Wallfall	2	40	100	3090	630	60	160	120	110	20	5760
Rooffall	2	40	120	1380	490	340	100	190	50	70	3450
Floors	4	20	110	3660	1180	290	1170	560	260	790	9420
Hearth	2	10	530	1570	650	320	30	320	30	0	5030
Rooms											
Post-occupation fill	3	0	0	1220	510	170	40	360	170	150	3380
Wallfall	3	0	30	2300	550	200	170	360	150	110	4810
Rooffall	2	0	50	4050	880	490	300	370	100	50	7660
Floors, front rooms	8	0	30	1510	420	60	60	460	100	150	3330
Floors, back rooms	6	10	120	1140	430	180	140	370	140	70	3220
Hearths	5	0	120	2820	460	80	140	430	310	350	5770

Summary

The main economic taxa identified from LA 86534 are maize, cholla, prickly pear, and beeweed, along with squash, sunflower (*Helianthus*), lily family, purslane, and possibly rose family. There was only one occurrence of squash pollen in a post-occupation kiva fill sample. Taxa occurring in one to three samples that may also reflect ethnobotanical use include nightshade family, evening primrose, pea family, parsley family, plantain, mustard family, marshelder type, and broad spine sunflower family type. No riparian pollen types were identified from LA 86534.

The pollen results show that the absolute abundance of pollen is greatest in kiva contexts and that maize, beeweed, cholla, and prickly pear—the main economic taxa—are concentrated in the kiva. Rooms are characterized by a greater diversity of wild native resources, such as rose, lily, nightshade, purslane, and pea family. Although maize is relatively common in samples from LA 86534, it is not abundant, and it is least abundant in rooms. Beeweed, however, is abundant, with the highest concentrations in kiva samples.

LA 135290 (Middle Coalition Period Roomblock)

This site is a seven-room pueblo with two attached plaza rooms (Rooms 8 and 9). Rooms 1, 2, and 3 are front rooms; Rooms 4, 5, 6, and 7 are back rooms. Seventy-seven pollen samples were analyzed, collected primarily from room fill sequences, floors, hearths, and postholes. The pollen results from Room 2, the room with the largest floor area (14.7 m^2), are unique compared to all other C&T Project rooms, and it is possible that Room 2 was a communal or ceremonial space. Back rooms at LA 135290 (Rooms 4, 5, 6, and 7) were characterized by multiple floors, indicating remodeling and perhaps a long occupation. Two samples from extramural rock alignment Feature 18, one midden sample, and a sample from an extramural rock cluster near Room 9 were also analyzed, but these samples produced little evidence of ethnobotanical resources and are not included in this summary. Maize and lily family pollen were identified in the midden sample. The six geology soil pit samples were summarized in the previous Summary of Pajarito Plateau Pollen Analog Studies section. The A horizon soil sample from the geology study is used here as a modern surface control for LA 135290.

Squash pollen is the big story at this site. Although it was identified in only 15 of 478 project samples, 11 of these samples are from LA 135290—eight from Room 2, two from Room 6, the back storage room behind Room 2, and one from Room 7. Room 2 also produced more maize and cholla than any other room at the site, as well as the only cotton pollen (from an adobe-lined pit in Room 2).

There are few occurrences of water indicators for the project, but four LA 135290 samples produced riparian types: a floor from Room 7 produced sedge, willow, and cottonwood type pollen, a wallfall sample from Room 7 contained sedge pollen, and a Room 2 floor and Room 6 posthole yielded cottonwood type. Room 7 is an interesting room not only for the high expression of riparian types, but also because a single Room 7 floor sample from beneath a floor artifact produced the highest maize concentration (5741 gr/g) from the project.

The sample frequencies by context groups for the main economic taxa are listed in Table 63.20. Although maize, cholla, and prickly pear were recovered from post-occupation fill and wallfall, frequencies are highest from the six hearth samples in Room 2 and front room floors. The Room 2 hearth samples also produced the only site record of purslane and mint family, and the only *project* record of a pollen grain identified as milkwort (*Polygala* sp.). Several species of milkwort were used medicinally, especially different preparations of the roots (Moerman 1998). There is one species of milkwort (*Polygala alba*) listed in the modern flora of the Jemez Mountains (Foxx et al. 1998). Plantain is another uncommon type identified in an adobe-lined pit sample (Feature 4) in Room 2, which also is the same sample yielding the only cotton pollen recovered from LA 135290.

Table 63.20. LA 135290 sample frequencies of economic taxa as a percent of samples by context.

	No. of Samples	Squash	Maize	Cholla	Prickly Pear	Rose Family	Other Types (Occur in 1 to 3 samples per context group)
LA 135290 FS 2275 (geology soil pit A horizon)	1	0	0	0	0	0	
Post-occupation fill	6	0	33	17	0	67	Buckwheat, mustard family,
Wallfall, front rooms	6	0	17	17	33	17	Large grass, mustard family,
Wallfall, back rooms	7	0	29	0	43	14	Sunflower, pea, and mustard families, evening primrose
Wallfall, plaza rooms	4	0	0	0	50	50	Mustard family
Floors, front rooms	5	60	60	40	100	20	Evening primrose

	No. of Samples	Squash	Maize	Cholla	Prickly Pear	Rose Family	Other Types (Occur in 1 to 3 samples per context group)
Floors, back rooms	17	12	59	18	53	41	Parsley, pea, and mustard families, large grass, marshelder, buckwheat, evening primrose
Floors, plaza rooms	5	0	20	0	20	20	Parsley, lily, and mustard families, evening primrose
Posthole, back rooms	8	13	63	0	63	38	Lily, cactus, and pea families, large grass, evening primrose
Hearths, front room 2	6	50	100	17	17	33	Purslane, mint family, polygala, marshelder, buckwheat, mustard, evening primrose
Pits	3	33	67	33	100	0	Cotton, plantain, marshelder, evening primrose

The wallfall samples from the plaza rooms, followed by plaza room floor samples, had the least evidence of economic pollen types. The occurrence of parsley and lily family pollen in plaza room floor samples may reflect ethnobotanical use.

Some associations revealed by the contextual frequency distribution are cholla and prickly pear pollen in intramural pit samples (from Rooms 2 and 5) and in front room floor samples. The back room posthole samples produced high frequencies of all the main economic taxa except cholla pollen. Back room posthole and floor samples produced the highest frequencies of native, wild resources such as lily and pea families, and the large grass type is also associated with back room contexts.

The distribution of rose family pollen is confusing, as the highest frequencies are in post-occupation fill and wallfall samples, but there are high frequencies in back room floor and posthole samples, which suggests an economic signal. The distribution of evening primrose is clearly associated with the primary cultural contexts.

Average pollen concentrations by context for dominant and select taxa are listed in Table 63.21. The maximum concentration values for maize, beeweed, sunflower family, grass, and sagebrush are from intramural pit samples; however, the two samples from adobe-lined pit Features 3 and 4 in Room 2 are driving the high values. The third pit sample, from Room 5, did not even yield maize pollen.

Table 63.21. Average pollen concentrations by context from LA 135290 (concentrations shown in gr/g and rounded to nearest 10).

	No. of Samples	Maize	Bee-weed	Cheno-Am	Sunflower Family	Grass	Sage-brush	Piñon	Juniper	Pine	Total Pollen Conc.
LA 135290 FS 2275 (geology soil pit A horizon)	1	0	0	80	680	0	0	2030	2860	790	6520
Post-occupation fill	6	20	0	2470	570	490	620	1830	1790	1770	10380
Wallfall, front rooms	6	10	10	2190	380	50	500	360	80	390	5020
Wallfall, back rooms	7	10	10	1320	300	50	440	90	80	60	3310
Wallfall, plaza rooms	4	0	0	4060	770	200	340	2790	470	1460	12090
Floors, front rooms	5	850	0	420	340	240	630	160	60	150	4620
Floors, back rooms	17	360	10	570	450	170	530	100	40	220	3120
Floors, plaza rooms	5	30	10	660	270	90	290	170	50	230	2380
Posthole, back rooms	8	30	20	560	420	190	470	100	120	210	2850
Hearths, front room 2	6	660	0	480	510	190	790	50	60	210	3620
Room pits	3	1120	190	940	1220	870	1200	70	60	110	6740

There are few coherent patterns in comparing pollen concentrations by context (Table 63.21). Maize abundance is high in the primary cultural contexts of floors and features and low in post-occupation fill and wallfall. Sunflower family, grass, and sagebrush are generally comparable across contexts, with a spike in sunflower family in plaza room wallfall, a spike in grass in post-occupation fill, and high sagebrush in the Room 2 hearth samples. Cheno-am is an exception, with a definite trend from high values in post-occupation fill down through wallfall in front, back, and plaza rooms, and then a significant drop in room floors and features. This pattern of decreasing abundance vertically from floors to fill is also true for piñon, juniper, and pine, with the exception of the plaza room wallfall samples, which are characterized by high values in all three conifers including the highest average piñon value.

The pollen sampling strategy at LA 135290 included several detailed series from multiple floors in back rooms (Rooms 4, 5, 6, and 7) and from the different contexts in Room 2. There was no significant difference in the pollen spectra from floor sample series in individual back rooms. This lack of sensible trends from youngest to oldest floors could indicate that pollen analysis is not sensitive enough to capture differences. Floor assemblages are mixed by reuse of construction materials, or the same general types of activities throughout the site occupation left comparable pollen assemblages.

The detailed sampling in Room 2, however, produced one of the best vertical pollen profiles from fill to floors from the C&T Project; this is probably related both to preservation and to the fact that this room was a focal point for the site. The pollen results from the Room 2 profile are shown graphically in Figure 63.7 as pollen concentrations. The sample at the top of the graph is from post-occupation fill, characterized by zero economic types and the maximum cheno-am, piñon, and juniper values. A few economic types register in wallfall samples and cheno-am and piñon are reduced from post-occupation fill. There are three floor samples, two taken from beneath artifacts, and there is also a subfloor sample; the subfloor sediments were described as outside fill brought in to level the floor before plastering. The two floor samples from beneath artifacts register the maximum maize and squash pollen concentrations, high grass and sagebrush and low cheno-am, piñon, and juniper pollen. This is the cultural pollen signature and it disappears in the subfloor sample, but comes back in the Feature 1 hearth, except for high cheno-am and juniper. There is a diluted cultural signature in the results from hearth Features 11 and 16, with low expressions of all taxa and then a strong cultural signature again in the two pit samples.

This overall profile indicates that grass and sagebrush were important resources used undoubtedly for a variety of construction, textile, fuel, and practical products. Cheno-am presents a mixed signal, with low background representation from floor samples and spikes in the pit samples and the Feature 1 hearth. Piñon is clearly an environmental pollen type and the piñon expression below wallfall is interpreted to reflect roofs restricting ambient pollen entry into the room. Raised juniper values in the Feature 1 hearth may reflect fuel wood use.

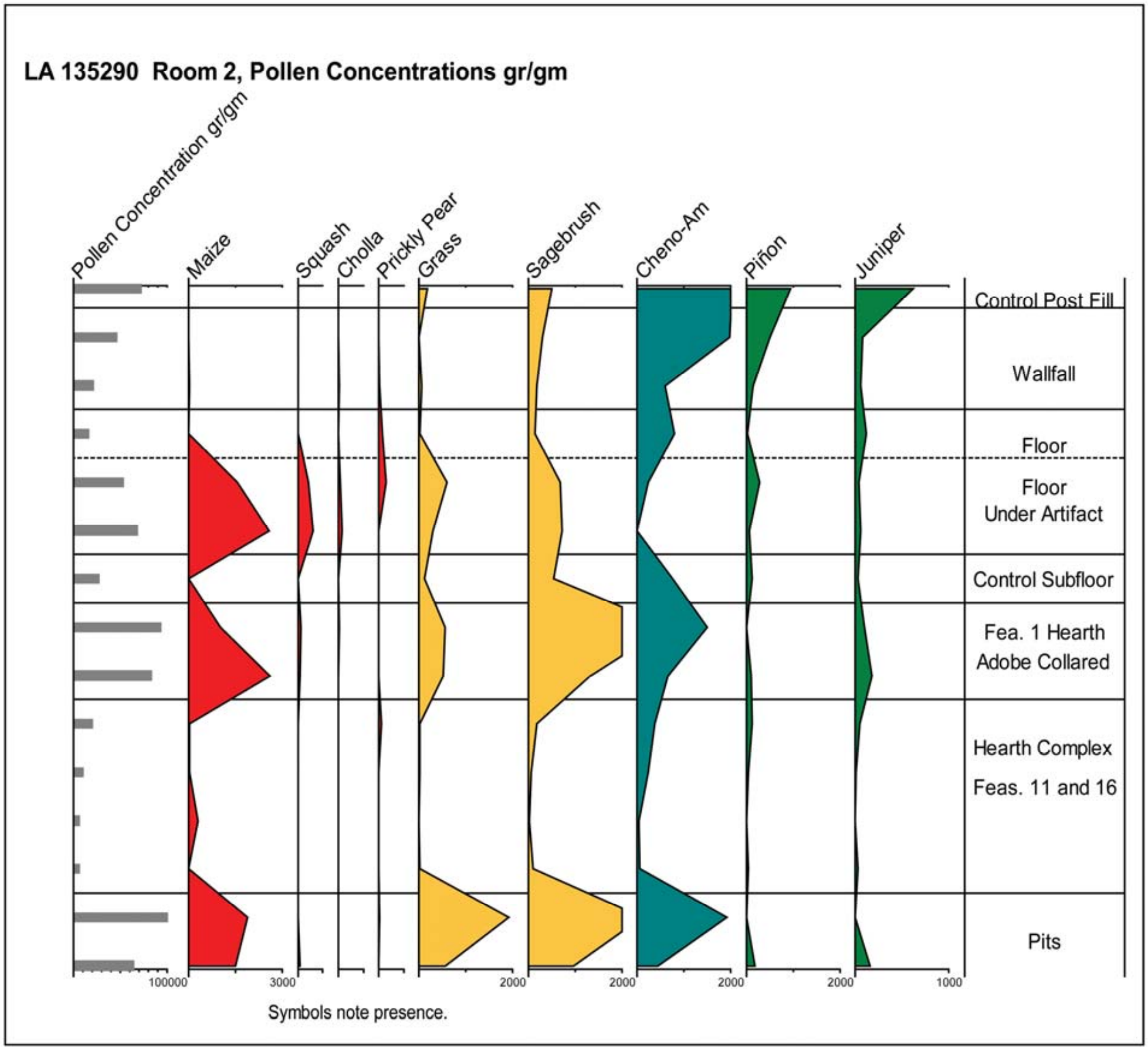


Figure 63.7. LA 135290 Room 2 pollen concentration data.

Summary

The main economic taxa recovered from LA 135290 are maize, squash, cotton, cholla, prickly pear, and beeweed. Low frequencies of lily family, purslane, mint family, parsley family, cactus family, large grass, evening primrose, buckwheat, mustard family, pea family, marshelder type, and rose family may also reflect ethnobotanical resources.

The roomblock at this site produced the project maximum values of maize and squash pollen. Clearly LA 135290 was a farming site. There are no obvious local water sources near this mesa top site, yet LA 135290 also produced the greatest project expression of riparian pollen types. The riparian signature could reflect pollen entrained in the water used to mix up adobe mud, but could also reflect some type of irrigation, perhaps pot-watering, of crops. The grid garden site at LA 139418 is not far from LA 135290 and water pollen types were also recovered at LA 139418 (see The Palynology of Gardens on the Pajarito Plateau). Another striking result in the pollen data is the abundance of economic pollen taxa in Room 2. Room 2 may have functioned as a communal or ceremonial space for the roomblock.

LA 141505 (Classic Period Fieldhouse)

Six pollen samples were analyzed from this Classic period fieldhouse: a post-occupation fill sample, two samples from the fieldhouse floor, a posthole, and one extramural sample each from a rock alignment and a rock pile. Economic types identified from floor samples include maize, beeweed, and prickly pear; walnut pollen, a riparian tree, was also recovered from a floor sample. The extramural samples produced alder (another riparian taxon), lily family, and sunflower (*Helianthus*) type.

Rendija Tract (Non-Fieldhouse Sites)

Archaic Lithic Scatters LA 85859 and LA 99397

Nineteen pollen samples were analyzed at LA 85859, an Early Archaic lithic scatter. Only eight samples produced significant counts of 80 or more pollen grains (range 88 to 243 grains) and the other 11 samples were evaluated as sterile, which is the worst return on pollen samples from any C&T Project site. Most LA 85859 samples were taken to profile soil pits, with 13 samples collected to complement the geology investigation (Drakos and Reneau 2004). Even the eight samples with significant counts were characterized by low pollen concentrations (range 260 to 780 gr/g), except for a surface sample that yielded 17,580 gr/g. As detailed in the summary of pollen results from geology soil pits (see Summary of Pajarito Plateau Pollen Analog Studies), pollen in soils is lost with depth due to physical and biological degradation, and most of the sterile pollen samples from LA 85859 were from B soil horizons. The soil stratigraphy at LA 85859 is also complicated by hillslope processes and substantial bioturbation (Drakos and Reneau 2004:35), and it is likely that the non-results are exaggerated due to the physical soils environment. Only two potential economic pollen types were identified. Beeweed pollen was documented in two samples, one from Stratum 4 (sample 336) and the second from Strata 3c/4 (sample 180), and lily family pollen occurred in sample 135 from Stratum 3c.

LA 99397 is also an Archaic lithic scatter, and similar to LA 85859, pollen samples (n = 13) were collected to profile soil pits with the result of a high proportion of sterile samples (n = 4). Nine pollen samples produced significant counts with economic taxa identified. Maize and cf. sunflower (*Helianthus*) were identified in sample 294 (Stratum 3), prickly pear in sample 317 (Stratum 5), beeweed in sample 300 (Stratum 2), and possible marshelder type pollen occurred in samples 294, 300, and 309. The co-occurrence of maize and beeweed pollen comprises a pueblo pollen signature possibly reflecting that the area of lithic scatter was a later field. A few ceramic sherds were collected in the top two strata and this site is adjacent to a Classic period fieldhouse (LA 85411) with maize pollen.

Jicarilla Apache Sites LA 85864 and LA 85869

These two sites were next to each other. Thirteen pollen samples were analyzed from LA 85869 and two samples from LA 85864; all 15 yielded significant counts. No evidence of any economic pollen types was recovered and the pollen spectra resemble natural pollen signatures (high pine and piñon and moderate cheno-am, sunflower family, and grass), except for three samples at LA 85869. These three samples were collected from a possible rock alignment (Feature 7) that after excavation proved to be a natural configuration. The pollen samples produced high percentages of sunflower family, sagebrush, and juniper, but low percentages of pine and piñon, which may reflect a subtle local natural vegetation difference, such as a drier area dominated by juniper. Two of the tipi ring samples at LA 85869 also yielded low pine and piñon percentages but high juniper, which may also reflect local microhabitat differences in the vegetation.

LA 127633 (Storage Bin)

Five pollen samples were analyzed from a storage bin (Feature 1) at LA 127633. Two of the samples are post-occupational fill and three are from the interior of the bin. No cultigens were identified and only one economic taxon was documented—lily family in a post-occupational fill sample. Pine and piñon pollen dominated all five samples, indicating that only natural pollen deposition is preserved in the fill from this feature.

LA 85407 (Serna Homestead)

Eight samples were submitted from this historic homestead site: three samples from the fill inside the cabin, two from test pits in the corral, one from a horno, and two from a reservoir feature. According to historical documents and interviews, this site was an early 1900s homestead that was seasonally occupied by the Serna family (see Chapter 32, Volume 2); the family grew corn, beans, wheat, pumpkins, and vegetables.

Maize pollen was recovered from one of the corral samples. In the cabin samples, economic pollen types included prickly pear, beeweed, and cf. sunflower (*Helianthus* type). A large grass pollen type was also identified from one of the cabin samples, which could represent Indian ricegrass or one of the cereal grasses, such as wheat. The main characteristic of the pollen results from this site is a high representation of cheno-am pollen compared to other Rendija Tract sites, which is interpreted as a weedy signature of disturbed ground.

Rendija Tract Fieldhouses

The pollen analysis included 94 pollen samples from 21 fieldhouses excavated in the Rendija Tract. Sixteen fieldhouses were built during the Classic period and five were constructed during the Coalition; two Coalition period sites contain other components (LA 99396 Archaic period lithic scatter and LA 86606 Classic period rock alignment). With one two-room exception (LA 85411), the fieldhouses are one-room structures with hard-packed floors and generally lacking interior hearths, though extramural hearths were found at a few sites. Interior hearths were recorded in seven fieldhouses and samples were analyzed from five of these hearths.

There are patterns to the distribution of economic pollen types in the Rendija Tract results (Table 63.22). First, economic taxa are associated with floors. Maize occurred in 30 percent of the floor samples (*n* = 47), compared to 23 percent of the post-occupational fill samples (*n* = 30). Cholla and squash were rare, occurring in three and two fieldhouse sites, respectively (Table 63.22), but always from floor samples. Prickly pear pollen occurred in only five samples, four floor samples and one post-occupational fill. Beeweed pollen was less common than maize, but structures registering beeweed also recorded maize, with one exception (LA 85403). Lily family pollen occurs in six samples and sunflower (*Helianthus*) in two samples.

The results from LA 85867 are unique. This was the only fieldhouse with cactus family pollen and an aggregate of cactus family was also identified. Additionally, the only project occurrence of locoweed (*Astragalus* type) was identified in three floor samples from LA 85867. It is impossible to interpret whether the locoweed reflects cultural use or some natural source (e.g., insect pollen cache), but occurrence of maize pollen, beeweed, and prickly pear in floor samples suggest there is a strong cultural signal in this structure. Several species of locoweed have medicinal and ceremonial uses and the roots of certain species were used for food (Moerman 1998).

Maize pollen is not abundant at any fieldhouse site compared to roomblocks. The maximum maize concentration from a Rendija Tract fieldhouse is 154 gr/g from a post-occupational fill sample at LA 85413. The project maximum maize concentration is 5741 gr/g from a roomblock floor sample at LA 135290 and six room samples produced maize concentrations greater than 1000 gr/g (all from LA 135290, Rooms 2 and 7). The contrast between fieldhouses and rooms is attributed to more ephemeral seasonal use of fieldhouse sites.

Although maize is low in fieldhouses, the pollen data were queried to explore any potential relationship between fieldhouse size, total sample pollen concentration, and maize concentration. Larger structures might reflect longer occupation or perhaps more people living at the site, which should result in deposition of a stronger pollen signature. The pollen results appear to support this idea. The top 10 samples with the highest maize and total sample concentration were sorted from the Rendija Tract database and a frequency distribution was calculated for three categories of fieldhouse area (Table 62.23). Only one of the smallest (less than 3.5 m^2) fieldhouses (LA 85867) recorded maize pollen (scan identification). High maize values correlate to the houses greater than 3.5 m^2 and the largest fieldhouses produced the highest sample pollen concentrations.

Table 63.22. Economic pollen taxa in Rendija Tract fieldhouses.

			Numbers of Samples by Context				Numbers of Samples Recording Economic Taxa			
Site	Room Area m2	Chronology	Post-Occupational Fill	Floor	Hearth	Other	Maize	Prickly Pear	Bee-weed	Other
15116	4.75	M Classic	1	3	-	-	1 F	-	-	Cholla
70025	4.50	E-M Classic	1	1	-	-	1 F 1 PF*	-	X	Cf. sunflower (*Helianthus*), maize pollen aggregate in post fill
85403	3.75	Classic	1	2	-	2	-	-	X	Lily family
85404	3.83	E-M Classic	1	4	-	-	2 F	-	-	Squash
85408	4.05	M Classic	-	3	-	-	1 F (room 2)	-	-	-
85411	7.02; 2.45	E-M Classic	-	4	3	-	1 F	-	-	Squash, lily family, pea family
85413	4.21	E Classic	2	2	-	-	2 PF	1 F	X	-
85414	2.87	M Classic	-	2	-	-	-	-	-	-
85417	3.22	Coalition	-	2	1	-	1 F	-	-	-
85861	5.19	L Coalition	1	1	1	-	1 H	-	X	-
85867	2.84	E Classic	-	4	-	-	1 F	1 F	X	Cactus, locoweed, purslane, cf. sunflower (*Helianthus*)
86605	3.50	L Classic	3	3	-	-	1 F, 1 PF	1 F	X	Cholla, lily family
86606	3.79	Coalition Classic	1	3	-	-	1 F	-	-	-
86607	3.78	Coalition	1	2	-	-	-	-	-	-
87430	3.89	Classic	1	2	-	2	1 F, 1 extramural H*	-	X	-
99396		Coalition	7	1	1	1	-	1 PF	-	Lily family
127627	3.10	M Classic	5	1	-	-	-	-	-	-

			Numbers of Samples by Context				Numbers of Samples Recording Economic Taxa			
Site	Room Area m^2	Chronology	Post-Occupational Fill	Floor	Hearth	Other	Maize	Prickly Pear	Bee-weed	Other
127634	4.50	M Classic	1	3	1	1	2 F, 1 PF, 1 posthole	1 F	X	Cholla
127635	5.23	E Classic	1	2	1	1	1 F, 1 rock conc.	-	-	-
135291	4.80	E Classic	2	-	-	2	1 PF	-		-
135292		E Classic	1	2	-	-	1 PF	-	X	Lily family
Totals			**30**	**47**	**8**	**9**	**14 F, 7 PF, and 4 Miscellaneous**	**5**	**9**	**3 cholla, 2 squash (F samples only), 5 lily family (mixed contexts)**

E = Early, M = Middle, and L = Late; F = floors, H = hearths, PF = post-occupation fill, * = occurrence maize pollen aggregates, X notes presence.

Table 63.23. Area and distribution of top 10 samples from Rendija Tract fieldhouses with highest pollen concentration and highest maize concentrations.

Fieldhouse Interior Area m^2	Number of Floor Samples	Top 10 Maize Concentration Samples (>10 gr/g)	Top 10 Highest Pollen Concentration Samples (>5000 gr/g)
2.5–3.5	15	-	3 (20%)
3.5–4.5	23	7 (30%)*	3 (13%)
4.5–7.0	8	3 (39%)	4 (50%)
Total	46	10	10

*Sample frequencies as a percent of floor samples are shown in parentheses.

Rendija Tract Fieldhouses Chronological Trends

Rendija Tract fieldhouses comprise a chronological cross-section from Coalition through Early, Middle, and Late Classic periods. The pollen results from post-occupational fill and floor samples are organized chronologically (Figure 63.8). Classic period fieldhouses have a higher representation of maize than Coalition structures. Of the 39 floor samples collected from 16 Classic period fieldhouses, 12 produced maize pollen (33% sample frequency) compared to two of nine floor samples with maize pollen from five Coalition period sites (22% sample frequency). Only three Classic period sites did not produce any maize pollen, but two of the Coalition period sites lack maize. The pollen samples collected from LA 85413 produced the highest maize and beeweed concentrations of all Rendija Tract fieldhouses.

The greatest expression of economic taxa is during the Early Classic period, which is represented by five sites (Figure 63.8). Beeweed pollen is almost exclusive to Early Classic period fieldhouses and there is a higher frequency of riparian taxa and more diverse assemblages. The average number of economic and potential economic pollen taxa (n = 32) by chronological period is listed in Table 63.24. Floor samples from Early Classic period sites are characterized by 3.0 economic taxa per sample compared to 1.0–1.7 in all other periods.

Table 63.24. Average economic taxonomic richness from floor samples by period in the Rendija Tract.

Period	Number of Fieldhouse Floor Samples	Average Economic Taxa (n = 32) per Sample
Late Classic	3	1.7
Middle Classic	14	1.4
Early Middle Classic	9	1.4
Early Classic	10	3.0
Late Coalition/Classic	4	1.0
Coalition	4	1.5

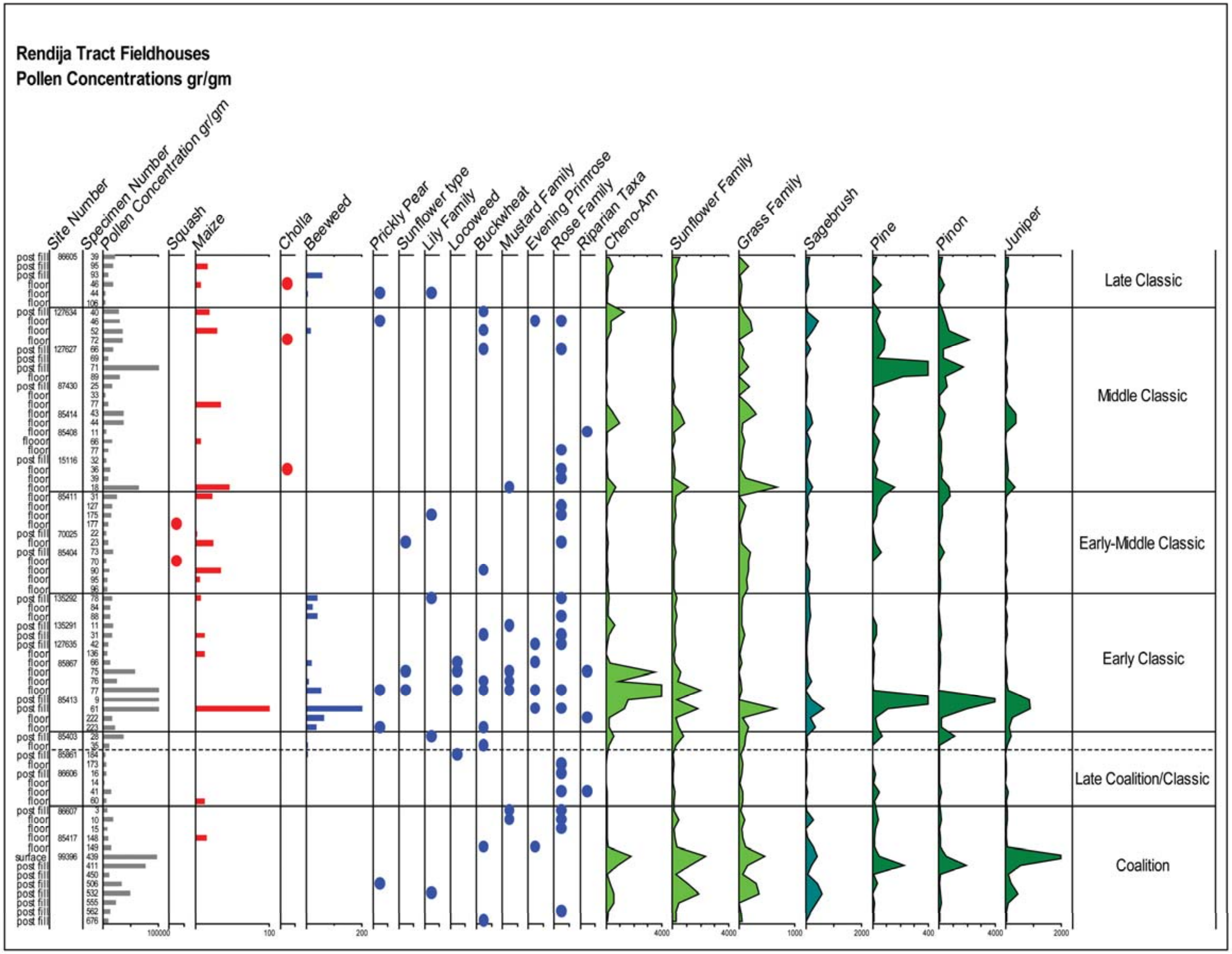


Figure 63.8. Rendija Tract fieldhouses pollen concentrations.

There are spikes in pollen concentrations at three Rendija sites—LA 127627, LA 85413, and LA 99396—but the high values are from post-occupational fill and are driven by pine, piñon, and juniper (see Figure 63.8). Sites with high pollen concentrations in floor samples are LA 85867, LA 127634, LA 85414, and LA 15116, where cheno-am, sunflower family, and grass are the source of the high values. These results are similar to pollen concentration patterns described at roomblocks and are interpreted to relate to enhanced weed signatures during site occupations. The greater representation of weedy types suggests either longer seasonal use of fieldhouses LA 85867, LA 127634, LA 85414, and LA 15116, or larger and perhaps more productive fields near the sites.

Grass pollen is notable in the majority of fieldhouses, but especially at LA 85404. Grass matting may have been used on floors or in roof materials. Cholla pollen is uncommon in fieldhouses and does not occur until the Middle and Late Classic period; cholla may have been grown at later sites on a limited basis.

COMPARISON BETWEEN SITES

Average sample pollen concentrations and economic taxa richness calculated from floor samples by site type (Table 63.25) show that there is more than twice as much pollen and a greater diversity of economic taxa on roomblock floors than fieldhouse floors. This is a statistically significant result, based on large sample populations. The contrast reflects the seasonal, ephemeral use of fieldhouses and the longer occupation and greater degree of cultural activities at roomblocks. There is also an exponentially greater abundance of maize pollen in roomblocks, which could reflect stockpiled harvests and larger, more productive gardens near the roomblocks in addition to the obvious greater intensity of human activity.

Table 63.25. Comparison of average pollen concentrations and economic taxonomic richness from floor samples by site type.

	Fieldhouses	Roomblocks
Number of structures	24	3 (24 rooms)
Floor samples	51	66
Average sample pollen conc.	2069	4677
Average maize conc.	7	191
Average economic taxa (*n* = 32 taxa) per sample	1.8	3.1

There are four Pajarito Plateau roomblock sites with detailed pollen data: LA 4618 (Smith 2006a) and the three C&T Project pueblos, LA 12587 (excluding Roomblock 3), LA 135290, and LA 86534. These four sites are compared in Table 63.26 by ranking the representation of economic taxa in floor samples. For each taxon, a score of one is assigned to the site with the greatest representation from either concentration or sample frequencies and four is assigned to the site with the lowest representation. Cheno-am is included as a disturbance indicator and other potential taxa are listed by site. Average pollen concentrations from floor samples (back and front rooms combined) are also listed in Table 63.26.

Table 63.26. Comparison of four Pajarito Plateau roomblocks; average pollen concentration and site rank (1 highest, 4 lowest) for the main economic taxa from floor samples.

	Late Coalition		Middle Coalition	
Vegetation	Area L (TA 54), piñon and juniper with patches of ponderosa pine	White Rock Tract piñon and juniper	Airport Mesa piñon and juniper	
Site	LA 4618 (excludes kivas)	LA 12587 Roomblock 1	LA 135290	LA 86534 (excludes kiva)
Elevation m (ft)	2060 (6760)	1982 (6500)	2165 (7100)	2149 (7050)
Number of room floor samples	7	23	22	14
Average pollen concentration	9980	7470	3220	3280
Site Rank				
Cotton	1	2	3	-
Squash	2	-	1	-
Maize	2	3	1	-
Beeweed	2	1	-	3
Cholla	1	2	4	3
Prickly pear	1	4	2	3
Cheno-Am (disturbance indicator)	1	2	4	3
Other potential economic taxa	Purslane, evening primrose, marshelder type, riparian types	Cactus family, large grass, plantain	Pea family, large grass type, parsley family, marshelder type, evening primrose, riparian types	Pea family, nightshade family (includes tobacco), lily family, parsley family, marshelder type, broad spine sunflower type, sunflower (*Helianthus*) type,

Pollen concentration trends from roomblocks and fieldhouses (Table 63.25) indicate that pollen abundance is a reliable index to the degree of cultural activity at sites. Contrasts between the four roomblocks (Table 63.26) show that there is more pollen in Late Coalition period roomblocks than Middle Coalition period sites. Late Coalition period sites also have a greater abundance of cultigens, based on ranking scores in Table 63.26. The highest-ranking site is LA 4618, a Late Coalition period roomblock on Mesita del Buey with two kivas; LA 4618 produced one of the best pollen records from the Pajarito Plateau (Smith 2006a).

The highest maize concentrations and squash frequencies, however, are from LA 135290, a Middle Coalition period roomblock. The high values are due to floor samples in Room 2, which may have served as a kiva or other communal space, and if true, this would skew the comparisons between sites. There is no ambiguity concerning LA 86534. This site ranks last for representation of major economic types; cultigens are essentially missing from LA 86534. But in terms of overall diversity of other economic taxa (excluding cultigens), LA 86534 ranks first and the Late Coalition period sites rank last. It is also notable that riparian pollen types were only recorded at LA 4618 and LA 135290, the two maize sites. Riparian taxa may be an indirect indicator of agriculture, probably as a result of watering gardens.

The contrasts between the four roomblocks (Table 63.26) fit a model of agricultural intensification during the Late Coalition period, presumably from a larger population; however, the same pattern could reflect the location and history of the sites. Both of the Middle Coalition period sites are on a mesa top at higher elevations and the pair of Late Coalition period sites are lower elevation near the toe of Mesita del Buey. The pollen results from gardens indicate that the agricultural potential was higher at LA 12587, compared to the Airport mesa. Thin aeolian sand covers the Airport mesa, but soils are deeper near LA 12587 (Drakos and Reneau 2003, 2004), and both LA 12587 and LA 4618 are closer to canyons, where residents may have procured water. The two Late Coalition period sites are also near each other and are part of a larger community of pueblo sites, whereas the two Middle Coalition period sites on Airport Mesa are isolated, although there are fieldhouses nearby.

CONCLUSIONS: THE POLLEN PERSPECTIVE

Pollen is a biased tool that is useful for tracking certain subsistence plants (e.g., cholla and beeweed), but blind to a host of other ethnobotanical resources, especially root crops. Archaeo-pollen data are also generally insensitive to environmental changes due to the overwhelming local input from disturbance floras that colonize sites and fields as well as subsurface pollen degradation. The natural preservation gradient in sediments affects pollen types differentially, with more conifer pollen lost than cheno-am and sunflower family in the first 10 cm below ground surface (see Summary of Pajarito Plateau Pollen Analog Studies). These natural processes and biases are important architects of the pollen assemblages recovered from archaeological sites.

The C&T Project pollen data were analyzed differently from typical Southwest archaeopalynology. The usual data display is by pollen percentages and sample frequencies. For the C&T Project, pollen percentages were used to explore contrasts between archaeological and modern pollen spectra and sample frequencies were calculated for rare and low count pollen types (e.g., cotton, squash, and cholla). For maize and beeweed and the dominant environmental taxa, analysis was based on pollen concentrations. Concentrations estimate the abundance or density of pollen grains in samples, whereas percentages are relative measures. Pollen concentrations proved to differentiate contrasts between sites that would have been missed or at least muted if pollen percentages were the sole analytical parameter employed.

What Were the Important Subsistence Resources?

Maize pollen is everywhere on the Pajarito Plateau, attesting to a history of farming throughout the Coalition and Classic periods. Squash and cotton were grown though perhaps only at the larger pueblos. Cotton may have been cultivated for ceremonial reasons or as a special crop. This conclusion is based on the low recovery of cotton pollen from pueblos and gardens and the absence of any macrobotanical or material artifacts (e.g., spindle whorls) that would confirm a substantial cotton industry. The floodplain along the Rio Grande was the cotton Eden, as shown by a San Ildefonso field study, where almost half of 81 subsurface samples produced cotton pollen (authors' data; Table 63.11). Cholla is interpreted here as another cultivated resource, one that was imported, as cholla does not occur in the native Jemez piñon and juniper woodland. Ethnographic accounts emphasize the use of cholla flower buds for food, but there is also a deep history of ceremonial and ritual use of cholla (see Housely 1974). Cholla representation is low in the C&T Project samples, and similar to cotton, cholla may have been a special crop.

Other important resources that were undoubtedly utilized and may have been encouraged, conserved in fields and other habitats, or directly cultivated include prickly pear, other cacti, lily family (e.g., yucca), beeweed, purslane, nightshade family (e.g., tobacco), and grasses. Native resources accessible throughout the archaeological periods that register in contexts floors, hearths, and other features include mint family, plantain, buckwheat, evening primrose, mustard family, rose family, parsley family, sunflower (*Helianthus*) type, large grass type, milkwort, locoweed, and possible marshelder. Two unknown sunflower members may have been subsistence resources—the broad-spine sunflower type and a sunflower family grain unique to LA 86637, a White Rock Tract multi-component lithic and ceramic scatter. Cottonwood type, walnut, willow, alder, sedge, and cattail are scarce pollen types, but the presence of these water indicators suggests that riparian habitats existed in the region and would have been intensively utilized. The marshelder type may also have been a water indicator, as the typical habitat for marshelder is wet soils. Cheno-am taxa represent resources that were surely utilized, but trends in cheno-am pollen between contexts are not as definitive as for other types.

Pine, piñon, juniper, and oak are the pollen types representing the native trees; these were core resources for fuel, construction wood, and food (piñon nuts, juniper berries, and oak acorns). These trees were undoubtedly utilized at all of the C&T Project sites, but no analysis of these taxa was attempted, as it is impossible to tease apart any cultural signal from background atmospheric pollen rain.

Can Different Contexts Be Discriminated?

Pollen assemblages are sensitive to context. The results presented here demonstrate that pollen concentrations track cultural activity. There is a gradient in abundance by site type from low in the seasonally occupied fieldhouses to the highest pollen concentrations in Late Coalition period roomblocks. Fieldhouses and rooms with larger floor areas also tend to have higher pollen concentrations.

There are examples of pollen types associated with particular contexts, such as purslane and high values of beeweed in hearths and high grass and maize pollen aggregates in burials. The results from the extensive sampling at roomblocks show that generally, floors and features are enriched in a cultural pollen signature composed of weedy dominants (cheno-am, grass, and sagebrush) and economic taxa. Floors are the best average recorder of cultural activities, postholes are the worst, and hearths are either a bust or a treasure with some of the highest expressions of subsistence resources and sterile samples.

Differences between front rooms and back rooms were also examined in detail, with mixed results. The four pueblo sites on the Pajarito Plateau with extensive pollen data are LA 4618 (Smith 2006a) and the three C&T Project pueblos, LA 12587 (excluding Roomblock 3), LA 135290, and LA 86534. The number of sites with the highest representations by room type of the five main economic taxa (squash, maize, cholla, beeweed, and prickly pear) are tallied in Table 63.27. Cultigen abundance can be high in front or back rooms, prickly pear is associated with front rooms, and beeweed and cheno-am are usually higher in back rooms.

Table 63.27. Number of roomblocks (*n* = 4) registering the highest representation of five economic taxa and cheno-am in front or back rooms.

	Front Rooms	Back Rooms
Squash	1	1
Maize	2	2
Cholla	2	2
Prickly pear	3	1
Beeweed	1	3
Cheno-Am	1	3

Although front and back rooms yield variable results by sites for the main economic taxa, there is a consistent higher diversity of other resources in back rooms (Table 63.28). The recovery of richer assemblages from back rooms is interpreted to relate to storage of plant resources as well as deposition of other pollen types that hitchhike on raw plant materials. Front rooms were likely swept out more frequently than back rooms, which could be another factor affecting diversity.

Table 63.28. Average taxonomic richness per floor sample for 32 economic and potential economic pollen taxa.

	Front Rooms	Back Rooms
LA 12587	3.0	3.9
LA 135290	3.5	4.0
LA 86534	2.8	3.0

There are few kiva samples to compare to roomblocks, but kivas tend to have higher representation of economic taxa than roomblocks. One kiva with four floor samples (LA 86534) was represented in the C&T Project data, and at LA 4618 there are two kivas with 21 floor samples (Smith 2006a). At LA 86534, the kiva floor samples produced a greater abundance of pollen than room floors. At LA 86418, back room floors were characterized by the highest pollen concentrations and representation of economic taxa, but kiva floor samples were comparable.

What Is the Pollen Evidence for Seasonality of Occupation?

Interpreting season of occupation from archaeobotanical assemblages is complicated by human behavior, as plant resources may be harvested or traded from other locales, but stored at a site. In their review of the assumptions and problems of seasonal interpretations, Adams and Bohrer (1998) suggest that the better markers of long-term site occupation are taxonomic diversity and a strong weed signal. Continual occupation, or long-term, repeated seasonal use of sites, creates disturbed ground that is expanded as sites grow, and the exposed soils are quickly colonized by weeds. The weedy signal may also become exaggerated as these plants are utilized and perhaps managed or encouraged as companion food resources in cultivated fields and gardens, on middens, and around sites.

The C&T Project sites offer an exceptional example of the weed syndrome of long-term occupation. Pollen concentrations provide an index to the abundance of pollen, showing exponentially greater pollen abundance in the more intensely occupied pueblos. The high pollen concentrations in the pueblo samples were derived primarily from cheno-am. Taxonomic diversity also reliably mirrors occupation history. Fieldhouses were characterized by minimal numbers of pollen types compared to pueblos.

The pollen results cannot determine whether roomblocks were occupied year round, but there are seasonal signals in the data. The overwhelming evidence for maize agriculture indicates spring through early fall occupation. The interpretation of the use of cholla as a cultigen at the pueblos supports an interpretation of late spring activities, as most cacti species flower between late April and June. Lily family encompasses both early spring plants (e.g., wild onion) and late spring and early summer resources, such as yucca. The prickly pear fruits, or tunas, another resource inferred from both the macro (see Chapter 62, this volume) and pollen data at fieldhouses and pueblos, are harvested later in the summer and into the early fall months. Beeweed, several cheno-am, and sunflower family taxa are late summer through early fall resources.

Chronological Trends

No significant pollen results were interpreted from the Jicarilla Apache tipi ring sites (LA 85869 and LA 85864) or the two Archaic lithic scatters (LA 85859 and LA 99397). Cultural pollen signatures are seldom recovered from open–air contexts and the potential decreases with the age of the site. Lack of cultural pollen evidence from the Jicarilla Apache sites suggests temporary use and that the sites were not used for significant plant processing.

Four roomblock sites were compared in this chapter (Table 63.26): the three C&T Project pueblos and LA 4618 (Smith 2006a), a Late Coalition period roomblock on Mesita del Buey upslope from LA 12587 (see Chapter 14, Volume 2). The pollen results from the two Late Coalition period sites (LA 4618 and LA 12587) are exceptional with significantly greater pollen concentrations than the two Middle Coalition period sites (LA 135290 and LA 86534). The patterns of pollen representation between sites and contexts support the interpretation that there was more activity and disturbed ground at Late Coalition period sites, which fits a model for Late Coalition period agricultural intensification. However, the roomblock sites are paired by period in different settings, and the pollen results could reflect better agricultural potential or perhaps more water at the lower elevation Late Coalition period sites. Additionally, the project maximum representation of maize and squash pollen is from the Middle Coalition site LA 135290, which emphasizes that roomblocks have individual pollen signatures.

Comparisons of the Rendija Tract fieldhouses present a clearer chronological trend than the pueblos. The fieldhouses comprise an excellent database of adequate numbers of sites and samples from the Coalition through the Classic periods all from approximately the same environment. The pollen results show that more maize was grown at Classic period fieldhouses than Coalition, and that the Early Classic was in some way unique. Three Early Classic sites (LA 135292, LA 85867, and LA 85813) are characterized by the highest beeweed concentrations out of all the Rendija fieldhouses and the most diverse pollen assemblages (Figure 63.8). Three Middle Classic period fieldhouse sites (LA 15116, LA 85414, LA 127634) and one Early Classic site (LA 85867) may have been occupied longer, supported more people, or associated with more productive fields. This conclusion is based on higher pollen concentrations of weed taxa at these sites.

CHAPTER 64
ANALYSIS OF FAUNAL REMAINS FROM THE LAND CONVEYANCE AND TRANSFER PROJECT, LOS ALAMOS, NEW MEXICO

Kari M. Schmidt

INTRODUCTION

This chapter presents the results of analyses conducted on the faunal remains recovered from 23 sites excavated during the 2002 through 2005 seasons at Los Alamos National Laboratory (LANL). The majority of faunal remains came from two Coalition period habitation sites (LA 12587 and LA 86534). LA 12587 consisted of two roomblocks, three rooms underlying a grid garden, a single room (Room 3) built over Roomblock 1, and three burials, while LA 86534 included eight habitation rooms and a subterranean circular kiva. Sites from five tracts were excavated and included two sites from the White Rock Tract (LA 12587 and LA 127631), two sites from the Airport Tract (LA 86534 and LA 135290), 15 sites from the Rendija Tract (LA 85404, LA 85407, LA 85408, LA 85411, LA 85413, LA 85414, LA 85859, LA 85861, LA 85864, LA 85867, LA 85869, LA 86605, LA 86606, LA 127627, and LA 135292), three sites in the Technical Area (TA) 74 Tract (LA 21596B, LA 110126, and LA 117883), and one site (LA 61035) in the White Rock Y Tract. Faunal remains from each of these sites are described in the remainder of this chapter.

The following chapter is organized into four parts: a brief discussion of the flora and fauna common to northern New Mexico, the analytical methods employed in the analysis of the faunal remains, the results of the faunal analysis, and a discussion of their significance. The discussion section contrasts the LA 12587, LA 86534, and LA 135290 assemblages with two other Coalition period faunal assemblages that were excavated at LANL in the early 1990s (LA 4618 and LA 4624; Schmidt 2006b and Vierra et al. 2002).

FLORA AND FAUNA IN NORTHERN NEW MEXICO

By and large, the sites excavated during the course of the project are located in piñon and juniper woodland. The piñon and juniper woodland (Brown 1994) includes a number of plant species but is dominated by piñon pine (*Pinus edulis*) and juniper (*Juniperus* sp.) The understory is typically composed of a number of grasses and shrubs. Dominant grasses include grama (*Bouteloua* sp.), Indian ricegrass (*Oryzopsis hymenoides*), western wheatgrass (*Agropyron smithii*), muhleys (*Muhlenbergia* sp.), and dropseeds (*Sporobolus* spp.). Dominant shrubs include gambel oak (*Quercus gambelii*), mountain mahogany (*Cercocarpus* sp.), cliffrose (*Cowania mexicana*), Mormon tea (*Ephedra* sp.), snakeweed (*Gutierrezia* sp.), fourwing saltbush (*Atriplex canescens*), rabbitbrush (*Chrysothamnus* sp.), and sagebrush (*Artemesia* sp.). Several cacti are found in the general site area and include small yuccas (*Yucca glauca* and *Y. baccata*), prickly pears (*Opuntia* sp.), and hedgehogs (*Echinocereus* sp.).

In addition to the wide-range of floral resources supported by the piñon and juniper woodland, this biome also supports a large number of mammals. Some of the major mammal species are rodents, including numerous different species of chipmunks and squirrels (Sciuridae), wood rats (*Neotoma* sp.), and mice (*Perognathus* sp. and *Peromyscus* sp.). Mammals in the biotic communities that may have been more economically important than the rodents include rabbits (Leporidae), carnivores (from the Felidae, Canidae, Procyonidae, and Mustelidae families), and deer and elk (Cervidae). Most of the taxa represented by these families would have been accessible relatively close to the site at various times throughout the year. Large cervids would have been in the area during the winter months as it falls within their winter range.

Birds and reptiles are also present in the site area. Some of the more common species include the piñon jay (*Gymnorrhinus cyanocephalus*), quail (*Callipepla* sp.), ravens (*Corvus* sp.), raptors (Falconiformes), whiptail lizards (*Cnemidophorus* spp.), rattlesnakes (*Crotalus* sp.), spiny lizards (*Sceloporus* sp.), and various non-venomous snakes (Colubridae). While the flora and fauna on the Pajarito Plateau remain similar to conditions that may have been found in the area prehistorically (with the exception of the introduction of some nonnative grasses and trees), the relative abundances of these species has likely changed.

ANALYTICAL METHODS

The faunal remains from the C&T Project sites were analyzed and assigned to the lowest taxonomic level whenever possible. Genus and species identifications remained the ideal goal throughout the analysis, but were not always possible. Identifications were made using the comparative osteological collection at the Arizona State Museum in Tucson, Arizona, and were augmented by osteological manuals when necessary (Cohen and Serjeanston 1996; Gilbert 1993; Lawrence 1951; Olsen 1964, 1968, 1979). Provenience data recorded for each specimen included site number, field specimen (FS) number, area number, room number (where applicable), easting, northing, Stratum, and level.

The analysis followed standard zooarchaeological procedures (Grayson 1984; Klein and Cruz-Uribe 1984) and recorded the following attributes for each bone: lowest taxonomic identification, element (e.g., tibia, ulna), portion of element present (e.g., proximal, distal, or complete), side (if able to be determined), age (presence or absence of epiphyseal fusion line, epiphyses, etc.), fusion (fused or unfused), presence and degree of burning, natural taphonomic factors (e.g., root-etching, weathering), break patterns (if other than natural), pathologies, and numbers of specimens present. In addition, other surface modifications (e.g., rodent or carnivore gnawing), if present, were recorded.

Unidentifiable materials classified as mammal were separated based on size. Following Shaffer and Baker's (1992) criteria, distinctions were made between small mammals (small rodents and leporids), medium-sized mammals (large rodents such as beaver, and carnivores such as coyotes and foxes),medium/large-sized mammals (deer, pronghorn, and bighorn sheep), and large-sized mammals (elk, bison, and bear). Similar distinctions were made for birds if element identification was not possible.

Although identifications to species are always preferable, certain specific identifications were not made for several reasons. The main reason for generic identifications (as opposed to specific) is the presence of multiple species in a given area. This phenomenon occurred for cottontail rabbits. There are presently two species of cottontail rabbits in northern New Mexico (Macdonald 1995). Both the desert cottontail (*Sylvilagus audubonii*) and Nuttall's cottontail (*Sylvilagus nuttallii*) inhabit the area today. Nuttall's cottontail has been reported as far south as northern New Mexico but is probably not significant to this analysis as there are very few archaeological examples from northern New Mexico. Despite this, however, cottontail identifications were made to the generic level, *Sylvilagus* sp., and not to the specific level to avoid conflating these two species.

Unidentifiable shaft fragments were kept separate from unidentifiable, non-shaft fragments in order to assess the number of shafts relative to other fragments. This was done to gain a sense of how many long-bone elements were in the assemblage relative to non-long-bone elements.

Several methods were employed to quantify both the unidentifiable and identifiable remains during the analysis. These techniques include the number of identified specimens (NISP), the minimum number of individuals (MNI), and the calculation of lagomorph and artiodactyl indices. Each of these is discussed in detail below.

Number of Identified Specimens

The NISP is the number of bones in an assemblage that can be assigned to a particular taxon (Klein and Cruz-Uribe 1984). In early faunal analyses, this was the primary method of quantification. Determining NISP values for an assemblage is fairly simple: bones are identified to the lowest possible taxonomic level, and the numbers of identifiable specimens within that taxon are tabulated. If an assemblage has 10 left tibiae and 8 right tibiae, the NISP value is 18. NISP is the most fundamental counting unit used to determine the abundance of taxa in a given faunal assemblage (Grayson 1984), and was employed during the course of the current analysis.

Despite the need to quantify taxa in faunal assemblages, there are inherent problems with using the NISP method (Grayson 1979, 1984). First, NISP methods assume that all bones are equally affected by breakage, which cannot control for interdependence as one bone has the potential to be broken into many fragments. This creates problems for statistical measures. Second, NISP does not account for differential preservation of bones, which is dependent on density or porousness. Third, NISP methods do not control for differing number of elements in different species. Fourth, NISP is affected by differing recovery techniques, specifically screening (Cannon 1999a; Shaffer and Sanchez 1994). Finally, NISP values are affected by butchering and transport decisions. Small animals killed away from a site are more likely to be carried back whole, while only the meatiest elements of larger animals are returned to the site. Each of these issues affects specimen counts.

Minimum Number of Individuals

The MNI in an assemblage is the number that signifies how many animals represent a particular taxon. White (1953) was one of the first to use this quantification. He described the MNI calculation as, "separating the most abundant element of the species found . . . into right and left components and using the greater number as the unit of calculation" (White 1953:397). For example, an assemblage with 10 left tibiae and 8 right tibiae has an MNI of 10. This quantification method has the potential to alleviate some of the shortcomings of the NISP method, especially in terms of interdependence and fragmentation, but it is not problem-free. MNI calculations are affected by analyst choices in terms of aggregation of data (e.g., which analytic units are used, pit structures, terraces, units, levels, etc.), and also in terms of how to compute the MNI (e.g., which element will be used for calculation). In this analysis, both NISP and MNI calculations were used to take advantage of the best of both methods without ignoring their weaknesses.

Lagomorph and Artiodactyl Indices

Because large game and small game are both economically important and consistently found in faunal assemblages throughout the Southwest, their importance relative to one another is significant (Bayham and Hatch 1985; Szuter 1991). In relatively arid areas where numbers of large game are reduced in archaeological assemblages because of natural scarcity (when compared to small game; see Brown 1994), large game is more likely to be recovered at residentially used locales. Because artiodactyls (white-tail and mule deer, bighorn sheep, elk, and pronghorn) and lagomorphs (jackrabbits and cottontail rabbits) are economically important and consistently appear in faunal assemblages throughout the Southwest, understanding their importance relative to one another is important. As a result, artiodactyl indices (ratio of artiodactyl remains to the sum of artiodactyl and lagomorph remains) and lagomorph indices (ratio of cottontail remains to the sum of all lagomorph remains) were calculated. The comparison of indices will be valuable in the assessment of site function, land use, and resource exploitation at the C&T Project sites.

RESULTS OF THE FAUNAL ANALYSES

White Rock Tract

Eight sites were excavated in the White Rock Tract in 2002, and faunal remains were only recovered at two, a Late Coalition period roomblock (LA 12587) and a Late Coalition/Early Classic period fieldhouse (LA 127631) (see Figure 13.1).

LA 12587 (Roomblock)

LA 12587 is located on a wide ridge at the east end of Mesita del Buey and sits at an elevation of 1979 m (6500 ft). Cañada del Buey lies some 300 m to the north of the site, and is defined on the north by a 70-m-tall cliff face. The wide floodplain of Pajarito Canyon is approximately 400 m south of the site. Cañada del Buey and Pajarito Canyon converge just east of LA 12587 and it is at this point that the two canyons begin to angle away from each other. Piñon and juniper woodlands dominate the ridges and mesa tops surrounding the site, while the canyon bottoms are vegetated primarily by broadleaf riparian species. Ponderosa pine forests are located upslope of the site in the foothills of the Jemez Mountains. The location of the site near three distinct biomes (woodland, riparian, and coniferous forest) made access to a number of distinct species not only possible, but also likely.

In general, the overall preservation of the bones from LA 12587 is good. For the most part, bones were recovered in large fragments, and a number of complete elements were identified. Weathering on the faunal remains was present, although the frequency and severity was generally low (*n* = 18), suggesting the remains may not have been exposed to the elements for a long period of time before deposition. The bones show minimal evidence of root-etching, and no evidence of rodent gnawing, carnivore gnawing, or carnivore-digestion. Modifications resulting from burning were present on 183 pieces of bone, constituting some 28 percent of the total assemblage. Pathologies were identified on two specimens: a pocket gopher femur and pubis. Thirty-two specimens recovered from LA 12587 were worked.

Of the 649 faunal remains recovered from the excavations at LA 12587, 33 percent (*n* = 217) were identified to at least the level of class (e.g., Mammalia, Aves). The 217 identified remains were recovered from a variety of contexts. Table 64.1 lists all the taxa that were recovered from the site. Because the most abundant taxa represented in the assemblage were intrusive pocket gophers (*Thomomys* sp.), Table 64.2 presents the same data with this taxon removed. Pocket gopher burrows were extensive in the immediate site area, and the visual appearance of their bones was quite distinct from the vast majority of the other bones recovered from the site.

Table 64.1. Identified faunal remains from all contexts at LA 12587.

TAXON	TOTAL			BURNED		
	NISP	MNI	%	NISP	%	% of Taxon
Freshwater catfishes (Ictaluridae)	1	1	0.5			
Bullfrog (*Rana catesbeiana*)	1	1	0.5			
cf. Woodhouse's Toad (*Bufo woodhousii*)	1	1	0.5			
Piñon jay (*Gymnorhinus cyanocephalus*)	1	1	0.5			
Turkey (*Meleagris gallopavo*)	32	2	14.0	4	16.0	12.5
Golden eagle (*Aquila chrysaetos*)	2	1	1.0			
Large bird	11	1	5.0	3	12.0	27.2
Pocket mice (*Perognathus* sp.)	9	3	4.0			
Kangaroo rats (*Dipodomys* sp.)	4	3	2.0			
Pocket gophers (*Thomomys* sp.)	81	8	37.0	1	4.0	0.1
Rock squirrels (*Spermophilus variegatus*)	7	2	3.0			
Black-tailed jackrabbit (*Lepus californicus*)	10	1	5.0	4	16.0	40.0
cf. Desert cottontail (*Sylvilagus audubonii*)	19	2	9.0	3	12.0	16.0
Coyote (*Canis latrans*)	2	1	1.0			
Domestic dog (*Canis familiaris*)	1	1	0.5			
Coyote/dog (*Canis latrans/familiaris*)	1	1	0.5			
Gray fox (*Urocyon cinereoargenteus*)	1	1	0.5			

TAXON	TOTAL			BURNED		
	NISP	MNI	%	NISP	%	% of Taxon
Artiodactyls (Artiodactyla)	1	1	0.5			
Mule deer (*Odocoileus hemionus*)	16	1	7.0	4	16.0	29.0
Sm/med mammals	5	1	2.5	1	4.0	20.0
Medium mammals	1	1	0.5	1	4.0	100.0
Med/lg mammals	10	1	5.0	4	16.0	44.0
IDENTIFIED TOTAL	217	--	100.0	25	100.0	--
UNIDENTIFIED TOTAL	432	--	--	154	--	--
SITE TOTAL	**649**	**--**	**--**	**179**	**--**	**--**

Table 64.2. Identified faunal remains, minus probable intrusive rodents, from LA 12587.

TAXON	TOTAL			BURNED		
	NISP	MNI	%	NISP	%	% of Taxon
Freshwater catfishes (Ictaluridae)	1	1	1.0			
Bullfrog (*Rana catesbeiana*)	1	1	1.0			
cf. Woodhouse's Toad (*Bufo woodhousii*)	1	1	1.0			
Piñon jay (*Gymnorhinus cyanocephalus*)	1	1	1.0			
Turkey (*Meleagris gallopavo*)	32	2	25.0	4	17.0	12.5
Golden eagle (*Aquila chrysaetos*)	2	1	1.5			
Large bird	11	1	9.0	3	12.5	27.0
Kangaroo rats (*Dipodomys* sp.)	4	3	3.0			
Rock squirrels (*Spermophilus variegatus*)	7	2	5.5			
Black-tailed jackrabbit (*Lepus californicus*)	10	1	7.5	4	17.0	40.0
cf. Desert cottontail (*Sylvilagus audubonii*)	19	2	15.0	3	12.5	16.0
Coyote (*Canis latrans*)	2	1	1.5			
Domestic dog (*Canis familiaris*)	1	1	1.0			
Coyote/dog (*Canis latrans/familiaris*)	1	1	1.0			
Gray fox (*Urocyon cinereoargenteus*)	1	1	1.0			
Artiodactyls (Artiodactyla)	1	1	1.0			
Mule deer (*Odocoileus hemionus*)	16	1	12.0	4	17.0	28.0
Sm/med mammals	5	1	4.0	1	3.5	20.0
Medium mammals	1	1	1.0	1	3.5	100.0
Med/lg mammals	10	1	7.5	4	17.0	44.0
IDENTIFIED TOTAL	127	--	100.0	24	100.0	--
UNIDENTIFIED TOTAL	432	--	--	153	--	--
SITE TOTAL	**559**	**--**	**--**	**177**	**--**	**--**

Table 64.2 shows that the majority of the identified fauna (25%) at LA 12587 is turkey (*Meleagris gallopavo*), followed by cottontail (*Sylvilagus* sp.), mule deer (*Odocoileus hemionus*), indeterminate large bird, jackrabbit (*Lepus californicus*), and indeterminate medium/large mammal remains. The remainder of the assemblage consists of a wide variety of taxa, including fish, amphibians, small and large birds, rodents, and carnivores. The variation present in the assemblage attests to its location near a number of distinct biomes.

MNI for each individual taxon was derived from the most common element represented in the assemblage. The ulna was used for the turkey, the mandible was used for the kangaroo rat, the maxilla was used for the rock squirrel, and the mandible was used for the cottontail rabbit. Other taxa in the assemblage were only represented by one individual.

The faunal remains recovered from LA 12587 demonstrate that lagomorphs, specifically cottontail rabbits and jackrabbits, were important components of the subsistence assemblage, second only to the exploitation of turkey (14%). Cottontail rabbits (*Sylvilagus* spp.) were more abundant in the assemblage relative to jackrabbits (*Lepus* spp.), but both species were important. Cottontails and jackrabbits comprise almost 14 percent of the identified assemblage. The open piñon/juniper woodland and canyon riparian areas within a short distance from the site would have supported both taxa. Artiodactyls comprise just under 13 percent of the assemblage at LA 12587. Only one species, mule deer, was positively identified. A single unidentified artiodactyl remain (tooth fragment) was identified, as were ten pieces of unidentified medium- to large-sized mammal long-bone fragments. As with the leporids remains, both the open piñon/juniper woodland and canyon riparian areas would have supported artiodactyls.

In general, the exploitation of non-turkey, leporid, and artiodactyl taxa seems to have been relatively less important. Although rodents appear to have been important in the LA 12587 assemblage given their relative abundance among identified remains (46%), their presence is probably over-represented by modern, intrusive remains. This is based on several factors: they are present in all levels of the stratigraphic column, very few are burned, their general appearance is different from the non-rodent remains, and often, a particular taxon is represented in a localized area. Based on these factors, it is probable that a large majority of the rodent remains in the assemblage represent post-depositional activity at the site. The pocket mouse and pocket gopher remains are most likely intrusive while the kangaroo rat and ground squirrel remains are more likely to have been associated with the occupations of the roomblock.

The remaining 13 percent of the identified assemblage at LA 12587 consists of fish, amphibians, birds, and carnivores. The presence of these taxa also suggests that the inhabitants of the site used a broad spectrum of resources from a wide range of woodland and riparian habitats.

Because the basic unit of analysis at LA 12587 was the room, faunal remains were discussed by individual room. Tables 64.3 through 64.12 show the breakdown of recovered bones from each room. Numbers of identified specimens from the individual rooms are not high, but are fairly consistent. Faunal remains recovered from fill contexts are briefly discussed after the material from each of the rooms is presented.

Room 1 (Roomblock 1)

Room 1 is a rectangular room located in the back row of rooms at the north end of the roomblock. The room was constructed with tuff blocks and adobe mortar and contained a plastered adobe floor. The room is contiguous with Room 2 on the east and Room 6 on the south. The fill below the surface is Stratum 10, the post-occupational fill present throughout the roomblock. Wallfall was encountered in the fill both inside and outside the room, as were chunks of adobe and melted adobe along the walls indicating that the walls had been higher before abandonment. Below the post-occupational fill, excavation of the room revealed intact portions of plastered floor, mostly in the eastern and southeastern portions of the room. Stratum 200 represents deposits from outside of Room 1. The faunal remains recovered in Room 1 are fairly representative of the site in general. Unidentified remains were the most abundant, followed by the intrusive pockets gophers, and a variety of other taxa. Two unidentified bone beads were recovered from Stratum 10 (post-occupational fill). Table 64.3 shows the taxa recovered from the individual strata in Room 1.

Table 64.3. Room 1 faunal remains by Stratum.

TAXON	STRATUM NUMBER		TAXON TOTAL
	10	200	
Unidentified	16	1	17
Cottontail (*Sylvilagus* sp.)	1	0	1
Jackrabbit (*Lepus californicus*)	1	0	1
Rock squirrel (*Spermophilus variegatus*)	2	0	2
Pocket gopher (*Thomomys* sp.)	3	1	4
Indet rodent (Rodentia)	1	0	1
Pocket mouse (*Perognathus* sp.)	1	0	1
Turkey (*Meleagris gallopavo*)	0	1	1
Total	**25**	**3**	**28**

Room 2 (Roomblock 1)

Room 2 is generally rectangular in shape and is located in the northeast end of Roomblock 1. The walls in this room were constructed using both shaped and unshaped tuff blocks, adobe mortar, and chinking stones. The walls enclose a plastered adobe floor in which two hearths (Features 4 and 20) were constructed. Two groups of postholes were also identified in the floor.

Stratum 1 is the top layer of unconsolidated sandy loam identified throughout the site and ranges from 2 to 5 cm thick in this room. Stratum 10, the post-occupational fill overlying the floor of the room, ranges in depth from 34 to 48 cm, and averages 42 cm deep. This Stratum is a moderately compact brown sandy loam with varying amounts of tuff gravels, fist-sized rocks, and wallfall, including construction stone and burned and unburned adobe chunks. A 2- to 4-cm-thick Stratum lying over the floor was identified as Stratum 70. Although the color remains the same as the overlying sediment, it is less consolidated and sandier in texture. Artifacts decrease, as do chunks of burned and unburned adobe relative to those recovered from the overlying Stratum 10, except in the southeastern corner. No bones were found in association with the floor in this room. Strata 170 and 171 are both subfloor deposits, while Stratum 200 represents the exterior deposits of Room 2. Table 64.4 shows the distribution of faunal remains associated with both the interior and exterior deposits.

Table 64.4. Room 2 faunal remains by Stratum.

TAXON	STRATUM NUMBER						TAXON TOTAL
	1	10	70	170	171	200	
Unidentified	2	54	1	0	0	2	**59**
Pocket mouse(*Perognathus* sp.)	0	2	0	0	0	0	**2**
Pocket gopher (*Thomomys* sp.)	0	6	0	1	1	1	**9**
Rock squirrel (*Spermophilus variegatus*)	0	1	0	0	0	0	**1**
Cottontail (*Sylvilagus* sp.)	0	6	0	0	0	0	**6**
Med/lg mammal	0	1	0	0	0	0	**1**
Medium mammal	0	1	0	0	0	0	**1**
Sm/med mammal	0	1	0	0	0	0	**1**
Large bird	0	4	0	0	0	0	**4**
Turkey (*Meleagris gallopavo*)	0	1	0	0	0	0	**1**
Total	**2**	**77**	**1**	**1**	**1**	**3**	**85**

As in Room 1, the faunal remains recovered in Room 2 are representative of the relative site distribution. Unidentified remains were the most abundant, followed by the intrusive pocket gophers, cottontails, large birds, and a variety of other taxa (mice, squirrel, and turkey). Nine specimens recovered from this room were worked, and all were recovered from Stratum 10 (post-occupational fill). Items represented include two fragmented bone tubes, two whistles, three bone beads, and two identified, but polished, shaft fragments. The whistles and the bone tubes were all found in the same context (FS 2117), and were all from a large bird, probably a turkey. No diagnostic features were present on the bones.

Room 4/5 (Roomblock 1)

Positioned between Rooms 2 and 7, Room 4/5 is a habitation room contiguous with Room 6 to the west. It is rectangular in shape, 4.0 m long, and 2.8 m wide and is enclosed by masonry walls that are mostly collapsed with only one to two courses remaining. The 2.6 m remaining of the north wall is also the south wall of Room 2. The east wall is mostly missing, with the exception of a 1-m segment in the center and 0.90 m of the southeast corner. Only 0.40 m of the south wall at the southeast corner remains, and the extent of the west wall is mostly complete with a 0.70-m gap at the south end. A hearth (Feature 1) is located in the approximate center of the room, and a posthole (Feature 8) is situated in the northwest quadrant.

Stratum 1 was the underlying fill just below the surface and was a loose, unconsolidated sandy loam that varied from 2 to 8 cm deep. Stratum 10, the post-occupational fill, varied in depth from 30 to 41 cm, and evidence for rodent and root activity was prevalent. Wallfall and adobe chunks were abundant in this Stratum, as were fist-sized rocks, and tuff gravels comprised from 5 percent to 25 percent of the fill. Stratum 14 includes the fill and decayed mortar in the east-west-oriented wall that separated the room into Room 4 and Room 5. After the two rooms were excavated, the wall was removed to expose the hearth and the room was re-designated as 4/5. From the wall and fill within it, two pieces of flaked stone and 12 sherds were recovered. Stratum 252 is the upper floor (Floor 2), which had been finished with a light gray ashy plaster. Disaggregation of the floor matrix, which was a very compact, indurated layer, and slightly ashy in content, resulted in the recovery of a surprisingly high number of artifacts suggesting that the floor matrix is composed of midden material. Table 64.5 shows the distribution of faunal remains associated with excavations in this room.

Table 64.5. Room 4/5 faunal remains by Stratum.

TAXON	STRATUM NUMBER			
	10	14	252	Taxon Total
Unidentified	16	3	2	21
Indet. Rodent	1	0	0	1
Sm/med mammal	1	0	0	1
Coyote/dog (*Canis latrans/familiaris*)	1	0	0	1
Pocket gopher (*Thomomys* sp.)	1	0	0	1
Total	**20**	**3**	**2**	**25**

Very few identifiable faunal remains were recovered in Room 4/5. The distribution of bones in this room was unlike most others, with only a single rodent and coyote/dog identified. The pocket gopher remain identified in this room was intrusive, suggesting disturbance in the room. Two worked bones were recovered from Stratum 10 (post-occupational fill). An unidentified bone bead was recovered, as was a bone awl. The awl was constructed from a medium/large mammal long-bone fragment, but no diagnostic features remained, thus precluding a specific identification. The single coyote/dog specimen was a first phalanx that showed signs of moderate weathering. The bone was recovered near the surface and may have been introduced.

Room 6 (Roomblock 1)

Room 6 is the middle room in the back row of rooms and is oriented north-northeast by south-southwest. The total area of this room is 7.9 m^2 (3.6 by 2.2 m). Room 6 is south of Room 1, north of Room 8, and west of Room 4/5. The walls and floors of this room are poorly preserved, and all the walls are only one course thick. A single subfloor pit (Feature 7) was found in the room. Faunal remains were found in two strata. Stratum 1 is the loose, unconsolidated, fine-grained sandy loam that is found across the surface of the entire site, and Stratum 10 is a heterogeneous mix of sandy loam and adobe melt. In a few areas the adobe occurred in layers up to 16 cm thick. Areas of highly consolidated sandy loam, which may be areas of decayed adobe were also recorded. Occasionally a thin layer of adobe melt was found just above the floor. No faunal remains were found in association with the floor. Table 64.6 shows the distribution of faunal remains recovered in this room. Remains were only recovered from the layers of post-occupational fill.

Of the 16 pieces of bone recovered from this room, eight were identified to at least the level of class. But, it is probable that all the identified remains are intrusive. The pocket gopher remains were extensive in room deposits, suggesting significant rodent disturbance. A premaxilla from a Woodhouse's toad was recovered in level 1, but its distinctive appearance also suggests it may have been intrusive. The rest of the bones were unidentifiable scraps, precluding meaningful interpretations. No worked specimens were recovered from this room.

Table 64.6. Room 6 faunal remains by Stratum.

TAXON	STRATUM NUMBER		
	1	10	Taxon Total
Unidentified	2	6	8
Woodhouse's toad (*Bufo woodhousii*)	1	0	1
Pocket gopher (*Thomomys* sp.)	0	7	7
Total	**3**	**13**	**16**

Room 7 (Roomblock 1)

Room 7 is in the southeast corner of the roomblock and is south of Room 4/5, east of Room 8, and partially below Room 3. The room is oriented north-northeast by south-southwest and only the west wall and north wall are at least partially intact. Because the shape and extent of the east and south walls cannot be defined, the room size cannot be precisely determined. Two features were identified in the room: a hearth and ash box complex (Feature 6) and four postholes (Feature 12). Faunal remains were only recovered from post-occupational fill (Strata 1 and 10). Table 64.7 shows the distribution of faunal remains recovered.

Table 64.7. Room 7 faunal remains by Stratum.

TAXON	STRATUM NUMBER		
	1	10	Taxon Total
Unidentified	1	7	8
Turkey (*Meleagris gallopavo*)	0	1	1
Med/lg mammal	0	3	3
Mule deer (*Odocoileus hemionus*)	0	1	1
Total	**1**	**12**	**13**

Of the 13 pieces of bone recovered from this room, only five were identified to at least the level of class, and three were only identified as medium/large mammal long-bone fragments. The two pieces of bone identified to a specific taxon include the distal portion of a mule deer metapodial and a right turkey coracoid. Both were recovered from post-occupational fill, and both were from level three. Three pieces of worked bone were identified in the Room 7 fill. A single bone bead was recovered from level one, but diagnostic features precluded a specific identification. A bone awl, recovered from level two, was manufactured from the distal portion of a deer metatarsal. And finally, a polished long-bone shaft fragment was also recovered from level two. The shaft was from a large bird, probably turkey, but diagnostic features were absent. It is probable that the piece was part of a whistle or flute.

Room 9 (Roomblock 1)

Room 9 is a relatively long, narrow, rectangular back room oriented to the northeast. The room measured 4.9 by 1.9 m with a total area of 9.31 m^2. Faunal remains were recovered from two strata (10 and 170). Stratum 10 was post-occupational fill and includes wallfall, adobe, and rooffall. Stratum 129 consists of the patchy floor plaster found in the northern portion of the room. Stratum 170 includes the fill below floor to the natural bedrock. Table 64.8 shows the distribution of faunal remains recovered from this room.

Table 64.8. Room 9 faunal remains by Stratum.

TAXON	STRATUM NUMBER			
	10	129	170	TAXON TOTAL
Unidentified	2	6	0	14
Pocket mouse (*Perognathus* sp.)	2	0	0	2
Cottontail (*Sylvilagus* sp.)	0	1	0	1
Med/lg mammal	0	0	1	1
Total	**4**	**7**	**1**	**12**

Of the 12 pieces of bone recovered from this room, only four were identified to at least the level of class. One of the identified remains was a long-bone fragment from a medium/large-sized mammal, and two were intrusive pocket mice remains found in the post-occupational fill. A cottontail vertebral fragment was found on the floor in Room 9. The element was not burned. One piece of worked bone was recovered from this room. It was recovered in the sub-floor stratum and was manufactured from a long-bone fragment of a large bird. No diagnostic features were present, so the element it derived from was not identified. None of the bones recovered in this room were burned.

Room 10 (Roomblock 3)

Room 10 is located near the center of Roomblock 3, and Room 12 is located to the north and Room 11 is to the south. The orientation of Room 10 is north-northeast by south-southwest and it has an area of 7.8 m^2 (3.4 by 2.3 m). This room was not entirely excavated: 91N/100E was unexcavated, only a small portion of 91N/101E was partially excavated, and 90N/100E was only partially excavated. The rest of the room was dug to bedrock. Two unidentified bone fragments were recovered from the post-occupational fill in this room. Both were heavily burned and neither was worked.

Room 11 (Roomblock 3)

Room 11 is located in the southern half of Roomblock 3. It is oriented north-northeast by south-southwest and is south of Room 10 and north of Room 13. It is the largest room at the site with an area of 15.6 m^2 (6.5 by 2.4 m). Room 11 was not fully excavated. Instead the walls were exposed and three east-west-running trenches were excavated across the room. Five pieces of bone were recovered from this room, and all were from post-occupational fill. Two fragments were unidentified and two were intrusive (both pocket gopher). The first digit proximal phalanx of a turkey was recovered in level two. None of the bones were burned or modified in any way.

Room 12 (Roomblock 3)

Room 12 is located near the center of Roomblock 3. Room 14 is located to the north and Room 10 is to the south. The orientation of Room 12 is north-northeast by south-southwest and it has an area of 7.9 m^2 (3.6 by 2.2 m). The northern half of the room was excavated down to bedrock, and units in the southern half of the room were unexcavated or only partially excavated.

Three strata were excavated in this room. Stratum 201 is the post-abandonment fill of Room 12. In the absence of any indication of a floor or use surface, this Stratum was terminated at the base of the walls. In the northern half of the room enough masonry blocks were found in Stratum 201 to account for an additional half a course of wall. There is no clear distinction between Strata 201 and 208 other than the base of the wall. Stratum 208 is generally 3 to 18 cm deep, although it is somewhat thicker in the east where the base of the wall is 22 to 25 cm above bedrock. No masonry was found in this Stratum except for a small amount along and under the east wall. It seems likely that this material is wallfall from Roomblock 1. Table 64.9 shows the distribution of faunal remains from this room.

Table 64.9. Room 12 faunal remains by Stratum.

TAXON	STRATUM NUMBER		
	201	208	Taxon Total
Unidentified	0	2	2
Catfish (Ictaluridae)	1	0	1
Turkey (*Meleagris gallopavo*)	2	0	2
Large bird	2	1	3
Pocket gopher (*Thomomys* sp.)	0	2	2
Med/lg mammal	1	0	1
Total	**6**	**5**	**11**

Of the 11 pieces of bone recovered from this room, nine were identified to at least the level of class. Identified remains in the upper portion of the post-occupational fill include a large catfish vertebra, two right turkey tibiotarsi, two unidentified large bird long-bone fragments, and a medium/large-sized mammal long-bone fragment. Identified remains in the lower portion of the post-occupational fill include two intrusive pocket gopher elements (right tibia and femur) and a large bird long-bone shaft fragment. Only one of the unidentified elements was burned. One of the large bird long-bone fragments from Stratum 201 was a small fragment of a bone awl. The element was heavily polished, and the tip remained. No diagnostic features were present on the tool, so a specific assignation was not possible.

Room 14 (Roomblock 3)

Situated in the northern portion of the roomblock, Room 14 is located between Room 12 on the south and Room 16 on the north. It is a rectangular room that is 3.9 m long north-south and 2.3 m wide east-west, 9.0 m^2, and consists of masonry walls a single course high. The extent of the north wall is nearly complete, missing only the westernmost end. The east and south walls are mostly complete, and all but the southern 0.78 m of the west wall is missing. All bones recovered from this room were found in post-occupational fill. Table 64.10 shows the distribution of bones from this room.

Table 64.10. Room 14 faunal remains by Stratum.

TAXON	STRATUM NUMBER
	201
Unidentified	3
Turkey (*Meleagris gallopavo*)	1
Domestic dog (*Canis familiaris*)	1
Mule deer (*Odocoileus hemionus*)	1
Total	**6**

Six pieces of bone were recovered from this room. Three were unidentified to the level of class, and three were identified. Identified remains in the post-occupational fill include a turkey phalanx, a mule deer rib, and the fourth metacarpal from a domestic dog. Only a single unidentified bone fragment in this room was burned. None of the remains were worked.

Room 16 (Roomblock 3)

This room is situated at the northern end of Roomblock 3. Two sample trenches were excavated wall to wall across the room, one bordering the interior of the south wall and the second at mid-room, to obtain a representative sample of artifacts and samples, to discern if a floor was present, and to investigate the stratigraphy of the room. These units were dug to bedrock. No bones were recovered in Stratum 1, but all 22 pieces of bone were recovered from Stratum 201. This Stratum, which extends from Stratum 1 down to the base of the wall, was filled with wallfall, including construction-sized stone and an abundance of chinking sized stones. This layer of moderately compact brown sandy loam varied from 11 to 29 cm in depth. Table 64.11 shows the list of faunal remains recovered in this room.

Table 64.11. Room 16 faunal remains by Stratum.

TAXON	STRATUM NUMBER
	201
Unidentified	16
Turkey (*Meleagris gallopavo*)	1
Pocket gopher (*Thomomys* sp.)	4
Cottontail (*Sylvilagus* sp.)	1
TOTAL	**22**

Twenty-two pieces of bone were recovered from this room. Of this total, only six were identified to at least the level of class. Identified remains in the post-occupational fill include a small fragment of a turkey radius, four intrusive pocket gopher elements (left humerus, radius, ulna, and maxilla), and a left cottontail femur. Only a single unidentified bone fragment in this room was burned. None of the remains were worked.

Room 18 (Roomblock 3)

Room 18 is the southernmost room of Roomblock 3. It is south of Room 17 and is oriented north-northeast by south-southwest. The room has an area of 6.9 m^2 (3.0 by 2.3 m). A roughly L-shaped section of this room was dug along the north and west walls. Each leg of the L was approximately 1 m wide. The only other excavation carried out in Room 18 consists of narrow trenches dug to define the room walls. Only one piece of bone, a right pocket gopher mandible, was found in this room. It was not worked and burned, and was likely intrusive.

Trenches

A number of backhoe trenches were placed around the site. Sediments removed from these trenches were not 100 percent screened, but were gone through by hand. Piles were picked through and visible artifacts were picked up. Several produced small numbers of bones. These will be listed and described briefly below.

Trench 2. Two bones were recovered in this trench. One was a small, unidentified fragment, and the other was a left turkey (*M. gallopavo*) tibiotarsus. Neither was burned or worked.

Trench 3. Eight pieces of bones were picked up in the hand-screening of sediments removed from this trench. Three of the bones were unidentified and not burned. Three unburned turkey (*M. gallopavo*) elements were identified. These include a right coracoid, a left ulna, and a right tarsometatarsus. All elements were complete. A burned left jackrabbit (*Lepus* spp.) ischium was identified. And, the right distal end of a mule deer (*O. hemionus*) radius was identified. This element was not burned and unworked.

Trench 5. Two unidentified remains were recovered from Trench 5. Both were burned.

Trench 6. Nine pieces of bone were recovered in this trench. All derived from a single animal and from a single element, a mule deer (*O. hemionus*) cranium. None of the bones were burned.

Faunal Remains Not Associated with a Specific Room

The majority of the faunal remains (*n* = 407, 63%) recovered at LA 12587 were from non-room contexts. Most of these bones were associated with the fill above rooms, or with the deposits just outside of the roomblock. Bones recovered from contexts such as these came from four strata: Stratum 1 was the loose, post-occupational fill that was found just below the surface across the entire site, Stratum 10 was the post-occupational fill below Stratum 1 and associated with Roomblock 1, Stratum 200 was the deposits from the exterior of Roomblock 1, and Stratum 280 was the Stratum underlying Stratum 1 in the area associated with the agricultural features (Area 2). Table 64.12 shows the distribution of faunal remains recovered from these deposits.

As in the individual rooms, the distribution of taxa is heavily weighted toward turkey, mule deer, and lagomorphs (rabbits and hares). Based on their distinctive appearance, the pocket gophers are likely intrusive and therefore insignificant. Other taxa represented include the bullfrog, golden eagle, piñon jay, pocket mouse, kangaroo rat, rock squirrel, gray fox, and coyote.

Indeterminate large birds, and small-medium and medium/large-sized mammals were identified as well.

Table 64.12. Faunal remains from outside rooms.

TAXON	STRATUM NUMBER				
	1	10	200	280	TAXON TOTAL
Unidentified	7	237	28	2	274
Bullfrog	0	1	0	0	1
Piñon jay	0	0	1	0	1
Turkey	0	18	2	0	20
Golden eagle	0	2	0	0	2
Large bird	0	4	0	0	4
Indet. Rodent	1	1	0	0	2
Pocket mouse	0	4	0	0	4
Pocket gopher	0	51	1	0	52
Kangaroo rat	0	2	1	0	3
Rock squirrel	0	1	3	0	4
Jackrabbit	0	8	0	0	8
Cottontail	1	6	2	0	9
Gray fox	0	1	0	0	1
Coyote	0	0	2	0	2
Mule deer	0	11	0	0	11
Med/large mammal	0	5	0	1	6
Sm/med mammal	0	2	1	0	3
Total	**9**	**354**	**41**	**3**	**407**

Resource Exploitation, Land Use, and Lagomorph and Artiodactyl Indices at LA 12587

Several species of animals that have been of great economic importance throughout the prehistoric sequence in the Southwest are lagomorphs (jackrabbits and cottontails) and artiodactyls (white tail and mule deer, bighorn sheep, and pronghorn). The presence of these taxa is constant in the prehistoric faunal record, although proportionately they have varied throughout the Southwest according to site location, site function, and other factors relating to horticulture and sedentism (Szuter and Bayham 1989, 1996). Because of their consistent presence in prehistoric assemblages, researchers have derived indices to gauge the relative importance of large and small game to each other and to other taxa. Table 64.13 gives the data used in calculating the lagomorph and artiodactyl indices at LA 12587.

Table 64.13. Quantity of Sylvilagus, Lagomorph, and Artiodactyl remains from LA 12587.

Number of Cottontails	Number of all Lagomorphs	Number of Artiodactyls	Lagomorph Index	Artiodactyl Index
19	29	17	0.66	0.37

The lagomorph index is the ratio of the quantity of cottontail remains to the sum of all lagomorph remains. It generally decreases as an area is more intensively or extensively occupied (Bayham and Hatch 1985; Szuter and Bayham 1989, 1996). For example, inhabitants of more continuously or extensively occupied sites tend to exploit more jackrabbits relative to cottontails. Cottontails are generally found in areas with denser vegetative cover where they can hide from predators, while jackrabbits prefer open spaces where they can flee from predators (Legler 1970; Macdonald 1995; Szuter and Bayham 1996). As groups of people occupy an area more intensively and extensively, they likely have a greater impact on the environment, thus creating a more favorable habitat for jackrabbits than cottontails. The relatively high lagomorph index at LA 12587 may suggest that the exploitation of cottontails was quite important to its inhabitants. Conversely, it may be a simple reflection of the fairly effortless access to both the open woodland environment on the nearby mesa tops (favorable jackrabbit habitat) and the more brushy, wooded areas (favorable cottontail habitat) in the canyon bottoms.

The artiodactyl index is the ratio of artiodactyl remains divided by the sum of artiodactyl and lagomorph remains (Bayham 1982; see Table 64.13). Artiodactyl indices throughout the Southwest vary primarily as a function of site location. Sites in upland areas typically have indices above 0.30 to 0.35 (Szuter and Bayham 1996). In contrast, lower elevation sites typically have artiodactyl indices below 0.10. The artiodactyl index of 0.37 supports this trend and suggests that artiodactyl exploitation was important, but may not have been as important in terms of contributions to total dietary significance. This may reflect a natural scarcity of large game in the surrounding areas during the later part of the Coalition period, or it may reflect the exploitation of relatively easier to capture small game. Either scenario documents the use of a number of biotic communities including the riparian areas of the nearby canyons, the woodland areas of the mesa tops and ridges, and the transitional areas in between. The use of these zones suggests movement across the landscape and concomitant exploitation of the available resources in each biome. This, combined with the high percentage of maize remains recovered in the botanical assemblage, suggests that a mixed farming-foraging economy was in place during the Coalition period on the Pajarito Plateau.

LA 127631 (Late Coalition/Early Classic Period Fieldhouse)

One piece of bone was recovered from this one-room fieldhouse, which is located immediately downslope of LA 12587. The distal end of a cottontail (*Sylvilagus* sp.) femur was found on the surface before excavation. It is probable, based on the sun-bleached appearance of the specimen, that the bone was not associated with the prehistoric use of the site. The bone was not burned and unmodified and bleached white by the sun.

Airport Tract

A total of five sites were excavated in 2002 and 2003 in the Airport Tract (see Figure 13.2). Faunal remains were recovered at two sites, both of which were Middle Coalition period roomblocks (LA 86534 and LA 135290).

LA 86534 (Middle Coalition Period Roomblock)

LA 86534 is located immediately north of Highway 502 on the Los Alamos town site mesa. The site is situated at an elevation of 2149 m (7050 ft) in an area vegetated with piñon and juniper trees and interspersed with native grasses and shrubs. Piñon (and juniper woodlands dominate the ridges and mesa tops surrounding the site, while the canyon bottoms are vegetated primarily by broadleaf riparian species. Ponderosa pine forests are located upslope of the site in the foothills of the Jemez Mountains. The location of the site near three distinct biomes (woodland, riparian, and coniferous forest) made access to a number of distinct species not only possible, but also likely.

LA 86534 consisted of a compact roomblock of nine rooms, a sparse but extensive artifact scatter, and a disturbed two-track road on the northern perimeter of the site. The roomblock consisted of a rectangular block of eight rooms (four front and four back) and a circular kiva located just to the east of the roomblock. The roomblock walls were generally in good condition, with one to two courses present on the northern end and up to four courses present in the center of the rooms. The southern walls of Rooms 7 and 8 were destroyed during the construction of NM 502. Most of the artifacts were recovered from post-occupational and general room fill, although a few pieces of animal bone were recovered from floor contexts.

In general, the overall preservation of the bones from LA 86534 was good. The bones tended to be in large fragments, and a number of complete elements were identified. Weathering on the faunal remains was present, although the frequency and severity was generally low (n = 17), suggesting the remains may not have been exposed to the elements for a long period of time before deposition. The bones show minimal evidence of root-etching, and no evidence of rodent gnawing, carnivore gnawing, or carnivore-digestion. Modifications resulting from burning were present on 88 pieces of bone, constituting some 23 percent of the total assemblage. Two specimens recovered from LA 86534 were worked.

Of the 388 faunal remains recovered from the excavations at LA 86534, 52 percent (n = 202) were identified to at least the level of class. The 202 identified remains were recovered from a variety of contexts. Table 64.14 shows all the taxa that were recovered from the site. Because the most abundant taxa represented in the assemblage were intrusive pocket gophers, Table 64.15 presents the same data with this taxon removed. Pocket gopher burrows were extensive in the immediate site area, and the visual appearance of their bones was quite distinct from the vast majority of the other bones recovered from the site. Table 64.15 also does not include other intrusive rodents identified at the site (harvest mice, pocket mice, and deer mice).

Table 64.14. Identified faunal remains from all contexts at LA 86534.

TAXON	TOTAL			BURNED		
	NISP	MNI	%	NISP	%	% of Taxon
Bufonidae (Toads)	1	1	0.5			
Pelobatidae (Spadefoot toads)	1	1	0.5			
Perching birds (Passeriformes)	1	1	0.5			
Piñon jay (*Gymnorhinus cyanocephalus*)	1	1	0.5			
Turkey (*Meleagris gallopavo*)	4	1	2.0			
Hawks (Accipitridae)	1	1	0.5			
Red-tailed Hawk (*Buteo jamaicensis*)	10	1	5.0			
Medium bird	1	1	0.5			
Large bird	1	1	0.5			
Indeterminate rodent (Rodentia)	8	1	4.0			
Harvest mouse* (*Reithrodontomys* sp.)	1	1	0.5			
Pocket mouse* (*Perognathus* sp.)	6	2	3.0			
Deer mouse* (*Peromyscus* sp.)	1	1	0.5			
Kangaroo rats (*Dipodomys* sp.)	8	3	4.0	1	4.0	13.0
Woodrats (*Neotoma* cf. *albigula*)	7	3	4.0			
Pocket gopher* (*Thomomys* sp.)	58	11	29.0	8	35.0	14.0
Squirrels (Sciuridae)	2	1	1.0			
Antelope squirrel (*Ammospermophilus* sp.)	1	1	0.5			
Rock squirrels (*Spermophilus variegatus*)	11	2	5.0			
Striped skunk (*Mephitis mephitis*)	2	1	1.0			
Black-tailed jackrabbit (*Lepus californicus*)	6	2	3.0	3	13.0	50.0
cf. Desert cottontail (*Sylvilagus audubonii*)	33	4	16.0	1	4.0	3.0
Coyote (*Canis latrans*)	3	1	1.0			
Artiodactyls (Artiodactyla)	1	1	0.5			
Mule deer (*Odocoileus hemionus*)	18	1	9.0	5	23.0	3.0
Sm/med mammals	5	1	3.0			
Medium mammals	1	1	0.5	1	4.0	100.0
Med/lg mammals	9	1	4.0	4	17.0	44.0
IDENTIFIED TOTAL (52.0%)	202	--	100.0	23	100.0	--
UNIDENTIFIED TOTAL (48.0%)	186	--	--	65	--	--
SITE TOTAL	**388**	**--**	**--**	**88**	**--**	**--**

*intrusive taxon

Table 64.15. Identified faunal remains, minus intrusive rodents, from all contexts at LA 86534.

TAXON	TOTAL			BURNED		
	NISP	MNI	%	NISP	%	% of Taxon
Bufonidae (Toads)	1	1	1.0			
Pelobatidae (Spadefoot toads)	1	1	1.0			
Perching birds (Passeriformes)	1	1	1.0			
Piñon jay (*Gymnorhinus cyanocephalus*)	1	1	1.0			
Turkey (*Meleagris gallopavo*)	4	1	3.0			
Hawks (Accipitridae)	1	1	1.0			
Red-tailed Hawk (*Buteo jamaicensis*)	10	1	8.0			
Medium bird	1	1	1.0			
Large bird	1	1	1.0			
Indeterminate rodent (Rodentia)	8	1	6.0			
Kangaroo rats (*Dipodomys* sp.)	8	3	6.0	1	7.0	13.0
Woodrats (*Neotoma* cf. *albigula*)	7	3	5.0			
Squirrels (Sciuridae)	2	1	1.0			
Antelope squirrel (*Ammospermophilus* sp.)	1	1	1.0			
Rock squirrels (*Spermophilus variegatus*)	11	2	8.0			
Striped skunk (*Mephitis mephitis*)	2	1	1.0			
Black-tailed jackrabbit (*Lepus californicus*)	6	2	4.0	3	20.0	50.0
cf. Desert cottontail (*Sylvilagus audubonii*)	33	4	24.0	1	7.0	3.0
Coyote (*Canis latrans*)	3	1	2.0			
Artiodactyls (Artiodactyla)	1	1	1.0			
Mule deer (*Odocoileus hemionus*)	18	1	13.0	5	32.0	3.0
Sm/med mammals	5	1	4.0			
Medium mammals	1	1	1.0	1	7.0	100.0
Med/lg mammals	9	1	7.0	4	27.0	44.0
IDENTIFIED TOTAL (42.0%)	136	--	100.0	15	100.0	--
UNIDENTIFIED TOTAL (58.0%)	186	--	--	65	--	--
SITE TOTAL	**322**	**--**	**--**	**82**	**--**	**--**

Table 64.15 shows that the highest percentage of the identified fauna (24%) at LA 86534 is cottontail (*Sylvilagus* sp.), followed by mule deer (*Odocoileus hemionus*), red-tailed hawk (*Buteo jamaicensis*), rock squirrels (*Spermophilus variegatus*), and indeterminate medium/large mammal remains. The remainder of the assemblage consists of a wide variety of taxa, including amphibians, small and large birds, rodents, leporids, and carnivores. The variation present in the assemblage attests to its location near a number of distinct biomes.

Faunal remains were analyzed by individual room. Tables 64.16 through 64.24 show the breakdown of recovered bones from each room. Numbers of identified specimens from the individual rooms are not high, but are fairly consistent. Faunal remains recovered from fill contexts are briefly discussed after the material from each of the rooms is presented.

Room 1

Room 1 is a habitation room located in the northeastern corner of the roomblock and is the most northerly of the front rooms. It was constructed with tuff blocks and adobe mortar, and contained a plastered adobe floor. The room measures 2.6 m north/south by 2.48 m east/west, giving about 6.45 m^2 of interior space. The room was highly disturbed by both rodents and roots. A large juniper stump was located in the center of the room, just over the eventual location of the hearth (Feature 4) and extends to the north wall. Its roots incurred a significant amount of damage to the collar, shape, and fill of the upper use of the hearth. The fill below the surface is Stratum 1, the post-occupational fill present throughout the roomblock. Wallfall (Stratum 2) was encountered in the fill both inside and outside the room, as were chunks of adobe along the walls. Excavation of the room revealed intact portions of plastered floor, mostly in the western half of the room. The faunal remains recovered in Room 1 are fairly representative of the site in general. Unidentified remains were the most abundant, followed by a single element each from an intrusive pockets gopher, mule deer, and unidentified small-medium mammal. One bone awl was recovered from Stratum 2 (wallfall) in this room. Table 64.16 shows the distribution of taxa by strata in Room 1.

Table 64.16. Room 1 faunal remains by Stratum.

TAXON	**STRATUM NUMBER**			
	1	2	6	Taxon Total
Unidentified	2	1	0	3
Sm/med mammal	1	0	0	1
Pocket gopher (*Thomomys* sp.)	1	0	0	1
Mule deer (*Odocoileus hemionus*)	0	0	1	1
TOTAL	**4**	**1**	**1**	**6**

Room 2

Room 2 is a habitation room located in the middle of the roomblock in the northern section that measures 3.40 m north/south by 2.40 m east/west, giving an interior floor space of 7.46 m^2. Room 2 is in the front set of rooms and is located immediately south of Room 1. All units in the room were then excavated down to floor (Stratum 8). Two features were identified in the room: Feature 2 was a collared hearth located near the center of the room, and Feature 3 was the doorway between the western wall of Room 2 and the eastern wall of Room 4.

Stratum 1 was an approximately 10-cm-thick layer of post-occupational fill and consisted of the very loose and unconsolidated post-occupational fill. Some areas contained a high organic content from the duff associated with piñon and juniper trees in the area. Stratum 2 consisted of the general room fill, which contained an abundant amount of rubble wallfall and was about 25 to 30 cm thick. The Stratum was loose and unconsolidated. The bottom of Stratum 2 contained the abrupt contact with rooffall (Stratum 6 and 7). Stratum 6 is the actual rooffall layer, but

Stratum 7, only identified in Room 1, was a very thin layer of sediment between the rooffall and the floor. Stratum 8 was the floor Stratum in this room, and a single jackrabbit (*Lepus* sp.) rib was associated with the floor. Small patches of floor were present throughout the room, but there were no large contiguous areas of floor at all. Table 64.17 shows the distribution of taxa by strata in Room 2.

Table 64.17. Room 2 faunal remains by Stratum.

TAXON	STRATUM NUMBER					TAXON TOTAL
	2	6	6/7	8	14	--
Unidentified	0	2	1	0	0	**3**
Wood rat (*Neotoma* sp.)	1	0	0	0	0	**1**
Pocket gopher (*Thomomys* sp.)	0	0	0	0	1	**1**
Jackrabbit (*Lepus* sp.)	0	0	0	1	0	**1**
Mule deer (*Odocoileus hemionus*)	0	0	1	0	0	**1**
Total	**1**	**2**	**2**	**1**	**1**	**7**

As in Room 1, the faunal remains recovered in Room 2 are representative of the relative site distribution. Unidentified remains were the most abundant, followed by a single element from each of the following taxa: wood rat, pocket gophers, cottontails, jackrabbit, and mule deer. No worked bones were identified in this room.

Room 3

Room 3 is a habitation room located in the northwestern corner of the site. It is the most northerly of the back rooms and is 3.2 m north/south by 2.00 m east/west, giving about 6.4 m^2 of interior space. It is in the back row of rooms and is located immediately to the west of Room 1. In general, the room was uniformly disturbed in the northern two-thirds by roots associated with the juniper tree outside Room 3. A single doorway feature (Feature 10) was identified in the eastern wall between Rooms 1 and 3. In Room 3, Stratum 1 was an approximately 10-cm-thick layer of post-occupational fill and consisted of the very loose and unconsolidated post-occupational fill, Stratum 2 consisted of the general room fill, which contained an abundant amount of rubble wallfall and was about 25 to 30 cm thick. The bottom of Stratum 2 contained the abrupt contact with rooffall (Stratum 6 and 7). Stratum 6 is the actual rooffall layer, but Stratum 7, only definitively identified in Room 1, was a thin layer of sediment between rooffall and floor. No faunal remains were associated with the floor in this room (Stratum 8), which was only present in the southern one-third of the room and in a small patch along the north wall. The only bone recovered was partially burned proximal femur from a kangaroo rat (Table 64.18).

Table 64.18. Room 3 faunal remains by Stratum.

TAXON	STRATUM NUMBER	TAXON TOTAL
	1	
Kangaroo rat (*Dipodomys* sp.)	1	1
Total	**1**	**1**

Room 4

Room 4 is a habitation room located in the north-central portion of the roomblock and is 3.1 m north/south by 1.8 m east/west, giving about 5.58 m^2 of interior space. It is in the back row of rooms and is located immediately to the south of Room 3 and to the west of Room 2. In general, the room was in very good shape, with smaller amounts of disturbed sediments relative to other rooms at the site. A single doorway (Feature 3) was identified in the eastern wall of the room between Rooms 2 and 4. Stratum 1 was approximately 10 cm thick and consisted of the post-occupational fill, which was very loose and unconsolidated. Some areas contained a high organic content from the duff associated with piñon and juniper trees in the area. Stratum 2 consisted of general room fill, which contained an abundant amount of rubble wallfall and was about 25 to 30 cm thick. The Stratum was also loose and unconsolidated. The bottom of Stratum 2 contained the abrupt contact with rooffall (Stratum 6), which contained abundant, but usually small, fragments of adobe similar to that observed in the walls. Stratum 8 was the floor Stratum, which contained only minimal rodent disturbance in the central and eastern portions of the southern wall and in a small area in the center of the room. The floor in this room was well-preserved. Table 64.19 shows the distribution of taxa by strata in Room 4.

Table 64.19. Room 4 faunal remains by Stratum.

TAXON	STRATUM NUMBER			
	1	1,2	6,7	TAXON TOTAL
Unidentified	3	1	1	5
Turkey (*Meleagris gallopavo*)	1	0	0	1
Red-tailed hawk (*Buteo jamaicensis*)	0	0	1	1
Pocket gopher (*Thomomys* sp.)	1	0	0	1
Indeterminate rodents	0	0	1	1
Mule deer (*Odocoileus hemionus*)	2	0	0	2
Small/med mammal	0	0	1	1
TOTAL	**7**	**1**	**4**	**12**

Of the 12 pieces of bone recovered from this room, seven were identified to at least the level of class. Identified remains include a single turkey bone, one red-tailed hawk bone, one pocket gopher bone, an indeterminate rodent bone, two mule deer remains, and a single unidentified small/medium mammal long-bone fragment. No worked bones were identified in this room.

Room 5

Room 5 is a habitation room located in the south-central portion of the roomblock and is 3.50 m north/south by 2.30 m east/west, giving an interior floor space of 8.05 m^2. Room 5 is in the front set of rooms and is located immediately south of Room 2 and west of Room 9. This room is the largest of the front rooms and has an entry/exitway in the northeast corner to Room 9. The room was highly disturbed by bioturbation and, as a result, the floor was in very poor condition. Three features were identified in the room: Feature 5 was a collared hearth located near the center of the room, Feature 8 was a possible second hearth located along the southern wall, and Feature 11 was the doorway between the western wall of Room 5 and the eastern wall of Room 6. Feature 8 was in extremely poor condition and all that remained was a 10-cm section of probable collar. Both hearths were heavily disturbed and mostly destroyed.

On average, Stratum 1 was an approximately 10- to 15-cm-thick layer of post-occupational fill and consisted of the very loose and unconsolidated post-occupational fill. Stratum 2 consisted of the general room fill, which contained an abundant amount of rubble wallfall and was about 25 to 35 cm thick. Strata 1 and 2 were combined throughout this room. The bottom of Stratum 2 contained the abrupt contact with rooffall (Strata 6 and 7), and the floor (Stratum 8) was immediately below the rooffall level. Table 64.20 shows the distribution of taxa by strata in Room 5.

Table 64.20. Room 5 faunal remains by Stratum.

TAXON	STRATUM NUMBER				
	1	6	6,7	8	TAXON TOTAL
Unidentified	0	4	12	0	16
Red-tailed hawk (*Buteo jamaicensis*)	0	0	1	0	1
Indeterminate rodent	0	0	1	0	1
Pocket gopher (*Thomomys* sp.)	2	1	3	0	6
Kangaroo rat (*Dipodomys* sp.)	0	0	1	0	1
Rock squirrel (*Spermophilus variegatus*)	0	1	0	0	1
Cottontail (*Sylvilagus* sp.)	0	0	1	0	1
Coyote (*Canis latrans*)	0	0	1	0	1
Mule deer (*Odocoileus hemionus*)	0	1	0	0	1
Med/large mammal	0	1	0	1	2
Medium mammal	0	1	0	0	1
Sm/med mammal	1	0	0	0	1
TOTAL	**3**	**9**	**20**	**1**	**33**

Of the 33 pieces of bone recovered from this room, 17 were identified to at least the level of class. The pocket gopher remains are likely intrusive, and the kangaroo rat specimen may also be intrusive, as all were associated with the rooffall level. Several of the bones, including the red-tailed hawk, the cottontail, and the coyote were recovered from just above the floor. The rest of the bones recovered in this room were unidentifiable scraps. No worked specimens were recovered from this room.

Room 6

Room 6 is a habitation room located in the south-central portion of the roomblock and is 2.95 m north/south by 1.8 m east/west, giving about 5.30 m^2 of interior space. It is in the back row of rooms and is located immediately to the south of Room 4 and to the west of Room 5. In general, the room was in good shape, with a minimal amount of disturbance. No roots or stumps were identified in the room, and the floor was in decent shape with about 50 percent of the floor intact. Three features were identified in this room: these include a doorway (Feature 11), a shallow plaster-lined pit (Feature 12), and a milling bin (Feature 13).

In this room, Stratum 1 was an approximately 10-cm-thick layer of post-occupational fill and consisted of the very loose and unconsolidated post-occupational fill. Stratum 2 was the general room fill, which contained an abundant amount of rubble wallfall and was about 25 to 30 cm thick. The Stratum was also loose and unconsolidated, and the bottom of Stratum 2 contained the abrupt contact with rooffall (Stratum 6). Rooffall in this room was abundant but was usually recovered in small fragments of adobe. As with the other rooms, Stratum 8 was the floor Stratum in this room. Table 64.21 shows the distribution of taxa by strata in Room 6.

Table 64.21. Room 6 faunal remains by Stratum.

TAXON	STRATUM NUMBER			
	1	6	6,7	TAXON TOTAL
Unidentified	4	1	1	6
Pocket gopher (*Thomomys* sp.)	1	0	0	1
Indeterminate rodents	1	0	0	1
Total	**6**	**1**	**1**	**8**

Of the 8 pieces of bone recovered from this room, only two were identified to the level of class. Identified remains are likely intrusive and include a single pocket gopher and indeterminate rodent bone. No worked bones were identified in this room.

Room 7

Room 7 is a habitation room located in the southeast corner of the roomblock and is 3.1 m north/south by 2.20 m east/west, giving about 6.82 m^2 of interior space. The north/south measurements and the overall interior floor space measurement are incomplete. This is due to the fact that Room 7 is the most southerly of the front rooms and was heavily impacted by the construction of NM 502. Based on the dimensions of the room, it is likely that construction just clipped the southern wall of the room, but it was not located during excavation. Room 7 is located immediately south of Room 5 and east of Room 8. In general, the remaining portion of the room was in fair shape. The south wall was gone, the floor was only present in about half of the room, and the remaining three walls were still upright. A significantly disturbed hearth (Feature 9) was identified in the center of the room. Like the other rooms discussed thus far, Room 7 contained four distinct strata: the post-occupational fill (Stratum 1), wallfall (Stratum 2), rooffall (Stratum 3), and the floor (Stratum 8). Additionally, the fill from the central hearth (Feature 9) was identified as Stratum 19. Table 64.22 shows the distribution of taxa by strata in Room 7.

Table 64.22. Room 7 faunal remains by Stratum.

TAXON	STRATUM NUMBER	TAXON TOTAL
	6,7	
Unidentified	6	6
Pocket gopher (*Thomomys* sp.)	1	1
Total	**7**	**7**

Of the seven pieces of bone recovered from this room, only one was identified to at least the level of class. The only piece of identifiable bone recovered from this room was a pocket gopher humerus. Based on the appearance of this specimen, the bone is likely intrusive and not related to the original occupation of the site. No worked bones were identified in this room.

Room 8

Room 8 is a habitation room located in the southwest corner of the roomblock and is 2.60 m north/south by 1.80 m east/west, giving about 4.68 m^2 of interior space. The north/south measurements and the overall interior floor space measurement are incomplete. This is due to the fact that Room 8 is the most southerly of the back rooms and, like Room 7, was heavily impacted by the construction of NM 502. Based on the dimensions of the room relative to other back rooms, it is likely that construction completely obliterated the southern wall of the room and it would have been an additional meter south of where our excavations ceased. Room 8 is located immediately south of Room 6 and west of Room 7. The remaining portion of Room 8 was in poor shape. The south wall was gone, the floor was non-existent, and the remaining three walls were semi-stable at best. No features were identified in the room. Like the other rooms discussed thus far, Room 7 contained four distinct strata: the post-occupational fill (Stratum 1), wallfall (Stratum 2), rooffall (Stratum 3), and the floor (Stratum 8). Table 64.23 shows the distribution of taxa by strata in Room 8.

Table 64.23. Room 8 faunal remains by Stratum.

TAXON	STRATUM NUMBER				
	1	6	6,7	12	TAXON TOTAL
Unidentified	2	0	1	0	3
Wood rat (*Neotoma* sp.)	0	0	0	1	1
Mule deer (*Odocoileus hemionus*)	0	1	0	0	1
TOTAL	**2**	**1**	**1**	**1**	**5**

Of the five pieces of bone recovered from this room, two were identified to at least the level of class. A single wood rat ulna and a mule deer naviculocuboid were recovered in this room. No worked bones were identified in this room.

Room 9

Room 9 is located immediately east of the roomblock and is adjacent to Rooms 2 and 5. Room 9 is a subterranean, circular kiva that was constructed into bedrock. The room measures 4.3 m north/south by 4.1 m east/west, giving about 17.63 m^2 of interior space, which is by far the largest of any of the rooms. In general, the kiva was in excellent shape. The floor was well preserved and was continuous across the entire surface of the kiva floor. The bedrock walls were in good condition, and the stacked masonry walls on top of the kiva were still present in the northeast and southern areas. Stratum 1 (post-occupational fill) and Stratum 2 (wallfall) were mechanically removed to the top of the rooffall layer (Stratum 15). The rooffall Stratum (15) was removed by hand to the floor of the kiva (Stratum 17). Nine features were identified in the kiva. These include two wall niches (Features 7 and 20), a floor niche (Feature 6), a ventilator shaft (Feature 14), an entryway between Rooms 5 and 9 (Feature 15), a collared and plaster-lined hearth (Feature 16, Stratum 20), an unplastered ash pit (Feature 17, Stratum 21), a sipapu (Feature 18), and a series of five holes and a groove between the ventilator shaft and the ash pit (Feature 19). Table 64.24 shows the distribution of taxa by strata in Room 9.

Table 64.24. Room 9 faunal remains by Stratum.

TAXON	STRATUM NUMBER				TAXON TOTAL
	1	1,2	2	15	--
Unidentified	13	32	32	19	**96**
Toads (Bufonidae)	0	0	0	1	**1**
Spadefoot toads (Pelobatidae)	0	1	0	0	**1**
Perching birds (Passeriformes)	0	0	0	1	**1**
Piñon jay (*Gymnorhinus cyanocephalus*)	0	1	0	0	**1**
Turkey (*Meleagris gallopavo*)	0	0	1	1	**2**
Red-tailed hawk (*Buteo jamaicensis*)	0	0	1	7	**8**
Hawks (Accipitridae)	0	0	0	1	**1**
Large bird	0	1	1	0	**2**
Deer mouse (*Peromyscus* sp.)	0	1	0	0	**1**
Pocket mouse (*Perognathus* sp.)	0	1	3	2	**6**
Kangaroo rat (*Dipodomys* sp.)	0	3	0	1	**4**
Wood rat (*Neotoma* sp.)	0	0	4	0	**4**
Antelope squirrels (*Ammospermophilus* sp.)	0	0	1	0	**1**
Rock squirrel (*Spermophilus variegatus*)	0	3	4	3	**10**
Squirrels (Sciuridae)	0	0	1	1	**2**
Pocket gopher (*Thomomys* sp.)	7	8	8	22	**45**
Indeterminate rodent	0	0	1	2	**3**
Striped skunk (*Mephitis mephitis*)	0	0	1	0	**1**
Cottontail (*Sylvilagus* sp.)	1	5	19	5	**30**
Jackrabbit (*Lepus* sp.)	0	3	0	2	**5**
Coyote (*Canis latrans*)	0	0	2	0	**2**
Indeterminate artiodactyl	0	1	0	0	**1**
Mule deer (*Odocoileus hemionus*)	0	5	1	1	**7**
Small-medium sized mammal	0	2	0	0	**2**
Medium-large sized mammal	0	4	1	0	**5**
TOTAL	**21**	**71**	**81**	**69**	**242**

Room 9 had far more faunal remains than any other room at this site. Unidentified remains were the most abundant, followed by the intrusive pocket gophers, cottontails, rock squirrels, red-tailed hawk, mule deer, and a variety of other taxa (rodents, jackrabbit, carnivores, and turkey). The diversity of species was also the greatest in this room. This may be related to its use as a kiva, as there are more birds in this room than at the rest of the site, as well as other unusual taxa, including toads, skunk, and coyote remains. One bone bead was recovered from the wallfall Stratum in this room.

Faunal Remains Not Associated with a Specific Room

Sixty-four bones recovered at this site were from non-room contexts. Most of these bones were associated with the fill above rooms and were recovered before the designation of room numbers, or with the deposits just outside of the roomblock. Bones recovered from contexts such as these came from three strata: Stratum 0 was the surface, Stratum 1 was the loose, post-occupational fill that was found just below the surface across the entire site, and Stratum 2 was the wallfall layer associated with the roomblock before rooms were designated. Many of these bones came from the excavations undertaken in the western portion of Area 1 before the location of the actual roomblock. Table 64.25 shows the distribution of faunal remains recovered from these deposits.

Table 64.25. Faunal remains from outside rooms.

TAXON	STRATUM NUMBER			TAXON TOTAL
	0	1	2	
Unidentified	1	19	28	48
Turkey	0	1	0	1
Indeterminate rodent	1	1	0	2
Pocket gopher	0	1	1	2
Kangaroo rat	0	1	1	2
Wood rat	0	0	1	1
Cottontail	0	1	1	2
Striped skunk	0	1	0	1
Mule deer	0	0	5	5
Med/large mammal	0	1	0	1
TOTAL	**2**	**26**	**37**	**65**

As in the individual rooms, the distribution of remains are heavily weighted toward unidentified remains, but also include turkey, mule deer, cottontails, and rodents. Based on their distinctive appearance, the pocket gopher are likely intrusive and therefore insignificant.

Heavy Fraction

A total of 142 pieces of bone were recovered from flotation samples taken from the hearths in Rooms 1, 2, 5, and 9 (Features 4, 2, 5 and 16). The majority of these bones appear to be modern in origin based on their distinct appearance and level of completeness, but many do show signs of burning and could have been introduced to the assemblage during the use-life of the hearth. This is especially true of the rodent remains (indeterminate rodent, pocket gopher, and deer mice), but may also be true for the small mammal and cottontail remains as well. Table 64.26 shows the taxa that were identified in the heavy fraction assemblage from the habitation and kiva hearths.

Table 64.26. Identified faunal remains in heavy fraction samples from hearths at LA 86534.

Common Name	Scientific Name	2 (Room 2 hearth)	4 (Room 1 hearth)	5 (Room 5 hearth)	16 (Kiva hearth)
Pelobatidae	Spadefoot toads				x
Indeterminate rodent	Rodentia		x	x	x
Deer mouse*	*Peromyscus* sp.			x	
Pocket gopher*	*Thomomys* sp.	x	x		x
Desert cottontail	*Sylvilagus audubonii*		x		x
Sm mammals	Sm mammals	x	x		x
Sm/med mammals	Sm/med mammals		x		x
Unidentified	Unidentified	x	x	x	x

x = present. *probably intrusive. Note: No faunal remains were identified during excavation in any of the hearths; all remains were recovered in flotation samples.

Based on the remains recovered and identified in the heavy fraction hearths, it does not appear that habitation hearths differ from the hearth in the kiva. The only taxon identified in the kiva hearth (Feature 16) that was not identified in the habitation hearths was spadefoot toad. The toad remains were most likely deposited in a post-occupational episode as they were fairly complete, unburned (when most of the other materials in the hearths were burned, even rodent remains), and showed signs of recent breaks.

Resource Exploitation, Land Use, and Lagomorph and Artiodactyl Indices at LA 86534

Several species of animals that have been of great economic importance throughout the prehistoric sequence in the Southwest are lagomorphs (jackrabbits and cottontails) and artiodactyls (white tail and mule deer, bighorn sheep, and pronghorn). Because of their consistent presence in prehistoric assemblages, researchers have derived indices to gauge the relative importance of large and small game to each other and to other taxa. Table 64.27 presents the data used in calculating the lagomorph and artiodactyl indices at LA 86534.

Table 64.27. Quantity of Sylvilagus, Lagomorph, and Artiodactyl remains from LA 86534.

Number of Cottontails	Number of all Lagomorphs	Number of Artiodactyls	Lagomorph Index	Artiodactyl Index
33	39	19	0.85	0.33

The lagomorph index is the ratio of the quantity of cottontail remains to the sum of all lagomorph remains (see LA 12587 discussion section for additional information on the significance of these indices). The high lagomorph index (0.87) at LA 86534 suggests that the exploitation of cottontails was quite important to its inhabitants. This is likely a reflection of the fairly effortless access to both the open woodland environment on the nearby mesa tops (favorable jackrabbit habitat) and the more brushy, wooded areas (favorable cottontail habitat) in the canyon bottoms.

The artiodactyl index is the ratio of artiodactyl remains divided by the sum of artiodactyl and lagomorph remains. Artiodactyl indices throughout the Southwest vary primarily as a function of site location. Sites in upland areas typically have indices above 0.30 to 0.35 (Szuter and Bayham 1996). In contrast, lower elevation sites typically have artiodactyl indices below 0.10. The artiodactyl index of 0.33 at LA 86534 supports this trend and suggests that artiodactyl exploitation was important. It is also likely that artiodactyls may not have been as important in terms of contributions to total dietary significance as lagomorphs, but they did comprise a significant portion of the diet. The decreased abundance of artiodactyls may reflect a natural scarcity of large game in the surrounding areas during the later part of the Coalition period, or it may reflect the exploitation of relatively easier to capture small game. Either scenario documents the use of a number of biotic communities including the riparian areas of the nearby canyons, the woodland areas of the mesa tops and ridges, and the transitional areas in between. The use of these zones suggests movement across the landscape and concomitant exploitation of the available resources in each biome. This, combined with the high percentage of maize remains recovered in the botanical assemblage, suggests that a mixed farming-foraging economy was in place during the Coalition period on the Pajarito Plateau.

LA 135290 (Roomblock)

In general, the overall preservation of the bones from LA 135290 is good. For the most part, bones tended to be in large fragments, and a number of complete elements were identified. Weathering on the faunal remains was present, although the frequency and severity was low (n = 2), suggesting the remains may not have been exposed to the elements for a long period of time before deposition. The bones show minimal evidence of root-etching and rodent gnawing, but no evidence of carnivore gnawing or carnivore-digestion. Modifications resulting from burning were present on 23 pieces of bone, constituting some 35 percent of the total assemblage. One piece of bone recovered at LA 135290 was heavily polished.

Of the 65 faunal remains recovered from the excavations at LA 135290, 52 percent (n = 34) were identified to at least the level of class. The 34 identified remains were recovered from a variety of contexts. Table 64.28 shows all the taxa that were recovered from the site. Because the most abundant taxa represented in the assemblage were intrusive pocket gophers (*Thomomys* sp.), Table 64.29 presents the same data with this taxon removed. Pocket gopher burrows were extensive in the immediate site area, and the visual appearance of their bones was quite distinct from the vast majority of the other bones recovered from the site.

Table 64.28. Identified faunal remains from all contexts at LA 135290.

TAXON	TOTAL			BURNED		
	NISP	MNI	%	NISP	%	% of Taxon
Bullfrog (*Rana catesbeiana*)	1	1	3.0	0	0	0
Western box turtle (*Terrapene ornata*)	1	1	3.0	1	9.0	100.0
Turkey (*Meleagris gallopavo*)	3	1	9.0	0	0	0

TAXON	TOTAL			BURNED		
	NISP	MNI	%	NISP	%	% of Taxon
Woodrats (*Neotoma* cf. *albigula*)	1	1	3.0	0	0	0
Pocket gopher* (*Thomomys* sp.)	12	2	36.0	0	0	0
Rock squirrels (*Spermophilus variegatus*)	3	1	9.0	2	18.0	66.0
Raccoon (*Procyon lotor*)	1	1	3.0	0	0	0
Black-tailed jackrabbit (*Lepus californicus*)	3	1	9.0	2	18.0	66.0
Desert cottontail (*Sylvilagus audubonii*)	4	1	11.0	4	36.0	100.0
Canids (Canidae)	1	1	3.0	0	0	0
Mule deer (*Odocoileus hemionus*)	4	1	11.0	2	18.0	50.0
IDENTIFIED TOTAL (52.0%)	34	--	100.0	11	100.0	--
UNIDENTIFIED TOTAL (48.0%)	31	--	--	12	--	--
SITE TOTAL	**65**	**--**	**--**	**23**	**--**	**--**

*intrusive taxon

Table 64.29. Identified faunal remains, minus pocket gophers, from LA 135290.

TAXON	TOTAL			BURNED		
	NISP	MNI	%	NISP	%	% of Taxon
Bullfrog (*Rana catesbeiana*)	1	1	5.0	0	0	0
Western box turtle (*Terrapene ornata*)	1	1	5.0	1	10.0	100.0
Turkey (*Meleagris gallopavo*)	3	1	13.0	0	0	0
Woodrats (*Neotoma* cf. *albigula*)	1	1	5.0	0	0	0
Rock squirrels (*Spermophilus variegatus*)	3	1	13.0	2	18.0	66.0
Raccoon (*Procyon lotor*)	1	1	5.0	0	0	0
Black-tailed jackrabbit (*Lepus californicus*)	3	1	13.0	2	18.0	66.0
Desert cottontail (*Sylvilagus audubonii*)	4	1	18.0	4	36.0	100.0
Canids (Canidae)	1	1	5.0	0	0	0
Mule deer (*Odocoileus hemionus*)	4	1	18.0	2	18.0	50.0
IDENTIFIED TOTAL (52.0%)	22	--	100.0	11	100.0	--
UNIDENTIFIED TOTAL (48.0%)	31	--	--	31	--	--
SITE TOTAL	**53**	**--**	**--**	**42**	**--**	**--**

With the intrusive pocket gopher remains removed from calculations (see Tables 64.28 and Table 64.29), the two most frequently recovered taxa (18%) are cottontail (*Sylvilagus* sp.) and mule deer (*Odocoileus hemionus*). After these taxa, turkeys (*Meleagris gallopavo*), rock squirrels (*Spermophilus variegatus*), and black-tailed jackrabbit (*Lepus californicus*) each comprise 13 percent of the identified assemblage. The remainder of the assemblage consists of a wide variety of taxa, including amphibians, reptiles, rodents, and carnivores. The variation present in the assemblage attests to its location near a number of distinct biomes.

Because the basic unit of analysis at LA 135290 was the room, faunal remains were analyzed by individual room. Faunal remains were recovered from six of the nine rooms. Tables 64.30 through 64.35 show the breakdown of recovered bones from each room. Numbers of identified specimens from the individual rooms are not high, but are fairly consistent. Faunal remains recovered from fill contexts are briefly discussed after the material from each of the rooms is presented.

Room 1

Room 1 is a habitation room located in the north-central portion of the roomblock. The room measures 3.8 m north/south by 3.5 m east/west, with 13.30 m^2 of interior space. After the removal of about 20 cm of post-occupational fill (Strata 1 and 2), the remainder of the room contained approximately 70 to 80 cm of Stratum 4. This was a silty clay loam soil mixed with wallfall and some adobe melt. Wallfall was generally present within 1 to 2 m of standing masonry walls, and adobe melt adjacent to the adobe western wall; whereas, the center of room contained a few small pieces of tuff with little adobe melt. The room fill had been disturbed by rodent activity, although this disturbance appears to increase with depth. On the other hand, there were fewer tuff blocks with an increase in small tuff fragments and adobe melt with depth. The lower 20 cm of room fill (Stratum 4b) exhibited an increase in the amount of charcoal, charred maize kernels, and artifacts.

The floor (Stratum 9) was heavily disturbed by rodent activity, with only about 10 percent of the surface being intact. These small intact sections were primarily situated in the northern areas of the room, consisting of a 5- to 7-cm-thick layer of adobe. The floor was defined by the presence of a burned and/or prepared adobe surface. Several pockets of ash were noted on or immediately above the level of the floor.

Four pieces of bone were recovered in Room 1. These included two medium/large-sized mammal long-bone shaft fragments, an intrusive pocket gopher cranium from level six, and a proximal turkey humerus. None of the remains were burned, and all contained recent breaks. Table 64.30 shows the bones recovered by individual Stratum in this room.

Table 64.30. Room 1 faunal remains by Stratum.

TAXON	STRATUM NUMBER	TAXON TOTAL
	4	
Unidentified med/lg mammal	2	2
Turkey (*Meleagris gallopavo*)	1	1
Pocket gopher (*Thomomys* sp.)	1	1
Total	**4**	**4**

Room 2

Room 2 is located in the east-central section of the roomblock. The room measures 4.4 m north/south by 3.5 m east/west, with 14.66 m^2 of interior space. An east-west test trench (93N/108-112E) was also excavated through the room to define site stratigraphy and the location of the floor. After the removal of about 5 to 15 cm of post-occupational fill (Strata 1 and 2), the remainder of the room contained a mix of Strata 3 and 4 that was 50 to 70 cm thick. Stratum 3 was a clay loam soil that was mostly situated in the western area of the room adjacent to the adobe wall, whereas Stratum 4 was a silty clay loam mixed with wall, some adobe melt, and possible roofing material (Stratum 19). The wallfall was primarily situated adjacent to the masonry northern and eastern walls, with little near the adobe western and masonry southern walls. There was a notable increase in the density of ceramics in the northeast area of the room.

Stratum 19 was identified in the central area of the room. The deposit was 5 to 10 cm thick consisting of burned chunks of adobe mixed with charcoal in grids 93N/110-112E. This material was situated on the floor and had burned this section of the floor. It presumably represents burned roofing material.

Floor 1 (Stratum 5) was first encountered in the southeastern corner of the room where there was obvious coping to the wall. The floor is very patchy due to extensive rodent disturbance, but does cover about two-thirds of the room. Most of the floor is not burned, although there is extensive burning in the central area of the room where the floor plaster is ashy and black sooted in some spots. Although the floor consists of a relatively thick 3- to 5-cm layer of adobe, it has collapsed in many sections of the room due to rodent burrows. Manganese staining is also present in some parts of the floor adjacent to the walls. Adobe coping can be found in about 90 percent of areas where the walls articulate with the floor. Nine features were identified on the floor. These consist of a collared hearth, three adobe lined pits (Stratum 32), two adjacent hearths, and three post holes. A sub-floor test pit (Stratum 43) was also excavated in this room. Table 64.31 shows the bones recovered by individual Stratum in this room.

Table 64.31. Room 2 faunal remains by Stratum.

TAXON	STRATUM NUMBER				TAXON TOTAL
	3,4	4	32	43	
Unidentified	2	11	0	0	13
Western box turtle (*Terrapene ornata*)	0	1	0	0	1
Woodrat (*Neotoma* sp.)	0	1	0	0	1
Pocket gopher (*Thomomys* sp.)	0	1	0	7	8
Rock squirrel (*Spermophilus variegatus*)	0	1	1	0	2
Cottontail (*Sylvilagus* sp.)	1	0	1	0	2
Total	**3**	**15**	**2**	**7**	**27**

As in Room 1, the faunal remains recovered in Room 2 are representative of the relative site distribution. Unidentified remains were the most abundant, followed by pocket gophers and then western box turtle, woodrat, and cottontail remains. No worked bones were identified in this room.

Room 3

Room 3 is located at the southeastern corner of the roomblock. It measures 4.0 m north/south by 3.15 m east/west, with 12.60 m^2 of interior space. Excavations proceeded from north to south in the room by grid and natural layer. The floor was exposed and a subfloor test pit (87N/110E) dug in the southeastern area of the room. After the removal of a 5- to 15-cm layer of post-occupational fill (Strata 1 and 2), most of the room fill consisted of Stratum 4a deposits. This layer consisted of wallfall with a little charcoal. In the northern part of the room it was about 30 to 40 cm thick, whereas in the southern section of the room it was only 10 to 15 cm thick. Most of the rubble was situated in the south-central part of the room with some along the north and west walls. Stratum 3b was a 5- to 10-cm-thick layer overlying the fill. This deposit exhibited a marked increase in the presence of artifacts and charcoal, without tuff rubble.

The floor (Stratum 11) in Room 3 was poorly preserved. Indeed, it was not a plastered surface as in Rooms 1 and 2, but rather a compacted living surface. The floor was defined as the surface directly underlying Stratum 4a/3b and in some areas having small burned patches. In the northern area of the room there were some sections where horizontal layers flaked off fairly easily to reveal the surface. However, these layers were continuous in other areas of the room possibly reflecting multiple fine clay lenses of washed adobe from the nearby walls. There is no evidence of the floor being coped to the walls. Table 64.32 shows the bones recovered by individual Stratum in this room.

Table 64.32. Room 3 faunal remains by Stratum.

TAXON	STRATUM NUMBER		TAXON TOTAL
	3	4	
Bullfrog (*Rana catesbeiana*)	0	1	1
Turkey (*Meleagris gallopavo*)	2	0	2
Pocket gopher (*Thomomys* sp.)	0	2	2
Jackrabbit (*Lepus californicus*)	0	1	1
Total	**2**	**4**	**6**

Of the six pieces of bone recovered from this room, all were identified to at least the level of class. Identified remains include a single bullfrog and turkey bone, two (likely intrusive) pocket gopher bones, and a single jackrabbit specimen. Only the jackrabbit bone was burned, and no worked bones were identified.

Room 5

Room 5 is located in the northwestern area of the roomblock. It measures 2.25 m north/south by 2.15 m east/west, with 4.83 m^2 of interior space. An east-west test trench (98N/107-109E) was excavated through the room to define site stratigraphy and the location of the floor. The excavation proceeded by removing the room fill by grid and natural layer to the south of the trench. After the removal of a 10-cm-thick layer of post-occupational fill (Strata 1 and 2), most of the room fill consisted of 40 to 50 cm of Stratum 3, with some Stratum 4. Stratum 4a/4b was situated adjacent to the east wall of the room. In contrast, Stratum 3a was situated in the western area of the room and Stratum 3c adjacent to the base of the walls.

Two separate floors were identified in Room 5. Floor 2 (Stratum 42 and 49) is the lowest and original floor, being equivalent to Floor 3 in Room 4. Both rooms were connected as a single room during this period, measuring 4.40 by 2.15 m in size and containing 9.46 m^2 in area. This is similar to the adjacent back room (Room 6) that contains 9.78 m^2 of space. Floor 2 was constructed by placing down a layer of adobe, on top of which was placed a thin layer of plaster. Floor 1 (Stratum 21 and 41) is very well preserved and covers the entire room, although the surface is eroded. Table 64.33 shows the bones recovered by individual Stratum in this room.

Table 64.33. Room 5 faunal remains by Stratum.

TAXON	STRATUM NUMBER		TAXON TOTAL
	3	41	
Unidentified	4	0	4
Mule deer (*Odocoileus hemionus*)	0	1	1
Total	**4**	**1**	**5**

Only a single piece of bone in this room was identified to at least the level of class. This specimen was a basal antler fragment from a mule deer. It was neither burned nor modified.

Room 6

Room 6 is located in the southwest area of the roomblock. It measures 1.75 m north/south by 1.75 m east/west, with 3.06 m^2 of interior space. An east-west test trench (93N/106-108E) was also excavated through the room to define site stratigraphy and the location of the floor. The excavation proceeded by first removing the fill to the north of the trench and then to the south by grid and natural layer. After the removal of a 10-cm-thick layer of post-occupational fill (Strata 1 and 2), most of the room fill consisted of 30 to 40 cm of Stratum 3. Stratum 4 was only defined in a small area in the south part of the room. Three distinct floors were identified in Room 6, and Floor 3 contained 15 possible postholes. Table 64.34 shows the bones recovered by individual Stratum in this room.

Table 64.34. Room 6 faunal remains by Stratum.

TAXON	STRATUM NUMBER	TAXON TOTAL
	3	
Mule deer (*Odocoileus hemionus*)	2	2
Total	**2**	**2**

Two pieces of mule deer bone were recovered in this room. Although the specimens of the metapodial could not be refit, it is likely they came from the same original element. Both contained modern breaks, both were uniformly burned, and both were from the distal end of the bone. No modified bones were recovered from this room.

Room 9

Room 9 is located in the southeastern corner of the roomblock. It is divided into northern (9A) and southern (9B) halves. The entire room measures 4.6 m north/south by 2.8 m east/west, with 11.48 m^2 of interior space. However, a dividing wall separates the room into two small areas with 7.28 m^2 and 3.96 m^2 of floor space, respectively. The fill consists of a thin 5 cm layer of Stratum 1, with 10 to 20 cm of Stratum 4 underlain with 5 to 15 cm of Stratum 3. In Room 9A the lower circa 10 cm contained a large amount of charcoal. This concentration of charcoal was missing from Room 9B. There is no prepared adobe floor in Room 9. The floor simply consists of a compacted living surface in both Room 9A (Stratum 38) and 9B (Stratum 39). The living surface was identified as a partially preserved layer of hardened adobe/sediment. Table 64.35 shows the bones recovered by individual Stratum in this room.

Table 64.35. Room 9 faunal remains by Stratum.

TAXON	STRATUM NUMBER		TAXON TOTAL
	3	4	
Unidentified sm/med mammal	1	0	1
Rock squirrel (*Spermophilus variegatus*)	1	0	1
Pocket gopher (*Thomomys* sp.)	0	1	1
Raccoon (*Procyon lotor*)	0	1	1
Mule deer (*Odocoileus hemionus*)	0	1	1
Total	**2**	**3**	**5**

Five pieces of bone were recovered in Room 9, and all were identified to at least the level of class. Identified elements include a small-medium sized mammal long-bone shaft fragment, an intrusive pocket gopher mandible from level three, a proximal rock squirrel femur, a proximal raccoon ulna, and a mule deer second phalanx. The unidentified fragment, which was also highly polished, and the rock squirrel femur were burned.

Faunal Remains Not Associated with a Specific Room

Sixteen bones recovered at this were from non-room contexts. Most of these bones were associated with the fill above rooms and were recovered before the designation of room numbers, or with the deposits just outside of the roomblock, especially in the plaza area (Area 2). Table 64.36 shows the distribution of faunal remains recovered from these deposits.

Table 64.36. Faunal remains from outside rooms.

TAXON	STRATUM NUMBER				TAXON TOTAL
	2	3	4	13	
Unidentified	0	1	0	8	9
Med/lg mammal	1	0	1	0	2
Sm/med mammal	0	0	1	0	1
Jackrabbit (*Lepus californicus*)	0	2	0	0	2
Cottontail (*Sylvilagus* sp.)	0	0	1	0	1
Canid (Canidae)	0	0	0	1	1
Total	**1**	**3**	**3**	**9**	**16**

Rendija Tract

A total of 27 sites were excavated between 2003 and 2005 in Rendija Canyon (see Figure 13.3). Faunal remains were recovered at 15 of these sites, which included a homestead (LA 85407), two Late Coalition/Early Classic period fieldhouses (LA 85404 and LA 85861), nine Classic period fieldhouses (LA 85408, LA 85411, LA 85413, LA 85414, LA 85867, LA 86605, LA 86606, LA 127627, and LA 135292), an Early Archaic period lithic scatter (LA 85859), and two Jicarilla Apache rock ring sites (LA 85864 and LA 85869).

LA 85404 (Late Coalition/Early Classic Period Fieldhouse)

One piece of bone was recovered from Room 1 (Stratum 2, Level 3) of this Late Coalition/Early Classic period fieldhouse. The bone was a mule deer (*Odocoileus hemionus*) distal metatarsal fragment (right) and was also manufactured into a partial fragment of a bone awl. The bone was unburned, but contained a possible cut-mark just above the epiphyseal fusion. The mark did not appear to be recent and was probably not incurred during excavation activities.

LA 85407 (Serna Homestead)

Twenty-seven pieces of bone were recovered during excavations at LA 85407. The site consists of the remains of a historic log cabin and various features in the surrounding area.

Cabin (Area 1)

The cabin was divided into Rooms 1 and 2. Ten bones were recovered in Room 1 and included one unfused kangaroo rat (*Dipodomys* sp.) femur, a fragment of a mule deer (*Odocoileus hemionus*) rib, a horn fragment from a domestic cow (*Bos taurus*), a fragment of an elk (*Cervus elaphus*) thoracic vertebra, two medium/large-sized mammal bones (one burned), two large-sized mammal rib fragments that both contained butcher saw marks, one large-sized mammal unidentified burned bone, and one unidentified piece of unburned bone.

Four bones were identified in the fill around the cabin and included a complete human premolar, a burned unidentified medium/large-sized mammal bone, an unidentified large-sized mammal bone, and a large-sized mammal rib that contained evidence for butchery from a large saw.

Horno (Area 3)

Three bones were identified in the area around the horno, but no bones were recovered directly from the feature fill. Analyzed bones included one medium/large-sized mammal bone fragment and two domestic cow vertebral body fragments. None of the bones were burned, and all contained evidence for old breaks.

Area 4 (Feature 2, Circular Rock Alignment)

Feature 2 was a small rock feature (Figure 12) located approximately 14 m south of the western end of the cabin. Before excavation, the feature appeared to be a small, circular concentration of rocks. The feature was excavated because it was believed to be the remains of a privy. The entire extant portion of the feature was excavated in four 1- by 1-m grid units (45-46N/91-92E). The excavations revealed that the feature was a circular rock alignment. One bone was recovered from the circular alignment and it was identified as a fragment of a domestic cow axis vertebra. It was not burned, but did contain evidence for some butchering activities.

Shed (Area 5, Room 3)

Room 3 is the remains of a wood structure located approximately 21.5 m north-northeast of the cabin. Two large wood beams were the only remains of this structure visible on the surface before excavation. These wood beams appear to have been part of the structure's south wall. Room 3 is most likely the pole shed described in Homestead Entry Survey No. 394 (see Chapter 32, Volume 2). Six bones were recovered from this feature and included one unidentified bone, one blue grouse axis vertebra (*Dendragapus obscurus*), a domestic goat (*Capra hircus*) cervical vertebra and rib fragment, and a domestic cow distal metatarsal fragment. None of these bones were burned or otherwise altered.

Corral (Area 6, Feature 3)

Feature 3 is the remains of a corral located approximately 14 m northeast of the shed. Two bones were identified in the feature: one was an unidentified small/medium-sized mammal bone and one was a medium/large-sized mammal bone fragment.

LA 85408 (Classic Period Fieldhouse)

One piece of bone was recovered from 107N/105E (Stratum 2, Level 2) from this Classic period fieldhouse. The bone was an unidentified piece of medium/large-sized mammal bone. The bone was unburned and contained an old break.

LA 85411 (Classic Period Fieldhouse)

Four pieces of bone were recovered during excavations of this Classic period fieldhouse. One bone was recovered in 104N/106E and was identified as a fragment of a mule deer (*Odocoileus hemionus*) atlas vertebra. Three bones were identified in 105N/106E and were all identified as part of a mule deer sacrum. None of the bones were burned and the pieces of the sacrum all contained recent breaks suggesting these bones may have come from a single animal.

LA 85413 (Classic Period Fieldhouse)

Twelve pieces of bone were recovered during excavations of this Classic period fieldhouse. The majority of the bones were recovered in Stratum 2 (post-occupational fill), but two bones were identified in Stratum 5, which was the living surface identified in the fieldhouse. The bones on the living surface were unidentified to the level of class and were both heavily calcined. The bones identified in Stratum 2 included two pocket gopher (*Thomomys* sp.) elements (right humerus, left mandible), five mule deer (*Odocoileus hemionus*) bones, one small/medium-sized mammal remain, one medium/large-sized mammal remain, and one unidentified remain. The mule deer elements included three rib fragments, one right calcaneus, and one right astragalus. None of the bones were burned.

LA 85414 (Classic Period Fieldhouse)

One piece of bone was recovered during excavations of this Classic period fieldhouse. The bone was recovered in 102N/105E and was identified as a fragment of the proximal metacarpal of a mule deer (*Odocoileus hemionus*). The bone was identified as a possible awl, but was definitely shaped and polished. The bone was not burned.

LA 85859 (Archaic Period Lithic Scatter)

Fourteen pieces of bone were recovered from this Early Archaic period lithic scatter. All of the bones were modern, and all were identified as pocket gopher (*Thomomys bottae*) remains. None of the bones were burned, and none showed signs of weathering. Bones were recovered throughout the excavated levels.

LA 85861 (Late Coalition/Early Classic Period Fieldhouse)

Five pieces of bone were recovered during excavations of this Late Coalition/Early Classic period fieldhouse. One piece of bone was recovered from Stratum 2 (post-occupational fill). This bone was identified as an unidentified mule deer (*Odocoileus hemionus*) second phalanx. The remaining four bones were recovered from a hearth (Feature 1, Stratum 4) and included a leporid molar and small-sized, small/medium-sized, and medium/large-sized mammal long-bone fragments. None of the remains were burned. The medium/large-sized mammal long-bone fragment was manufactured into an awl fragment.

LA 85864 (Jicarilla Rock Ring)

Four unidentified pieces of bone (FS 11) were recovered from this Jicarilla Apache rock ring. The bones were heavily burned (calcined) and were recovered in Stratum 3, Level 4 in Feature 2.

LA 85867 (Classic Period Fieldhouse)

One piece of bone was recovered during excavations of this Classic period fieldhouse. The bone was identified as an unburned rib fragment from an elk (*Cervus elaphus*) and was recovered in the post-occupational fill level (102N/102E).

LA 85869 (Jicarilla Rock Ring)

One elk (*Cervus elaphus*) scapula (FS 161) was recovered from the surface of this Jicarilla Apache rock ring. The bone was broken into three distinct pieces, was not burned and slightly weathered, and was likely from the recent death of an elk in the area. In addition, two small, unidentified mammal fragments were recovered from inside the tipi ring. These appear to be modern, and their sun-bleached appearance suggests they have been near the surface for some time.

LA 86605 (Classic Period Fieldhouse)

One piece of bone was recovered from Room 1 (Stratum 2, Level 5) of this Classic period fieldhouse. The bone was a mule deer (*Odocoileus hemionus*) distal humerus (right) that was fairly weathered and may have been exposed to the elements for quite some time before deposition. The bone was unburned and its location in the fieldhouse was point-plotted (103.35N/102.72E).

LA 86606 (Classic Period Fieldhouse)

One piece of bone was recovered during excavations of this Classic period fieldhouse. The bone was identified as a heavily burned medium/large-sized mammal long-bone fragment and was recovered in the post-occupational fill level (102N/104E).

LA 127627 (Classic Period Fieldhouse)

Two pieces of unidentified bone were recovered from this Classic period fieldhouse. The bones were both recovered from the same unit (103N/107E), both were burned, and both were very small. Both pieces of bone were recovered from the fill of the fieldhouse, and both contained old breaks.

LA 135292 (Classic Period Fieldhouse)

One piece of unidentified bone was recovered from this Classic period fieldhouse in Rendija Canyon. The bone was recovered from unit 102N/103E, was heavily burned, and was a very small fragment of cancellous bone. The bone was recovered from the upper fill of the fieldhouse and contained an old break.

TA-74 Tract

LA 110126 (Classic Period Fieldhouse)

One unidentified piece of bone (FS 5) was recovered from this Classic period fieldhouse. The bone was not burned and unmodified and came from Stratum 3 (20 to 30 cm).

LA 117883 (Archaic Period Lithic Scatter)

Five pieces of bone were recovered from this Archaic period lithic scatter. One piece of bone showed signs of burning (unidentified), but no other modifications were noted. All recovered bones came from Test Pit 2. Three unidentified bones came from 60 to 70 cm, 70 to 80 cm, and 80 to 90 cm. An unidentified medium/large-sized mammal long-bone fragment was recovered from Level 6, and a juvenile rock squirrel (*Spermophilus variegatus*) cervical vertebra was found between 80 and 90 cm.

LA 21596B (Classic Period Grid Garden)

Four pieces of bone were recovered from this Classic period grid garden. Two of the bones were unidentified and two were identified as cottontail (*Sylvilagus* sp.) remains. None of the bones were burned, and all were modified by the elements as they were found on the surface. The cottontail remains include the proximal and distal ends of a left humerus. It is likely that the fragments hailed from the same element/animal, but they could not be confidently refit. It is probable, based on the sun-bleached appearance of the specimens, that the bones were not associated with the prehistoric use of the site.

White Rock Y Tract

LA 61035 (Coalition/Classic Period Lithic and Ceramic Scatter)

Seven pieces of bone were recovered from this Coalition/Classic period lithic and ceramic artifact scatter. All of the bones were unidentifiable, and only a single bone was burned. No other modifications were present on any of the faunal remains.

CHRONOMETRIC ASSEMBLAGE GROUPS

Faunal remains from a number of different temporal periods were analyzed as part of the C&T Project. Sites include two Archaic period lithic scatters (LA 85859 and LA 117883), three Coalition period roomblocks (LA 12587, LA 86534, and LA 135290), one Ceramic period artifact scatter (LA 61035), three Late Coalition/Early Classic period fieldhouses (LA 85404, LA 85861, and LA 127631), 10 Classic period fieldhouses (LA 85408, LA 85411, LA 85413, LA 85414, LA 85867, LA 86605, LA 86606, LA 127627, LA 110126, and LA 135292), one Classic period grid garden (LA 21596B), two Jicarilla Apache rock ring sites (LA 85864 and LA 85869), and one homestead (LA 85407). Faunal assemblages from two other Coalition period roomblocks (LA 4618 and LA 4624) that were previously excavated by LANL personnel were also analyzed.

Archaic Period

Two Archaic period lithic scatters produced faunal remains. Fourteen pieces of bone were recovered from LA 85859, an Early Archaic period lithic scatter in the Rendija Tract, but all of the bones were modern and identified as pocket gopher (*Thomomys bottae*) remains. None of the bones were burned, and none showed signs of weathering. Bones were recovered throughout the excavated levels. Five pieces of bone were recovered from LA 117883, an Archaic period lithic scatter in TA-74. One piece of bone showed signs of burning (unidentified), but no other modifications were noted. All recovered bones came from Test Pit 2. An unidentified medium/large-sized mammal long-bone fragment was recovered as was a juvenile rock squirrel (*Spermophilus variegatus*) cervical vertebra.

Coalition Period Roomblocks

During the Coalition period (AD 1150–1325), the population of the Pajarito Plateau increased dramatically (Kohler 2004; Powers and Orcutt 1999b; Vierra et al. 2002). Relative to the preceding Developmental period (AD 600–1150), there was a substantial increase in the number, size, and distribution of above-ground pueblos (Vierra 2002). The increase of year-round settlements across the Pajarito Plateau substantially decreased the amount of arable land available to its inhabitants. Without a doubt, the dramatic increase in crop production during the Coalition period increased the production of a stable resource thereby reducing some of the nutritional stresses. But, the production of maize and other domesticates also altered the natural landscape and, in doing so, decreased the areas where wild foods were collected.

To examine the subsistence changes associated with the increase in crop production during the Coalition period, faunal remains from five excavated roomblocks (LA 4618, LA 4624, LA 12587, LA 86534, and LA 135290) were analyzed. Macrobotanical and pollen remains were also recovered and analyzed (Chapters 62 and 63, this volume). The macrobotanical and pollen results are summarized briefly after the faunal remains are discussed. Three sites (LA 12587, LA 86534, and LA 135290) were excavated as part of the C&T Project and were summarized earlier in this chapter. The other two sites (LA 4618 and LA 4624) were excavated in the early 1990s (Vierra et al. 2002; Schmidt 2006b). Based on ceramic assemblages recovered from each of the roomblocks (Chapter 58, this volume), the sites have been separated into Early Coalition (LA 4624), Middle Coalition (LA 86534 and LA 135290), and Late Coalition (LA 4618 and LA 12587) period samples. Chronometric dates support these temporal groupings (Chapter 69, this volume).

Data recovery activities were conducted at LA 4618 and LA 4624 in the early 1990s. LA 4624 (Figure 64.1, right) is a 25-room pueblo that is located approximately 500 m southeast of LA 4618. Excavations at LA 4624 were conducted in both habitation rooms and communal structures, and seven of the 25 rooms were partially or completely excavated. No midden deposits were identified. LA 4618 (Figure 64.1, left), a 13-room linear roomblock with both a circular and a square kiva, was excavated in 1991 and 1992. The site has a large and highly diverse artifact assemblage relative to the other sites in this sample. LA 4618 was completely excavated, and a small midden deposit was located east of the roomblock.

Table 64.37 shows the NISP from each roomblock site, the percentage of the identified remains that each taxon comprised, the total number of bones from each site, and the number of taxa identified at each site.

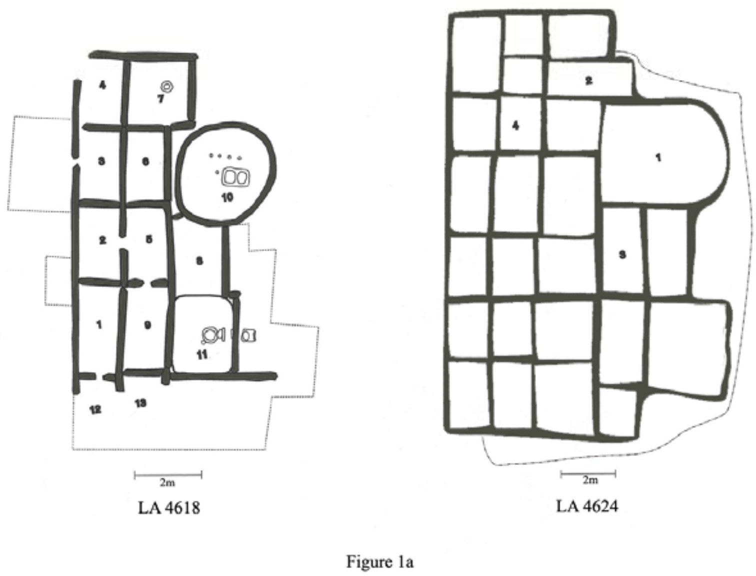


Figure 64.1. Plan view drawings of LA 4618 and LA 4624.

Table 64.37. Faunal remains from the Coalition period roomblocks on the Pajarito Plateau.

Taxon	LA 4624		LA 86534		LA 135290		LA 4618		LA 12587	
	NISP	Percent	NISP	Percent	NISP	Percent	NISP	Percent	NISP	Percent
Catfishes	0	0	0	0	0	0	0	0	1	1.0
Bullfrog	0	0	0	0	1	2.7	0	0	1	1.0
Toads	0	0	1	1.0	0	0	0	0	0	0
Woodhouse's toad	0	0	0	0	0	0	0	0	1	1.0

Taxon	LA 4624		LA 86534		LA 135290		LA 4618		LA 12587	
	NISP	Percent	NISP	Percent	NISP	Percent	NISP	Percent	NISP	Percent
Spadefoot toads	0	0	1	1.0	0	0	0	0	0	0
Non-venomous snakes	0	0	0	0	0	0	2	0.3	0	0
Western box turtle	0	0	0	0	1	2.7	1	0.1	0	0
Perching birds	0	0	1	1.0	0	0	2	0.3	0	0
Piñon jay	0	0	1	1.0	0	0	0	0	1	1.0
Turkey	5	6.8	4	3.0	2	5.4	386	58.6	32	25.0
Golden eagle	0	0	0	0	0	0	0	0	2	1.5
Hawks	0	0	1	1.0	0	0	0	0	0	0
Red-tailed hawk	0	0	10	8.0	0	0	0	0	0	0
Medium bird	0	0	1	1.0	0	0	0	0	0	0
Large bird	28	38.1	1	1.0	4	10.9	205	31.1	11	9.0
Indet. rodents	1	1.4	8	6.0	0	0	2	0.3	0	0
Kangaroo rats	0	0	8	6.0	0	0	0	0	4	3.0
Woodrats	0	0	7	5.0	1	2.7	8	1.2	0	0
Squirrels	0	0	2	1.0	0	0	0	0	0	0
Antelope squirrel	0	0	1	1.0	0	0	2	0.3	0	0
Rock squirrels	1	1.4	11	8.0	3	8.1	5	0.8	7	5.5
Porcupine	0	0	0	0	0	0	3	0.5	0	0
Black-tailed jackrabbit	2	2.7	6	4.0	2	5.4	2	0.3	10	7.5
Desert cottontail	1	1.4	33	24.0	4	10.9	10	1.5	19	15.0
Indet. carnivores	0	0	0	0	1	2.7	0	0	0	0
Striped skunk	0	0	2	1.0	0	0	0	0	0	0
Weasel	1	1.4	0	0	0	0	0	0	0	0
Coyote	0	0	3	2.0	0	0	0	0	2	1.5
Domestic dog	0	0	0	0	0	0	0	0	1	1.0
Coyote/dog	0	0	0	0	0	0	0	0	1	1.0
Gray fox	0	0	0	0	0	0	0	0	1	1.0
Artiodactyls	0	0	1	1.0	0	0	0	0	1	1.0
Mule deer	9	12.3	18	13.0	4	10.9	6	0.9	16	12.0
Pronghorn	2	2.7	0	0	0	0	0	0	0	0
Sm/med mammals	9	12.3	5	4.0	2	5.4	17	2.6	5	4.0
Medium mammals	4	5.5	1	1.0	0	0	0	0	1	1.0
Med/lg mammals	10	13.7	9	7.0	12	32.2	8	1.2	10	7.50
Identified Total	73	100.0	136	100.0	37	100.0	659	100.0	127	100.0
Unident. Total	36	--	186	--	11	--	221	--	432	--
Site Total	**109**	**--**	**322**	**--**	**48**	**--**	**880**	**--**	**559**	**--**
Total Taxa	**7**	**--**	**13**	**--**	**8**	**--**	**10**	**--**	**14**	**--**

Of the five Coalition period sites, LA 4618 had the largest assemblage (*n* = 880). The LA 4618 assemblage also had the largest percentage of turkey remains, which constituted over 58 percent of the NISP assemblage (Table 64.37). Although it was the largest assemblage, it was not the most diverse assemblage and contained only 10 identified taxa. The LA 4618 assemblage contained the highest number of worked remains, with 15 bone awls, pendants, needles, and flutes, and over 800 bones beads (Figures 64.2 through 64.4), which were not included as part of the total site assemblage (Schmidt 2006b). Additionally, nearly 30 individual specimens and three partial turkey skeletons were recovered from floor contexts.

Figure 64.2. Bone awls from LA 4618.

Unlike the large assemblage from LA 4618, the LA 4624 excavations produced a very small collection of bones (*n* = 109), most of which were recovered from post-occupational fill (Schmidt 2002). Only four bones were associated with floor contexts at LA 4624, and all were unidentifiable to taxon. Despite the low NISP at this site, however, seven taxa were identified.

A total of 559 bones were recovered during excavations at LA 12587. Most of these were recovered from post-occupational and room fill, although only a single piece of cottontail (*Sylvilagus audubonii*) bone was recovered from the floor. The LA 12587 assemblage was the most diverse of any of the sites, with 14 identified taxa, and was one of three assemblages dominated by turkey and large bird remains, which comprised nearly 35 percent of the identified assemblage. Over 20 pieces of worked bone, including awls, needles, and flutes, and a large number of bone beads, were recovered.

Figure 64.3. Bone flute fragment from LA 4618.

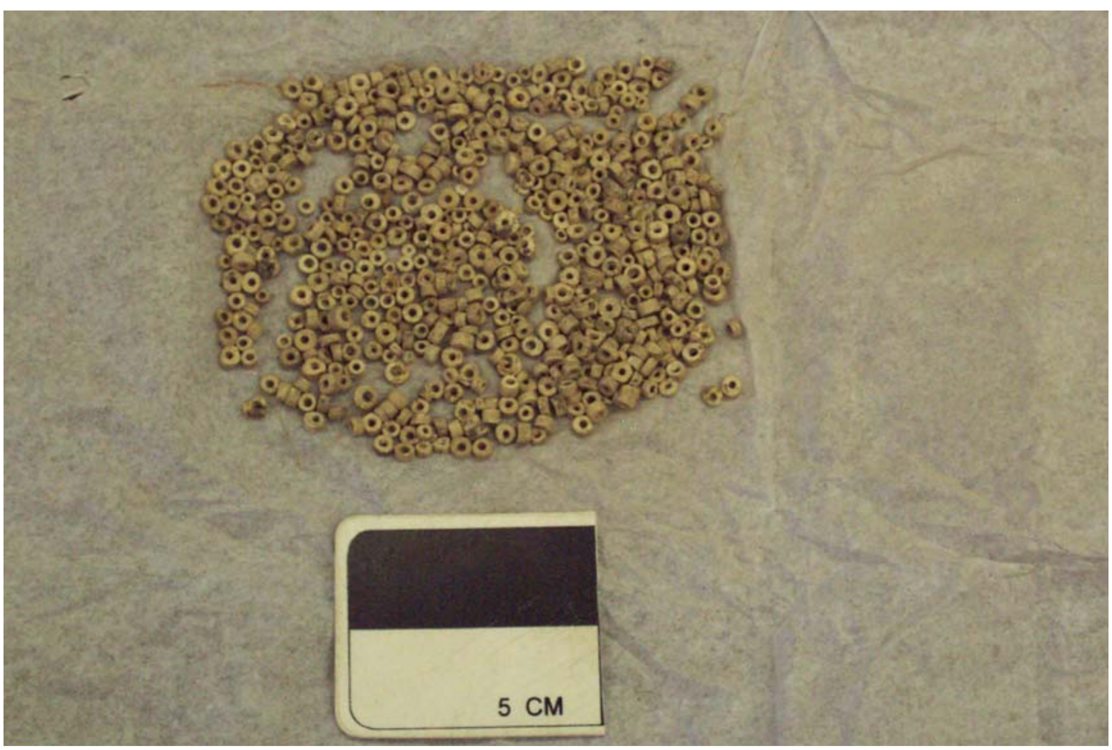


Figure 64.4. A sample of the bone beads from LA 4618.

The LA 86534 faunal assemblage was relatively small compared to the other roomblock sites, with only 322 bones recovered. Most of these bones were recovered from post-occupational fill, room fill, and kiva fill, although three pieces of bone were recovered from the floor of Room 5. Bones recovered from the floor of Room 5 include a cottontail (*Sylvilagus audubonii*) vertebra fragment, a red-tailed hawk (*Buteo jamaicensis*) coracoid, and a piece of unidentified material. The LA 86534 faunal remains were similar to the LA 12587 assemblage in terms of diversity, with 13 identified taxa. Relative to the other four sites, the LA 86534 assemblage contained the fewest turkey (*Meleagris gallopavo*) remains, comprising only three percent of the identified assemblage. But, despite the low percentage of turkey remains in the assemblage, the variety of bird taxa (n = 5) was greater than at any other site. Two bone awl fragments were recovered, but no beads were identified.

Excavations at LA 135290 produced the smallest assemblage with only 48 faunal remains, most of which were recovered from post-occupational and room fill. Of the sites discussed here, LA 135290 had one of the least diverse assemblages, which is not necessarily unexpected given the small sample size, but it had a higher percentage of deer and rabbits relative to the later assemblages, which were dominated by turkey and large bird remains. No worked bones were recovered at this site.

The faunal remains recovered from the Coalition period roomblocks are compared in Table 64.37. In general, these data do not show an increase in taxonomic diversity through time and, with the exception of LA 4618, the differences among the assemblages appear to be a function of sample size. Rabbits (Leporidae), turkeys (*Meleagris gallopavo*), and artiodactyl (Artiodactyla) remains are present at all sites regardless of time period. Turkey and large bird remains are more abundant than all other taxa at all sites except for those from the Middle Coalition period where mule deer (*Odocoileus hemionus*) are more abundant. Artiodactyl taxa are represented by mule deer and pronghorn (*Antilocapra americana*) remains, with small numbers of pronghorn identified at LA 4624 and LA 12587. In general, mule deer remains are more abundant than leporid remains (jackrabbit and cottontail rabbit) at each of the sites, which is unusual for faunal assemblages from the southwestern United States. Overall, Table 64.37 shows that NISP values for artiodactyls were consistent throughout the Coalition period, suggesting that even as populations were increasing, animal resources near the habitation locales were not exhausted.

Turkey remains, although identified in each of the roomblock assemblages, increase dramatically in the Late Coalition period assemblages. At LA 4624, turkey remains make up only six percent of the assemblage. At the Middle Coalition period sites (LA 86534 and LA 135290), their overall percent of the identified remains drops to less than five percent. At the Late Coalition period sites (LA 12587 and LA 4618), however, the percentage of turkey remains increases to 25 percent and 60 percent of the identified remains, respectively. Amphibian and carnivore remains increase during the course of the Coalition period, while the diversity of bird remains decreases through time. The ubiquity of a single animal taxon (turkey) increases dramatically throughout the course of the Coalition period, while the NISP contribution of wild taxa remains virtually unchanged or varies slightly among different taxa.

Because the diet of Coalition period occupants of the Pajarito Plateau cannot be adequately addressed without considering all subsistence materials, macrobotanical and pollen remains are briefly discussed and are compared in Table 64.38. Corn, goosefoot, pigweed, and purslane are present throughout the Coalition period and are the most common taxa encountered in flotation samples. Their consistent presence underscores the relationship between disturbance-loving weedy annuals and agricultural pursuits. Although Table 64.38 appears to show an increase in the diversity of taxa throughout the Coalition period, the disparity in sample size presents an interpretation conundrum. Until a more sizeable database from the Early Coalition period is available, the question of whether low taxa diversity is a true reflection of diet breadth in the Early Coalition or a factor of small sample size cannot be adequately determined (Chapter 62, this volume).

Table 64.38. Comparison of carbonized plant remains from Coalition period sites on the Pajarito Plateau.

Site	LA 4624[1]	LA 86534	LA 135290	LA 12587	LA 4618[2]
Coalition Phase	Early	Middle		Late	
No. of Flots Analyzed	5	53	79	123	60
Annuals					
Beeweed			+		+
Bugseed				+	+
Cheno-am	+	+	+	+	+
Goosefoot	+	+	+	+	+
Goosefoot family		+			+
Pigweed	+	+	+	+	+
Purslane	+	+	+	+	+
Purslane family			+		
Sunflower				+	
Sunflower family		+	+		
Tobacco			+	+	+
Winged pigweed			+		
Cultigens					
Bean			+	+	+
Maize	+	+	+	+	+
Squash rind		poss. +	poss. +	poss. +	poss. +
Grasses					
Dropseed	+		+	+	+
Grass family		+	+	+	+
Ricegrass				+	
Other					
Evening primrose		+	+		+
Groundcherry		+		+	+
Knotweed family			+		
Mint family		+	+	+	+

Site	LA 4624[1]	LA 86534	LA 135290	LA 12587	LA 4618[2]
Coalition Phase	Early	Middle		Late	
No. of Flots Analyzed	5	53	79	123	60
Plantain			+		
Spurge					+
Perennials					
Banana yucca					+
Four-wing saltbush	+	+		+	+
Globemallow	+				
Hedgehog cactus	+			+	
Juniper		+	+	+	
Pincushion cactus			+		
Piñon	+ nutshell	+nutshell	+ nutshell	+nutshell	+ nutshell
Prickly pear cactus				+	+
Sage					+
Total Taxa	**9**	**14**	**20**	**19**	**21**

+ present; [1]McBride and Smith 2002; [2]Chapter 62, this volume.

When the more comparable Middle and Late Coalition macrobotanical assemblages are compared, it becomes clear that a wide variety of annual and perennial species were exploited and that agricultural efforts were an important part of the subsistence regime. The ubiquity of domesticates, annuals, perennials, and grasses for the Middle and Late Coalition is presented in Table 64.39. With the exception of the Middle Coalition grass and perennial assemblages at LA 86534, there is no discernable difference in the percent presence of domesticates, annuals, perennials, and grasses throughout the Coalition period (Chapter 62, this volume). The reason for the spike in perennial ubiquity and the very low ubiquity of grasses at LA 86534 is likely neither a factor of environment nor a change in dietary preferences; LA 135290 is just 500 m to the west and both sites date to the Middle Coalition period. Overall, the macrobotanical data indicate that corn and a wide array of wild plant resources remained stable components of the diet throughout the Coalition period (Chapter 62, this volume).

Table 64.39. A comparison of plant class ubiquity from Coalition period sites on the Pajarito Plateau (from Chapter 62, this volume).

Site	Phase	Domesticates	Annuals	Perennials	Grasses
LA 4624	Early	38	31	23	8
LA 86534	Middle	50	37	13	<1
LA 135290	Middle	49	39	4	8
LA 4618	Late	49	33	9	9
LA 12587	Late	55	29	6	10

Note: ubiquity = percent presence of the total occurrences of each plant class at a site.

In general, pollen analyses show that corn signatures increase in the Late Coalition period. Although sample sizes from the Early Coalition period are small ($n = 3$), the two Late Coalition period sites show evidence for more economically important taxa (e.g., cotton and squash) relative to the Middle Coalition period site (LA 86534) that has been analyzed (Chapter 63, this volume).

Discussion of the Coalition Period Roomblocks

Several trends in the Coalition period assemblages are highlighted. The LA 4618 faunal assemblage was dominated by bird remains, especially turkeys; LA 4624 and LA 12587 were also dominated by bird remains but generally had a more even taxonomic distribution. In contrast with these assemblages, however, the LA 135290 and LA 86534 assemblages were dominated by artiodactyls and rabbits, with birds comprising only about 10 percent of the identified taxa. Given the small sample sizes at LA 135290 (n = 48) and LA 4624 (n = 109), one would expect these sites to be the least diverse taxonomically. In fact, while they do have the two smallest values with nine and seven identified taxa, respectively, they are not significantly different from the LA 4618 assemblage, which is represented by only 10 distinct taxa but has a sample size that is 8 to 18 times larger depending on the site. Since Grayson (1984) has stated that a longer and more intensive use of a site will produce more diversity in subsistence materials, the Coalition period assemblages suggest that other factors may have been at work on the Pajarito Plateau. If length and intensity of occupation were contributing factors to the small sample size and low taxonomic diversity at these sites, it is interesting to note that two of the three sites (LA 4618 and LA 4624) have multiple kivas, a factor typically equated with more intensive site occupations. In general, sample size does not appear to directly bias the number of identified taxa at each of the roomblock sites.

The five Coalition period sites can be separated into three spatially distinct groups on the plateau. LA 86534 and LA 135290 are located within 500 m of each other on the mesa top near the Los Alamos airport. LA 12587 is located 6.5 km (4 miles) southeast of the Airport cluster just north of White Rock, New Mexico, and LA 4624 and LA 4618 are located 2.5 km (1.5 miles) northwest of LA 12587 near TA-54. Like the Airport sites, the two TA-54 sites are also located within 500 m of each other. Figure 64.5 groups the faunal assemblages by geographic location and taxonomic representation within the study area. Figure 64.5 shows that differences in faunal exploitation (e.g., more birds in the TA-54 cluster and more artiodactyls in the Airport cluster) may be tied to subtle geographic differences between the site clusters. Although these differences are not vast since all five sites are located in the central Pajarito Plateau, they do appear to contribute to the variable signatures in the faunal record.

Interestingly, the Classic period site of Tsirege, which is located in between the TA-54 and White Rock clusters, translates to "down at the bird place" in Tewa, suggesting birds may have been especially abundant in this area. However, Harrington (1916) has suggested that the name Tsirege derives from a large rock outcrop near the site that resembles a bird, and may in fact have nothing to do with elevated numbers of birds in the area. But, given the location of the TA-54 and White Rock sites, it is not entirely unexpected that the former may be true given their proximate location to large canyons. In Figure 64.5, there are clear patterns in the "bird" and "other taxa" groups, but the "rabbit" and "deer" groups are more variable. This difference is likely due to the use of rabbits and deer for food, whereas birds, with the exception of turkey, and other taxa may have been used more frequently for ritual activities. Interestingly, the presence of a kiva or kivas at a site does not appear to increase the number of taxa used primarily for ritual purposes (e.g., golden eagle) as LA 12587, the only site besides LA 135290 that does not have a kiva, contains as many ritual taxa as LA 4618, LA 4624, and LA 86534, which all have kivas.

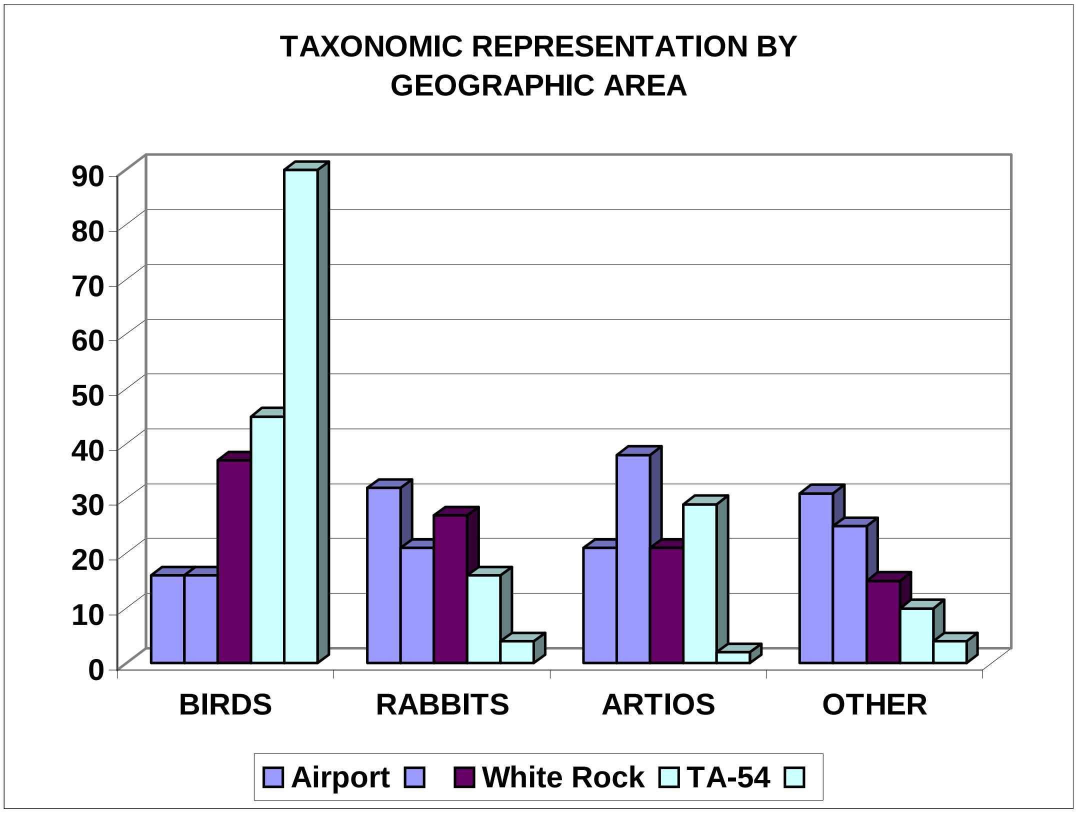


Figure 64.5. Taxonomic breakdown of Coalition period assemblages by geographic area.

As already mentioned, the importance of turkeys increased considerably during the Coalition period. While wild turkeys supplied a stable and edible source of food for the residents of the Pajarito Plateau for millennia before the Coalition period, its domestic counterpart was not skeletally identified until the Coalition period (McKusick 1980, 1986a). Additionally, Harrington (1916) notes the following in his book on the ethnozoology of the Tewa Indians:

> [Wild] turkeys breed in considerable numbers in the [Jemez] mountains … They come down into the canyons in the autumn in large numbers and congregate about the springs, where, it is said, they are slaughtered. There is no doubt that they were formerly more abundant and probably constituted an important article of food of the ancient inhabitants. The Indians long ago domesticated this bird, or at any rate, kept many of them in inclosures [sic]. It is supposed that the birds in captivity were kept for ceremonial purposes, the feathers being used in various rites. This raises some doubt as to whether the captive birds were used also for food.

Harrington's speculation about wild and domesticated turkeys may have been accurate. At LA 4618, turkeys comprise some 58 percent of the assemblage, and two distinct sizes of complete turkey bones are present (Figures 64.6 and 64.7). Interestingly, the smaller bones were recovered from the trash deposits, while the larger bones were found in the kiva and on two room floors. This may support Harrington's contention that wild turkeys were likely used as food (present in the trash at LA 4618), and domesticated turkeys were used for ceremonial purposes (present in ceremonial contexts and room floors at LA 4618), but may also be the result of sexual dimorphism with the larger turkeys representing males and the smaller turkeys representing females. More detailed studies of plateau turkey bones are needed to clarify these issues for Pajaritan subsistence. What is clear, however, is that the residents of the plateau did not ignore a readily available food source in the form of domesticated turkeys during the Coalition period.

Figure 64.6. Distinct sizes of adult femora from LA 4618.

Finally, the wide array of wild plant and animal taxa from a number of ecological areas in Coalition period assemblages indicates efforts to amass food resources were not concentrated in one area. Instead, grasslands, riparian areas, piñon/juniper and oak woodlands, and coniferous areas were all used by inhabitants of the plateau, which maintained a diversified range of dietary resources during the Coalition period. Maintaining diversity in subsistence resources is not only healthier for dietary intake in general, but it also helps to mitigate the effects of crop failure (Minnis 1985). Nonetheless, the increase in both maize and turkey remains during the Coalition period suggest these two species were becoming increasingly more important to the residents of the Pajarito Plateau. Because of the significant increase in the number of people living on the Plateau, places to live and grow food were decreasing. The use of wild animal resources decreased relative to the use of a domesticated resource (e.g., turkey), especially by the Late Coalition period. Among the plant remains, however, while maize was becoming increasingly more ubiquitous in the subsistence assemblages, the use of wild taxa continued to be equally important. Despite these subtle differences among the subsistence classes, however, residents of the plateau placed increasing emphasis on resources that provided more stable and predictable food supplies during the Coalition period.

Figure 64.7. Distinct sizes of adult tibiotarsi from LA 4618.

Late Coalition/Early Classic Period Fieldhouses

Faunal assemblages were analyzed from three Late Coalition/Early Classic period fieldhouses (LA 85404, LA 85861, and LA 127631). A mule deer (*Odocoileus hemionus*) distal metatarsal fragment (right), which was manufactured into a partial fragment of a bone awl, was identified at LA 85404 in the Rendija Tract. Five pieces of bone were identified at LA 85861, which was also located in the Rendija Tract. These included one mule deer (*Odocoileus hemionus*) second phalanx, a leporid (rabbit/hare) molar, and three unidentified mammal long-bone fragments, one of which was an awl fragment. One piece of bone was recovered from LA 127631, a site located in the White Rock Tract. The bone was identified as the distal end of a cottontail (*Sylvilagus* sp.) femur.

Classic Period Fieldhouses

Faunal remains were recovered at 10 Classic period fieldhouses (LA 85408, LA 85411, LA 85413, LA 85414, LA 85867, LA 86605, LA 86606, LA 127627, LA 110126, and LA 135292). All but one of these sites (LA 110126) was located in the Rendija Tract. LA 110126 was located in the TA-74 Tract.

One unidentified piece of medium/large-sized mammal bone was recovered from LA 85408. Four pieces of bone were analyzed from LA 85411 and included one mule deer (*Odocoileus hemionus*) atlas vertebra fragment and three pieces of a recently broken mule deer sacrum. Twelve pieces of bone were analyzed from LA 85413 and included two unidentified pieces of bone on the living surface and two pocket gopher (*Thomomys* sp.) elements (right humerus, left mandible), five mule deer (*Odocoileus hemionus*) bones (three rib fragments, one right calcaneus, and one right astragalus), one small/medium-sized mammal remain, one medium/large-sized mammal remain, and one unidentified piece of bone from the fill. None of these bones were burned.

One piece of bone was analyzed from LA 85414 and was identified as a fragment of the proximal metacarpal of a mule deer (*Odocoileus hemionus*). The bone was identified as a possible awl, but was definitely shaped and polished. The bone was not burned. One piece of bone was analyzed from LA 85867 and was identified as an unburned rib fragment from an elk (*Cervus elaphus*). The bone was probably of modern origin. One piece of bone was recovered from LA 86605 and was identified as a mule deer (*Odocoileus hemionus*) distal right humerus. The bone was unburned. One piece of bone was analyzed from LA 86606 and was identified as a heavily burned medium/large-sized mammal long-bone fragment. Two pieces of bone were analyzed from LA 127627 but were not identifiable to the level of class. One piece of bone was analyzed from LA 135292 and was identified as a very small fragment of cancellous bone. One piece of bone was analyzed from LA 110125 and was not identifiable to the level of class.

Classic Period Grid Garden

Faunal remains were analyzed from one grid garden (LA 21596B) in the White Rock Y Tract. Four pieces of bone were recovered and included two unidentified remains and the proximal and distal ends of a left cottontail (*Sylvilagus* sp.) humerus. None of the bones were burned and were recovered from the surface.

Jicarilla Rock Rings

Faunal remains from two Jicarilla Apache rock rings in the Rendija Tract were analyzed. Four unidentified pieces of bone (FS 11) were recovered from LA 85864. The bones were heavily burned (calcined). Three bones were identified at LA 85869 and included one elk (*Cervus elaphus*) scapula that was recovered from the surface and probably not associated with the Jicarilla use of the site. In addition, two small, unidentified mammal fragments were recovered from inside the rock ring.

Historic Period Homestead

Twenty-seven pieces of bone were recovered during excavations at LA 85407, the Serna Homestead, which was located in the Rendija Tract. The site consists of the remains of a historic log cabin, an horno, a circular rock alignment, a shed, and a corral. Ten bones were recovered in Room 1 of the cabin and included one unfused kangaroo rat (*Dipodomys* sp.) femur, a fragment of a mule deer (*Odocoileus hemionus*) rib, a horn fragment from a domestic cow (*Bos taurus*), a fragment of an elk (*Cervus elaphus*) thoracic vertebra, two medium/large-sized mammal bones (one burned), two large-sized mammal rib fragments that both contained butcher saw marks, one large-sized mammal unidentified burned bone, and one unidentified piece of unburned bone. Four bones were identified in the fill around the cabin and included a complete human premolar, a burned unidentified medium/large-sized mammal bone, an unidentified large-sized mammal bone, and a large-sized mammal rib that contained evidence for butchery from a large saw.

Three bones were identified in the area around the horno, but no bones were recovered directly from the feature fill. Analyzed bones included one medium/large-sized mammal bone fragment and two domestic cow vertebral body fragments. None of the bones were burned, and all contained evidence for old breaks.

Feature 2 was a small, circular rock feature (Figure 12) located approximately 14 m south of the western end of the cabin. One bone was recovered from the circular alignment and it was identified as a fragment of a domestic cow axis vertebra. It was not burned, but did contain evidence for some butchering activities.

Six bones were recovered in the probable shed and included one unidentified bone, one blue grouse axis vertebra (*Dendragapus obscurus*), a domestic goat (*Capra hircus*) cervical vertebra and rib fragment, and a domestic cow distal metatarsal fragment. None of these bones were burned or otherwise altered.

Two bones were identified in the corral. One was an unidentified small/medium-sized mammal bone and one was a medium/large-sized mammal bone fragment.

CONCLUSIONS

Over time, the inhabitants of the Pajarito Plateau were farmers, hunters, and gatherers who used the natural landscape to flourish in an arid to semi-arid environment. Evidence for what the residents of the plateau ate comes from plant and animal remains recovered from recent archaeological excavations. In this summary, analyses conducted on all the bones recovered during the C&T Project excavations were summarized, and the animal remains from five Coalition period roomblocks were highlighted and discussed; plant and pollen remains were also summarized briefly. Before the Coalition period, the hunting of game and the collection of wild resources were the primary subsistence emphases on the Pajarito Plateau (also see Schmidt and Matthews 2005). By the Coalition period, analyses of subsistence remains shows that maize and other domesticates (e.g., beans and squash) became more ubiquitous in the macrofossil record, while turkey remains dominated faunal assemblages. Even though maize farming and turkey procurement were critical components of the diet by the Coalition period, the inhabitants of the Pajarito Plateau never completely eliminated wild resources from their diet.

The excavations at the Coalition period roomblocks, demonstrate that these sites are important for understanding the formation of social identities among the inhabitants of the Pajarito Plateau. During the Coalition period, occupation of the plateau increased dramatically (Vierra 2000). Relative to the earlier Archaic and Developmental periods, there was a substantial increase in the number, size, and distribution of pueblos, substantially decreasing the amount of arable land available to the plateau's inhabitants. The dramatic increase in maize production during the Coalition period did two things for the occupants of the plateau: it increased the production of a stable resource reducing some of the nutritional stresses, but its production also altered the natural landscape and decreased the areas where wild foods were collected.

The LA 4624 (Area G) assemblage was dominated by turkey and large mammal, with fewer rabbits, hares, rodents, and carnivores (Schmidt 2002). The LA 4618 assemblage was dominated by turkey and unidentified large bird remains at almost 90 percent of the assemblage and was followed in importance by leporids (jackrabbits and cottontails) and rodents (Schmidt 2006a). LA 86534 and LA 12587 were dominated by leporids, large mammals, and rodents, and LA 12587 had a considerable amount of turkey remains. The similarity in their assemblage composition suggests a uniform subsistence strategy as the assemblages vary slightly in terms of the relative proportions of taxa, but the same taxa are consistently represented. Maize agriculture likely contributed significantly to the subsistence economy of populations on the plateau, but the hunting and gathering of wild species also continued to be important and to play a significant role.

CHAPTER 65
ANALYSIS OF HUMAN SKELETAL REMAINS FROM LA 12587

Michael A. Schillaci

INTRODUCTION

This chapter describes the results of the analysis of three human burials and miscellaneous human remains recovered from LA 12587 in the White Rock Tract (see Chapter 14, Volume 2). The primary purpose of the analysis was to estimate the age, sex, biological affinity, and stature of the burials and, where possible, the miscellaneous remains. In addition, the analysis was to describe any observed pathological conditions or developmental disorders on the remains. The chapter describes each burial separately. An inventory of the remains associated with each burial is presented in Table 65.1, and cranial and postcranial metric data are presented in Table 65.2.

Table 65.1. Inventory of human remains from LA 12587 by burial number.

Burial #	Bone	Comments
1	Right Humerus	90% complete, fragmentary distal epiphysis
1	Left Humerus	90% complete, fragmentary proximal epiphysis
1	Right Radius	90% complete, 2 large fragments
1	Left Radius	70% complete, 3 fragments, both epiphyses
1	Right Ulna	Complete
1	Left Ulna	Complete
1	Right Clavicle	Both epiphyses missing
1	Right Scapula	40% to 50% complete, 3 fragments, body is largely missing, portions of acromian and coracoids processes are present
1	Left Scapula	50% to 60% complete, 2 fragments, most of body is missing, glenoid fossa and acromian process are missing
1	Ribs	Fragments of 6 right ribs, and 11 unsided fragments
1	Vertebrae	Spinous processes of L1-L3, and 4 thoracic vertebrae, 4 centra fragments from 4 vertebrae, 6 indeterminate fragments
1	Miscellaneous	17 unidentified small bone fragments
2	Cranium	Virtually complete with mandible, nasal conchae are missing
2	Dentition	Left M^3, Right M^1, Left $M_{1,2}$, $P_{3,4}$, lower left C, lower right C, Right $P_{3,4}$
2	Right Femur	Complete
2	Left Femur	85% complete, 3 fragments including both epiphyses
2	Right Tibia	95% complete, 5 fragments, including both epiphyses
2	Left Tibia	60% complete, 18 fragments, including both epiphyses
2	Right Fibula	90% complete, distal epiphysis missing
2	Left Fibula	60% complete, 4 fragments
2	Right Humerus	Complete
2	Left Humerus	Complete, two fragments
2	Right Ulna	Virtually complete, 2 fragments

Burial #	Bone	Comments
2	Left Ulna	Complete
2	Left Radius	Complete
2	Right Os Coxa	Complete
2	Left Os Coxa	Complete
2	Sacrum	Complete
2	Right Scapula	80% complete
2	Left Scapula	70% complete
2	Sternum	Body only
2	Left Clavicle	Complete
2	Right Clavicle	Complete
2	Cervical Vertebrae	C1-C7 largely complete
2	Thoracic Vertebrae	T1-T5 largely complete, T6 is fragmentary, T7-T9 are represented by 12 fragments, T10, T11 are fragmentary, T12 complete
2	Lumbar Vertebrae	L1-L5 complete
2	Ribs	Complete right 1st rib, 8 right rib fragments, largely complete 1st left rib, 16 left rib fragments from 9 ribs; 19 unidentified rib fragments
2	Hyoid	Complete
2	Left Foot	Complete 1st metatarsal, talus, medial cuneiform, intermediate phalanx, 2nd metatarsal, lunate
2	Right Hand	Complete 2nd proximal phalanx, 3rd proximal phalanx, 4th proximal phalanx
2	Left Hand	Complete 4th metacarpal, 5th metacarpal, 1st, 2nd and 4th, or 5th proximal phalanges
2	Hand	2 distal phalanges, 2 intermediate
2	Miscellaneous	3 unidentified bone fragments
3	Cranium	Mandible (2 fragments), relatively complete facial skeleton including much of the frontal bone, maxillae and zygomatics, relatively complete left temporal, 1 fragment of the right parietal, 1 fragment of left parietal, 3 unidentified fragments
3	Dentition	Left: M^3, M^2, M^1, P^3, P^4 C, M_2, P_3, C, I_2; Right: M^3, M^2, P^3, P^4 C, M_3, M_2, M_1, P_4, P_3, C, I_2, I_1
3	Right Humerus	85% complete, distal epiphysis is fragmented
3	Left Humerus	<50 complete, approx. 60% of the diaphysis, 1 fragment of distal epiphysis
3	Left Radius	Complete
3	Right Radius	Complete, 3 fragments
3	Right Ulna	75% complete, 4 fragments
3	Left Ulna	Complete
3	Right Clavicle	80% complete, 2 fragments
3	Sacrum	70% complete

Burial #	Bone	Comments
3	Left Scapula	70% complete, glenoid fossa and much of the acromian process are missing
3	Right Scapula	30% to 40% complete w/ glenoid fossa, 3 fragments
3	Os Coxae	<50% complete, 9 fragments
3	Ribs	2 complete left ribs and 8 left rib fragments; 2 right rib fragments from 2 ribs, 10 unsided rib fragments

Table 65.2. Cranial and postcranial metric data by burial number.

Burial	Element	Measurements	Source[1]
1	Right Humerus	Vertical diameter of head: 38.03 mm	1
1	Left Humerus	Biepicondylar breadth: 53.35 mm	1
1	Right Ulna	Maximum length: 238.5 mm Physiological length: 213 mm	1 1
1	Left Ulna	Maximum length: 240 mm Physiological length: 212 mm	1 1
2	Cranium	Nasion – prosthion: 65.80 mm Nasion – alveolare: 68.23 mm Nasal breadth: 27.9 mm Nasal height: 44.84 mm Orbital breadth (left): 39.30 mm, (right): 41.0 mm Orbital height (left): 34.45 mm, (right): 33.18 mm Biorbital breadth: 101.3 mm Bifrontal breadth: 101.8 mm Interorbital breadth: 24.15 mm Palate breadth (interior): 38.89 mm Palate length (interior): 42.5 mm Maxillo-alveolar breadth: 57.0 mm ** Maxillo-alveolar length: 49.0 mm Foramen magnum length: 30.17 mm Foramen magnum breadth 24.68 mm Bizygomatic breadth: 131.5 mm Cranial length: 168.5 mm Cranial breadth: 145 mm Minimum frontal breadth: 94 mm Biauricular breadth: 119 mm Basion – nasion: 97.0 mm Basion – prosthion: 98.0 mm **	1 2 1 2 1 1 1 1 1 2 2 1 1 1 1 1 1 1 1 1 1 1
2	Right Humerus	Maximum length: 258.3 mm Minimum diameter at midshaft (50%): 16.28 mm Maximum diameter at midshaft (50%): 22.69 mm Biepicondylar breadth: 51.90 mm Vertical diameter of head: 36.66 mm	1 1 1 1 1
2	Left Humerus	Maximum length: 254 mm Minimum diameter at midshaft (50%): 16.97 mm	1 1

Burial	Element	Measurements	Source[1]
		Maximum diameter at midshaft (50%): 22.71 mm Biepicondylar breadth: 51.45 mm Vertical diameter of head: 35.47 mm	1 1 1
2	Left Ulna	Maximum length: 213 mm Physiological length: 181.5 mm	1 1
2	Left Radius	Maximum length: 195 mm	1
	Right femur	Maximum length: 358.4 mm Bicondylar length: 356.6 mm Maximum diameter of head: 38.1 mm Maximum diameter at midshaft (50%): 26.94 mm Minimum diameter at midshaft (50%): 21.96 mm AP diameter at midshaft (50%): 26.68 mm ML diameter at midshaft (50%): 26.6 mm Diameter of femoral neck: 24.01 mm	1 1 1 1 1
2	Left Femur	Maximum diameter of head: 37.43 mm	1
2	Right Clavicle	Length: 126.7 mm Minimum diameter at midshaft (50%): 8.98 mm Maximum diameter at midshaft (50%): 10.26 mm	1
2	Left Clavicle	Length: 126.5 mm Minimum diameter at midshaft (50%): 8.31 mm Maximum diameter at midshaft (50%): 10.45 mm	1
2	Left Scapula	Height of glenoid fossa: 32.34 mm	2
2	Right Scapula	Height of glenoid fossa: 32.61 mm	2
2	Sacrum	Maximum anterior height: 100.49 mm Breadth: 116.1 mm	1 1
3	Cranium	Nasion – prosthion: 65.63 mm Nasion – alveolare: 66.288 mm Nasal breadth: 25.79 mm Nasal height: 46.78 mm Orbital breadth (left): 35.83 mm, (right): 36.8 mm Orbital height (left): 34.19 mm, (right): 34.16 mm Biorbital breadth: 97.97 mm Bifrontal breadth: 96.91 mm Interorbital breadth: 26.15 mm Palate breadth (interior): 43.38 mm Palate length (interior): 44.04 mm Maxillo-alveolar breadth: 65.0 mm Maxillo-alveolar length: 48.0 mm Height of mandibular symphysis: 32.60 mm	1 2 1 2 1 1 1 1 1 2 2 1 1 1
3	Right Humerus	Maximum length: 284.5 mm Vertical diameter of head: 38.33 Maximum diameter at midshaft (50%): 22.45 mm Minimum diameter at midshaft (50%): 15.25 mm	1 1 1 1
3	Left Ulna	Maximum length: 236.2 mm	1
3	Sacrum	Height: 99.18 mm	1

1, Buikstra and Ubelaker (1994); 2, Bass (1995). ** estimated measurement

BURIALS

Burial 1 Mortuary Context

Burial 1 represents the partial disarticulated remains of a possible adult female. The position and orientation of this burial was disturbed during initial excavation by a backhoe. The burial was excavated at an unknown depth from fill containing both ceramic and lithic artifacts. Although the context of this burial was disturbed, a number of artifacts found in direct association with the skeletal remains likely represent burial items. These items include three pieces of ground stone (one of which exhibited red paint), several cores or core fragments, an obsidian biface fragment, one obsidian drill, five projectile points, one bone bead, 30 to 40 ceramic sherds—likely from a single Black-on-white vessel—and one small piece of shell.

Estimated Age

Due to the lack of craniodental remains and a missing pelvis, an accurate estimate of age is not possible for this skeleton. But, all epiphyses of the postcranial skeleton were fused indicating this individual was likely an adult. In addition, four vertebral body fragments from four vertebrae showed moderate to severe osteophytosis. In my experience, this level of vertebral osteophytosis is not observed until at least the third decade of life. As such, this individual was almost certainly older than 30 years at the time of death.

Estimated Sex

Unfortunately, the pelvis and cranium of this individual, which are the most reliable aspects of skeletal anatomy for estimating sex based on morphology, were missing. Use of the vertical diameter of the right humeral head (38.03 mm) to determine sex yields an estimate of female (see Stewart's [1979] method derived from the present-day population).

Biological Affinity

Due to the lack of craniodental remains it is not possible to estimate biological affinity accurately using morphology. But, the archaeological context of the remains, as well as the condition of the recovered skeletal elements, suggest strongly that this individual was a prehistoric Native American.

Estimated Stature

The only complete long bones available for estimating stature are the left and right ulnae. Unfortunately, there are not any regression formulas published for Native American, or even "Mongoloid" females. Because regression models used for estimating stature are population specific, stature could not be estimated for Burial 1 based on the available remains.

Pathological Conditions and Developmental Disorders

The right ulna exhibited a broken styloid process with associated bone remodeling on its distal epiphysis, suggesting a healed broken wrist. Degenerative osteoarthritis evidenced by osteophytosis was noted for the glenoid fossa of the left scapula, proximal left ulna, and for four vertebral bodies. One of these bodies had collapsed. Osteopinia may be indicated for both humeri. Both distal humeri exhibited septal apertures. Several enthesiopathies were noted on the distal ends of the right and left radius.

Comments

Both the humeri and radius exhibited moderately rugose muscle markings, often associated with increased or intense limb use (see Weiss 2003).

Burial 2 Mortuary Context

Burial 2 represents the partial semi-articulated remains of an adult female. The position and orientation of this primary burial were partially disturbed during initial excavation by a backhoe. The head of this individual was pointed to the southwest. Interment of this individual seems to have occurred within a bedrock niche, which might have been covered or capped with a piece of bedrock. Partial disturbance due to the initial excavation by the backhoe, however, makes this determination tentative. A number of burial items accompanied this burial, including four pieces of ground stone, three round stones, 20 black-on-white ceramic vessel sherds, one bone pendant, one chert projectile point, and one obsidian biface fragment.

Estimated Age

The age of this individual was estimated by assessing the morphological changes to the pubic symphysis and the auricular surface of the pelvis. In addition, the degree of closure for cranial sutures was used as a secondary method.

The age estimates of this individual based on the pubic symphysis ranged from 45 to 50+ years (Todd Method, Phase 9-10, right and left) to a mean estimate of 58 years (Suchey-Brooks Phase 6, right and left) (see Buikstra and Ubelaker 1994). The estimated age at death based on the auricular surface ranged from 45 to 59 (right surface, Phase 6-7 in Buikstra and Ubelaker 1994 after Lovejoy et al. 1985 and Meindl and Lovejoy 1989), and 50 to 59 years (left surface). The age estimates based on cranial sutures were similar (i.e., cranial vault score = S6, mean age 51; lateral-anterior score = S6, mean age 52 years; Buikstra and Ubelaker [1994:38]).

When all methods are considered, a range estimate of 45 to 59 years and a point estimate of 51 years is indicated.

Estimated Sex

The sex of this individual was estimated by assessing the morphology of the pelvis and cranium using the standardized protocol outlined in Buikstra and Ubelaker (1994) (Table 65.3). The estimated sex of this individual based on pelvis morphology is female. The morphology of the cranium, however, is indeterminate with respect to sex. The vertical head diameters of the humeri (right = 36.66 mm, left = 35.47 mm) support the estimate of female (see Stewart 1979). The chin of this individual was rounded, which is considered a female trait.

Table 65.3. Sex estimate scores based on morphological attributes.

Morphological Attribute	Sex Estimate Score
Pelvis (Female 1, Male 5)	
Ventral Arc	1
Subpubic Concavity	1
Ischiopubic Ramus Ridge	2
Greater Sciatic Notch	2
Preauricular Sulcus	1
Cranium (Female 1, Male 5)	
Prominance of Glabella	2
Mental Eminence	3
Mastoid Process	3
Supra-orbital Margin	3
Nuchal Crest	4

[1]attributes described in Buikstra and Ubelaker (1994)

Biological Affinity

Based on the archaeological context of the burial, the biological affiliation of this individual is Native American. Also, the cranium of this individual exhibits occipital deformation or “cradle-boarding,” which is a cultural modification typically seen in post AD 700 Pueblo Indian remains. The presence of shovel-shaped incisors, often used to identify Native American remains, was not determined based on the lack of anterior teeth recovered.

Estimated Stature

Based on the maximum length of the right femur (35.84 cm), the estimated stature of this female was only 4 foot, 8.1 inches (142.7 cm) using the regression formula presented by Genoves (1967) derived from a Mesoamerican population. Based on the maximum length of the humerus (25.4 cm), the estimated stature for this individual is approximately 4 foot, 8.3 inches (143 cm) based on Trotter and Gleser (1952) regression formula for American “white” females.

Pathological Conditions and Developmental Disorders

The pelvis of this individual was asymmetrical. When the os coxae are held together with the sacrum and viewed ventrally, the entire pelvis is shifted to the right. In addition to this asymmetry, there are several other pathological conditions observed on the pelvis. First, the auricular surface exhibits osteophytosis, perhaps indicative of arthritis at the sacroiliac joint. There was also a small lytic lesion of unknown etiology observed on the auricular surface of the left sacral ala, associated with what appears to be minor sclerotic bone formation on the auricular surface of the ilium. In addition there is a small dished-out lesion in the anterior margin of the left sacroiliac joint. The bone surface of this lesion is smooth and resorbed and seems to be the result of a space-occupying mass. Based on the bone resorption, this lesion is likely not a result of cancer (see Hershkovitz et al. 1998). It is unclear whether the two lesions on the pelvis are related.

The lumber vertebrae exhibited moderate osteophytosis along the anterior margins of the vertebral bodies. Osteophytosis was also observed for the left diarthroidal surface between the fifth lumbar and first sacral elements. The fragmentary sixth thoracic vertebra exhibits a collapsed body with an associated central fistula. Eburnation on the medial condyles of the femora and tibiae, and osteophytic lipping along the margins of the articular surfaces of the knee joint, suggest this individual suffered from severe osteoarthritis. Possible ligament damage is suggested for both knees by several ossified ligament insertions. Minor osteophytosis indicative of degenerative osteoarthritis was observed on the margins of the glenoid fossa of both the left and right scapulas. It is possible that the pelvis asymmetry, arthritic knees, and collapsed vertebra are related conditions. In any event, it seems quite likely that this individual experienced daily pain and discomfort, as well as reduced mobility.

Antemortem tooth loss resulted in significant maxillary alveolar bone loss for this individual. Only the upper left third molar and upper right first molar remain in the upper dentary. Dental carries were observed on the lower left third premolar and the lower left first molar, both near the cervical-enamel juncture. Several alveolar fistulae, likely the result of periodontal abscesses, were observed. The first abscess was observed above the upper right first molar, while the second was observed near the upper right second incisor (missing antemortem).

Comments

Occlusal wear is severe (dentin exposed for >75% of surface) for the lower dentition. Minor calculus was observed on the lingual surface of the lower dentition. The right and left humerus exhibited moderately rugose muscle markings. The body of the sternum exhibits an abnormal curvature, possibly due to postmortem processes.

Burial 3 Mortuary Context

Burial 3 represents the partial semi-articulated remains of an adult female. Although this burial appears to have been a primary burial in a formal grave that was likely covered with tuff blocks, the exact context of the interment is not identifiable due to disturbance by the initial excavation by a backhoe. Despite this disturbance, it was determined that this individual was interred with her head oriented to the east and facing north. The interment occurred within the cultural fill containing a small number of lithic and ceramic artifacts and a few pieces of ground stone and animal bone. No formal burial items or grave offerings were recovered.

Estimated Age

The age of this individual was estimated by assessing the degree of closure for cranial sutures as well as the pattern of dental eruption and occlusal wear. The composite score for cranial vault suture closure was zero, which precludes age estimation. This score does, however suggest this individual was likely younger than 30 (see Buikstra and Ubelaker 1994:38). The third molars of this individual had erupted and were in occlusion at the time of death indicating an age of greater than 20 years was likely. Based on my experience, the observed minimal occlusal wear on the third molars is consistent with an age of less than 30 years. The estimated age range for this individual, therefore, is 20 to 30 years, with a midpoint estimate of 25 years.

Estimated Sex

The sex of this individual was estimated using the morphological attributes of the pelvis and the cranium (see Buikstra and Ubelaker, 1994). Of the attributes on the pelvis typically used for estimating sex, only the greater sciatic notch and the preauricular surface were available. The score of the greater sciatic notch indicates this individual was likely female, while the score for the preauricular sulcas suggest the sex of this individual is indeterminate (Table 65.4). The average scores for the pelvis and the cranium were both 2.5, suggesting this individual was probably female. Similar to burials 1 and 2, the vertical head diameter of the right humerus (38.33 mm) supports the estimate of female for this individual (see Stewart 1979).

Table 65.4. Sex estimate scores based on morphological attributes for Burial 3[1].

Morphological Attribute	Sex Estimate Score
Pelvis (Female 1, Male 5)	
Greater Sciatic Notch	2
Preauricular Sulcus	3
Cranium (Female 1, Male 5)	
Prominance of Glabella	3
Mental Eminence	3
Mastoid Process	2
Supra-orbital Margin	2
Nuchal Crest	N/A

[1]attributes described in Buikstra and Ubelaker (1994). N/A = not available

Biological Affinity

Minor shoveling of the incisors suggests this individual was Native American. This assessment is supported by the archaeological context of the burial. Unfortunately, the cranium was fragmentary and distorted postmortem, thus precluding identification of cranial deformation.

Pathological Conditions and Developmental Disorders

There appears to have been some lytic erosion of the anterior nasal spine that is accompanied by reactive bone. This pathological condition is only slight however, and is of unknown etiology. There was a small enthesiopathy observed near the right maxillary foramen. There appears to have been a congenital agenesis of the lower left central incisor and possibly the lower left third molar. There is less than expected wear on the first and second molars and the wear gradient across these two molars is minimal. Occlusal carries were observed on the lower right and upper left third molars. The sacrum exhibited minor clefting at S5 and S4 (see Barnes 1991 for discussion). Minor osteophytosis was observed on the anterior margin of the auricular surface of the sacrum.

Comments

There appears to have been some post-depositional distortion or compression of the cranial vault. The endocranial surface exhibits erosion and distortion, presumably the result of post-depositional factors. The incisors show minor to moderate wear (see Smith's stage 4 in Buikstra and Ubelaker [1994:52, Figure 25]). The right humerus exhibits a septal aperture. Moderately rugose muscle markings were observed on the right humerus.

MISCELLANEOUS HUMAN REMAINS

Most of the miscellaneous remains described in Table 65.5 likely came from Burial 1, Burial 2, or Burial 3 based on the elements, primarily pedal, present and the estimated sex of at least one of these elements. One infant rib found with Burial 1 represents a fourth individual.

Table 65.5. Miscellaneous human remains from LA 12587 by FS number and provenience.

Site	FS	Provenience	Description
LA 12587	673	103N/109E, Strat 6, Level 3	Adult right capitate
LA 12587	787	105.59N/109.33E, Strat 17, Level 4	Adult right intermediate pedal phalanx
LA 12587	1059	102N/109E, Strat 14, Level 6	Adult intermediate hand phalanx
LA 12587	1208	105N/107E, Strat 42, Level 4	Adult right talus (length 47.54), a length of 52 mm indicates this talus likely came from a female
LA 12587	1373	103.12N/107.43E, Strat 68, Level 2	Fragment of adult left distal humerus
LA 12587	1469	104N/110E, Strat 73, Level 2	Adult right cuneiform
LA 12587	1487	103N/111E, Strat 85, Level 2	Adult intermediate hand phalanx
LA 12587	1515	106.16N/110.90E, Strat 86, Level 2	Adult right intermediate pedal phalanx
LA 12587	1941	104.52N/111.22E, Strat 10, Level 2	Adult right 2nd metatarsal
LA 12587	2319	103.30N/109.21E, Strat 10,	Adult right 1st metatarsal

Site	FS	Provenience	Description
		Level 6	
LA 12587	2323	103.19N/109.67E, Strat 10, Level 6	Adult right rib fragment, 2 unidentified rib fragments
LA 12587	2523	110N/123E, Strat 10, Level 2	Adult right 1st pedal phalanx
LA 12587	4178	112N/115E, Trench 3	Adult right rib fragment
LA 12587	1242	101N/108E, Strat 59, Level 3	Fragment of adult left humerus
LA 12587		Bagged with Burial 1	Fragment of infant rib

CHAPTER 66
ARCHAEOMAGNETIC DATING FINAL REPORT

Eric Blinman, J. Royce Cox, and Gary Hein

INTRODUCTION

The duration and extent of archaeological investigations associated with the Los Alamos National Laboratory's Land Conveyance and Transfer (C&T) Project provide a valuable opportunity to both apply and evaluate the effectiveness of archaeomagnetic dating. At the start of the C&T Project in 2002, the Museum of New Mexico's Archaeomagnetic Dating Laboratory (ADL) prepared a background study of archaeomagnetic dating in the northern Rio Grande Valley (Chapter 9, Volume 1). That study describes the history, theory, and practice of archaeomagnetic dating as relevant to the Pajarito Plateau and the C&T Project. The study also uses archaeomagnetic sample results provided by Dr. Robert DuBois to assess the effectiveness of two of the three prevailing archaeomagnetic calibration curves for date interpretations (Figure 66.1): SWCV2000 (Lengyel and Eighmy 2002) and the Wolfman Curve (Cox and Blinman 1999). The DuBois Curve (DuBois 1989) was constructed interactively with the DuBois data and was not assessed as part of the background study. The dating curves have different strengths and weaknesses in terms of describing the movement of the virtual geomagnetic pole (VGP) through time and supporting date range interpretations from sample results. Following up on this assessment, our focus on archaeomagnetic dating here includes an explicit curve evaluation component as well as simply inferring and reporting dates.

Over the four years of the C&T Project fieldwork, ADL staff and volunteers collected and analyzed 27 sets of archaeomagnetic specimens from 10 excavated sites. An experimental sampling technique was applied in one case, and experimental substrates were sampled in two cases. Since fine-grained chronology was a goal of the C&T Project, multiple sets of specimens were collected from features wherever possible. Results from associated radiocarbon and ceramic date estimates provide independent means of assessing both the accuracy of the archaeomagnetic dates and the effectiveness of the VGP dating curves. Luminescence dating techniques (thermoluminescence, optically stimulated luminescence, and infrared stimulated luminescence) and obsidian hydration were also applied to C&T Project contexts (Chapter 69, this volume), but those results are sufficiently equivocal that they are inadequate for assessment purposes.

This chapter is divided into five sections. The first is a brief recapitulation of the foundations and practice of archaeomagnetic dating. The second is an overview of archaeomagnetic sampling at the C&T Project sites with a discussion of substrate qualities and experimental sampling techniques. The third section is a summary of the C&T Project archaeomagnetic dating results and interpretations on a site-by-site basis. The fourth section evaluates the C&T Project archaeomagnetic chronology as compared with the results from other sites in the northern Rio Grande region. The final section reviews the nature and effectiveness of the archaeomagnetic calibration curves in terms of both describing the VGP path and supporting both the accuracy and precision of date range estimates.

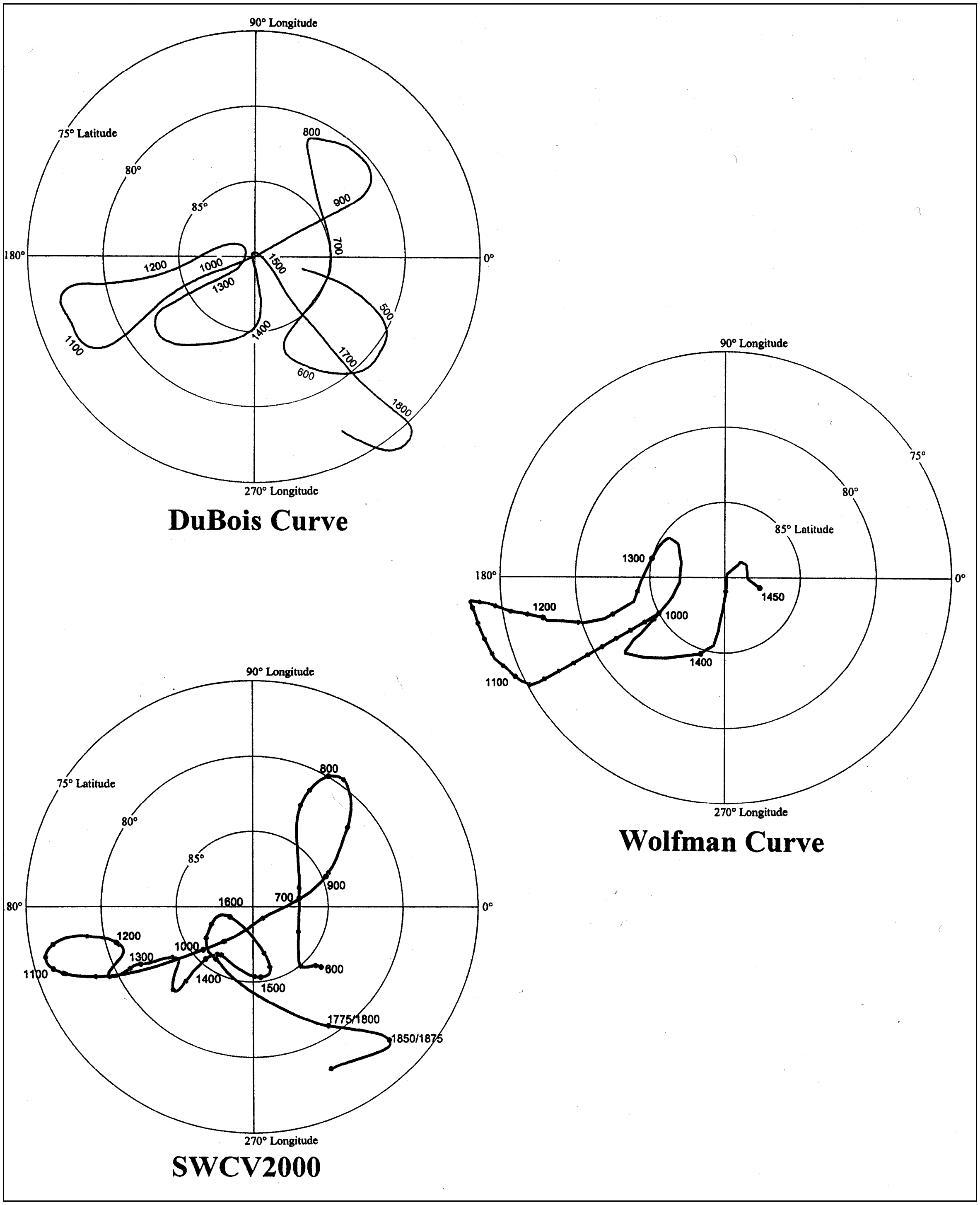


Figure 66.1. Three archaeomagnetic dating curves are used to interpret date ranges from archaeomagnetic set results in the Southwestern United States. These include the DuBois curve (DuBois 1989), the Wolfman Curve (Cox and Blinman 1999), and SWCV2000 (Lengyel and Eighmy 2002).

ARCHAEOMAGNETIC DATING

Archaeomagnetic dating derives from the acquisition of a magnetic moment (direction and strength) by susceptible minerals when they are heated and cooled (see Chapter 9, Volume 1 for additional discussions of archaeomagnetism; more complete treatments are in Sternberg 1990 and Wolfman 1984). Magnetic orientations of susceptible minerals are aligned with the earth's prevailing magnetic field upon cooling (thermal remanent magnetism or TRM), and those alignments generally persist until the material is again heated to the original or a higher temperature. Since the earth's magnetic field is constantly changing, heated earths retain a record of the past apparent or VGP position at the time of cooling. Pole positions from heated archaeological earths can be compared with the regional calibration of VGP movement through time, and the position of the sample VGP along the calibration curve can be interpreted as a date range. Successful archaeomagnetic dating requires appropriate earthen materials, fires sufficiently hot to create an alignment, recovery of carefully aligned specimens from the burned archaeological feature, laboratory measurement of the specimens to determine a mean pole position or VGP and its error term for the specimen set, and interpretation of a date range from the juxtaposition of the error ellipse of the set result and a calibration curve.

Although archaeomagnetic dating is often characterized as an "absolute dating technique," this belies uncertainties in calibration curves, measurement results, and a host of potentially confounding variables. The latter include other magnetic alignments that are acquired independently of the TRM and that influence the VGP of the sample. Some of these non-TRM alignments can be removed by progressive demagnetization that effectively removes or erases weakly held orientations. Some results appear to be uncontaminated, and the best approximation of the TRM. VGP is at the natural remanent magnetism (NRM) of the set. In other cases, progressive demagnetization "improves" the result by removing confounding magnetic moments. In these cases a "best" result is chosen from a number of alternatives based on the movement of the set VGP and changes in the magnitude of the error term of the result through the demagnetization sequence. If a result is improved by demagnetization, the intensity of the selected demagnetization level is report in Oersteds (Oe).

An archaeomagnetic dating result is expressed as a VGP centerpoint and a surrounding error ellipse. The centerpoint is the mean of the orientations of the individual specimens. An error ellipse is defined by the dispersion of the individual specimen orientations around the set mean. The error is visualized as a cone whose tip is at the location of the archaeological feature, whose axis points to the VGP centerpoint, and whose spread or dispersion is expressed in degrees. The spread (α_{95}) describes the area within which the mean centerpoint can be expected to fall 95 percent of the time assuming that the specimen orientations are representative of the orientation of the feature as a whole. The ellipse represents the cone's intersection with the earth's surface at the geographic pole. As error terms become larger, VGP locations are less precisely known and the date range interpretations become larger and less useful. Large α_{95} values also imply that the TRM contribution to a sample's magnetic orientation may be weakly expressed compared with other sources of magnetic orientations within the material. α_{95} values of less than 1° are excellent and imply a strong TRM that should be relevant for dating purposes. α_{95} values of more than 4º are imprecise and raise the possibility that the magnetic moment is less exclusively relevant to the TRM of the heating event that is of archaeological interest.

VGP calibration curves are approximations built up by the analysis of many independently dated samples (see Daly and Le Goff 1996; Lengyel and Eighmy 2002; Sternberg and McGuire 1990b). VGP curves have both a path that traces the past movement of the pole and the calibration of the path to the calendric time scale. Since the independently dated VGPs are both estimated with error and calibrated with error, VGP calibration curves are periodically redefined and improved as more data become available (such as Eighmy and Klein 1988, 1990; Hathaway et al. 1983; LaBelle and Eighmy 1995; Sternberg and McGuire 1990a). The need for improvement is revealed by failures of the curves to deal effectively with new sample results or systematic disagreements between a curve's calibration and new independently dated results (such as Cox and Blinman 1999; Lengyel and Eighmy 2002). The pole position and error term of an archaeomagnetic dating result is fixed, while the dating implications of that result will vary with the curve used to interpret the date range.

Three curves are currently in use for date estimation in the greater Southwest (see Figure 66.1). Each curve has strengths and weaknesses, and date estimates for the C&T Project results are interpreted using the Wolfman Curve (Cox and Blinman 1999), the SWCV2000 (Lengyel and Eighmy 2002), and occasionally the DuBois Curve (DuBois 1989). We believe that date ranges for the AD 1000–1450 period are more accurate if interpreted using the Wolfman Curve (see Chapter 9, Volume 1 and the discussion later in this chapter), but the SWCV2000 dates are reported for comparison. Although not relevant for the C&T Project results, we believe that dates interpreted for the AD 650–1000 period using the SWCV2000 are accurate (although precision can be improved; Cox and Blinman 1999). The DuBois Curve provides the only basis for date interpretations in the AD 400–650 period, while both the SWCV2000 and DuBois curves can be used to interpret post-AD 1450 date ranges.

The interaction between an error ellipse and the VGP calibration curve determines the estimated date range(s) for a sample result. Since dating curves are approximations and centerpoints are measured with error, few centerpoints should be expected to fall on the curve. To the extent that curve paths are accurate and that VGPs express the TRM exclusively, error ellipses should overlap the curve path. However, neither assumption can be made with absolute confidence. The most common dating convention is to assume that every curve segment that is intersected by or is immediately adjacent to an error ellipse is potentially relevant to the date interpretation of that result. Depending on location and error size, an ellipse can intersect multiple curve segments, each of which could support a valid date interpretation (although only one is correct). To estimate a date range that reflects the precision or imprecision of the VGP estimate, the oval is moved as if the centerpoint were replotted to coincide with the nearest point on each curve segment in turn. The points of intersection between the ellipse and each curve segment determine the early and late end points of the date range interpretations (rounded to the nearest five-year point outside of the ellipse).

There can be one, two, three, or even four possible date range interpretations for any individual result within the past 2000 years of polar movement. If VGP movement were known with precision for the past 10,000 years, there would be many more possible date interpretations since the wandering of the pole in the past millennia is confined to the high northern latitudes. Since only one range is actually relevant to the archaeological event that produced the TRM, independent information must be used by the archaeologist to determine which archaeomagnetic date range is appropriate. Archaeomagnetic date interpretations are thus most useful where there are multiple sources of chronology that can help focus attention on a particular date range as relevant.

C&T PROJECT SUBSTRATES AND SAMPLING TECHNIQUES

The Ancestral Puebloan architecture of the Pajarito Plateau incorporates wall, floor, and feature plasters that are rich in volcanic ash and volcanic ash-derived clays. These plasters appear to harden (sinter) at relatively low burn temperatures, resulting in a light but crisp consolidated material that does not soften or deform significantly when wet. Only a minority of the ostensibly burned examples was oxidized pink, brown, or red, and the vast majority of these plasters was buff to white in color. The hardness and texture of the plasters were the principal indications that they were burned. Hearth linings and burned room floors and plasters were preserved as indurated rinds up to several cm thick, resting on either unconsolidated earth or occasionally against rock (often rhyolite, basalt, or shaped blocks of tuff). The linings were often broken into fragments by earth pressure or tree roots, but individual fragments could be up to 200 square cm in area. Most of the architectural plasters in the C&T Project sites appear to have been carefully selected by the site builders or perhaps blended of clay and volcanic ash rather than simply consisting of subsoil from the site location.

Although generally lacking the reddish hues usually associated with good archaeomagnetic dating material, the indurated quality of hearth linings, burned floors, and burned walls encouraged our initial sampling efforts. The plasters cut relatively easily with carbide-edged saw blades, and only a few of the plasters contained pebbly material that either constrained specimen preparation or could pose problems in sample measurement. The greatest challenges were the need to sample vertical surfaces and the presence of soft or incoherent substrates underneath many of the plaster layers. A full-depth cut to accommodate normal archaeomagnetic mold placement often would have severed the specimens from any rigid support, and mold placement and leveling would have risked compromising the orientation of the specimen before casting. In order to maintain orientations through casting, many specimen cuts were kept shallow, and these specimens were broken free, trimmed, and “pushed” deeper into their molds after their initial plaster encasement had cured and their mold orientations had been taken. Pushing a specimen risks slightly distorting the inclination of the specimen within the mold, but over multiple specimens the distortion should be “random” and should affect precision rather than the accuracy of subsequent archaeomagnetic measurements.

A second problem was that plaster fragments had to be assessed for post-burning tilting due to root pressure or slumping before sampling. Any post-burning movement would result in systematic misalignment of all specimens taken from a fragment, resulting in a precise but inaccurate VGP location estimate. Sampling strategies included collecting specimens from fragments with a low risk of fragment tilt, and efforts were made to distribute specimens across multiple fragments wherever possible. In a few cases, the quality and quantity of the material allowed the collection of multiple full sets from different portions of features, addressing the question of any distortion through redundancy.

The decision to aggressively collect non-reddened plaster samples was validated by subsequent measurement results. Of the 17 samples collected from crisp plasters, 16 (94 percent) had interpretably precise error terms ($\alpha_{95} \leq 4.0°$). Of the 10 samples collected from other burned materials, only six had such precise error terms. In addition to a high proportion of interpretable results, the median precision for the plaster samples was excellent. The mean error term was 1.6º and the median was 1.3º. The quality associated with these ash plasters compares with mean and median α_{95} values of 6.0º and 3.2º for the ADL sample data file as a whole (*n* = 933). Most sets had very strong magnetic moments of 1 by 10^{-3} Oe or higher and four had moments of 1 by 10^{-2} Oe and higher. These moments are 10 to 100 times stronger than the majority of archaeomagnetic dating sets measured by the ADL. Given the variety of problems that could act to lower the precision of measurements based on these sets of specimens, the volcanic ash-rich substrate is an excellent material for the preservation of TRM vectors.

Some hearth features were constructed by using rocks set in small amounts of volcanic-ash-rich mortar. Most narrow mortar joints could not be sampled, and two sets of rock lining samples were collected to see if either tuff or rhyolite acquired TRM vectors related to the use of the fire hearth. In both cases, the rocks should have had an original magnetic orientation from the time of rock formation. Archaeomagnetic dating would only be possible if that orientation had been reset to the prevailing earth's magnetic field by the intensity of the hearth fire. Five specimens were cut from a tuff block that formed one side of a hearth (1209b), while six specimens were cut from plaster fragments elsewhere around the same hearth (1209a) (Table 66.1). The tuff specimens were imprecise (α_{95} = 24.5º) with extremely aberrant mean inclination and declination. The fire had not been hot enough to reset the TRM vectors in the sampled surface (<1 cm) of the tuff block. The specimen VGPs reflected, albeit weakly, the original magnetic orientation established when the tuff was formed.

Another hearth (sample 1307) was defined by burned sediments that were so loose and unconsolidated that they could not be sampled. One side of the hearth was lined by a rhyolite cobble that was too hard for archaeomagnetic field sampling tools. An experimental sampling technique was attempted in which "empty" plaster cubes were custom cut to fit an accessible burned surface of the cobble. Four plaster cubes were glued to the cobble face with quick-setting epoxy resin, and an edge of each cube was leveled as the epoxy cured to create an orientation axis. The orientation of the axis (strike) and the dip of the adjacent cube face were measured for each cube before removal of the cobble from the feature. A water-cooled diamond saw was used to isolate and trim the rhyolite glued to each cube, attempting to retain as much of the burned surface as possible while removing deeper unburned portions of the cobble. Once the trimming was complete, the circa 0.5-cm-thick specimen was placed in a brass mold using the faces of the adhering plaster cube for orientation (much like a "pushed" sample described above). Plaster was poured into the mold to complete the cube, and the cured specimens were subsequently measured using the strike and dip orientations.

Table 66.1. C&T Project archaeomagnetic set results.

Set	Site (LA)	Feature	Inc. (º)	Dec. (º)	VGP Lat. (º)	VGP Long. (º)	α_{95} (º)	δ_p	δ_m	N	De-mag level (Oe)	AM Date ranges (AD) Wolfman or *DuBois*	AM Date ranges (AD) SWCV2000	Collect-ed by
1202	86534	Room 1, Hearth 4, upper lining	59.485	345.510	77.785	189.345	1.773	1.999	2.663	8/8	100	1170–1230	1110–1200	EB/JK
1203	86534	Room 1, Hearth 4, lower lining	64.235	346.633	75.734	213.077	3.718	4.745	5.940	8/7	150	1035–1140 1065–1265	1000–1390 1010–1315	JK
1204	86534	Room 2, Hearth 2	55.354	349.603	81.580	166.844	0.644	0.654	0.918	8/7	300	1280–1300	1175–1230	EB/GH
1205	86534	Room 5, Hearth 5	59.229	352.486	82.776	200.955	1.097	1.229	1.642	8/8	150	1005–1035 1235–1270	1265–1325	EB
1206	86534	Kiva 9, Hearth 16	59.994	350.941	81.319	201.676	1.038	1.186	1.569	8/8	100	1020–1050 1220–1255	1185–1240 1250–1315	EB
1209a	12587	Room 4/5, Hearth 1, lining	62.695	348.952	78.192	211.502	3.611	4.426	5.654	6/6	NRM	1015–1130 1160–1275 1335–1410	1005–1375	EB
1209b	12587	Room 4/5, Hearth 1, tuff block	80.198	268.175	33.012	230.870	24.505	45.090	47.009	5/5	NRM	NA	NA	EB/DT
1210	12587	Room 2, Hearth 4	57.155	357.500	87.218	208.491	2.347	2.493	3.421	8/8	50	925–1015 1245–1310 1315–1355	925–1015 1275–1425 1370–1510 1550–1700	EB/JN
1211	12587	Room 7, Hearth 6, upper west inner lining	59.728	352.129	82.203	203.731	4.359	4.946	6.567	7/7	50	Imprecise	Imprecise	EB
1212	12587	Room 7, Hearth 6, upper north inner lining	57.620	356.172	86.098	203.398	2.669	2.869	3.913	5/4*	50	930–1025 1235–1305 1315–1360	925–1015 1260–1465	EB
1213	12587	Room 7, Hearth 6, lower west	53.367	355.115	85.562	139.723	10.910	10.551	15.173	8/7	NRM	Imprecise	Imprecise	EB

Set	**Site (LA)**	**Feature**	**Inc. (º)**	**Dec. (º)**	**VGP Lat. (º)**	**VGP Long. (º)**	**α_{95} (º)**	**δ_p**	**δ_m**	**N**	**De-mag level (Oe)**	**AM Date ranges (AD)**		**Collect-ed by**
												Wolfman or *DuBois*	**SWCV2000**	
		inner lining												
1214	12587	Room 2, Hearth 20, west wall	58.761	345.034	77.614	185.500	0.613	0.678	0.912	10/8	100	1185–1205	1145–1170	EB
1215	12587	Room 2, Hearth 20, base lining	58.508	344.952	77.609	184.163	1.343	1.477	1.992	5/5	50	1175–1220	1125–1185	EB
1226	135290	Room 6, Floor 3	59.205	344.366	77.023	186.909	1.082	1.212	1.620	8/8	100	1170–1210	1125–1175	GH
1227	135290	Room 4, Floor 2	59.965	344.272	76.727	190.478	0.724	0.826	1.094	7/7	200	1180–1205	1125–1165	JC
1228	135290	Room 6, West wall	61.241	346.691	77.843	199.830	1.284	1.515	1.972	6/6	100	1185–1230	1020–1110 1225–1290	GH
1229	135290	Room 2, Hearth 11	61.694	351.335	80.328	212.656	2.304	2.752	3.561	7/7	50	1010–1075 1195–1275 1340–1395	1005–1045 1175–1325 1250–1410	JC
1230	135290	Room 8, Hearth 9	61.077	348.250	78.946	201.790	1.269	1.491	1.946	8/7	50	1195–1240 1035–1070	1015–1050 1230–1285	JC
1231	135290	Room 2, Hearth 16 (below and to the east of Hearth 11)	60.768	342.854	75.432	192.809	1.717	2.001	2.621	8/7	200	1105–1150 1155–1210	1035–1165	JC
1232	135290	Room 4, Floor 3	58.199	347.760	79.830	184.559	2.391	2.609	3.532	7/6	100	1180–1260	1130–1305	GH
1233	99396	Structure 2, Hearth 7	60.694	348.182	79.14	199.488	2.545	2.961	3.882	8/8	300	1020–1085 1175–1260	1010–1125 1155–1320	JC
1234	85864	Tipi ring, Hearth	63.556	7.603	79.121	283.368	3.063	3.841	4.851	7/7	NRM	*1600–1820* *1730–present*	1675–1840 1850–present	JC/GH
1249	127634	Feature 2; Slab-lined Hearth	45.012	6.339	79.212	41.889	31.827	25.468	40.263	5/5	NRM	Imprecise	Imprecise	GH
1250	127635	Feature 2;	59.700	349.595	80.610	196.478	1.253	1.421	1.887	8/8	NRM	1210–1250	1170–1245	GH

Set	Site (LA)	Feature	Inc. (º)	Dec. (º)	VGP Lat. (º)	VGP Long. (º)	α_{95} (º)	δ_p	δ_m	N	De-mag level (Oe)	AM Date ranges (AD)		Collect-ed by
												Wolfman or *DuBois*	SWCV2000	
		Hearth												
1251	127635	Feature 2; Hearth	60.535	347.405	78.706	197.241	0.652	0.756	0.993	8/7	100	1200–1225	1020–1045 1160–1190	GH
1281	85411	Room 1, Feature 1	-9.724	317.3	32.882	127.31	13.623	6.696	13.772	9/8	NRM	Imprecise	Imprecise	JC
1282	85417	Room 1, Burned floor, NW corner	56.129	342.284	75.721	172.081	4.017	4.159	5.781	10/9	NRM	1100–1235	1010–1310	EB
1307	85861	Room 1, Hearth 1	-19.589	44.9	27.523	22.145	7.118	3.887	7.439	4/4	NRM	NA	NA	EB

* An aberrant specimen result was manually eliminated from the Solution rather than being eliminated by the Fisher test. NA – Result does not reflect an archaeological TRM orientation. Collectors: DT – Donald Terry, EB – Eric Blinman, GH – Gary Hein, JC – Jeffrey R. Cox, JK – Jonathan Kaplan, JN – Jennifer Nisengard

Although each rhyolite specimen had been trimmed to maximize the volume of heat-affected material in the mold, the hearth fires had not been sufficiently hot to reset the magnetic orientation of the bulk of the measured material. The α_{95} of 7.1º is too imprecise for archaeomagnetic interpretation but is consistent with the precision of many geomagnetic samples. The mean inclination and declination were extremely aberrant, unrelated to the TRM of the hearth and presumably representative of the magnetic orientation acquired when the rock formed. The result is sufficiently coherent to conclude that the field collection technique was successful in recovering the remanent orientation of the rhyolite cobble. This epoxy-plaster cube technique may be valuable in recovering samples where specimens cannot be defined through normal specimen isolation and casting approaches (vertical and undercut burned surfaces as well as thin plasters over substrates that prevent normal sampling).

The orientations of specimen molds are routinely taken in the field with a magnetic compass. The orientation readings must be corrected for the local magnetic declination at the time of collection before the calculation of VGPs for individual specimens. Declinations are usually determined by reference to the U.S. Geologic Survey Geomag International Geomagnetic Reference Field (IGRF) model (http://geomag.usgs.gov/models) and are approximations for the date and location of the sampling effort. Model-derived declinations are less likely to be accurate in heterogeneous igneous geologic settings where volcanic extrusions may create local anomalies that are too fine-grained to be represented in the global models. In 2005 two series of sun compass readings were taken while sampling to determine the local declination for comparison with the IGRF model. A land survey compass was leveled on a tripod adjacent to the site excavations. Sun orientation readings were taken throughout the day, the true sun orientation was determined, and the resulting declination estimates were averaged to determine the local declinations (Table 66.2). One obvious outlier reading was removed from each sequence.

Ignoring the outliers, standard deviations in the periodic measurements were 0.26º and 0.16º, and differences between measured and model-derived declinations were 0.61º and 0.18º. The magnitudes of the angular differences (errors) are too small to be significant in the interpretation of the resultant centerpoints or error ellipses. However, the differences in individual readings (especially if the outliers had been included) would add to the apparent dispersion of specimen results if single sun compass readings had been used for specimen orientations. The difference in measured declination between the two sites (0.41º) is larger by a magnitude than the IGRM model predicted (0.02º). This suggests that local anomalies are present and that future sampling on the Pajarito Plateau would benefit from sun-compass determinations of declination at each site to affirm that any local deviations are inconsequential to interpretation.

Table 66.2. Sun compass declination reductions.

Site:	LA 85417				Site:	LA 85861			
Set:	ADL 1282				Set:	ADL 1307			
Location:	N 35.92º, W 106.26º				Location:	N 35.91º, W 106.26º			
Date:	10/31/2005				Date:	12/01/2005			
Time	**Compass Reading (º)**	**Magnetic Azimuth (º)**	**Sun Azimuth (º)**	**Declination (º)**	**Time**	**Compass Reading (º)**	**Magnetic Azimuth (º)**	**Sun Azimuth (º)**	**Declination (º)**
10:59	S24.5E	155.5	164.6	9.1	9:09	S50.4E	129.6	139.2	9.6
11:15	S19.6E	160.4	169.5	9.1	9:16	S49.2E	130.8	140.7	9.9
11:22	S17.1E	162.9	171.6	8.7	9:26	S47.0E	133.0	142.8	9.8
11:46	S9.9E	170.1	179.2	9.1	9:35	S45.1E	134.9	144.7	9.8
12:04	S4.1E	175.9	184.8	8.9	9:42	S43.3E	136.7	146.3	9.6
12:31	S4.0 W	184.0	193.2	9.2	9:54	S40.6E	139.4	149.0	9.6
12:40	S6.6W	186.6	195.9	9.3	10:18	S34.9E	145.1	154.7	9.6
13:04	S13.8W	193.8	202.9	9.1	10:37	S30.2E	149.8	159.4	9.6
13:16	S17.2W	197.2	206.3	9.1	10:51	S26.3E	153.7	163.0	9.3
13:21	S18.5W	198.5	207.7	9.2	11:14	S20.4E	159.6	169.0	9.4
13:50	S25.9W	205.9	215.3	9.4	12:04	S6.9E	173.1	182.7	9.6
14:08	S30.0W	210.0	219.7	9.7	12:19	S2.8E	177.2	186.8	9.6
14:36	S36.4W	216.4	226.0	9.6	12:44	S3.8W	183.8	193.5	9.7
14:47	S38.9W	218.9	228.3	9.4					
			Mean	9.21º				Mean	9.62º
		Standard deviation:		0.26º			Standard deviation:		0.16º
		IGRF 2005 Model:		9.82º			IGRF 2005 Model:		9.80º

Note: One outlier reading was removed from each sequence.

ARCHAEOMAGNETIC RESULTS

Twenty-two of the C&T Project archaeomagnetic set measurement results were sufficiently precise for interpretation (see Table 66.1). Of these, 21 sets were collected from Coalition period sites. One set was collected from a Protohistoric hearth.

LA 12587

The excavated rooms at this site reflect a long and complex history of growth, remodeling, and reoccupation. Burned sediments (hearth features in all cases) were located in Room 2, Room 4/5, and Room 7. Hearth 20 from Room 2 appears to be the earliest in the sequence, separated from Room 2, Hearth 4 by a significant remodeling event that relocated the hearth and possibly the walls of the room. The hearth in Room 7 (Feature 6) was significantly remodeled through its use life through the addition of linings that reduced the interior capacity of the hearth. Only one of the three lining samples (the earliest) produced a sufficiently precise result for date estimation, although another set is marginal and may be interpretable in terms of archaeomagnetic sequencing. The hearth in Room 4/5 (Feature 1) represents a single apparently late hearth in the sequence of site occupation.

Room 2, Hearth 20

Two sets of specimens were collected from Hearth 20. The first set (1214) was collected from the burned volcanic-ash-rich plaster lining of the side of the hearth. Burning caused consolidation of the plaster (effectively firing its clay content) and some reddening. There was no evidence of post-burning slumping, and the minor cracking that defined two larger fragments of the lining did not suggest any movement of either fragment. Ten specimens were collected from the lining, and two were eliminated from the final result as outliers. The result following demagnetization at 100 Oe was determined to be the best, with an error term (α_{95}) of 0.6º (Figure 66.2). A second set with only five specimens (1215) was collected from the base of the hearth as a corroboration sample. The plaster substrate was identical, but it was thinly laid over a layer of packed cobbles. Specimens were relatively thin, moderately consolidated, and heavily reduced. All five of the specimens were included in the final result following demagnetization at 50 Oe. The pole position was almost identical with that of 1214, but the error term was slightly larger (α_{95} = 1.3º) (see Figure 66.2).

Both samples were stable, both have high precision, and both record the same pole position. When compared with the Wolfman Curve, the results yield date estimates of AD 1185–1205 and AD 1175–1220, respectively (see Table 66.1). When compared with the SWCV2000, the date interpretations are slightly earlier: AD 1145–1170 and AD 1125–1185. When compared with the scatter plots of otherwise well-dated DuBois result centerpoints (AD 1125–1225 and AD 1225–1300 periods) (see Chapter 9, Volume 1, Figures 9.14 and 9.21), a circa AD 1200 interpretation appears to be appropriate.

There are no radiocarbon dates from this feature, but a stratigraphically later radiocarbon date (Hearth 4) spans the AD 1020–1280 period with an intercept at AD 1180 (Table 66.3). Pottery from the site as a whole is characterized as dating to the Middle Coalition period with evidence of persistence into the Late Coalition period.

Table 66.3. Archaeomagnetic, radiocarbon, and ceramic dating comparisons.

Sample	Site (LA)	Feature	VGP L (º)	VGP Long. (º)	α95 (º)	AM date ranges (AD)		Radiocarbon date (calibrated AD two-sigma range and intercept(s))	Ceramic age assignment
						Wolfman or *DuBois*	SWCV2000		
1202	86534	Room 1, Hearth 4, upper lining	77.785	189.345	1.773	**1170–1230**	1110–1200	1040–**1190**–1260 (maize)	Middle Coalition
1203	86534	Room 1, Hearth 4, lower lining	75.734	213.077	3.718	1035–1140 **1065–1265**	1000–1390 1010–1315		
1204	86534	Room 2, Hearth 2	81.580	166.844	0.644	**1280–1300**	1175–1230	1240–**1280**–1300 (maize)	
1205	86534	Room 5, Hearth 5	82.776	200.955	1.097	1005–1035 **1235–1270**	1265–1325	1180–**1250**–1280 (maize)	
1206	86534	Kiva 9, Hearth 16	81.319	201.676	1.038	1020–1050 **1220–1255**	1185–1240 1250–1315	1180–**1260**–1290 (charred material)	

Sample	Site (LA)	Feature	VGP L (º)	VGP Long. (º)	α95 (º)	AM date ranges (AD)		Radiocarbon date (calibrated AD two-sigma range and intercept(s))	Ceramic age assignment
						Wolfman or *DuBois*	SWCV2000		
1209a	12587	Room 4/5, Hearth 1, lining	78.192	211.502	3.611	1015–1130 **1160–1275** 1335–1410	1005–1375	1270–**1290**–1320 1350–1390 (maize)	Middle Coalition with some Late Coalition
1209b	12587	Room 4/5, Hearth 1, tuff block	33.012	230.870	24.505	NA	NA		
1210	12587	Room 2, Hearth 4	87.218	208.491	2.347	925–1015 **1245–1310** 1315–1355	925–1025 1275–1425 1370–1510 1550–1700	1020–**1180**–1280 (maize)	
1211	12587	Room 7, Hearth 6, upper west inner lining	82.203	203.731	4.359	Imprecise	Imprecise	1040–**1190**–1280 (maize)	
1212	12587	Room 7, Hearth 6, upper north inner lining	86.098	203.398	2.669	930–1025 **1235–1305** 1315–1360	925–1015 1260–1465		
1213	12587	Room 7, Hearth 6, lower west inner lining	85.562	139.723	10.910	Imprecise	Imprecise		
1214	12587	Room 2, Hearth 20, west wall	77.614	185.500	0.613	**1185–1205**	1145–1170	No date	
1215	12587	Room 2, Hearth 20, base lining	77.609	184.163	1.343	**1175–1220**	1125–1185		
1226	135290	Room 6, Floor 3	77.023	186.909	1.082	**1170–1210**	1125–1175	No date	Middle Coalition
1227	135290	Room 4, Floor 2	76.727	190.478	0.724	**1180–1205**	1125–1165	No date	
1228	135290	Room 6, West wall	77.843	199.830	1.284	**1185–1230**	1020–1110 1225–1290	No date	
1229	135290	Room 2, Hearth 11	80.328	212.656	2.304	1010–1075 **1195–1275** 1340–1395	1005–1045 1175–1325 1250–1410	No date	
1230	135290	Room 8, Hearth 9	78.946	201.790	1.269	1035–1070 **1195–1240**	1015–1050 1230–1285	1160–**1220**–1270 (maize)	
1231	135290	Room 2, Hearth 16, (below and to the east of Hearth 11)	75.432	192.809	1.717	1105–1150 **1155–1210**	1035–1165	1040–**1190**–1260 (maize)	
1232	135290	Room 4, Floor 3	79.830	184.559	2.391	**1180–1260**	1130–1305	No date	
1233	99396	Room 1, Hearth 7	79.140	199.488	2.545	1020–1085 **1175–1260**	1010–1125 1155–1320	1040–**1180**–1260 1020–**1050–1100-1140**–1200 (both wood)	Coalition

Sample	Site (LA)	Feature	VGP L (º)	VGP Long. (º)	α95 (º)	AM date ranges (AD)		Radiocarbon date (calibrated AD two-sigma range and intercept(s))	Ceramic age assignment
						Wolfman or *DuBois*	SWCV2000		
1234	85864	Tipi ring, Hearth	79.121	283.368	3.063	*1600–1820* ***1730–present***	1675–1840 1850–present	1650–**1680**–**1770**–**1800**–1890 (wood)	Protohistoric
1249	127634	Feature 2, Slab-lined Hearth	79.212	41.889	31.827	Imprecise	Imprecise	1450–**1520**–1650 (charred material)	Late Classic
1250	127635	Room 1, Hearth 2	80.610	196.478	1.253	**1210–1250**	1170–1245	1180–**1250**–1280 1210–**1270**–1290 (both charred material)	Mixed Coalition and Classic
1251	127635	Room 1, Hearth 2	78.706	197.241	0.652	**1200–1225**	1020–1045 1160–1190		
1281	85411	Room 1, Feature 1	32.882	127.310	13.623	Imprecise	Imprecise	1290–**1310**–1410 (charred material)	Middle Classic
1282	85417	Room 1, Burned floor, NW corner	75.721	172.081	4.017	**1100–1235**	1010–1310	No date	Coalition and Historic
1307	85861	Room 1, Hearth 1	27.523	22.145	7.118	NA	NA	1020–**1050**–1200 (charred material)	Coalition and Late Classic

Note: Preferred Wolfman or DuBois archaeomagnetic date range interpretations are designated in bold.

Room 2, Hearth 4

The upper hearth in Room 2 (Feature 4) was lined with cobbles that were set in a volcanic ash-based mortar. The mortar was moderately fired, turning the clay content into a moderately coherent ceramic material. Only one area of mortar between two cobbles lining one side of the hearth was of sufficient quality for sampling. The block of mortar was intact, although it was detached from the matrix behind it. There was no obvious evidence of slumping, but there was a possibility of rotation with the top of the fragment tilting inward toward the hearth center (top tilting in, bottom remaining in place). The field estimate for the maximum possible rotation was 2° along an azimuth of about 115°.

Eight of the nine specimens cut from this portion of the hearth were measured (1210), and all eight were included in the final result after demagnetization at 50 Oe with a moderate error term (α_{95} = 2.3º). The possibility of rotation means that the accuracy of this result may be in question (although the precision is not). If a correction were necessary, the centerpoint of the ellipse would be shifted to a lower latitude and slightly lower longitude but within the current error ellipse (Figure 66.3). Both the existing and a hypothetical corrected result would overlap the same segments on the Wolfman Curve, and a corrected centerpoint could potentially add an overlap with the AD 1250–1350 segment of SWCV2000.

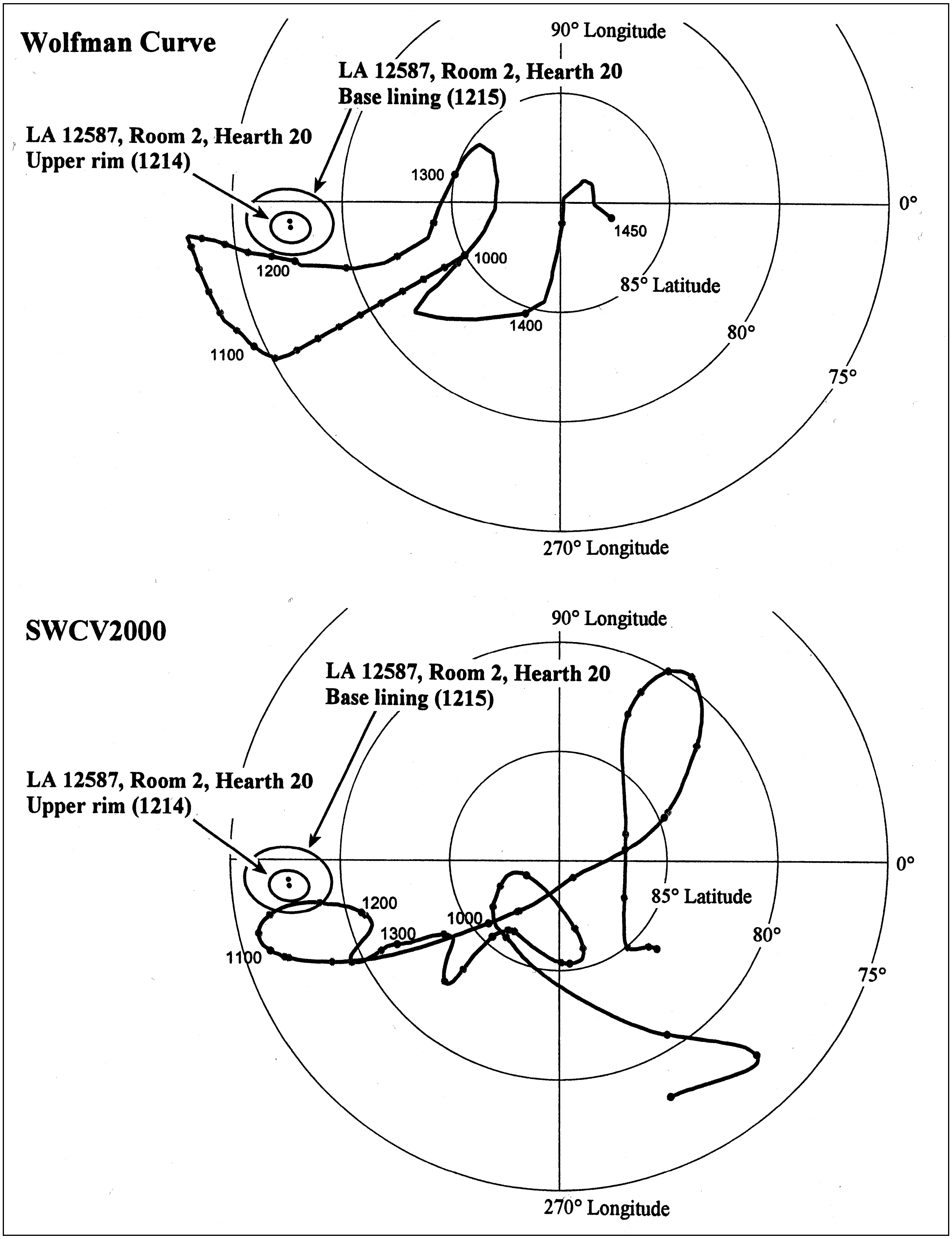


Figure 66.2. LA 12587, Room 2, Hearth 20 archaeomagnetic results for sets 1214 and 1215. Centerpoints and error ellipses are plotted against both the Wolfman Curve and SWCV2000.

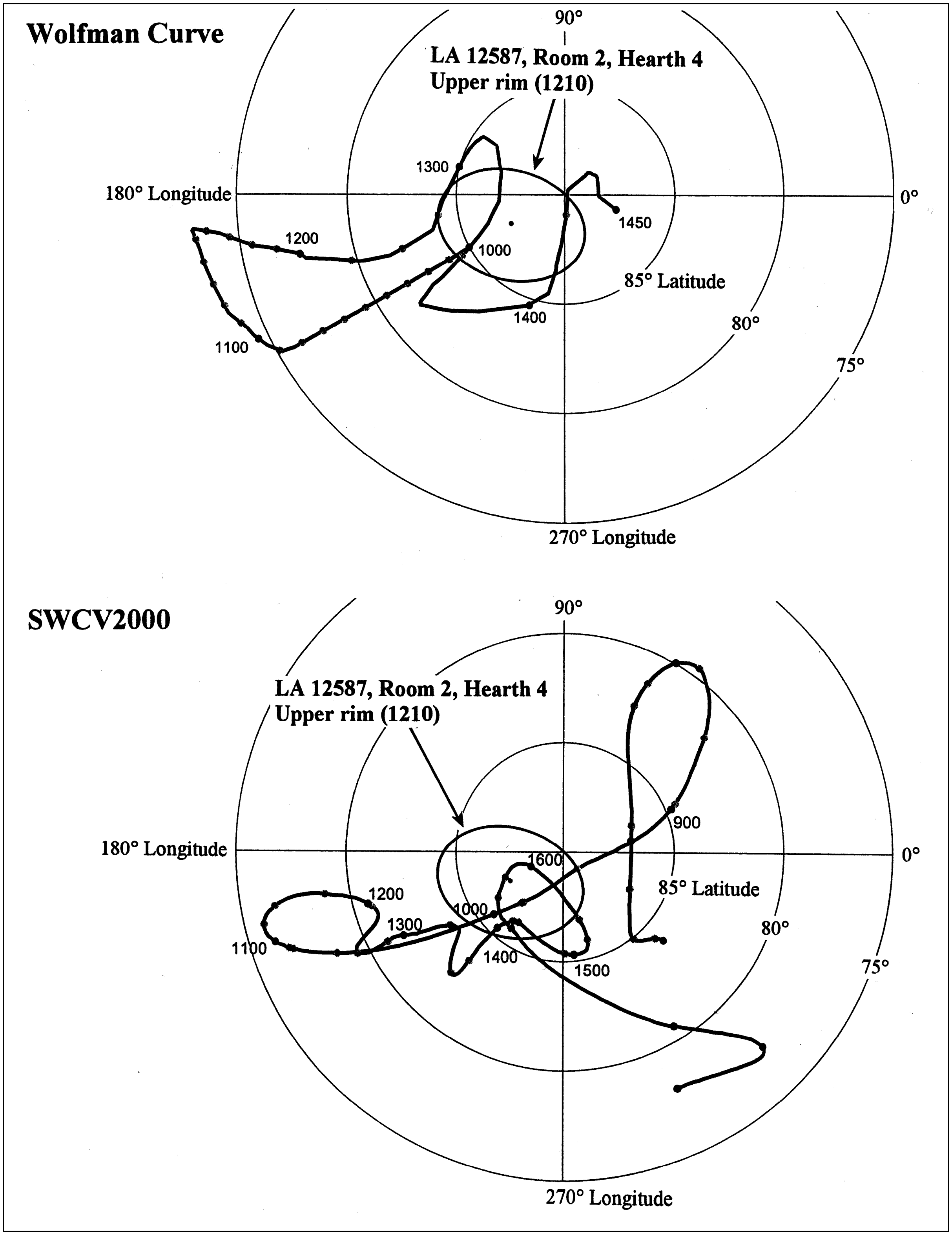


Figure 66.3. LA 12587, Room 2, Hearth 4 archaeomagnetic results for set 1210. The centerpoint and error ellipse are plotted against both the Wolfman Curve and SWCV2000.

Although this result overlaps the AD 900–1100 segment of both VGP curves, pre-AD 1100 alternatives can be eliminated based on the stratigraphically earlier result for Hearth 20. Both VGP curves yield overlaps with mid to late 14th century curve segments (and later for the SWCV2000), but these interpretations are inconsistent with the ceramic dating information from the site. The ellipse overlaps with the Wolfman Curve in the late 13th century, and the overlap would be greater if any tilt adjustment were warranted. Similarly, any adjustment would bring the ellipse into contact with the AD 1250–1350 segment of SWCV2000. These segments are associated with date estimates of AD 1245–1310 (Wolfman Curve) and AD 1275–1425 (SWCV2000).

This result can be compared with the DuBois sample centerpoints from the northern Rio Grande region (see Figures 9.14, 9.21, and 9.28 in Chapter 9, Volume 1). The result is clearly later than the scatter of centerpoints associated with the AD 1125–1225 period, and it is marginal to the AD 1225–1300 scatter. It lies within the AD 1300–1400 centerpoints, however there are ambiguities in the comparative data set between samples closely predating and postdating AD 1300. Until these ambiguities are resolved, our preferred date interpretation is that associated with the AD 1245–1310 segment of the Wolfman Curve.

A single radiocarbon assay on maize from the hearth fill produced a two-sigma calibrated date range of AD 1020–1280, with an intercept of AD 1180 (see Table 66.3).

Room 7

The hearth of Room 7 (Feature 6) underwent a series of construction and remodeling events. A relatively large partially lined cobble-and-mortar hearth was progressively decreased in size by the addition of cobble and mortar linings. The mortar included a high proportion of volcanic-ash-derived clay, which was lightly fired during each use period of the feature. Three sets of specimens were collected from the hearth at different stages in the excavation of the feature. The mortar associated with the final architectural form of the hearth was too poorly preserved to sample successfully, and none of the samples represent a last-use date for the feature. The west upper lip of an earlier manifestation of the hearth was sufficiently intact for sampling (1211), but it may have been affected by heating after remodeling. The blocks of mortar were cracked and unstable, although no material was collected that was demonstrably out of position. A second set of specimens was collected from the north rim of the hearth after the remodeled lining was removed (1212). This area of plaster lining was slightly more intact, it appeared to have been heated slightly more intensely, and it was more protected from heating during post-remodeling use of the hearth than was true of the 1211 sampling location. A final set of specimens (1213) was collected from low on the wall of the lining beneath the area sampled by the 1211 set. It was slightly more stable in appearance than the upper portion of the same wall, although it had been subjected to lower temperatures. The 1213 sampling location had been protected from significant heat after the hearth had been remodeled with the added lining.

Only one of the three results was sufficiently precise to support a date interpretation. The 1213 result was extremely incoherent (α_{95} = 10.9º), and there is no clear explanation for the high degree of imprecision. The 1211 result was too incoherent to support a formal date estimate (α_{95}

= 4.4°), but it is plotted on Figure 66.4 with the 1212 result for comparison. The 1212 result was moderately precise (α_{95} = 2.7°) after demagnetization at 50 Oe. The 1211 result probably records a pole position earlier than or contemporary with the 1212 result.

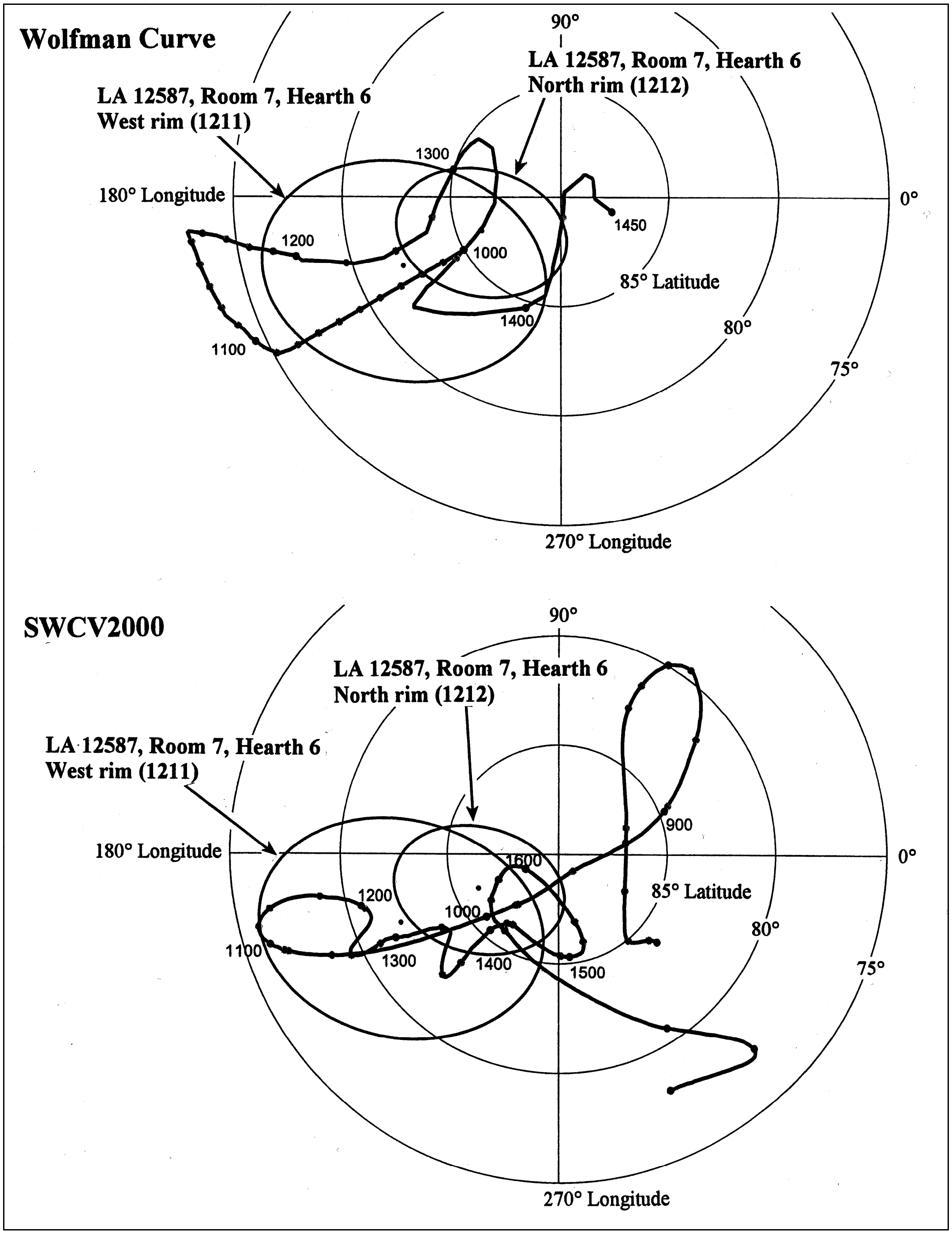


Figure 66.4. LA 12587, Room 7, Hearth 6 archaeomagnetic results for sets 1211 and 1212. Centerpoints and error ellipses are plotted against both the Wolfman Curve and SWCV2000.

The 1212 result is based on only five specimens. Four yielded VGP estimates that were only partially dispersed, but the fifth was aberrant, resulting in a α_{95} of 12.9E. Since there were only five data points, the Fisher statistic did not identify the aberrant result as an outlier, but it was removed manually from the result accepted here. The resulting ellipse intersects three segments of the Wolfman Curve, but the earliest date range (AD 930–1025) can be ruled out on contextual grounds. Both of the other ranges, AD 1235–1305 and AD 1315–1360, are plausible, but the former is more likely on the basis of other dating information from the site. The SWCV2000 yields two date ranges for the result, the earlier of which (AD 925–1015) can be ruled out. The later date range (AD 1260–1465) spans more than 200 years due to the slow looping characterization of this portion of SWCV2000. Although the early decades of this span are plausible based on independent dating information from the site, the latter half of the range is unlikely.

When compared with the scatters of pole locations in the DuBois calibration data set, the 1212 result clearly post-dates the majority of the AD 1125–1225 samples (see Figure 9.14, Volume 1). It overlaps a significant subset of both the AD 1225–1300 and AD 1300–1400 calibration points (see Figures 9.21 and 9.28 in Volume 1). Given all of the available information, including the possible direction of movement between the pre- and post-remodeled hearth pole locations, the AD 1235–1305 Wolfman Curve date range is the most likely for the intermediate remodeling of the hearth.

This is supported only on the earlier end of the range by a radiocarbon date on maize from the fill of the hearth (see Table 66.3). The calibrated age is AD 1040–1280, with an intercept of AD 1190.

Room 4/5

The hearth (Feature 1) in Room 4/5 was partially lined with a volcanic-ash-rich plaster between and over blocks and cobbles. The plaster layer could not be sampled in areas over underlying rocks, and only one area between rocks was sufficiently stable for sampling. The area of plaster was small, and only six specimens could be recovered. A large block of unplastered tuff formed a portion of the southern margin and was also burned. It was soft enough to allow sample collection with tungsten carbide-edged tools, and six additional specimens were cut from the upper edge of the block.

All of the 12 specimens were measured. When combined into a single set (at NRM), three specimens were excluded as outliers, and the resulting pole location (1209) was relatively imprecise (α_{95} = 3.3º). When the tuff block specimens were combined as a set (1209b), they yielded an extremely incoherent result (α_{95} = 24.5º) with a centerpoint in the tropical latitudes. Although some of the tuff block specimens appear to have acquired a TRM component from the hearth, the overall orientation was unrelated to the hearth. A third result was calculated (1209a) using only the specimens from the plaster lining. This result is also imprecise (α_{95} = 3.6º), but it is much more likely to approximate the true pole location than either of the other specimen combinations.

The 1209a result overlaps with three segments of the Wolfman Curve (Figure 66.5). The centerpoint is closest to the 11th century segment, but this date range (AD 1015–1130) can be ruled out on contextual grounds.

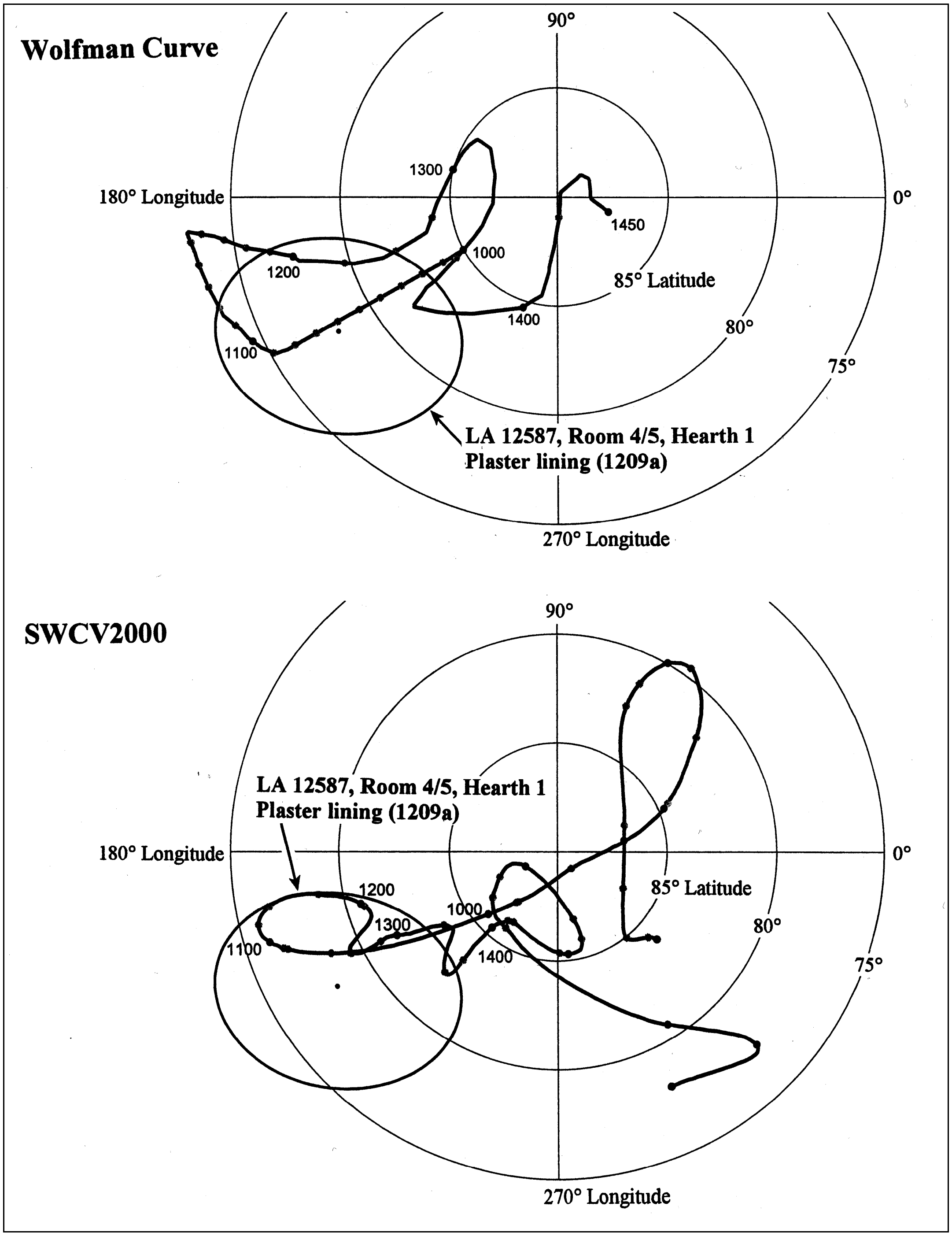


Figure 66.5. LA 12587, Room 4/5, Hearth 1 archaeomagnetic results for set 1209a (the subset of specimens cut from the plaster lining). The centerpoint and error ellipse are plotted against both the Wolfman Curve and SWCV2000.

The second segment overlapped by the ellipse yields a date range estimate of AD 1160–1275, which is plausible. The ellipse also barely overlaps the 14th century segment of the curve, and that segment yields a date range of AD 1335–1410. This date range is later than can be supported by other chronologic information. When compared with the SWCV2000, the large ellipse encompasses a 370-year range from AD 1005–1375.

When compared with the DuBois calibration data set, the ellipse overlaps the later half of the AD 1125–1225 point scatter (see Figure 9.14, Volume 1). It encompasses a majority of the AD 1225–1300 calibration centerpoints (see Figure 9.21, Volume 1), and it encompasses approximately half of the AD 1300–1400 points (see Figure 9.28, Volume 1). The contribution of this result to the interpretation of the site chronology is limited by its imprecision, but it is consistent with the other results that suggest a late 13th or perhaps early 14th century age for the final use of the hearths in the roomblock.

A radiocarbon date on maize from the hearth fill overlaps two portions of the radiocarbon calibration curve at the two-sigma level (see Table 66.3). However, only one range, AD 1270–1320, includes an intercept (AD 1290). The later date range (AD 1350–1390) is incompatible with the pottery at the site.

Summary

The interpretable archaeomagnetic results from LA 12587 are presented in Figure 66.6. The two samples from Hearth 20 of Room 2 are extremely precise, confirm each other, and are stratigraphically earlier than the other samples collected from the site. The Room 2, Hearth 4, and Room 7 VGPs fall at relatively high latitudes, and although the accuracy of the Room 2 VGP could be questioned, it is reinforced by the Room 7 result. The Room 4/5 result is less precise than the others and occupies either an intermediate position or a later position in terms of VGP movement. The possibility of a later position is based on the associated radiocarbon date, which is slightly later than those from the two other dated hearths. Based on the Wolfman Curve, the date range associated with these VGPs begins as early as AD 1200 or slightly before and carries through until the late 13th century. There is a chance that one or more of the burned features could date as late as AD 1300, but this portion of the Wolfman Curve is slightly less secure than the pre-AD 1275 portion (see Chapter 9, Volume 1).

LA 86534

This site represents a relatively discrete occupation, with evidence of remodeling and structure longevity but without evidence for distinct multiple components. Five sets of specimens were collected from burned features in three rooms and a kiva. One room hearth showed clear evidence of remodeling, and two sets were collected from its linings. Apart from these two sets, there is no clear indication of stratigraphic sequencing between the samples. The four room hearth samples were subject to post-burning disturbance from wetting and drying, freeze-thaw, and root invasion. All of the hearths were lined with a plaster composed of volcanic ash-rich soil that appears to have been derived from weathered tuff. The clay content of the plaster was sintered by the cooking and heating fires, consolidating the material to a weak ceramic consistency. However, the fires were not particularly hot, and the linings were fragile. The surface room hearth linings were cracked and subject to displacement, raising the risk of systematic error when multiple specimens were cut from single lining blocks. In addition to eliminating lining blocks from sampling consideration if there was any suggestion of movement, whenever possible, specimens were collected from multiple blocks so that any significant internal bias could be detected.

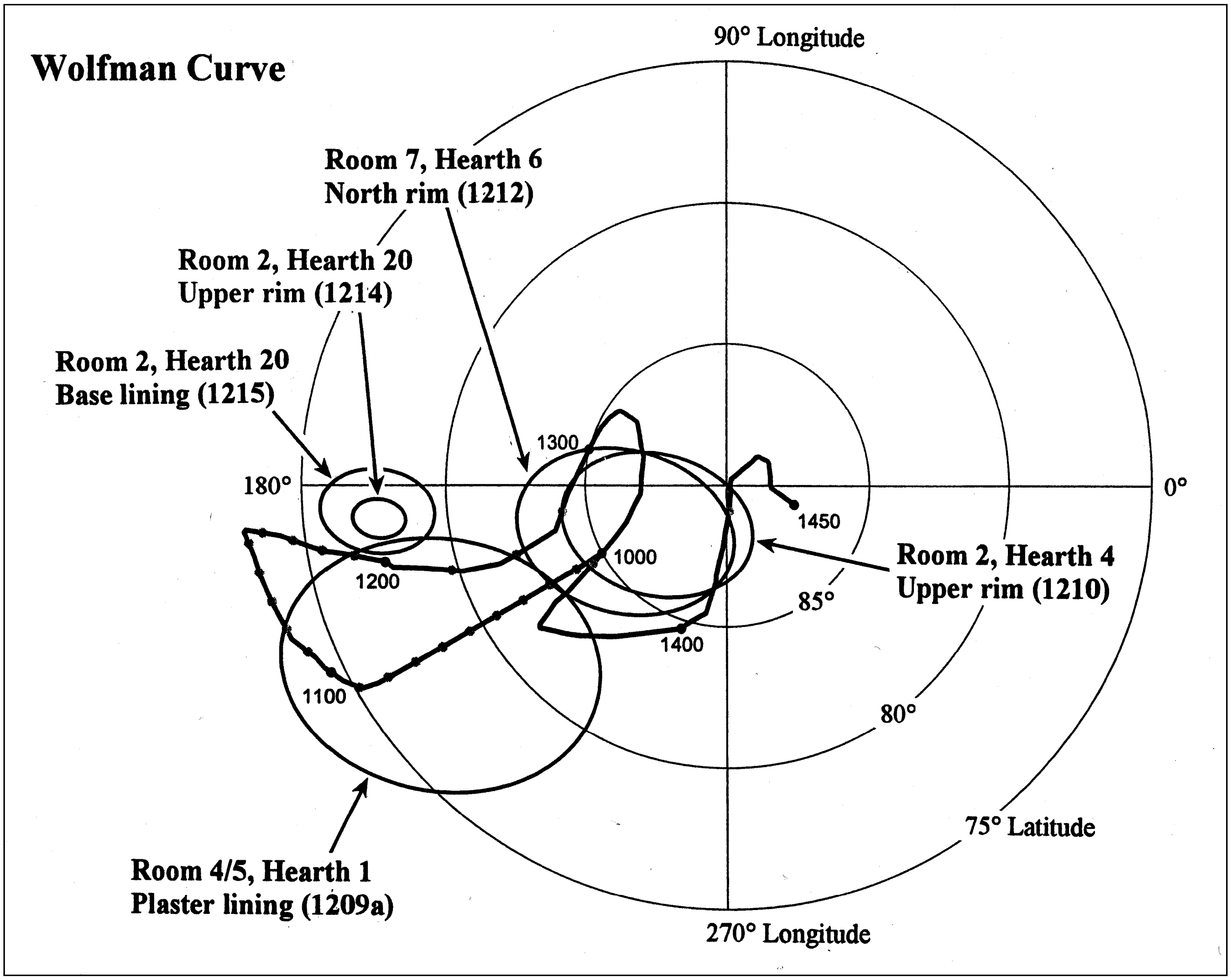


Figure 66.6. All interpretable LA 12587 archaeomagnetic ellipses plotted against the Wolfman Curve.

Room 1

The hearth, Feature 4, consisted of a depression in the floor that was loosely lined with stones and then lined with a volcanic-ash-rich plaster. The plaster lining was moderately well burned but was fragmented from weathering and root invasion. After the first set of specimens was collected, it was clear that the hearth had been remodeled at least once through the period of structure use. After the upper hearth elements were removed, a second set of specimens was collected from a lower lining. Intervening sediments were shallow, and the earlier hearth could have been slightly affected by heating events associated with the later hearth fires. In both cases, specimens could not be collected from the upper walls of the hearths due to fragmentation and displacement of the linings.

Eight specimens were collected from the upper hearth lining (1202). Only a single lining fragment was suitable for sampling, but there was no evidence that the lining had shifted its orientation. The specimens yielded a best result after demagnetization at 100 Oe, and no specimens were identified as statistical outliers. The result is moderately precise, with an α_{95} value of 1.8º (Figure 66.7). The ellipse overlaps one segment of the Wolfman Curve, and the associated date range is AD 1170–1230. It also overlaps with a single segment of the SWCV2000, and the associated date range is AD 1110–1200. When compared with the scatter plots of otherwise well-dated AD 1125–1225 and AD 1225–1300 centerpoints from DuBois data set for the northern Rio Grande region (see Figures 9.14 and 9.21, Volume 1), the ellipse encompasses a significant subset of the AD 1125–1225 results. The ellipse overlaps only a small number of the AD 1225–1300 centerpoints and is marginal to the AD 1300–1400 point scatter (see Figure 9.28, Volume 1).

Eight specimens were also collected from lining fragments from the underlying hearth (1203). The lining blocks were small and slightly unstable, and multiple lining fragments were sampled. Individual specimen vectors were relatively dispersed, yielding a large error term (α_{95} = 3.7º) after demagnetization at 150 Oe; one specimen was excluded as an outlier. The pole position is at a higher longitude than that of the overlying sample, and the two ellipses only barely overlap (see Figure 66.7). Despite its large size, the ellipse intersects only one segment of the Wolfman Curve, yielding a date range estimate of AD 1035–1140. The ellipse is adjacent to the AD 1125–1300 segment of the Wolfman Curve, and it is close enough to warrant interpretation of a date range of AD 1065–1265. The intersection of the ellipse and the SWCV2000 is much more marginal but involves two segments. Because of the size of the ellipse and the curve conformation, the date range estimates are large and overlap substantially. The range based on the closest point of intersection is AD 1010–1315, while a range of AD 1000–1390 is associated with the other segment intersection. When compared with the DuBois calibration points, overlap is partial with the AD 1125–1225 scatter (see Figure 9.14, Volume 1) and with centerpoints associated with the AD 1000–1125 period (see Figure 9.7, Volume 1). Nearly half of the AD 1225–1300 centerpoints fall within the error ellipse of the result (see Figure 9.21, Volume 1), but the ellipse is marginal to the AD 1300–1400 scatter (see Figure 9.28, Volume 1).

If we could be confident that both sets of specimens were robust, the results could be interpreted as representing a stratigraphic occupational sequence from the late 11th century through the early 13th century. However, the early end of this range is inconsistent with other dating information from the site, and the instability of the lower lining provides reason to question the accuracy of the 1203 result. Although it should be earlier than the 1202 result, the centerpoint location is far removed and the error ellipses barely overlap. Coupled with both 1203's large α_{95} value and the fragmented condition of the hearth lining, there is reason to suspect that the pole position is not representative.

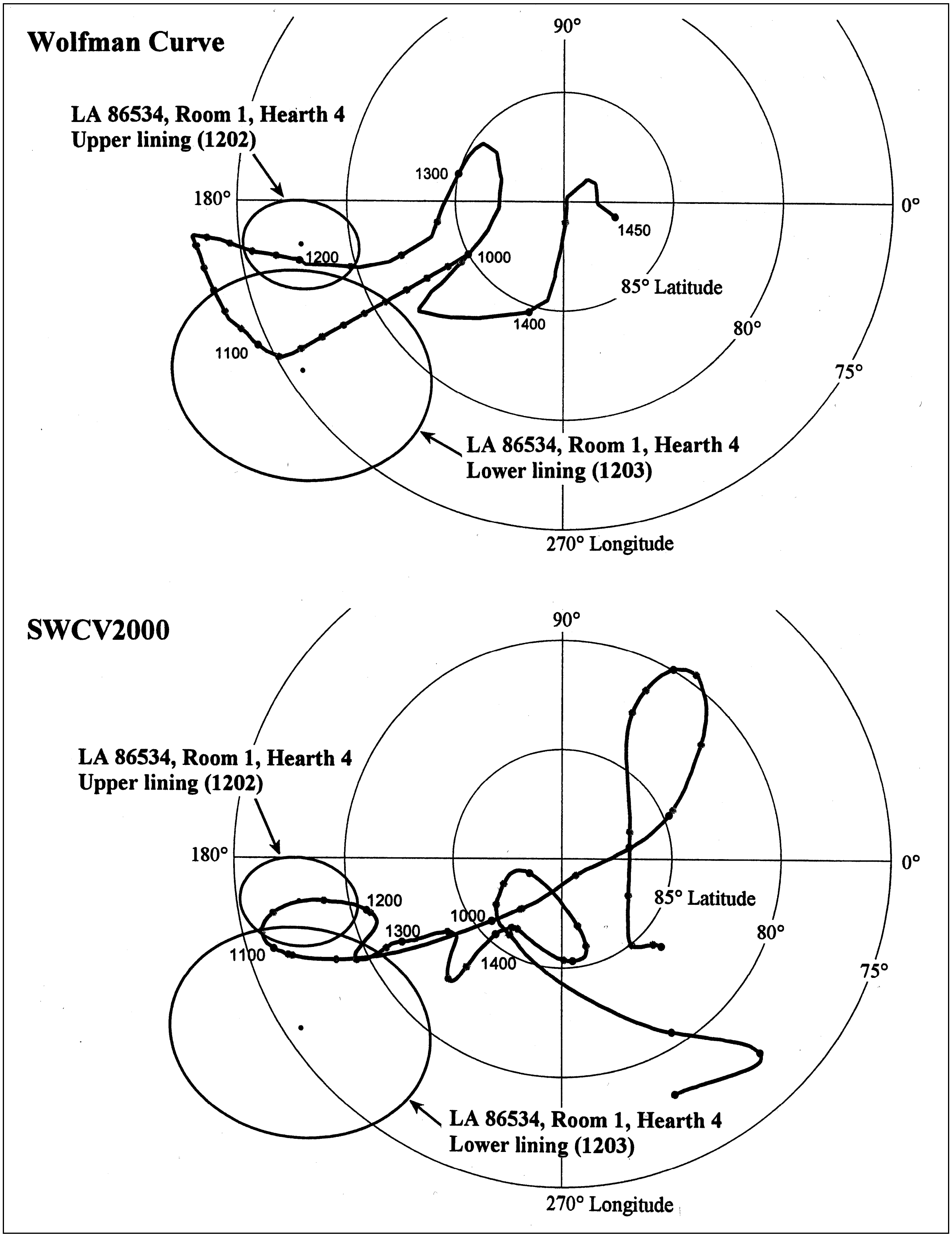


Figure 66.7. LA 86534, Room 1, Hearth 4 archaeomagnetic results for sets 1203 (earlier) and 1202 (later). Centerpoints and error ellipses are plotted against both the Wolfman Curve and SWCV2000.

By itself, the 1202 result is relatively consistent with other site dating information, suggesting use of the hearth in the late 12th or early 13th centuries. This is consistent with a radiocarbon date on maize from the hearth fill that yielded a range of AD 1040–1260 with an intercept of AD 1190 (see Table 66.3). However, both the archaeomagnetic and associated radiocarbon dates from other hearths at the site are slightly later in time.

Room 2

The hearth (Feature 2) in Room 2 consisted of a depression with tuff block walls and a lining of volcanic-derived plaster. The plaster lining was fragmented, and specimens were cut from three distinct fragments. These fragments were more stable than others within the feature, but each was at risk of having been displaced slightly by ground pressure and weathering. Eight specimens were collected as set 1204, and all but one were characterized as being “solid” during field collection.

The specimens yielded an extremely precise result ($\alpha_{95} = 0.6^{o}$) after demagnetization at 300 Oe (Figure 66.8). One specimen was excluded from the result as an outlier. In part because of its precision, the ellipse falls off of the existing curves by several standard deviations. Compared with the Wolfman Curve, the sample is closest to the AD 1225–1300 segment. When the centerpoint is replotted at the closest point on the curve segment, the resulting date range is AD 1280–1300. The AD 1300 loop of the Wolfman Curve is the weakest portion of the curve (Chapter 9, Volume 1), and a more conservative interpretation would be to push the early end of the range more toward the middle 13th century. The closest point on the SWCV2000 is around AD 1195, and the resulting date range after replotting is AD 1175–1230. The result is at the margins of the AD 1125–1225 centerpoint swarm of the DuBois calibration data set (see Figure 9.14, Volume 1), and it is further removed from the AD 1225–1300 and 1300–1400 calibration point scatters (see Figures 9.21 and 9.28, Volume 1).

The discrepancy between the high precision of the result and the relative distance of the result from both the dating curves and the scatter of DuBois calibration points is disquieting. Because the dating curves are approximations and because high precision error ellipses are small, it is not unusual for precise samples to fall off of the curves. In this case, however, the distance is large and only a single point of the DuBois data points comes close to the 1204 result. Distortion of the lining fragments is a possible explanation, but it is improbable since the plotted result includes specimens from all three fragments, and it is unlikely that all three would be displaced in exactly the same direction. A local magnetic anomaly might have affected the orientations of the specimens or of the compass reading during sample collection, resulting in a skewed but precise result location.

A radiocarbon date on maize from the hearth fill yielded a calibrated two-sigma range of AD 1240–1300 with an intercept of AD 1280 (see Table 66.3). Despite all of the caveats in interpreting the 1204 VGP location, a realistically conservative conclusion is that this sample dates to the last third of the 13th century.

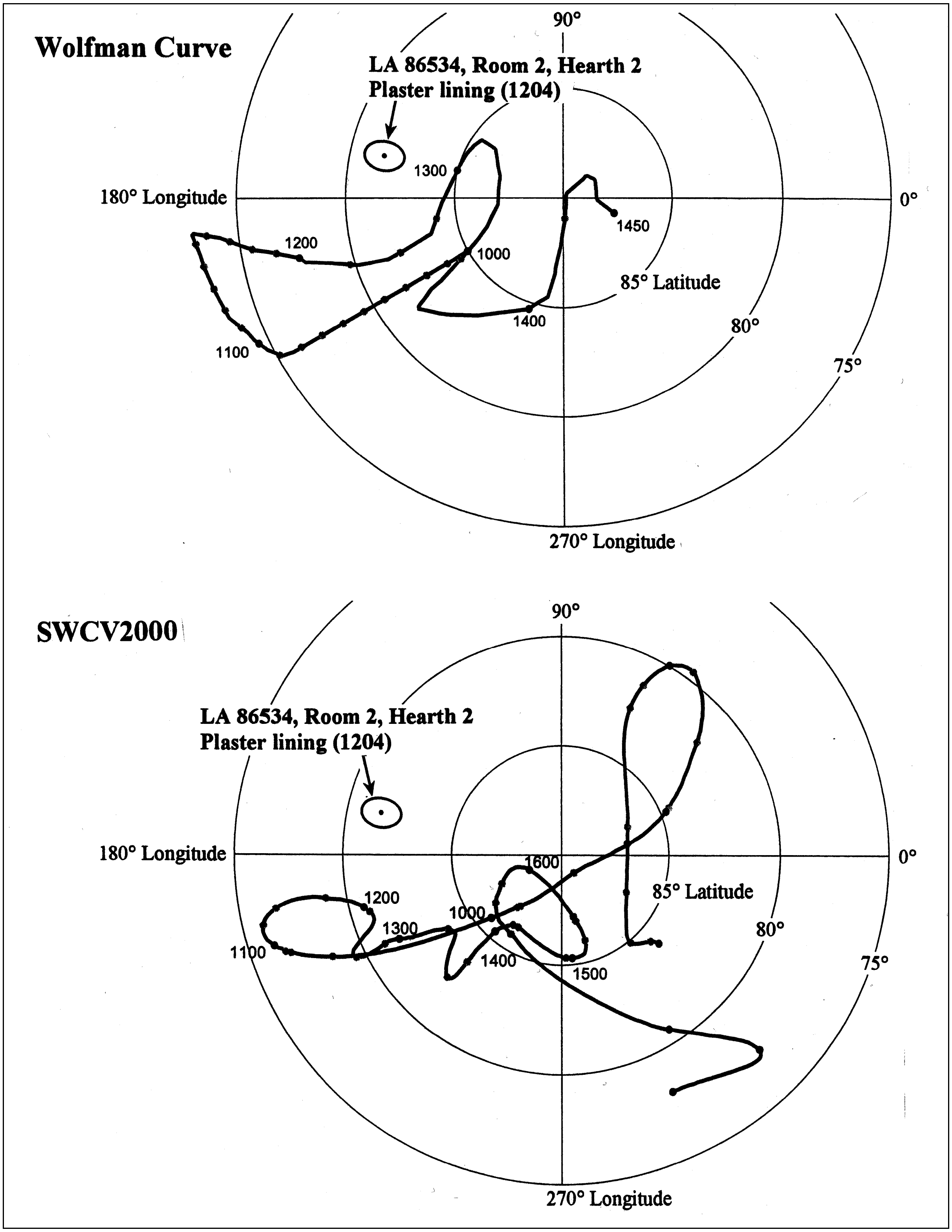


Figure 66.8. LA 86534, Room 2, Hearth 2 archaeomagnetic results for set 1204. The centerpoint and error ellipse are plotted against both the Wolfman Curve and SWCV2000.

Room 5

Specimens were collected from the plaster lining the base of Hearth 5 in Room 5 (set 1205). The plaster was relatively intact, and there is no suggestion of mass movement that might have altered the pole position. A vesicular basalt cobble was present in the fill below the hearth, but it did not appear to cause a magnetic anomaly when a compass was moved across it after the sampling was completed.

Eight specimens were collected from the lining. The best result was following demagnetization at 150 Oe and is associated with an α_{95} of 1.1^{o} using all eight specimens. The result overlaps two segments of the Wolfman Curve (Figure 66.9). The date estimate associated with the earlier segment (AD 1005–1035) can be discounted on contextual grounds. The later segment includes the middle of the 13th century, and relocation of the result centerpoint to the curve produces a date range of AD 1235–1270. The 1205 ellipse overlaps only one segment of the SWCV2000 dating curve, and the associated date estimate is AD 1265–1325. Compared with the DuBois calibration data set, the 1205 result is at the margin of the centerpoints dating to the AD 1125–1225 period. It is in the center of the AD 1225–1300 point distribution, and it overlaps a significant minority of the AD 1300–1400 centerpoints (see Figures 9.14, 9.21, and 9.28, Volume 1).

A radiocarbon date on maize from the hearth fill yielded a calibrated two-sigma range of AD 1180–1280, with an intercept at AD 1250 (see Table 66.3). The radiocarbon date is consistent with the Wolfman Curve date range that indicates a middle 13th century age for the last use of the feature.

Room 9 (Kiva)

Room 9 was excavated into tuff bedrock, and the hearth (Feature 16) was developed from a pit excavated into the bedrock floor of the kiva. The pit was lined with a volcanic ash-rich plaster, and a thick annular plaster coping was built up around the exterior of the hearth. Due to its depth below the modern ground surface and the hearth's bedrock foundation, the lining and coping suffered little weathering or mechanical damage since abandonment. The plaster coping was slightly oxidized (reddened) and well consolidated by the heat, but there was no indication of extreme heat exposure.

Eight specimens were collected from the inner surface of the coping toward the ventilator opening where the hearth material should have been exposed to the highest temperatures from fuel combustion. The best result for the set (1206) was after demagnetization at 100 Oe and included all eight specimens. The precision is good (α_{95} = 1.0E), and the error ellipse overlaps two segments of the Wolfman Curve (Figure 66.10). The date estimate associated with the earlier segment (AD 1020–1050) can be discounted on contextual grounds. The later segment includes the middle of the 13th century, and relocation of the result centerpoint to the curve produces a date range of AD 1220–1255. The 1205 ellipse also overlaps two segments of the SWCV2000 dating curve. The associated date estimates are both plausible, one at AD 1185–1240 and the other at 1250–1315. Compared with the DuBois calibration data set, the 1205 result is at the margin of the centerpoints dating to the AD 1125–1225 period (see Figure 9.14, Volume 1). The ellipse is near the center of the AD 1225–1300 point distribution, and it overlaps a minority of the AD 1300–1400 centerpoints (see Figures 9.21 and 9.28, Volume 1).

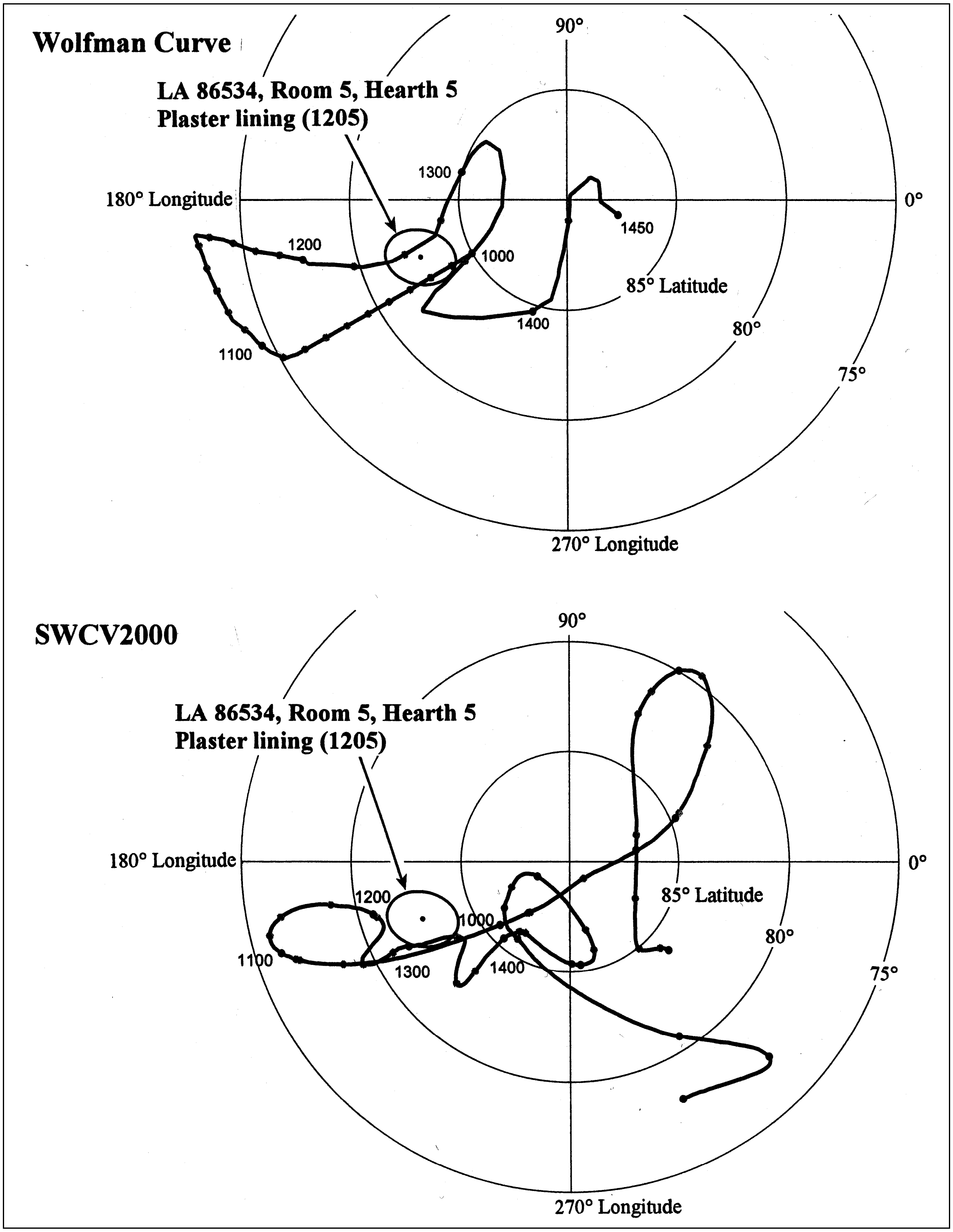


Figure 66.9. LA 86534, Room 5, Hearth 5 archaeomagnetic results for set 1205. The centerpoint and error ellipse are plotted against both the Wolfman Curve and SWCV2000.

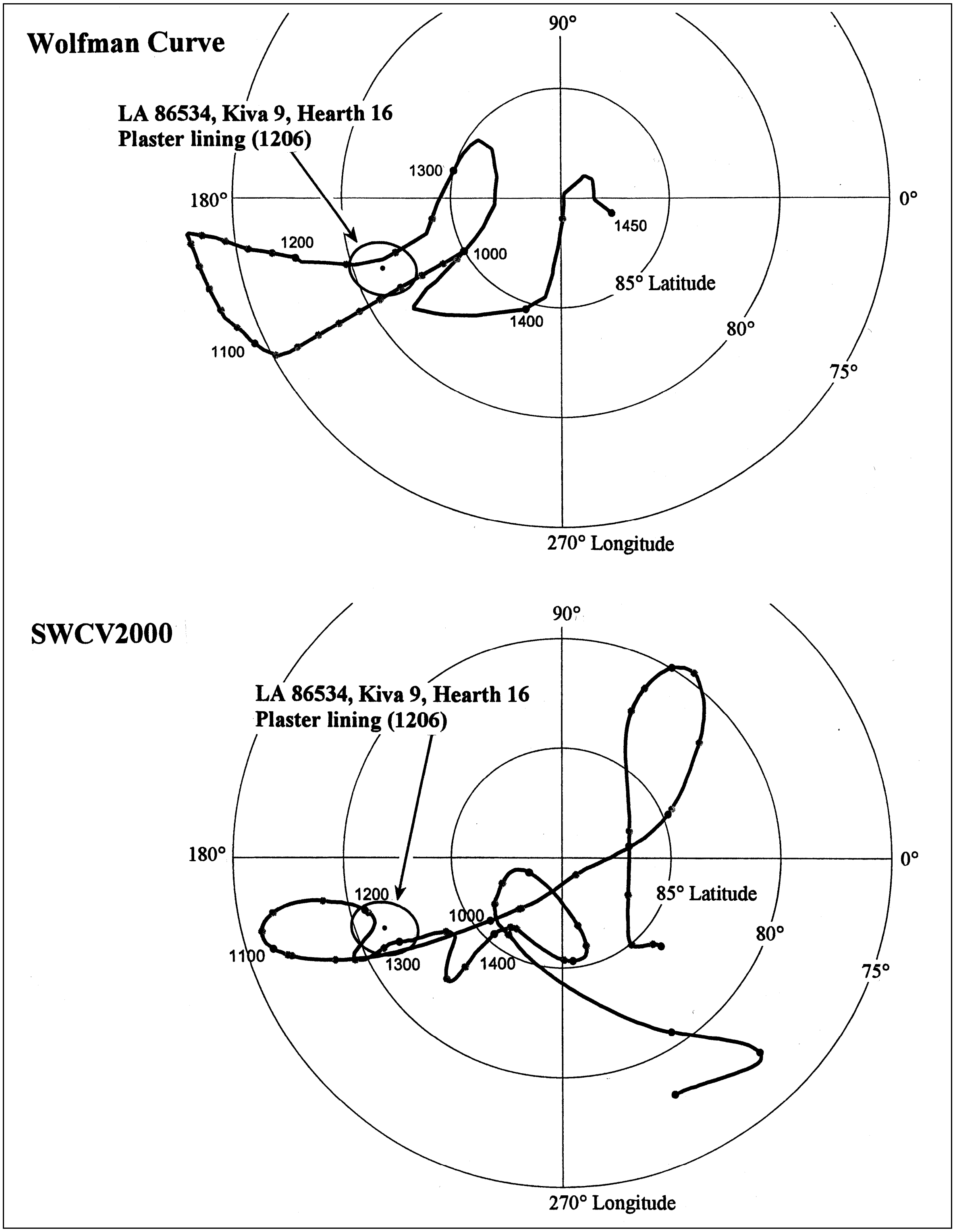


Figure 66.10. LA 86534, Kiva 9, Hearth 16 archaeomagnetic results for set 1206. The centerpoint and error ellipse are plotted against both the Wolfman Curve and SWCV2000.

A radiocarbon date on unidentified charred material from the hearth fill yielded a calibrated two-sigma range of AD 1180–1290 with an intercept at AD 1260 (see Table 66.3). This is consistent with the DuBois- and Wolfman-based interpretations of a middle 13th century date for the last use of the hearth.

Summary

The archaeomagnetic sets from LA 86534 include two anomalous results, one with high precision, and three results whose Wolfman and DuBois interpretations are consistent with associated radiocarbon dates (Figure 66.11). If the anomalous results are ignored, Room 1, Hearth 4, yielded the earliest VGP from the site with a result that falls close to AD 1200. This date would require that the hearth had been abandoned and disused for one or more generations before the abandonment of the site as a whole. The hearths from Room 5 and Kiva 9 yielded later overlapping pole positions, suggesting a probable middle 13th century age for both that would represent the abandonment of the site. Associated radiocarbon dates are consistent with all three of the "well-behaved" archaeomagnetic results. The anomalous Room 1 result (1203) is stratigraphically earlier than the non-anomalous result, but not as early as the VGP would suggest. The anomalous Room 2 sample is marginal to known calibration point scatters. Its latitude is consistent with the Room 5 and Kiva 9 results, but its longitude is much lower. The conventions used for deriving archaeomagnetic date ranges (moving centerpoints to the closest positions on potentially relevant dating curve segments) produce an age range only slightly later than Room 5 and Kiva 9 hearths, but the feature pole position is unique and the archaeomagnetic date assignment is problematic (although it is consistent with the radiocarbon date).

LA 135290

Excavations within a rubble mound and artifact scatter at this site defined the presence of a surface roomblock. No pit structures or formal middens were present. Despite the lack of formal midden accumulations, the rooms revealed a complex remodeling sequence, with multiple floors and hearths. This complexity suggests a long and relatively continuous, if not intense, occupation of the site. In addition to three cooking or heating hearths, at least three burning incidents occurred in the rooms, affecting both floors and walls. Stratigraphic relationships between archaeomagnetic sets are relatively clearly defined, increasing the interpretive potential of the results.

Room 2

Two archaeomagnetic sets were collected from hearths in Room 2. The stratigraphically earliest set (1231) was collected from Hearth 16. This hearth was associated with an undefined floor surface that would have been built and used early in the life of the roomblock, probably as part of the initial occupation. Floor 1 was built over this hearth, replacing the earlier floor. A later feature, Hearth 11 (set 1229) was associated with Floor 1, installed by cutting through and destroying part of Hearth 16. Floor 1 was directly overlain in some areas by burned structural remains, suggesting that the last use of Hearth 11 would be before or contemporary with one of the other burning incidents in the roomblock.

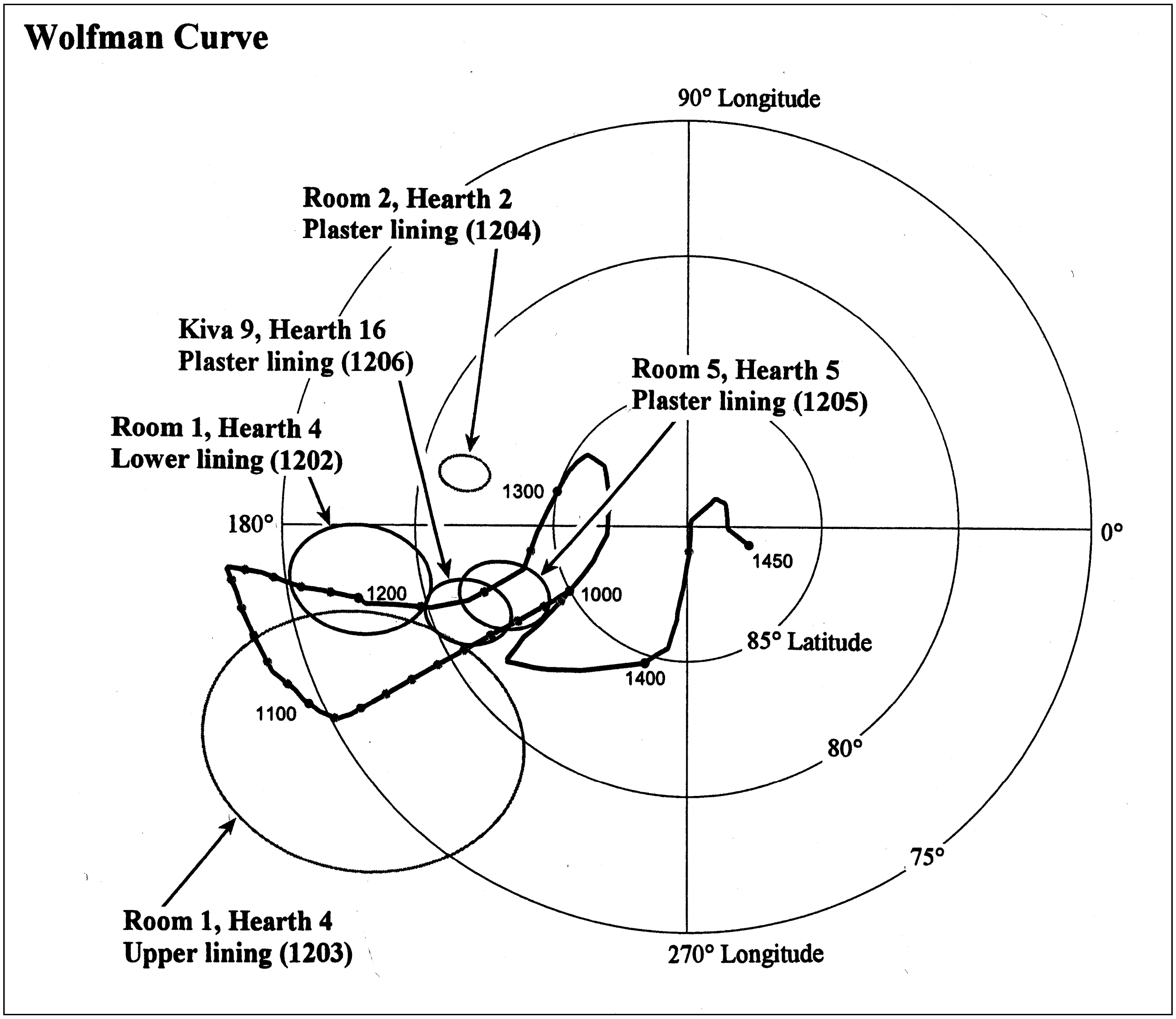


Figure 66.11. All interpretable LA 86534 archaeomagnetic ellipses plotted against the Wolfman Curve. Anomalous results are presented in gray.

Eight specimens were collected from the lower Hearth 16 (set 1231; see Table 66.1). The best VGP result followed demagnetization at 200 Oe. One specimen vector was an outlier and was eliminated from the final VGP calculation. The error term is moderate ($\forall_{95}$ = 1.7E). The error ellipse overlaps two segments of the Wolfman Curve within the AD 1100–1300 time span, resulting in two possible date ranges (Figure 66.12). The earlier and less likely range is AD 1105–1150, while the later range of AD 1155–1210 is a more probable date interpretation for the last burning of the hearth. The date range based on the SWCV2000 is AD 1035–1165, but this range is too early given contextual information. Compared with DuBois' AD 1125–1225 samples (Figure 9.14, Volume 1), the ellipse encompasses the earlier portion of the point scatter. Compared with the DuBois AD 1225–1300 centerpoints, the ellipse slightly overlaps the early end of the distribution (Figure 9.21, Volume 1). A radiocarbon date was derived from maize from the hearth fill, yielding a calibrated two-sigma range of AD 1040–1260 and an intercept of

AD 1190 (see Table 66.3). These independent chronological data support the Wolfman mid to late 12th century date interpretation.

Set 1229 was collected from Hearth 11 and consists of seven individual specimens (see Table 66.1). During the measurement process, the best result was obtained after demagnetization at 300 Oe. The error term was moderately large ($\forall_{95}$ = 2.3E), and there were no outliers in calculating the final result. The error ellipse overlaps two segments of the Wolfman calibration curve in the AD 1000–1300 time period (see Figure 66.12), but a pre-AD 1125 date possibility is unlikely given the pottery associations of the site. The most probable date range based on the Wolfman Curve is AD 1195–1275. The large range is due to the imprecise pole location estimate; the centerpoint of the result is closest to the curve at about AD 1245. The relevant date range based on the SWCV2000 is AD 1175–1325, encompassing the Wolfman Curve date range. This result overlaps the later scatter of centerpoints from the AD 1125–1225 DuBois data set (Figure 9.14, Volume 1) and a portion of the early scatter of centerpoints for the AD 1225–1300 period (Figure 9.21, Volume 1).

The two samples are in proper stratigraphic and temporal sequence, spanning the middle to late 12th century and the early to middle 13th century.

Room 4

Two archaeomagnetic sets were collected from floors within Room 4. The earliest set (1232) was collected from a portion of Floor 3 that had been thoroughly hardened by a room fire. This floor was the original floor in this portion of the roomblock, and it had been in place before the construction of what is now the south wall of Room 4. This floor is known as Floor 3 in Room 4, while the same floor installation is designated Floor 2 within the adjacent Room 5. The burned portion of this floor was against the eastern wall of Room 4. The burning of Floor 3 was followed by room abandonment, deterioration, and rodent disturbance of the non-burned portions of Floor 4. A reoccupation began with clearing of deterioration debris, chinking of rodent holes, placement of the wall subdividing Room 4 from Room 5, and installation of a 3- to 4-cm-thick layer of clean adobe to form Floor 2. The wall extended only part way across the width of the room, resulting in a doorway to Room 5 at one end. After an unknown duration of use that left no features and no artifacts, another burning incident occurred. Floor 2 was burned in the vicinity of the doorway to Room 5, along with a portion of the doorway and adjacent wall. The second archaeomagnetic set (1227) was collected from Floor 2 in the vicinity of the doorway. The sequence of abandonment, deterioration, rodent disturbance, clearing, and rebuilding was repeated after this fire as well. The final floor, Floor 1, was constructed, used, and abandoned, also with evidence of a burning incident either at or shortly after the time of abandonment. The burning of Floor 1 could not be sampled.

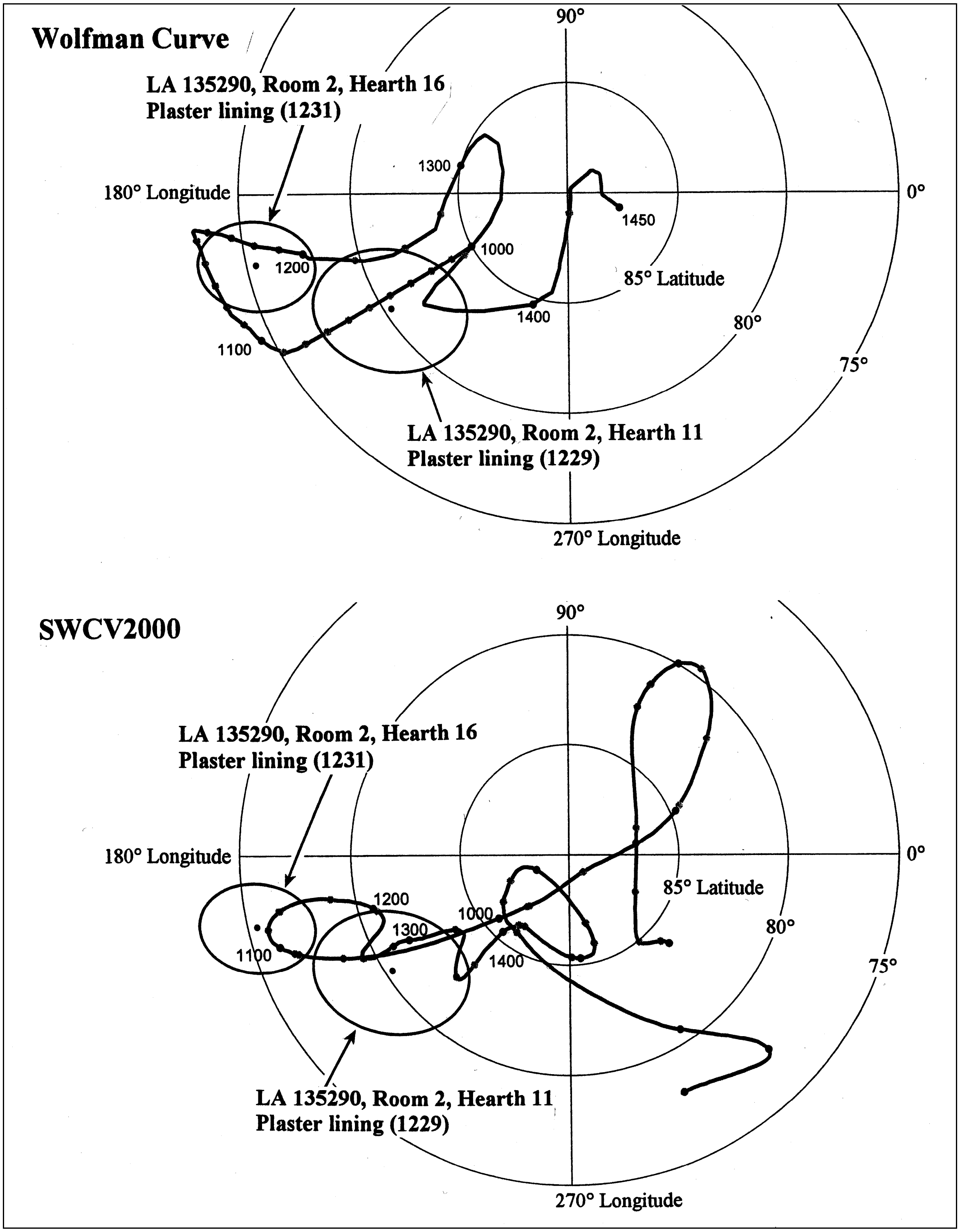


Figure 66.12. LA 135290, Room 2 archaeomagnetic results for sets 1229 (later) and 1231 (earlier). Centerpoints and error ellipses are plotted against both the Wolfman Curve and SWCV2000.

Floor 3 yielded seven specimens (1232), one of which proved to be an outlier and was eliminated from the final best result after demagnetization at 100 Oe (see Table 66.1). Precision of the result is moderate (α_{95} = 2.4º), but despite the uncertainty the ellipse overlaps only one segment of the Wolfman Curve (Figure 66.13).

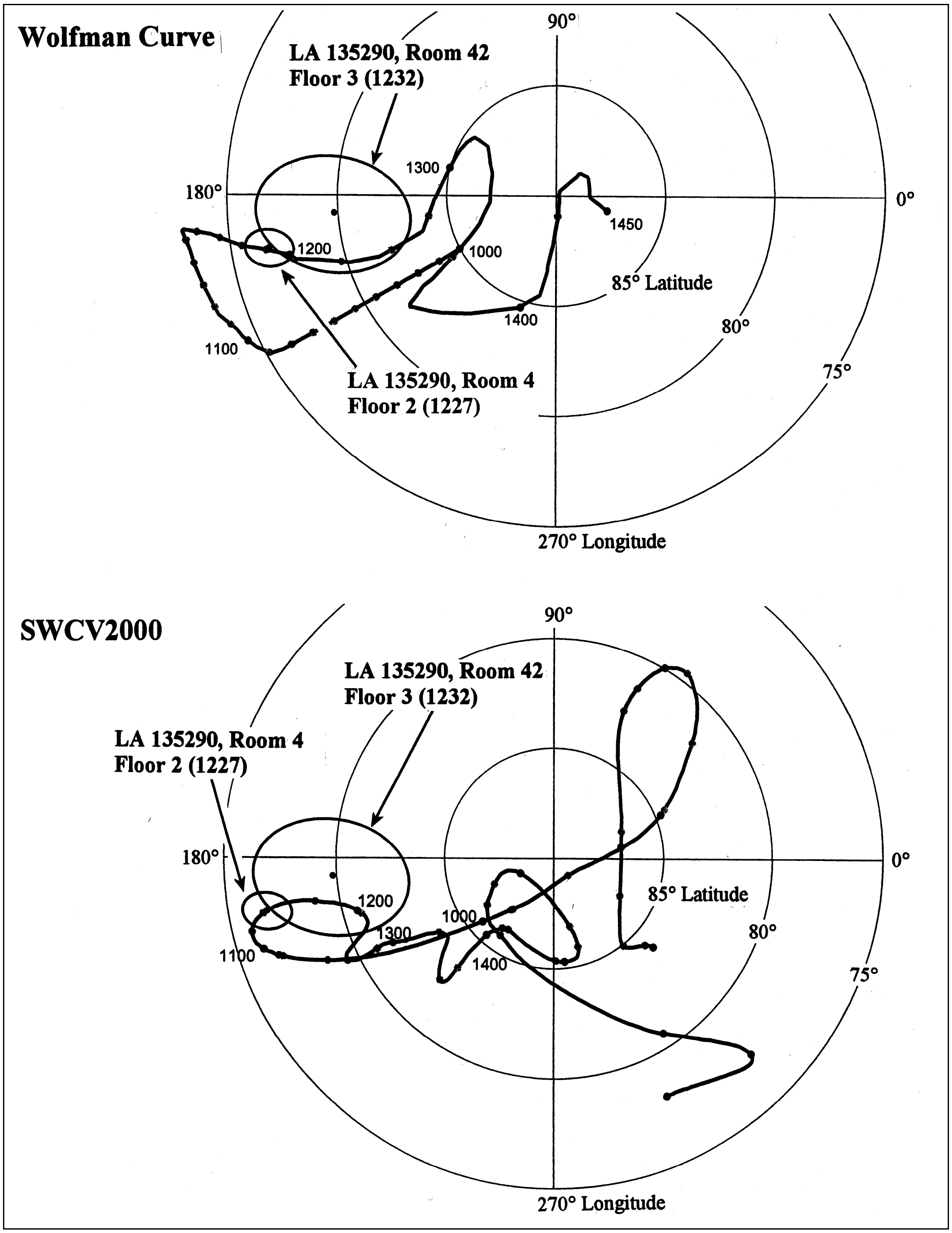


Figure 66.13. LA 135290, Room 4, Floor 3 and Floor 2 archaeomagnetic results for sets 1232 (earlier) and 1227 (later).

Intercepts of the result provide an estimated date range of AD 1180–1260. When compared with the SWCV2000, this result produces a date range of AD 1130–1305, encompassing the more precise interpretation based on the Wolfman Curve. The ellipse encompasses DuBois' sample centerpoints in the middle to late AD 1125–1225 period, but primarily those points that are at lower longitudes (Figure 9.14, Volume 1). The ellipse encompasses a smaller proportion of AD 1225–1300 DuBois centerpoints in the early to middle portion of the scatter (Figure 9.21, Volume 1).

Set 1227 was collected from Floor 2. It consisted of seven specimens, and all were included in the calculation of the final result after demagnetization at 200 Oe. The result is extremely precise (α_{95} = 0.7º), and it overlaps only a single segment of the Wolfman Curve (see Figure 66.13). The date range interpretation is AD 1180–1205. Comparison with the SWCV2000 yields a date range of AD 1125–1165, but a date this early is unlikely given the pottery at the site. When compared with the DuBois' sample centerpoints in the AD 1125–1225 period (Figure 9.14, Volume 1), the ellipse overlaps the early to middle portion of the centerpoint scatter. In the AD 1225–1300 period, the overlap is with DuBois' centerpoints in the early portion of the scatter (Figure 21, Volume 1).

The centerpoints of the two samples are in reverse stratigraphic sequence along the VGP curve, but the error ellipse of the stratigraphically earlier sample overlaps that of the later result.

Room 6

Room 6 also experienced multiple burning incidents. Floor 3 was the original floor of the room. After a period of use, the room burned, baking the floor and littering the floor with charcoal and other structural debris. Set 1226 was collected from this lower floor. Floor 2 was constructed on top of the debris from the first fire, and it also was burned after a period of use. No archaeomagnetic samples were collected from Floor 2, but a set was collected from the east wall of the room, above the level of Floor 2 (1228). This wall would have been affected by the burning incidents associated with both Floors 3 and 2, but the Floor 2 fire may be exclusively reflected in the magnetic orientation of the wall sample if the second burning reached equivalent or higher temperatures than the first. Evidence of a final floor (Floor 1) was preserved as a large unburned adobe patch in the fill above Floor 2. Floor 1 was not visibly burned.

Eight specimens were collected from Floor 3 (1226). The best result includes all eight specimens and was achieved after demagnetization at 100 Oe (see Table 66.1). The result is relatively precise (α_{95} = 1.1º) and overlaps only one segment of the Wolfman Curve (Figure 66.14). Based on that curve the ellipse intersection points yield a date range estimate of AD 1170–1210. The date range based on the SWCV2000 again appears to be slightly too early (AD 1125–1175). The ellipse encompasses DuBois' sample centerpoints in the early to middle AD 1125–1225 period (Figure 9.14, Volume 1). The ellipse is marginal to the early portion of the scatter of AD 1225–1300 DuBois centerpoints (Figure 9.21, Volume 1).

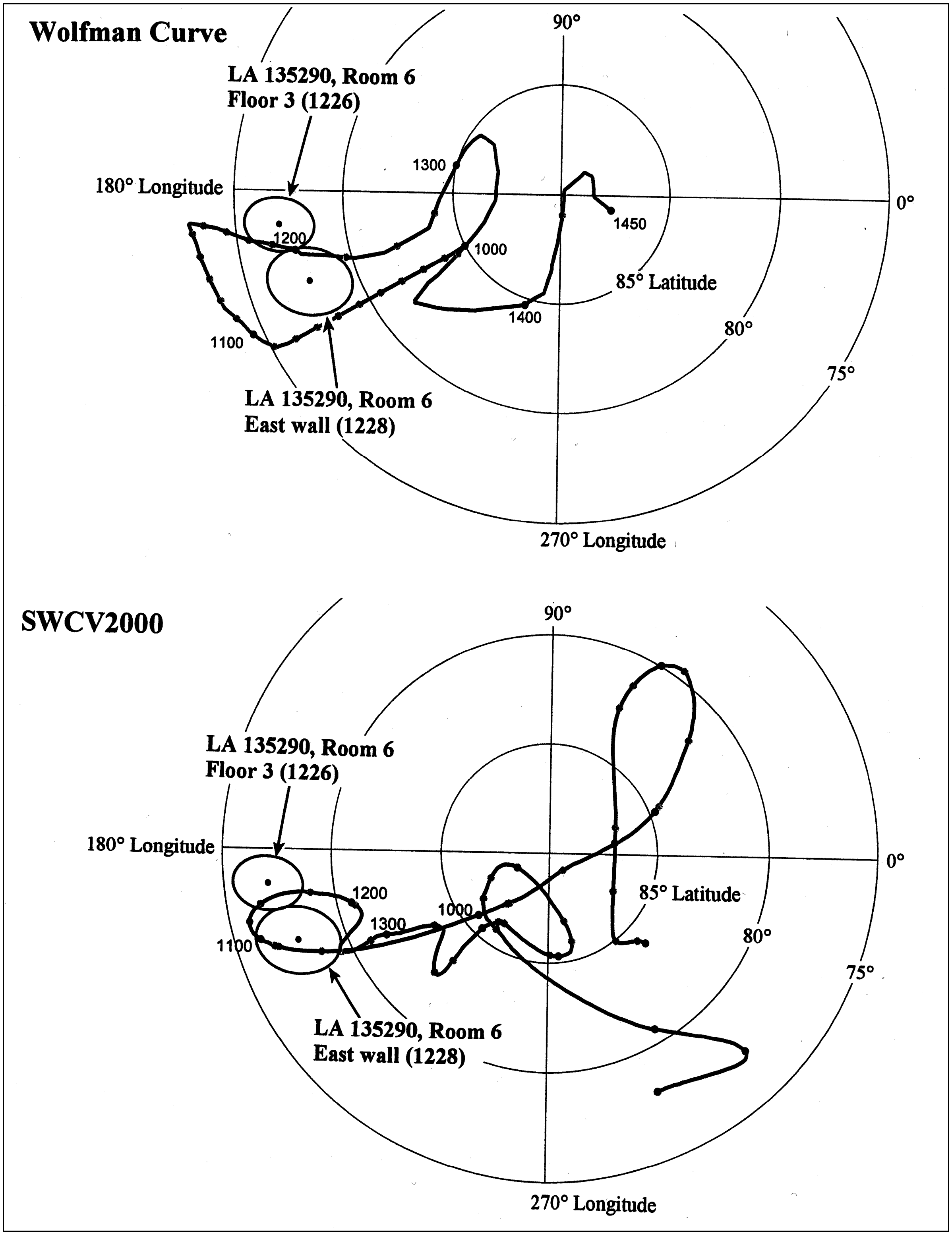


Figure 66.14. LA 135290, Room 6, Floor 3 and east wall archaeomagnetic results for sets 1226 (earlier) and 1228 (contemporary or later). Centerpoints and error ellipses are plotted against both the Wolfman Curve and SWCV2000.

Only six specimens were collected from the wall of the room (1228). They were collected between 16 and 25 cm above Floor 3, and at that elevation they would have been affected by the fire that is associated with Floor 2 as well as that of Floor 3. If the Floor 2 fire generated a similar or greater heat than the Floor 3 fire, the magnetic orientation of this set would have been influenced by both or by the Floor 2 fire alone. Despite the smaller than desirable sample size, the result after demagnetization at 100 Oe was moderate in precision (α_{95} = 1.3º). The ellipse overlaps only one segment of the Wolfman Curve, and the date range estimate based on that curve is AD 1185–1230. The corresponding date estimate based on the SWCV2000 is AD 1020–1110, which is unlikely, although the ellipse also grazes the curve at AD 1225–1290. The ellipse encompasses DuBois' sample centerpoints in the middle AD 1125–1225 period (Figure 9.14, Volume 1), and the ellipse encompasses points in the early portion of the AD 1225–1300 DuBois point scatter (Figure 9.21, Volume 1). These two results are in stratigraphic sequence along the curve.

Room 8

The floor and lower walls of Room 8 appear to have escaped significant effects of the burning incidents noted for the other rooms, although less intense burning cannot be ruled out based on two lightly heat-affected areas of the floor. Only a single floor was detected during excavation, associated with a single cylindrical hearth. The hearth itself was remodeled, but the only area that could be sampled was the lip and rim. The resulting set (1230) represents the last use of the hearth.

Eight specimens were collected from the rim of Hearth 9 (1230), representing the last use of the room. The best measurement result for the hearth sample was following demagnetization at 50 Oe (see Table 66.1). One specimen measurement was an outlier and was excluded from the final calculations. The error term is good to moderate (α_{95} = 1.3º), and the ellipse intersects two segments of the AD 1000–1300 portion of the Wolfman Curve (Figure 66.15). The early segment (middle 11th century) is unlikely based on ceramic dating evidence. The date range estimate based on the later segment is AD 1195–1240. The segment intercepts with the SWCV2000 again include one that is early (AD 1015–1050) and one at AD 1230–1285. Compared with the scatter of DuBois' centerpoints that are dated to the AD 1125–1225 period, the ellipse falls within the middle to late portion of the scatter (Figure 9.14, Volume 1). When compared with the AD 1225–1300 centerpoint scatter, the ellipse overlaps the early end of the distribution (Figure 9.21, Volume 1). A radiocarbon date on maize from the hearth fill yielded a calibrated two-sigma range of AD 1040–1260, with an intercept of AD 1190 (see Table 66.3).

Summary

The archaeomagnetic sets span most if not all of the occupation and remodeling sequences of the site. No sets represent the second construction phase of Rooms 3, 7, and 9B (there were no hearths or burning incidents recorded in the rooms). However, if these rooms were added as storage space (as appears to be the case), the hearths in Rooms 2 and 8 (1229 and 1230) should be contemporary with their use and should record the final occupation of the site. It is likely that the final occupation date is contemporary with or earlier than the final burning of the site, but there are no floor or wall samples that can be confidently attributed to this final burning episode. Without such samples we cannot assess the contemporaneity of abandonment and burning.

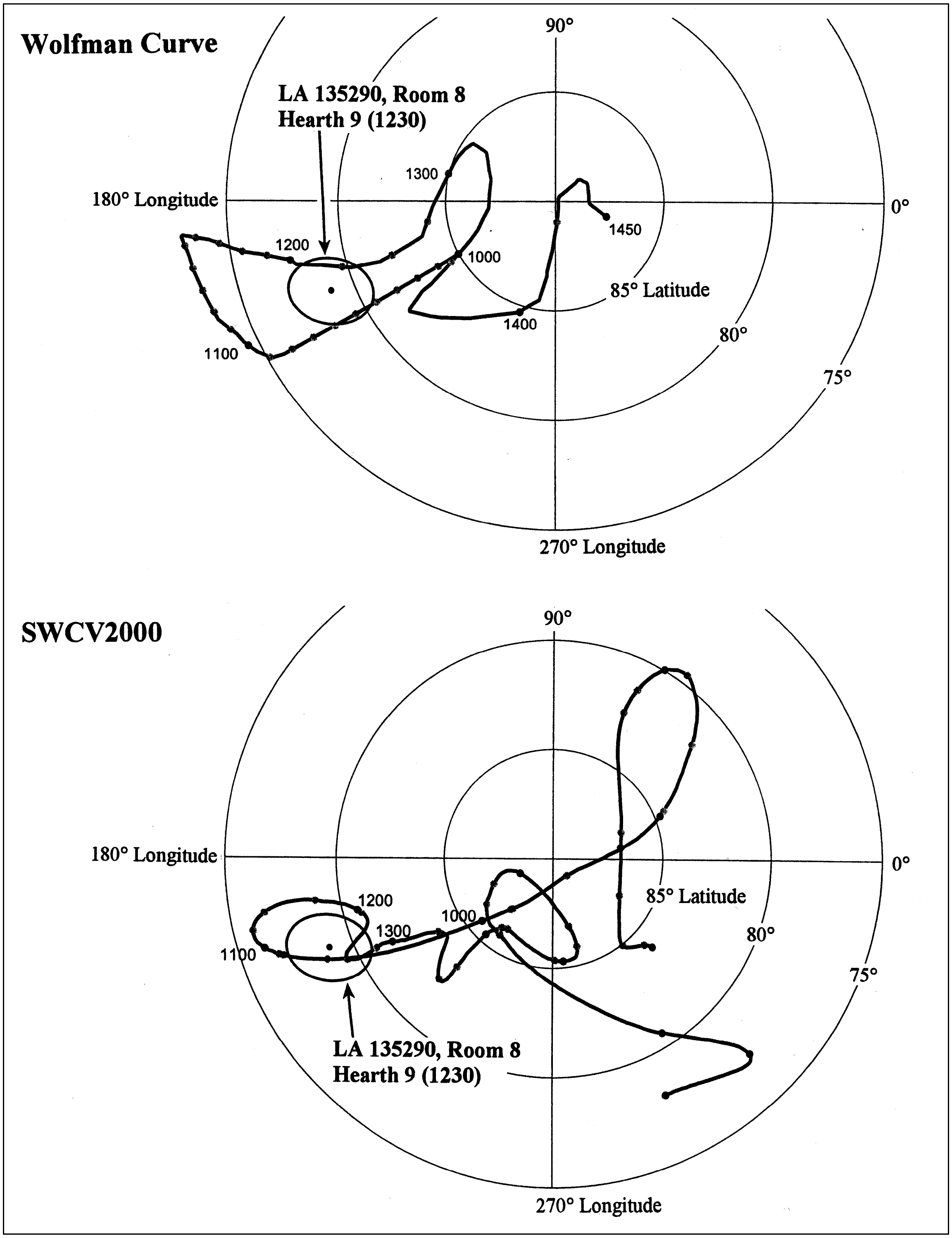


Figure 66.15. LA 135290, Room 8, Hearth 9 archaeomagnetic results for set 1230. The centerpoint and error ellipse are plotted against both the Wolfman Curve and SWCV2000.

Two sets (1227 and possibly 1228) record what appears to be the penultimate burning of the roomblock. These sets are from the Room 4 floor and the Room 6 wall. If the stratigraphic reconstruction of burning and remodeling events in this portion of the site is accurate, these two results should be contemporary. Similarly, what appears to be the first burning of this portion of the site is documented by sets from the lower floors in Rooms 4 and 6. The hearth sample from Room 2 could be either earlier than, or contemporary with, this burning event.

All of the results are portrayed together in Figure 66.16. They cluster tightly, and their centerpoints span the AD 1180–1240 segment of the Wolfman Curve.

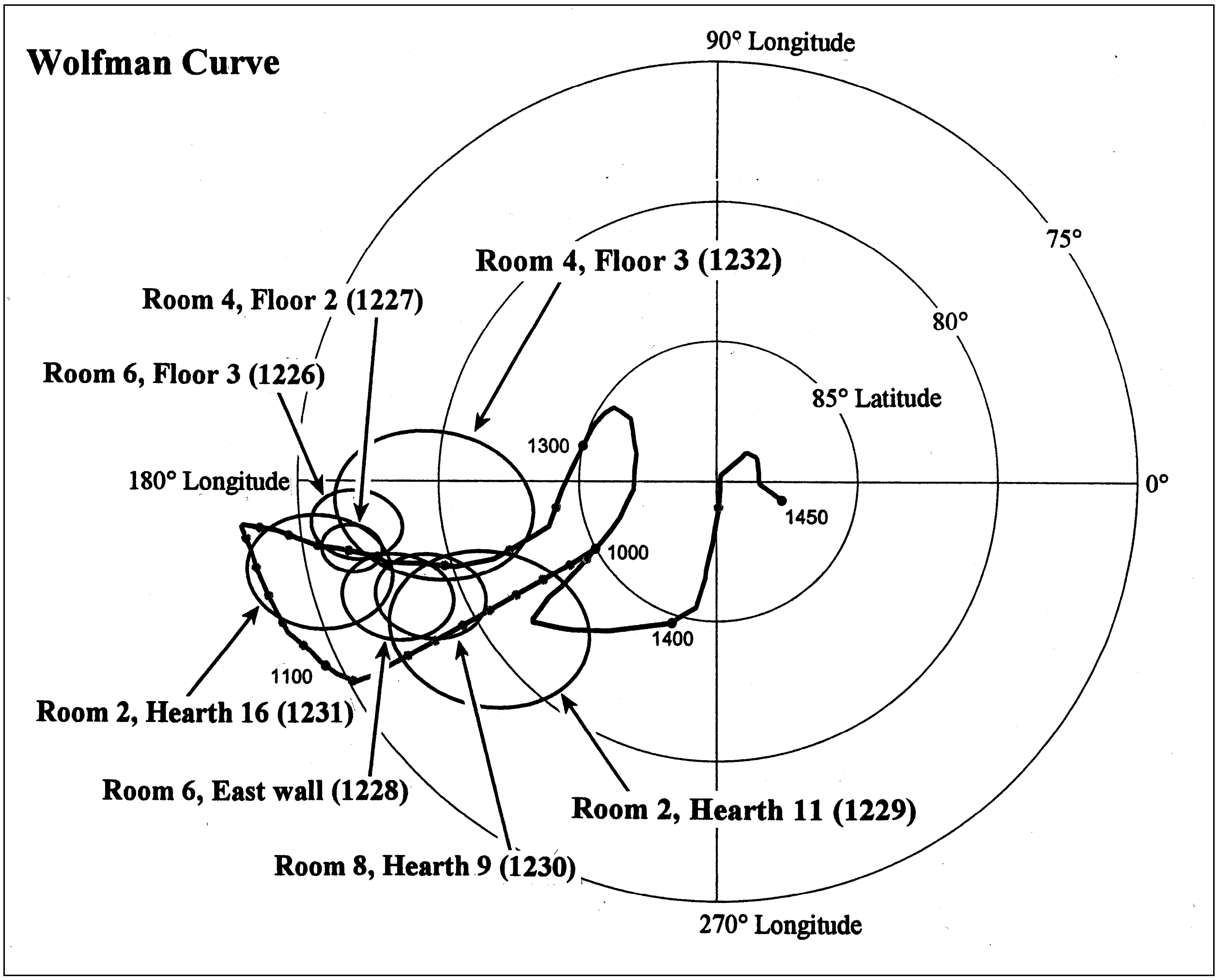


Figure 66.16. LA 135290 archaeomagnetic error ellipses plotted against the Wolfman Curve.

Room 2, Hearth 16 (1231) was expected to be the earliest sample or one of the earliest samples, and it falls at the earliest end of the series along the curve. The sets from Room 4, Floor 3 (1232) and Room 6, Floor 3 (1226) represent the first burning of the roomblock, equal to or slightly later in age than the Room 2, Hearth 16, sample. Both results are slightly later than the hearth. The Room 6, Floor 3, result is imprecise, and although its centerpoint is later in time than the Room 4 sample, its error ellipse encompasses the centerpoint and most of the ellipse for the presumably contemporary Room 4 result. Assuming that the more precise result is more accurate, the initial burning of the roomblock occurred around the last decade of the 12th century and the burning was a slightly later event than the last use of the Room 2 hearth.

The Room 4, Floor 2 (1227) and Room 6, wall (1228) samples were expected to be contemporary, representing a second major burning of the roomblock. Although clearly stratigraphically separated from the earlier floors (1226 and 1232), the archaeomagnetic date estimate for the Room 4, Floor 2 sample (1227) appears to be contemporary with the more precise of the lower floor results (1226). Both results are relatively precise, their error ellipses overlap (each encompassing the centerpoint of the other), and they are given equivalent date ranges based on the Wolfman Curve. Although we believe that the SWCV2000 is incorrect in its representation of VGP movement in the late 12th and early 13th centuries, the SWCV2000 does suggest an excursion of the pole location in the early 13th century that is in the direction of the centerpoint separations of the 1226 and 1227 results. However, the error ellipses overlap, and the centerpoint comparison may be misleading.

The second of the potentially contemporary samples, the Room 6 wall set result (1228), is less consistent with the expected temporal relationships. Although the wall sample orientation could have been affected by both the earlier Floor 3 burn and the later Floor 2 burn, we had assumed that the magnetic orientation would have been partially or totally reset by the later burn. The 1228 result location supports that assumption since there is little overlap with either of the two earlier burn results (1226 or 1232), and the 1228 VGP location is in the expected position for a later date. However, there is also little overlap with the supposedly contemporary Floor 2 sample (1227), suggesting that the wall recorded a significantly later burning event than was recorded by Floor 2. Wall samples can be subject to systematic distortion through settling or tilting of entire wall sections, producing precise-appearing but inaccurate results. No evidence of wall movement was noted during field sampling, but that possibility cannot be ruled out. If wall movement has affected the set, then the 1228 result is simply invalid. If the wall set is not distorted, the result documents an additional later burning of Room 6, possibly contemporary with the burned material noted on the floor in Room 2 and the minor burned floor patches in Room 8. Also, the location of the centerpoint for the wall sample is consistent with the possible excursion of the calibration curve that is suggested by SWCV2000 but that is not reflected in the Wolfman Curve.

Hearths in Rooms 2 (1229) and 8 (1230) were expected to document the final occupation of the site. Burned structural materials overlay the Room 2 floor, suggesting a third and final burning of the roomblock coincident with or after the final use of the hearth. Only traces of burning were present on the floor of Room 8, away from the hearth, but the hearth was architecturally associated with the final occupation of the roomblock. Neither of these traces of the final burning could be sampled for archaeomagnetic dating. The Room 2 hearth result (1229) is relatively imprecise and encompasses the centerpoint and most of the ellipse of the Room 8 result (1230). If the general position of the Room 2 result is accurate it would support abandonment as late as AD 1270, but such an interpretation is unlikely. Given the imprecision of the Room 2 result and its statistical compatibility with the Room 8 dating implications, the latter suggests abandonment around or before AD 1240. The Room 8 result also encompasses the centerpoint and most of the error ellipse of the Room 6 wall sample (1228), suggesting that they could be contemporary or closely contemporary. If they are both recording the third and presumably final burning of the roomblock, then burning and abandonment could date to AD 1225 or slightly earlier.

The suite of samples conservatively places the occupation of the roomblock within the AD 1155–1270 time range, but the more precise suite of results narrows that range slightly to AD 1170–1240. This range is consistent with the ceramic dating implications for the site and with radiocarbon dates that are associated with two burned features (see Table 66.3). Both dates are on maize, one associated with Room 2, Hearth 16 (the stratigraphically earliest archaeomagnetic dating sample) and one with Room 8, Hearth 9 (the last use component at the site). The calibrated range of the earlier sample is AD 1040–1260, with an intercept of AD 1190, while the later date is AD 1160–1270, with an intercept of AD 1220.

LA 85411

Nine specimens were collected as a set (ADL 1281) from a hearth (Feature 1) in Room 1 at the site. No specimens could be collected from the hearth walls or rim, and all were collected from the plaster lining of the hearth floor. The material was measured at NRM, and the individual specimens yielded an anomalous VGP location (32.9˚ latitude, 127.3˚ longitude) with a large dispersion of individual moments (α_{95} = 13.6˚) (see Table 66.1). Eight of the nine specimens were included in the result calculation, with one specimen omitted as an outlier. Declinations of the individual specimens were within the expected range (308º to 338º longitude), but inclinations were highly variable, ranging from –28˚ to 44˚ from horizontal. Specimen intensity was moderately strong at 10^{-3} Oe. However, the anomalous pole position and dispersed specimen orientations at NRM suggested that the sample result would not improve upon demagnetization. No demagnetization and remeasurement steps were carried out.

Error terms greater than 4.0˚ are normally considered unreliable for archaeomagnetic date interpretation, although such imprecise results usually still carry some chronologic information. In this case, the apparent pole position is extremely unusual, suggesting an inaccurate (or irrelevant) as well as imprecise result. Strong samples with aberrant pole positions due primarily to unusual inclinations can be produced by the magnetic influence of a nearby lightning strike. Lightning strikes are a common feature of the Pajarito Plateau, and it is likely that a lightning strike added a strong vertical moment to the TRM vector of this sample, rendering the specimens unusable for archaeomagnetic dating.

LA 85417

Ten specimens were collected as a set (ADL 1282) from a portion of burned floor in the northwest corner of Room 1 at the site. All 10 specimens were measured, both at NRM and after demagnetization at 50 Oe. In this case, the "best" result was the orientation after measurement at NRM (see Table 66.1). The sample was relatively incoherent, with a large error term (α_{95} = 4.0˚)

after 1 of 10 specimens was eliminated as an outlier. The ellipse overlaps the late 12th century segments of both the Wolfman and SWCV2000s (Figure 66.17).

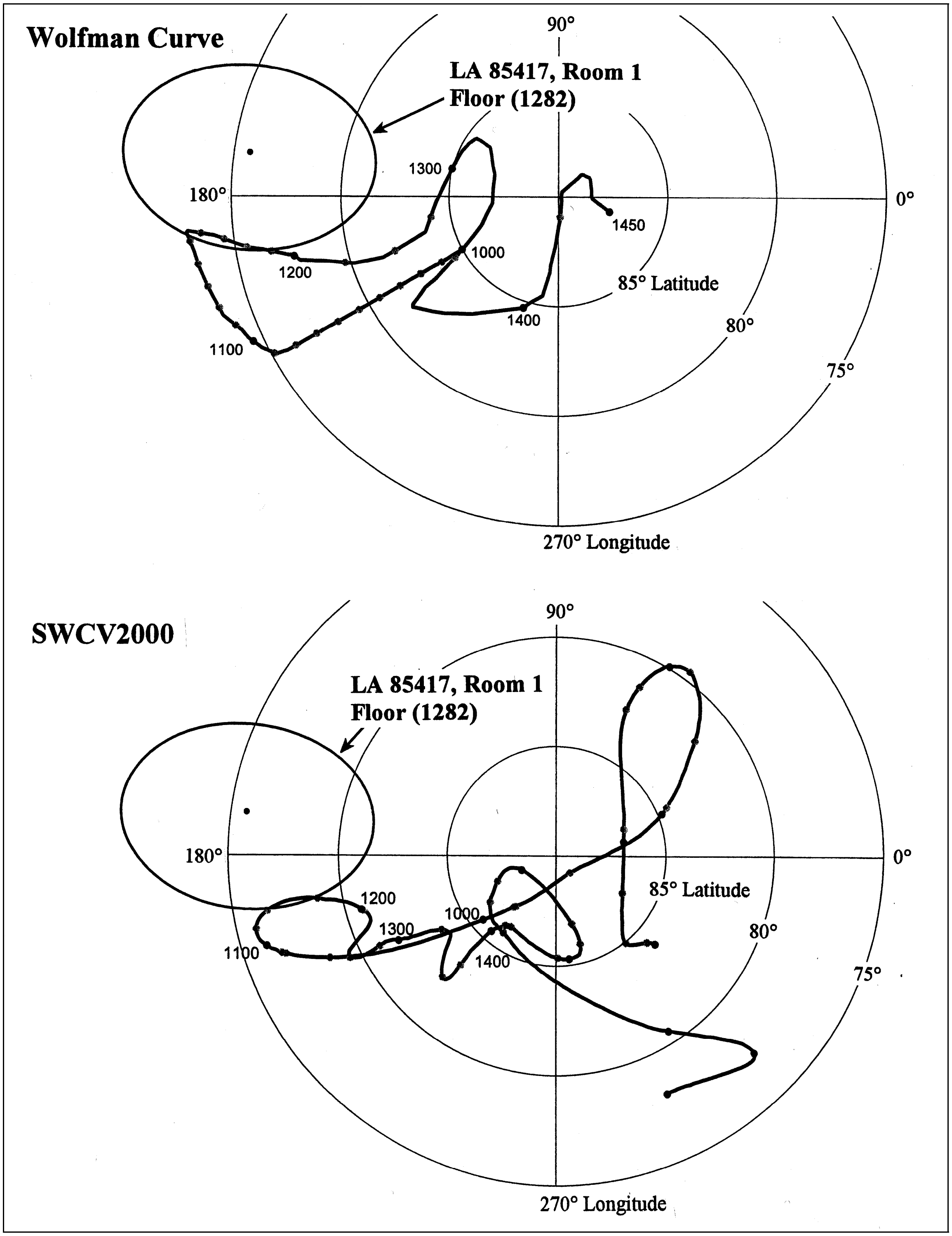


Figure 66.17. LA 85417, Room 1, floor archaeomagnetic results for set 1282. The centerpoint and error ellipse are plotted against both the Wolfman Curve and SWCV2000.

In both cases, the centerpoint is located more than 5˚ lower in longitude than the curves, and only the large error ellipse size allows the overlap with the curves. The estimated date range based on the Wolfman Curve is AD 1100–1235, whereas the date range based on SWCV2000 is AD 1010–1310. The date range is much bigger for the SWCV2000 because of the tightness of the AD 1125 loop represented in that curve and because of the size of the sample error ellipse. Compared with the scatter of DuBois' centerpoints that are dated to the AD 1125–1225 period, the ellipse encompasses the early to middle portion of the swarm at lower longitudes (Figure 9.14, Volume 1). There is no overlap with the AD 1225–1300 or 1300–1400 centerpoint scatters (Figures 9.21 and 9.28, Volume 1).

The dating implications of the archaeomagnetic pole position are that the structure burned in the Early Coalition period, probably before AD 1250 (based on the Wolfman Curve). Site excavators believed that the site could date to the Classic period (14^{th} and 15^{th} centuries AD), but laboratory analysis of pottery identified Coalition and Historic period occupations only. The Coalition pottery is consistent with the archaeomagnetic VGP implication. No radiocarbon date was obtained from the hearth fill.

LA 85861

A single surface room with a hearth was the only candidate for archaeomagnetic sampling at this site. The surface room was a fieldhouse, and associated pottery suggested an Early Classic period occupation to the field excavators. The hearth itself was rock-lined, and the interstitial plaster was too weakly burned and too disturbed for normal sample definition and collection. An experimental sampling technique was applied to a rhyolite cobble that was the most accessible stone of the hearth lining. The sampling was experimental in two ways. First, there was no guarantee that the heat of the hearth fire was sufficient to reach the Curie point of the magnetic minerals in the rock. If not, the magnetic moment of the specimens would represent the magnetic orientation of the rock at the time of its formation rather than the TRM orientation associated with the use of the hearth. The second experimental aspect of the sampling was the use of epoxy to adhere oriented plaster cube portions to the fire-exposed surface of the rock. After the adhesive had cured and the orientations of the faces of the cube portions were recorded, the rock was removed for subsequent laboratory preparation of the specimens. The rock was then cut with a water-cooled diamond masonry saw, and the specimens were trimmed to remove excess material from the interior of the cobble. Removing excess rock both removed material that would have been relatively weakly affected by hearth fires and allowed the specimen to fit within a standard 1-inch mold for plaster encasement and measurement.

Four specimens were prepared following these procedures and were submitted for measurement as ADL 1307 (see Table 66.1). The average of the specimen moments were strong (1.4 by 10^{-2}) but were more incoherent than would be expected for such strong archaeomagnetic samples (α_{95} = 7.1˚). The estimated VGP location was at 27.52˚ latitude and 22.19˚ longitude (in the Atlantic Ocean off of the northwestern coast of Africa), and the error ellipse does not approach any of the Southwestern archaeomagnetic dating curves despite its size. Although an error term as large as 7.1˚ is uninterpretable in archaeomagnetic dating, geomagnetic VGP locations are commonly this imprecise. These specimens reflect the coherence of the original magnetic orientation of the rhyolite formation, and the orientation reflects the rhyolite magnetic moment as modified by incorporation of the rock into the hearth lining. Although these results are not helpful for the dating of the LA 85861 structure, they do validate the experimental field sampling approach used in this case.

LA 85864

A single burned feature was sampled at this site. It was located within an apparent tipi ring and appears to have served as the hearth of that structure. The burned sediments were extremely variable in quality, and only two specimens were collected from well-burned material. The occupation is believed to have been Apachean within the Historic period, with historic artifacts that suggest a late 19th or early 20th century use of the site.

Seven specimens were collected (set 1234), and all seven were included in the final result (see Table 66.1). The results did not improve upon demagnetization (the best result was at NRM), and the result has poor precision ($\alpha_{95} = 3.1^{o}$). The imprecision is not simply due to the inclusion of specimens cut from weakly burned material in the set. One of the two specimens cut from well-burned material falls near the centerpoint of the result, while the other falls just outside the limit of the confidence ellipse (Figure 66.18). Only the SWCV2000 and DuBois curves cover the Protohistoric period for the Southwest. The ellipse overlaps the 1625–1850 and post-AD 1925 segments of SWCV2000. The ellipse overlaps only the modern end of the DuBois curve, but it is adjacent to the DuBois curve along the late 17th through early 19th century segment. The calibration of the SWCV2000 suggests an erratic pace of VGP movement during this time span, with a period of rapid movement before 1775 and very little movement through the early decades of the 19th century.

Dating estimation with the pre-1850 portions of both curves is relatively straight forward, yielding date ranges of AD 1600–1820 and circa AD 1675–1840 on the DuBois and SWCV2000s, respectively. Since the ellipse also overlaps the terminal ends of both curves, alternative interpretations would be AD 1730–present and AD 1850–present on the DuBois and SWCV2000s, respectively. Neither the earlier nor the later date ranges can be preferred using these sample data alone, and both are compatible with a radiocarbon date on wood that yielded a calibrated two-sigma date range of AD 1650–1890, with three intercepts at AD 1680, 1770, and 1800 (see Table 66.3).

The date interpretation for this result is hampered by both the imprecision of the 1234 result and the weak nature of the calibration curves for the Protohistoric time period. The ellipse for this result does not encompass the centerpoint for a relatively precise result from Ft. Burgwin (ADL 1184) that is independently well-dated to the early AD 1860s (see Figure 66.18). The Ft. Burgwin result is more consistent with the path of the DuBois curve but it is more consistent with the calibration of SWCV2000. If the Ft. Burgwin result is both an accurate and precise ($\alpha_{95} = 0.9^{o}$) representation of the VGP position in the early AD 1860s, and if the general direction of the true VGP path can be inferred from the two calibration curves, then it is slightly more likely that the date of the 1234 result is in the late 19th century than the late 18th century. However, due to its imprecision, a date in the late 18th century cannot be ruled out for the ADL 1234 result on the basis of archaeomagnetic data alone.

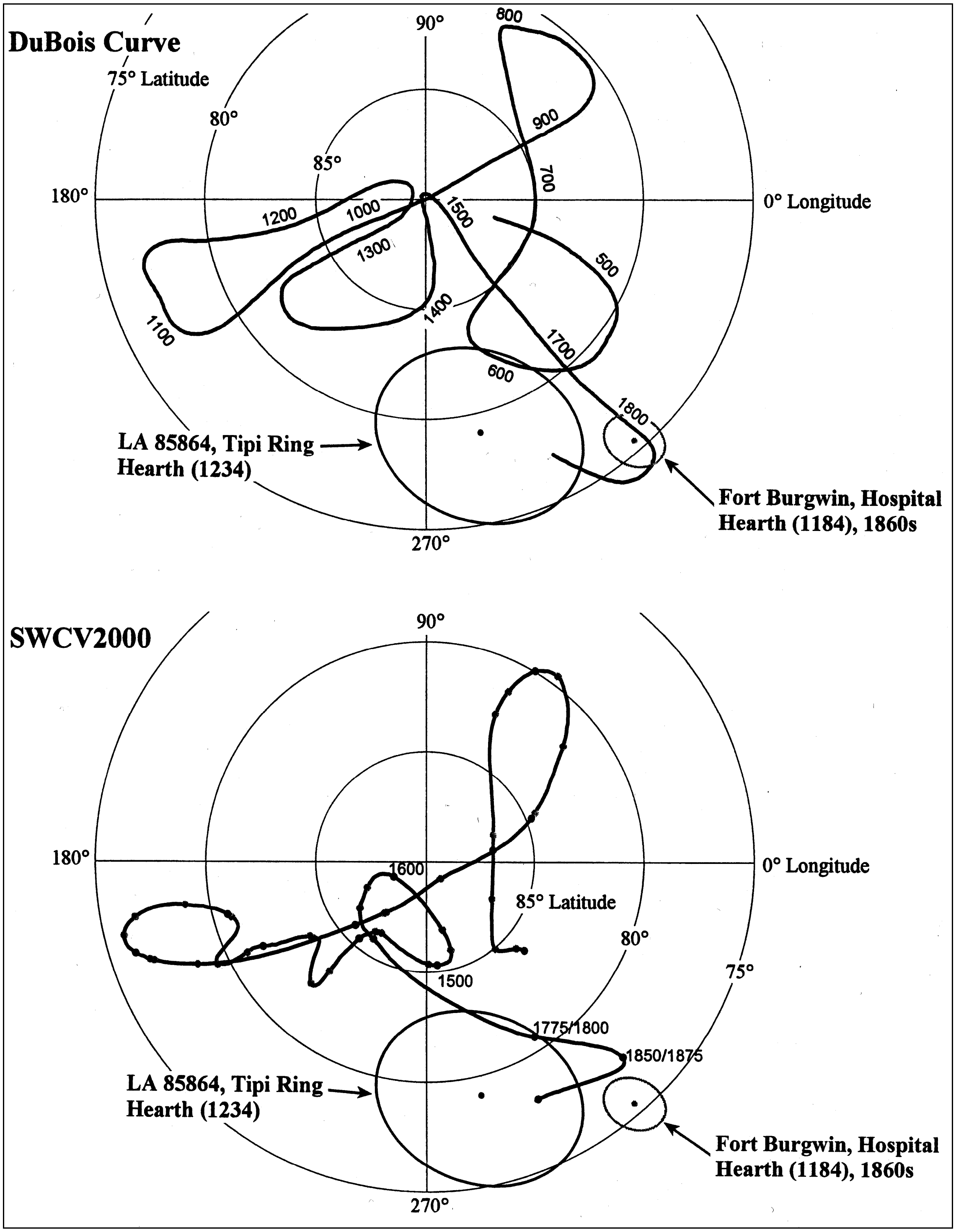


Figure 66.18. LA 85864, tipi ring hearth archaeomagnetic result for set 1234 and a comparative result from the 1860s Ft. Burgwin Hospital. The centerpoints and error ellipses are plotted against both the Wolfman Curve and SWCV2000.

LA 99396

A single hearth was suitable for archaeomagnetic sampling at this site. It was located within Room 1, and a field assessment of the very sparse associated pottery suggested a Late Developmental period age for the component. However, subsequent laboratory analysis of the pottery identified organic-painted Santa Fe Black-on-white and firmly indicates a Coalition period date assignment for the occupation.

Set 1233 was collected from Hearth 7 and consists of eight individual specimens (see Table 66.1). During the measurement process, the best result was obtained after demagnetization at 300 Oe. The error term was moderately large (α_{95} = 2.5º), and there were no outliers in calculating the final result. The error ellipse overlaps two segments of the Wolfman calibration curve in the AD 1000–1300 time period (Figure 66.19). The two possible date ranges are AD 1020–1085 and 1175–1260. Using only archaeomagnetic data, the later date range is slightly more probable since the centerpoint is closer to the later than to the earlier curve segment. When the result is compared with the SWCV2000 VGP curve, the error ellipse completely encompasses the AD 1010–1315 loop of the SWCV2000. When the centerpoint is moved to the two closest points along the pre- and post- AD 1125 segments of the SWCV2000, the resulting date estimates are AD 1010–1125 and 1155–1320. These date ranges overlap those inferred from the Wolfman Curve. The ellipse encompasses the later portion of the DuBois AD 1125–1225 centerpoints (Figure 9.14, Volume 1) and the earlier portion of the AD 1225–1300 centerpoints (Figure 9.21, Volume 1).

The laboratory analysis of the associated pottery supports the Coalition period interpretation of the archaeomagnetic date estimates (AD 1175–1260, based on the Wolfman Curve). Two radiocarbon samples, both wood, were submitted from the hearth contents (see Table 66.3). One yielded a calibrated two-sigma date range of AD 1040–1260, with an intercept at AD 1180. The second date yielded a date range of AD 1020–1200, with multiple intercepts (AD 1050, 1100, and 1140). Wood samples are expected to be either contemporary with or older than the target event, and these dates are consistent with the Coalition interpretation of the archaeomagnetic VGP.

LA 127634

A set from LA 127634 was collected in the vicinity of Feature 2, a slab-lined hearth. No specimens could be cut from either the rock lining or the interstitial plaster, but areas of the adjacent floor appeared to have been heat affected. A thin burned layer of floor was collected, overlying a soft and incoherent soil. Only five specimens were collected, and all five were measured at NRM. The precision of the result is too poor for interpretation (see Table 66.1), and the large error term (α_{95} = 31.8º) suggested that no improvement would be expected on demagnetization. The result was vaguely coherent (the large error ellipse would have encompassed the expected age of the sample), but it is likely that the burn was too light to establish a sufficiently strong TRM vector.

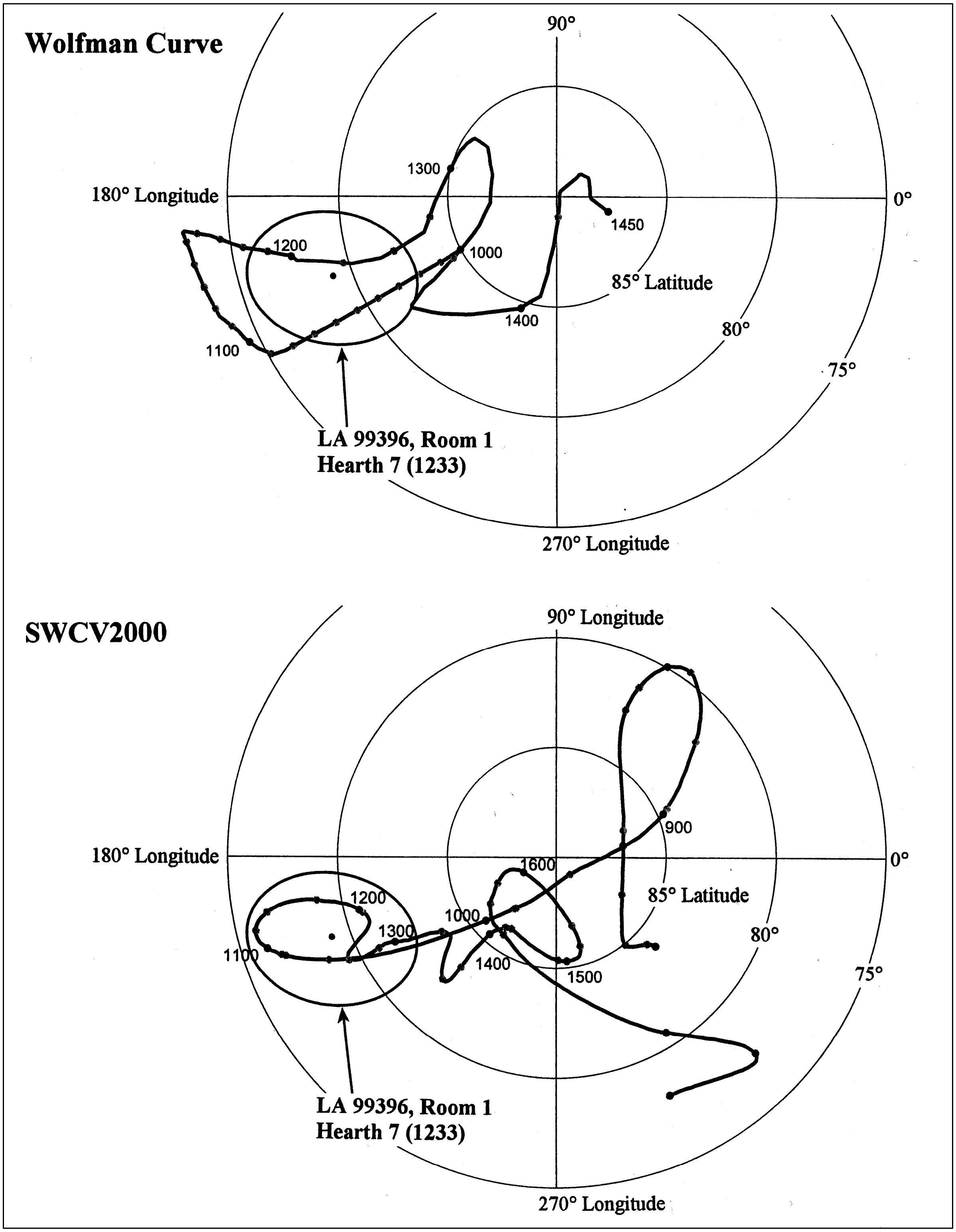


Figure 66.19. LA 99396, Room 1, Hearth 7 archaeomagnetic result for set 1233.

LA 127635

Two sets were collected from Feature 2, a plaster-lined hearth within Room 1. Both sets were collected from the upper portion of the lining, below the rim. The substrate is described as blue-gray on the surface (reduced) and oxidized to a light red within the plaster layer. Eight specimens were cut from each of the northeast and southwest portions of the rim. The southwest set was cut from substrate deeper within the hearth. Field observations included Biscuit B sherds that imply an occupation into the Late Classic period (15th century), while laboratory analysis of pottery from the site identified both Late Classic and Coalition components.

Both measurement results were coherent at NRM, and both sets were subjected to a full demagnetization protocol. The northeast set (1250) yielded a best result at NRM, while the southwest set (1251) yielded a best result after demagnetization at 100 Oe (see Table 66.1). The northeast set yielded a moderately precise VGP location (α_{95} = 1.3º), while the southwest set yielded an excellent result (α_{95} = 0.7º). Both VGP centerpoints fall along the Wolfman Curve in the AD 1200–1250 segment (Figure 66.20). The ovals do not intercept any other segments of the curve, and context suggests that no other segments need to be considered in interpretation. The two ellipses overlap, but they do not encompass each other's centerpoints. The samples should represent the same point in time (the same archaeomagnetic VGP location), and averaging would be warranted although it might lead to a spurious appearance of precision. Individually, the date range associated with set 1250 is AD 1210–1255, while the date range for set 1251 is AD 1200–1225. Since they should reflect the same burning event, their area of overlap in the Coalition period (AD 1210–1225) is a reasonable date estimate for the last use of the feature.

Slightly different date ranges are suggested by comparison with the SWCV2000. The set 1250 centerpoint is close to the SWCV2000 at about AD 1200, and the error ellipse overlaps only one segment of the curve. The SWCV2000 date range for this result is AD 1170–1245. The set 1251 error ellipse does not overlap any segments of the SWCV2000, although it is closely adjacent to both the early 11th and late 12th century segments. The early 11th century interpretation (AD 1020–1045) is probably not relevant, whereas the late 12th century date range of AD 1160–1190 is possible but somewhat early for the pottery assemblage.

The sample ellipses overlap the middle to late scatter of the DuBois 1125–1225 centerpoints (Figure 9.14, Volume 1) and the early low-longitude portion of the DuBois 1225–1300 centerpoints (Figure 9.21, Volume 1).

The archaeomagnetic results are not consistent with a 14th century (Classic period) occupation of the structure, but they are consistent with Middle Coalition occupation. Two radiocarbon dates were obtained for two samples of unidentified charred material from the hearth (see Table 66.3). The first yielded a date range of AD 1180–1280 with an intercept of AD 1250. The second yielded a date range of AD 1210–1290 with an intercept of AD 1270. Radiocarbon dates on unknown material are expected to be contemporary with or older than the target event, and these results are consistent with or slightly younger than the archaeomagnetic date range based on the Wolfman Curve.

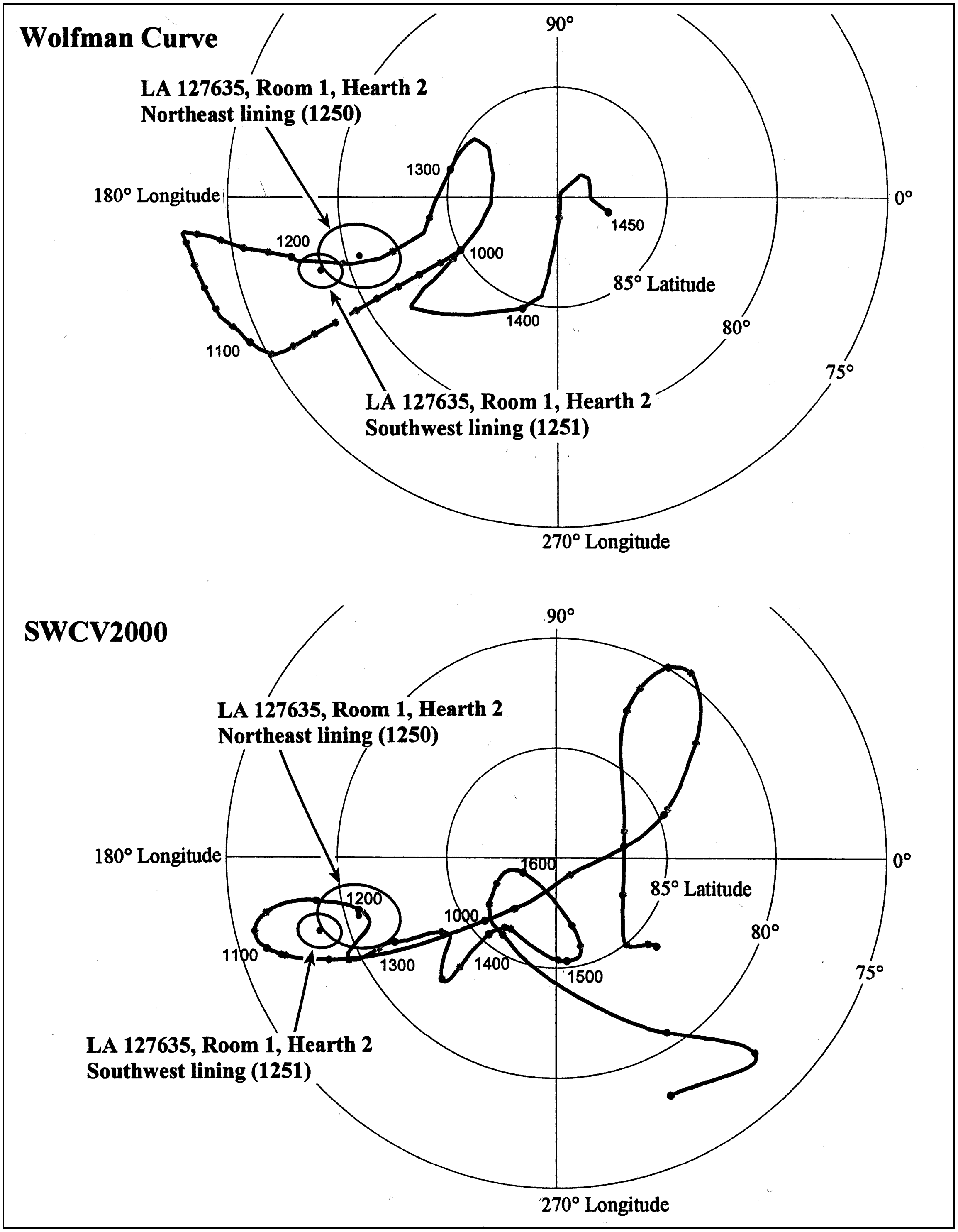


Figure 66.20. LA 127635, Room 1, Hearth 2 archaeomagnetic results for sets 1250 and 1251. Centerpoints and error ellipses are plotted against both the Wolfman Curve and SWCV2000.

Summary

Twenty-two of the 27 archaeomagnetic sets produced interpretable results. One of these was from a Protohistoric context, and the remainder were from Coalition period occupations. Two samples were collected from potential Classic (post-AD 1300) components, but they were too imprecise for date interpretation.

The Protohistoric context was a hearth within a tipi ring at LA 85864 (see Figure 66.18). The archaeomagnetic VGP does not help significantly with the dating of the occupation due to its imprecision and ambiguity between the paths and calibrations of the DuBois and SWCV2000s. The VGP appears to be either earlier or later than AD 1860, within the broad AD 1730–present window.

All of the remaining results come from contexts that date within the middle to late Coalition period based on pottery type associations. The VGP error ellipses are plotted on the Wolfman Curve in Figure 66.21, organized by precision categories. High precision results ($\forall_{95}$<1.1E) fall within the AD 1170–1275 period, with one anomalous result that could be either within this span or that could date as late as the AD 1280–1300. Centerpoints for the slightly lower precision results (1.2E<$\forall_{95}$<1.8E) fall within the AD 1170–1275 period, while their ellipses span the AD 1155–1260 period. The error ellipses of the low precision results (2.3E<$\forall_{95}$<4.0E) span a wider time range, from as early as AD 1100 through AD 1310. Six of these results look like they represent the same temporal population as the higher precision results (dominated by Middle Coalition period contexts). Two of these low precision results (1210 and 1212) are from features at LA 12587 where there is pottery and radiocarbon evidence that the site occupation may have persisted into the Late Developmental period. These two VGPs could date as late as the early 14^{th} century.

The Coalition period samples are plotted against SWCV2000 in Figure 66.22. Date interpretations based on SWCV2000 for the high precision samples would suggest that project sites could date as early as AD 1125 and as late as AD 1325. Moderate precision results overlap the AD 1020–1240 range, whereas poor precision results overlap the curve as late as the late 15^{th} century. These date ranges are in conflict with both the ceramic and radiocarbon chronologies for the site occupations. C&T Project archaeomagnetic dates based on the Wolfman Curve are both more internally consistent and appear to be more accurate than those based on SWCV2000.

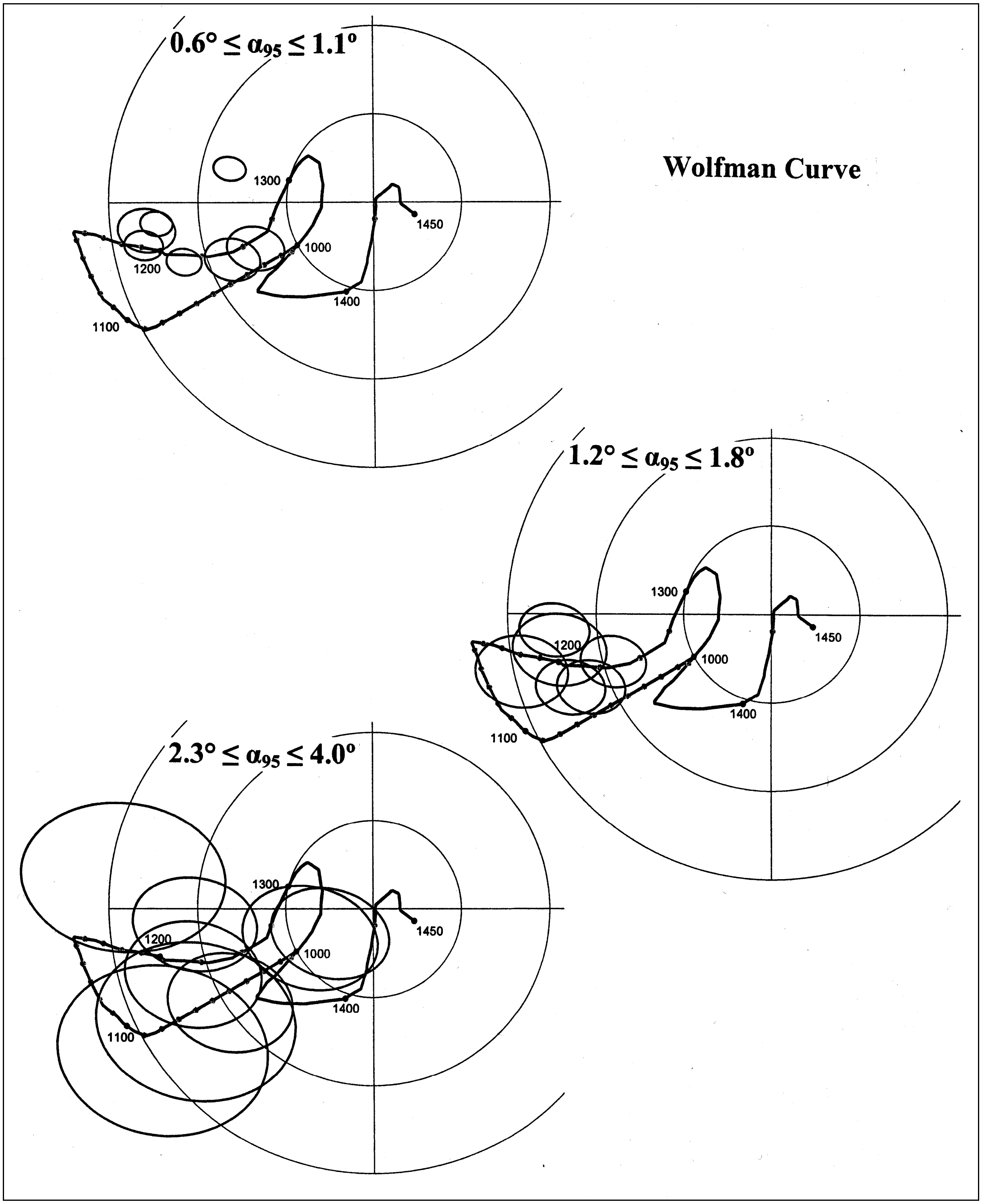


Figure 66.21. Interpretable C&T Project archaeomagnetic ellipses plotted on the Wolfman Curve. Ellipses are grouped by the sizes of their error terms: $0.6^o \leq \alpha_{95} \leq 1.1^o$; $1.2^o \leq \alpha_{95} \leq 1.8^o$; and $2.3^o \leq \alpha_{95} \leq 4.0^o$.

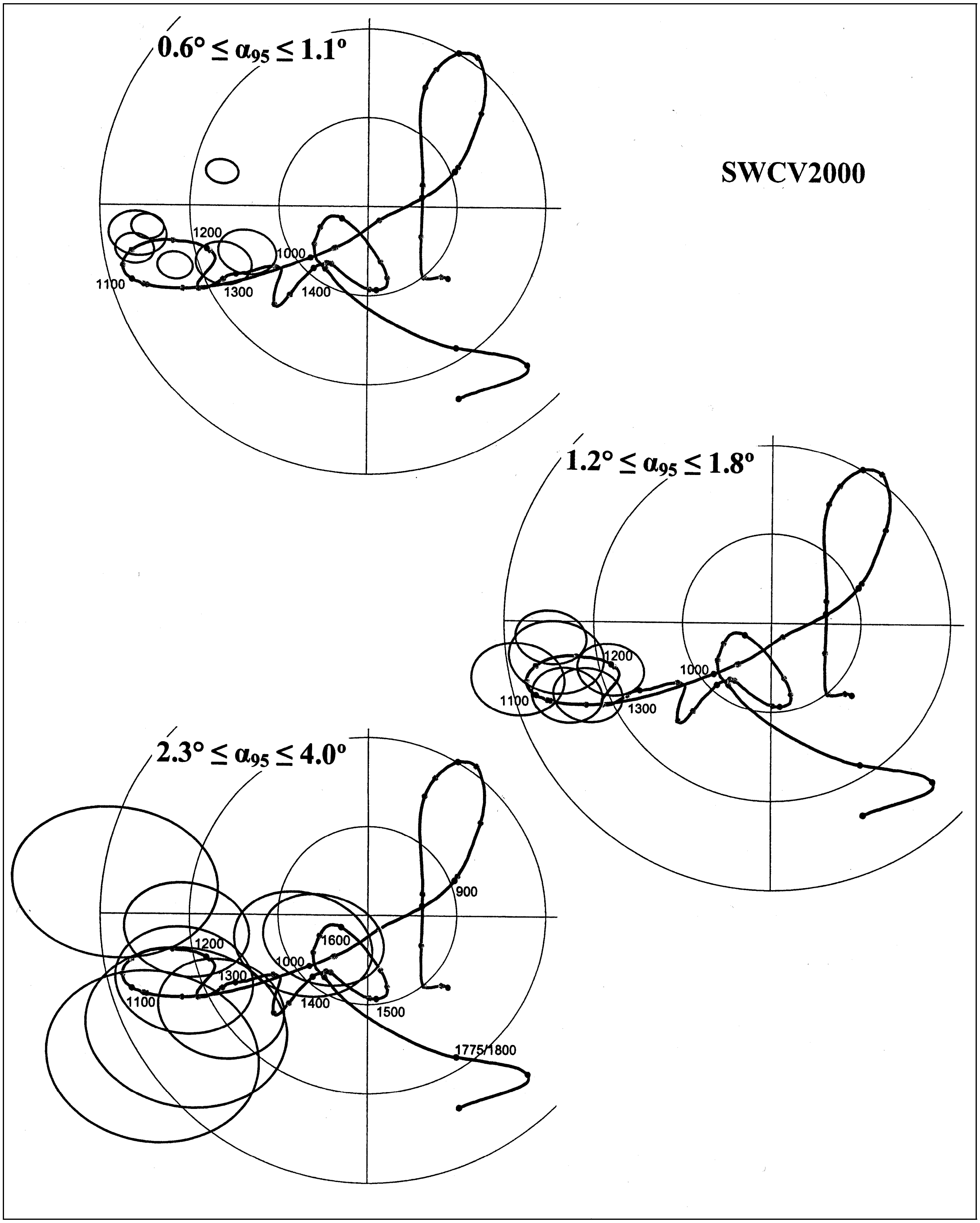


Figure 66.22. Interpretable C&T Project archaeomagnetic result ellipses plotted on SWCV2000. Ellipses are grouped by the sizes of their error terms: $0.6^o \leq \alpha_{95} \leq 1.1^o$; $1.2^o \leq \alpha_{95} \leq 1.8^o$; and $2.3^o \leq \alpha_{95} \leq 4.0^o$.

C&T Project Coalition Period Dates in Regional Context

The archaeomagnetic pole positions from the C&T Project Coalition sites are relatively consistent, but it seems prudent to test the chronology of the sites with other archaeomagnetic dating results from the northern New Mexico region. For this comparison we draw from catalogs of archaeomagnetic VGPs provided by the ADL and by Robert L. DuBois. The first purpose of this exercise is to test the contemporaneity of the C&T Project results with results from other projects. The second purpose is to assess whether the inferred bracket dates for the C&T Project occupations (late 12th through middle to late 13th centuries) are supported by archaeomagnetic VGPs and independent dates from slightly earlier and slightly later sites.

Galisteo Basin Area

Three sites in the Galisteo Basin area have yielded potentially relevant comparative samples. The results are plotted in Figures 66.23 and 66.24.

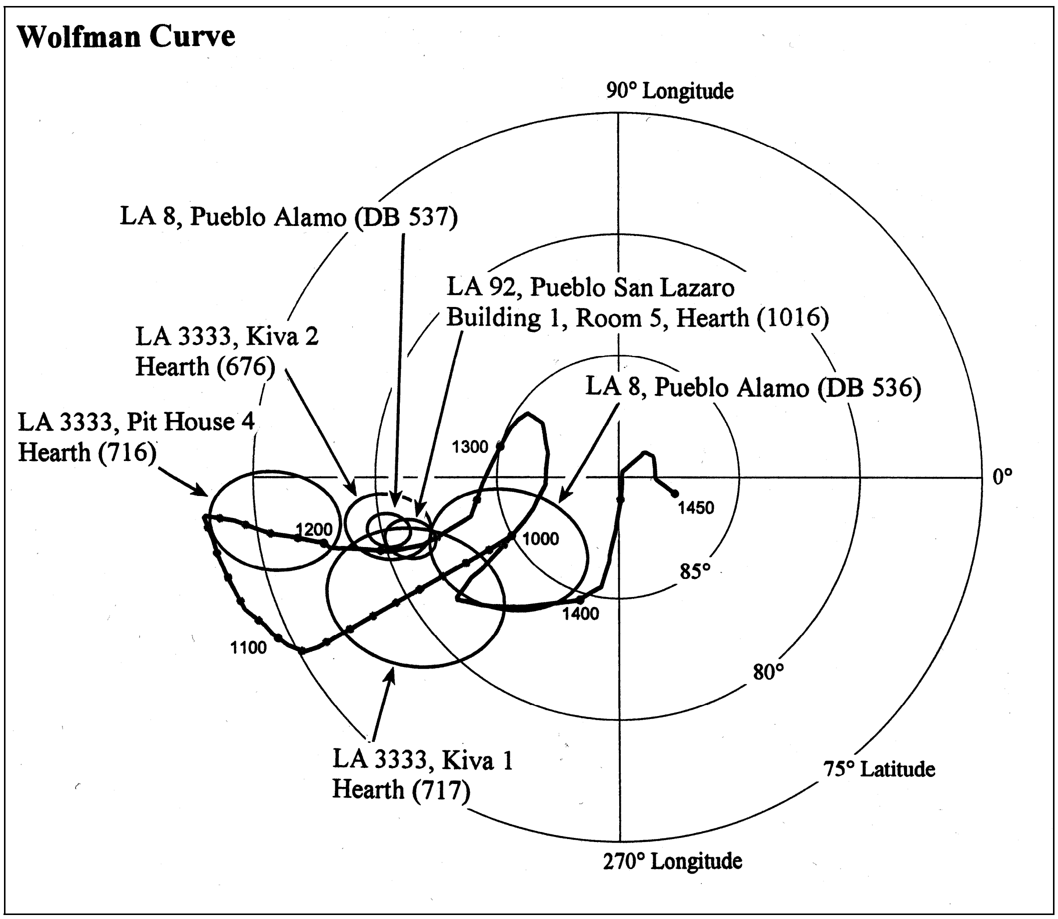


Figure 66.23. Comparative archaeomagnetic VGP results from the Galisteo Basin area plotted against the Wolfman Curve. Results from LA 3333 (676, 716, and 717) fall within the Middle Coalition period. Results from Pueblo Alamo (LA 8; DB 536 and DB 537) appear to be associated with a Late Coalition component. The result from Pueblo San Lazaro (LA 92: 1016) is believed to date to the 13th or 14th century.

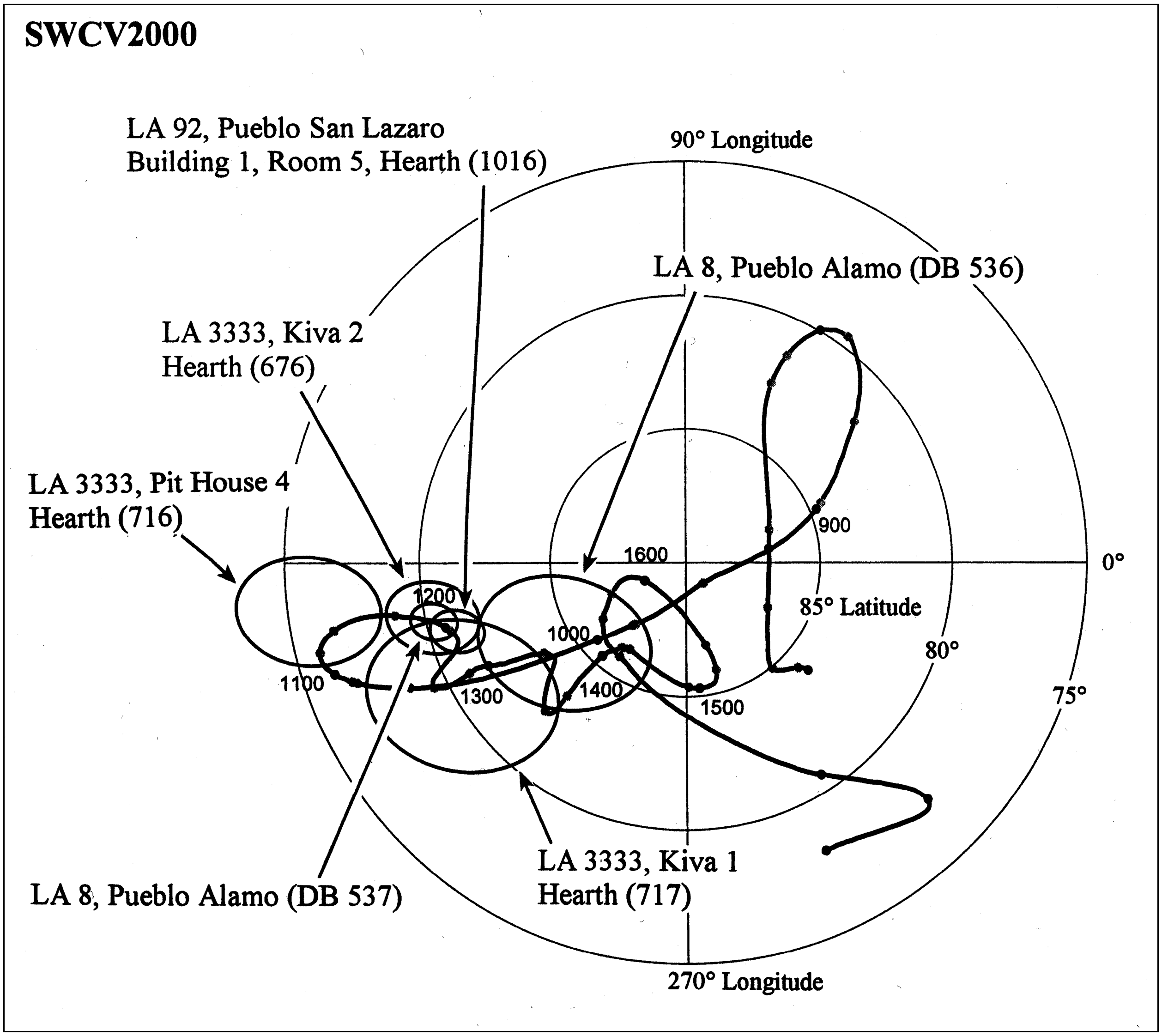


Figure 66.24. Comparative archaeomagnetic VGP results from the Galisteo Basin area plotted against SWCV2000. Results from LA 3333 (676, 716, and 717) fall within the Middle Coalition period. Results from Pueblo Alamo (LA 8; DB 536 and DB 537) appear to be associated with a Late Coalition component. The result from Pueblo San Lazaro (LA 92: 1016) is believed to date to the 13th or 14th century.

LA 3333

The occupation of LA 3333 appears to have been relatively early in the initial homesteading process of the Galisteo Basin by Puebloan farmers. Pit House 4 yielded tree-ring cutting dates of AD 1209 and 1210, and it is considered an early (if not the earliest) structure in the site occupation (Ware et al. n.d.). An archaeomagnetic set was collected from its hearth (716), with a moderate α_{95} = 2.0º. Other portions of the site had been excavated in the 1950s and 1960s, and several of these structures were reopened in the 1990s for the purpose of collecting archaeomagnetic dating samples. Kiva 1 had originally yielded tree-ring samples with cutting dates of AD 1204 and 1225 (Robinson et al. 1973:56) indicating that structure use had persisted after AD 1225. Archaeomagnetic set 717 was collected from its hearth, with a moderate α_{95} of 2.4º. Kiva 2 lacked independent dates, and its hearth was sampled as set 676.

When compared with the Wolfman Curve (see Figure 66.23), the Pit House 4 VGP (716) overlaps equivalent precision results from the C&T Project Coalition components (see Figure 66.21). The kiva results (676 and 717) are slightly later in time, consistent with the time spans seen within C&T Project sites such as LA 135290. The Wolfman Curve date range for the Pit House 4 sample from LA 3333 is AD 1140–1215, and the ellipse centerpoint is at about AD 1180. Although this range encompasses the tree-ring construction dates from the structure, it appears to be slightly too early for the structure's probable abandonment date. The result from Kiva 1 (717) is given a date range of AD 1195–1270, and its centerpoint is close to AD 1230, effectively encompassing the probable abandonment date of the structure. The Kiva 2 result is relatively precise, with a Wolfman Curve date range of AD 1205–1250, but there are no independent dates other than its similarity to Kiva 1.

The VGP and ellipse for set 716 would be dated several decades too early using SWCV2000 (see Figure 66.24), but dating conventions would result in date ranges for sets 676 and 717 that would encompass their probable abandonments.

Pueblo Alamo (LA 8)

Pueblo Alamo is at the northeast margin of the Galisteo Basin. The site was excavated for tree-ring samples by W. S. Stallings in 1931 and 1933 (Robinson et al. 1973:31–32), and it was excavated by Joe Allen in 1971 before highway construction (Allen 1973). Two DuBois archaeomagnetic sets (DB 536 and DB 537) were collected as part of the Allen excavations but are not described in Allen's preliminary report. The large numbers of tree-ring samples are not attributed to specific locations and cannot be linked specifically to Allen's excavations or the archaeomagnetic samples. However, the tree-ring samples document significant construction at the site as a whole in the 1250s and 1260s with evidence of site growth or remodeling continuing into the 1280s.

DB 537 (see Figure 66.23) is a high-precision result that coincides with the LA 3333 Kiva 2 result and falls within the area of the late half of the moderate and high precision C&T Project results. DB 536 is moderately precise and is later in time, coinciding with the two apparently late VGPs from LA 12587. These samples from Pueblo Alamo suggest later initial occupation than the C&T Project sites followed by a similar temporal progression toward abandonment. The Wolfman-based date range for the high-precision VGP from Pueblo Alamo (DB 537) pre-dates the earliest tree-ring construction dates by a decade or so. Since TRM events are usually abandonment rather than construction, the Wolfman-based age could be several decades too early. The less-precise VGP results in a date range that easily encompasses the tree-ring dates for the augmentation or remodeling of the structures at the site. If the tree-ring dates from Pueblo Alamo are applied to the similar pole positions at C&T Project sites, the occupations of some of the C&T Project sites may easily extend into and perhaps beyond the AD 1280s.

The relationships between the Pueblo Alamo VGPs and date estimates based on SWCV2000 are slightly less satisfactory than those of the Wolfman Curve (see Figure 66.24). The DB 537 result spans the AD 1180–1230 period, two decades before the earliest tree-ring documented construction at the site. The less-precise DB 536 result spans the AD 1275–1455 range, overlapping the probable date of site abandonment at the early end of the range.

San Lazaro Pueblo (LA 92)

Building 1 at San Lazaro Pueblo was defined by Nelson (1914). The rooms investigated by Nelson are associated with Glaze D pottery, and a burned room yielded tree-ring samples suggesting construction in the middle 16th century (Ware et al. 1996:55). This roomblock had been constructed over the razed remains of an earlier black-on-white period roomblock that could date to the Coalition or Early Classic periods (pre-AD 1400). In 1994 an archaeomagnetic set was collected from the hearth in Room 5 of this earlier roomblock (1016).

The VGP position of this result (see Figures 66.23 and 66.24) is only slightly different than that of DB 537 from Pueblo Alamo. Since there is no precise independent dating for this result, it serves only to reinforce the location of the path of both the Wolfman and SWCV2000 VGP curves at this point in time.

Greater Santa Fe Area

Two sites in the Santa Fe area, the U.S. Federal Courthouse and Arroyo Hondo Pueblo, have relevant comparative samples (Figure 66.25).

U.S. Federal Courthouse (LA 143460)

Excavations at LA 143460 exposed a pit structure as one element of a multi-component occupation at the Santa Fe Courthouse (Scheick 2005). The abandonment of the structure is attributed to the Early Coalition period based on Santa Fe Black-on-white and a small percentage of Kwahe'e Black-on-white pottery that had been discarded into the structure fill. If the minority of Kwahe'e Black-on-white pottery in this ceramic assemblage were in use while the trash was discarded into the abandoned structure, the VGP should slightly predate the C&T Project suite of archaeomagnetic results. If the Kwahe'e Black-on-white pottery was simply drift from prior occupations in the vicinity of the structure, the VGP is more likely contemporary with the occupations documented by the C&T Project excavations. Although a third option would be that the dating of the transition between Kwahe'e Black-on-white and Santa Fe Black-on-white technology was slightly slower in the Santa Fe area, that is less likely given the dominance of Santa Fe Black-on-white in the slightly earlier LA 3333 collections.

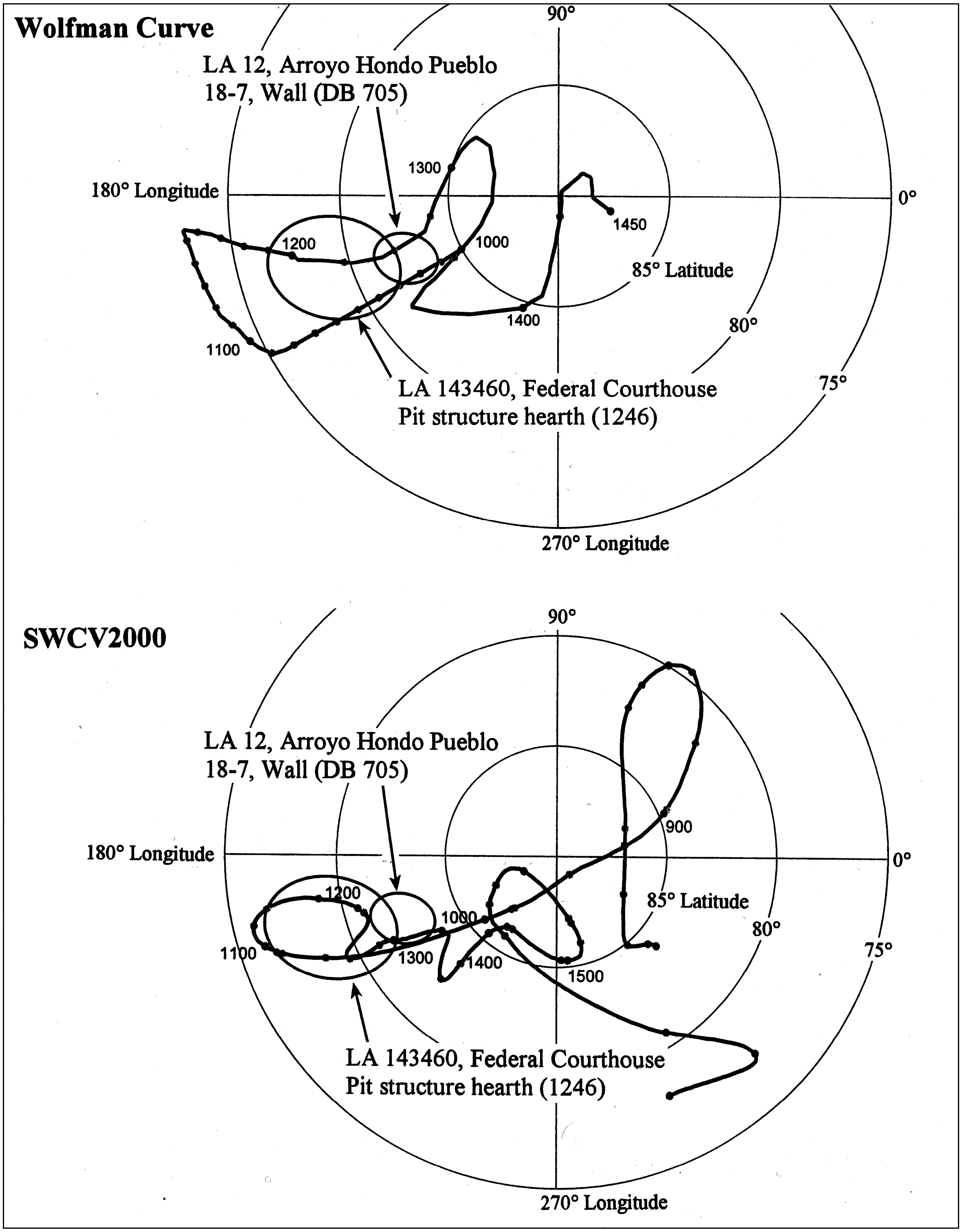


Figure 66.25. Comparative archaeomagnetic VGP results from the Santa Fe area plotted against the Wolfman and SWCV2000 curves. An Early Coalition period result (1246) is from excavations at the Federal Courthouse (LA 143460; Scheick 2005) while an Early Classic period result (DB 705) is from excavations at Arroyo Hondo Pueblo (LA 12).

The VGP for the pit structure hearth (1246) lies within or slightly later than the area of most of the C&T Project high and moderate precision results. Its date range based on the Wolfman Curve is AD 1195–1240. The result is later but slightly overlaps the ellipse associated with the Pit House 4 result from LA 3333 (dated to shortly after AD 1210). The VGP is similar or slightly earlier than the VGPs of the precise results from Pueblo Alamo, Kiva 2 from LA 3333, and San Lazaro Pueblo, Room 5.

Both the centerpoint location and the ellipse size result in a large date range (AD1155–1310) when compared with SWCV2000 (see Figure 66.25). This range encompasses most of the Coalition period and is accurate if imprecise.

Arroyo Hondo Pueblo (LA 12)

Extensive excavations were carried out at Arroyo Hondo Pueblo (LA 12) by the School for American Research. Two distinct components were present, one with construction dates in the AD 1310s through 1330s and one with construction dates in the AD 1370s through 1410s (Creamer 1993:Table 7.3). Component I appears to have been substantially abandoned by the AD 1350s, while a major fire coincided with a significant Component II abandonment before the AD 1420s. An archaeomagnetic set was collected from a burned wall of Room 18-7 (DB 705). Room 18-7 was part of construction in the AD 1310s, was destroyed by a fire, and then was rebuilt, still within the Component I occupation of the site (Creamer 1993:184). The Component I fire that established the TRM of the wall appears to have occurred between the 1310s and the1330s.

Although the error ellipse of the DB 705 result (see Figure 66.25) overlaps the Wolfman Curve at about AD 1250, it is immediately adjacent to the middle 14th century portion of the curve as well. The relevant Wolfman Curve date range for the result would be AD 1345–1365. The relevant date range based on SWCV2000 would be AD 1275–1320. Although the Wolfman and SWCV2000s allow both middle 13th and early to middle 14th century interpretations of the DB 705 pole position, the paths of the curves are substantially different during the interval between these two points in time. Focusing on the 14th century possibilities, the Wolfman Curve appears to overestimate the age of this sample by a decade or two, whereas SWCV2000 appears to underestimate it or capture the correct date at the extreme upper end of its range.

The VGP position for this sample is identical to one of the apparently later results in the C&T Project VGP series (1205; see Figure 66.11). However, the calendric date of DB 705 must be much later based on ceramics, tree-ring, and radiocarbon dates.

*Gallina Are*a

Although the available site descriptions are incomplete (Mackey and Holbrook 1978), five DuBois archaeomagnetic results are from Gallina structures or sites that have associated tree-ring dates (Robinson and Cameron 1991). DB 1069 was collected from the central hearth of a Gallina unit house (LL-1) at LA 12063; DB 1070 was collected from LA 12059; DB 1072 was collected from the central hearth of a Gallina unit house at LA 12066; DB 1074 was collected from a circular hearth of a Gallina unit house at LA 12054; and DB 1077 was collected from a hearth at a Gallina unit house at LA 12062.

These five results are plotted against both the Wolfman and SWCV2000s in Figure 66.26. The error ellipses occupy approximately the same polar region as the C&T Project Coalition period samples (see Figure 66.21). Date ranges based on Wolfman Curve ellipse intercepts are listed in Table 66.4. The limited tree-ring data that are available suggest that the sites were established in a relatively narrow time window of between AD 1228 and 1243. Construction or remodeling continued at the sites through at least AD 1247–1260, apparently encompassing more than a generation in at least two cases. The late tree-ring dates (remodeling or new construction) are more likely to correspond with the archaeomagnetic dates (although we have no details of the relationships between sampled features and dated structures at the sites). Only two of the Wolfman-based archaeomagnetic date ranges encompass the last tree-ring dates from the sites, while the other archaeomagnetic ranges fall between 10 and 30 years short of the tree-ring dates. Also, the sequence of pole positions along the Wolfman Curve does not correspond with any tree-ring based measures of chronological sequence between the sites (see Table 66.4).

Table 66.4. Selected Gallina area Coalition period archaeomagnetic dates.

DuBois Set Number	Site Number (LA)	Wolfman Curve Sequence	Wolfman Date Range (AD)	Earliest Tree-ring Cutting Date (AD)	Latest Tree-ring Date (AD)
1072	12066	1	1170–1240	1237	1253
1070	12059	2	1190–1220	1243	1256
1077	12062	3	1185–1250	1228	1260
1069	12063	4	1205–1280	1231	1259
1074	12054	5	1225–1290	1240	1247

Note: Tree-ring date information from Robinson and Cameron 1991

Date ranges for the Gallina samples are far broader when calculated using SWCV2000. The single precise sample (DB 1070) results in a late 11th century date range, approximately 150 years earlier than the tree-ring dates for the site. SWCV2000-based date ranges for two of the less-precise ellipses (DB 1072 and DB 1077) also predate their tree-ring dates, but only by a decade or two. The final two results (DB 1069 and DB 1074) encompass portions of the SWCV2000 that include the tree-ring dates of the site occupations.

Pajarito Plateau

Eight ADL and DuBois archaeomagnetic results are available from Pajarito Plateau sites to the south of the C&T Project sites. The results are plotted against the Wolfman Curve in Figure 66.27 and against SWCV2000 in Figure 66.28.

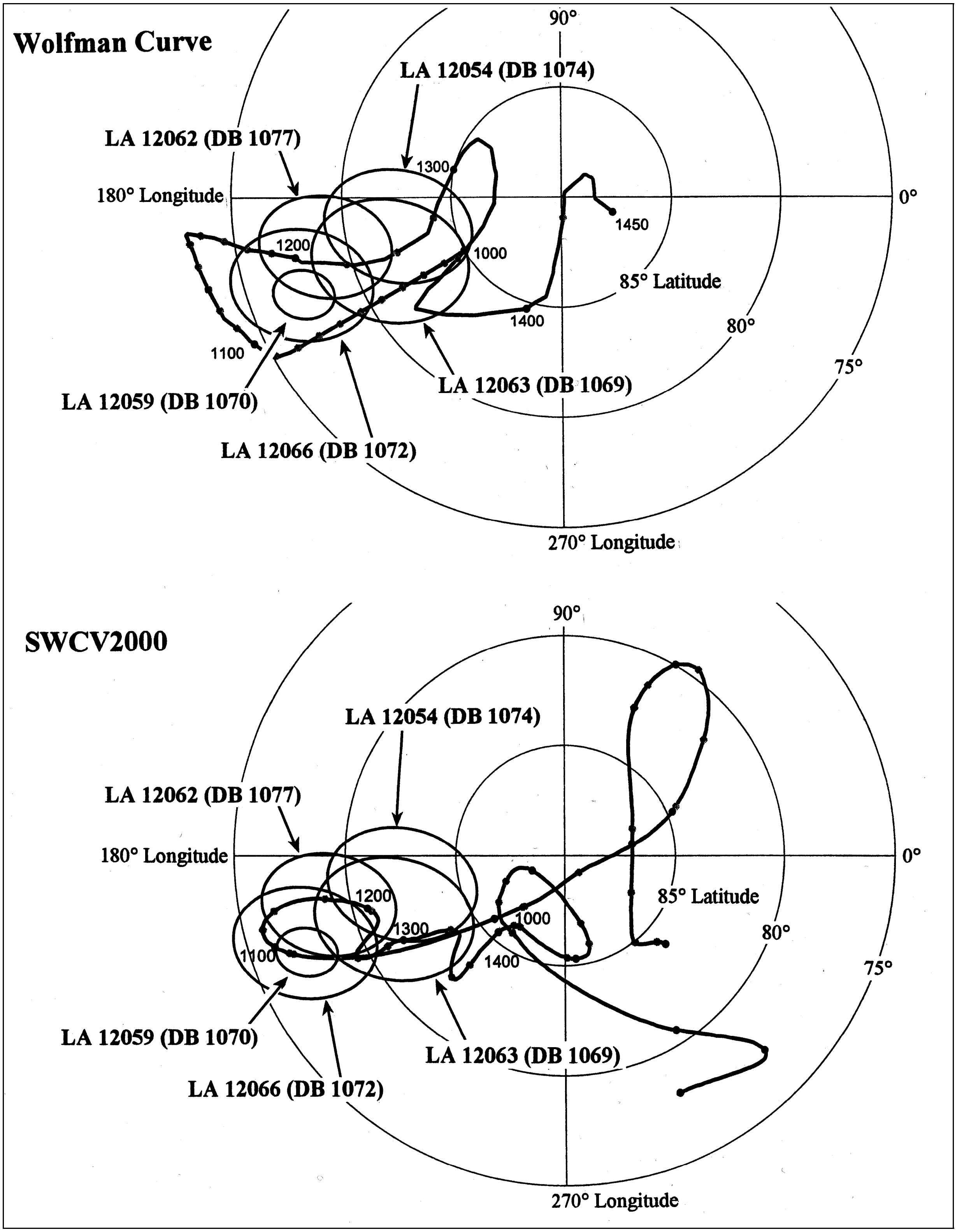


Figure 66.26. Comparative archaeomagnetic VGP results from the Gallina area plotted against the Wolfman Curve and SWCV2000.

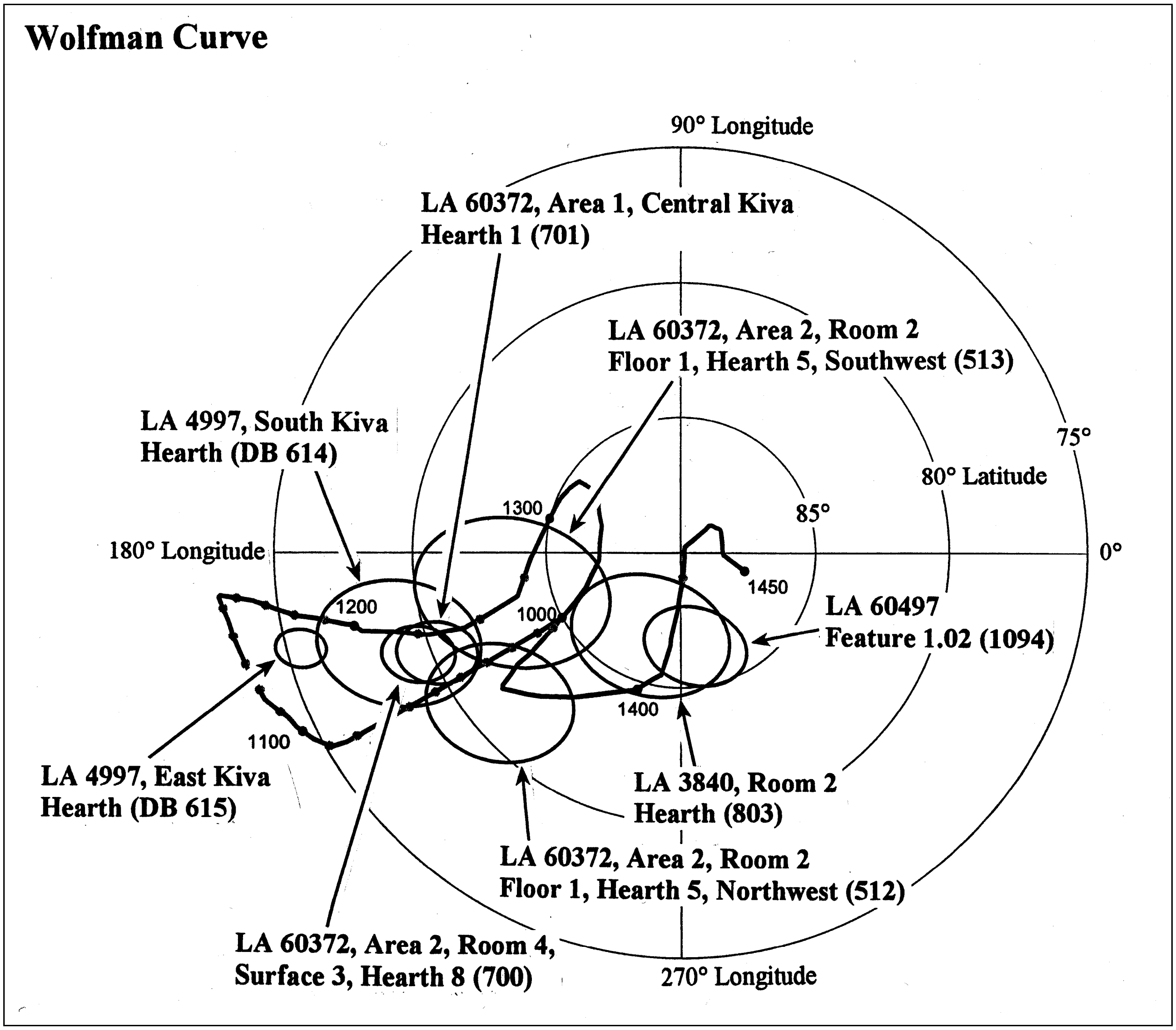


Figure 66.27. Comparative archaeomagnetic VGP results from the Pajarito Plateau plotted against the Wolfman Curve. LA 4997 and LA 60372 results are from Coalition period contexts, while LA 3840 and LA 60497 are from Classic period contexts.

Saltbush Pueblo (LA 4997)

Saltbush Pueblo (LA 4997) is a small roomblock and kiva that were excavated on the floor of Frijoles Canyon in Bandelier National Monument (Snow 1971). The kiva was constructed and then substantially remodeled at a later time. The initial construction incorporated an east-oriented hearth and ventilator system. After this occupation ceased, the kiva was rebuilt with a south-oriented hearth and ventilator and a southern recess over the ventilator tunnel. There is no evidence of the time lag between the construction and remodeling event. Three charcoal samples from room and kiva fill, believed to be fuel wood rather than construction material, yielded non-cutting tree-ring dates of AD 1194vv, 1215vv, and 1241vv. Pottery types are dominated by Santa Fe Black-on-white, but Galisteo Black-on-white and Wiyo Black-on-white are present and are assumed to be associated with the later occupation of the site (Snow 1971:33–35).

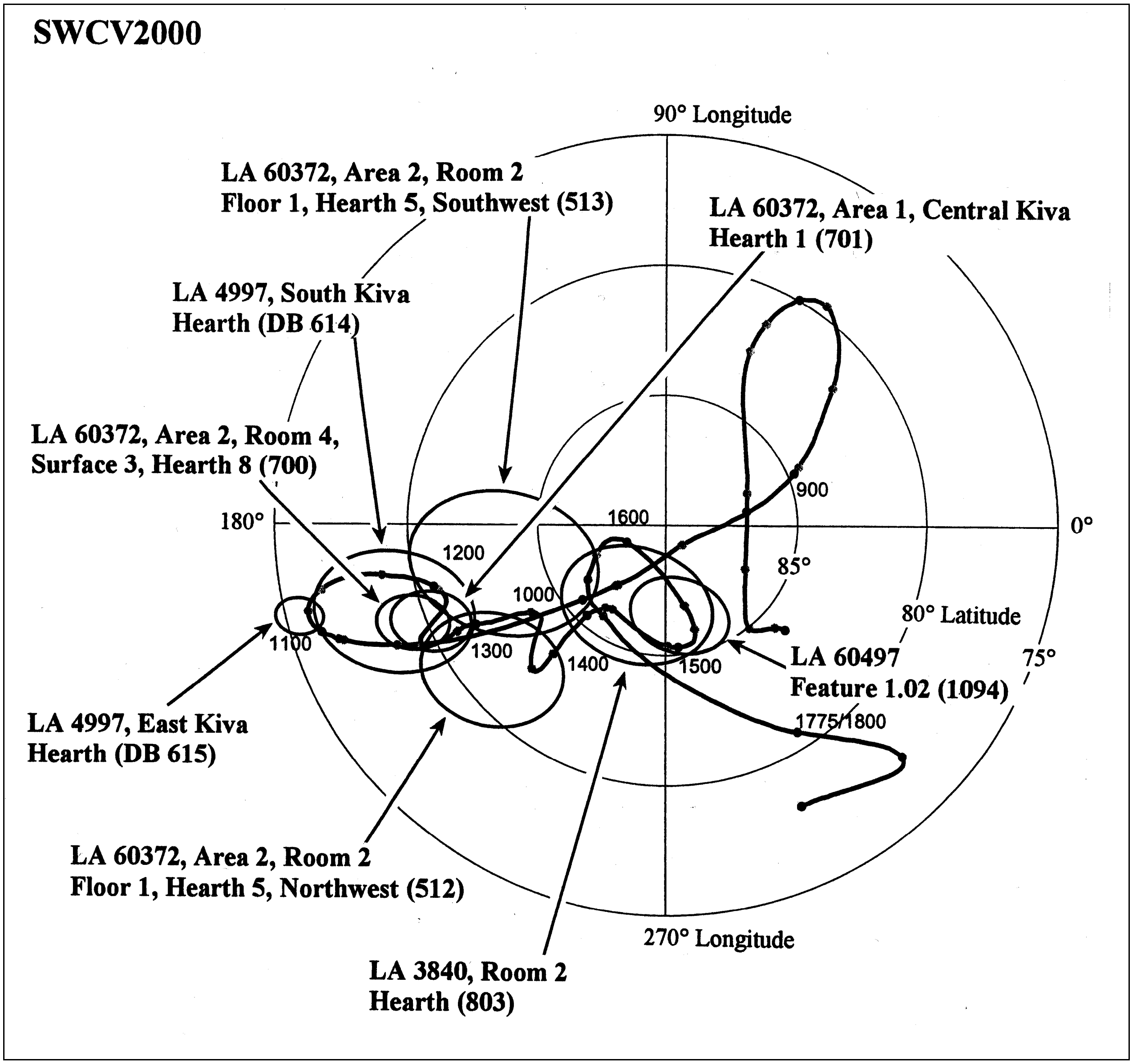


Figure 66.28. Comparative archaeomagnetic VGP results from the Pajarito Plateau plotted against SWCV2000. LA 4997 and LA 60372 results are from Coalition period contexts, while LA 3840 and LA 60497 are from Classic period contexts.

Archaeomagnetic sets were collected from both hearths (DB 615 and DB 614, respectively) and are plotted on Figures 66.27 and 66.28. The very precise VGP ellipse from earlier east-oriented kiva hearth (DB 615) is assigned a date range of AD 1175–1195 based on the Wolfman Curve (see Figure 66.27). The less-precise result from the later south-oriented kiva hearth (DB 614) is assigned a date range of AD 1185–1255. While the former date range is plausible in the absence of independent evidence, the latter date interpretation is not. Based on our current knowledge of pottery type chronologies for the Pajarito Plateau (see Chapter 58, this volume), the Galisteo Black-on-white and Wiyo Black-on-white pottery attributed to this component should post-date AD 1275 and could extend well into the 14th century.

The plausibility-implausibility of date ranges are reversed for the two VGPs when the ellipses are compared with SWCV2000 (see Figure 66.28). The precise result for DB 615 is assigned a date range of AD 1100–1140 based on SWCV2000, which would require that Kwahe'e Black-on-white be a significant contributor to the site ceramic assemblage (which it is not; Snow 1971:42). In contrast, the-less precise result from the later kiva hearth (DB 614) encompasses nearly the entire SWCV2000 VGP path between AD 1015–1300. The very end of this range is possible for the associated pottery types, but an even later date would be more probable.

The DB 615 result coincides with the earliest VGP positions from the C&T Project sites (see Figure 66.21), but there is no independent basis to assess the accuracy of this correlation. The DB 614 result does not correlate with any of the C&T Project archaeomagnetic samples due to the combination of apparent late ceramic age and relatively low latitude ellipse position.

Burnt Mesa Pueblo (LA 60372)

Burnt Mesa Pueblo (LA 60372) is within Bandelier National Monument and was excavated over several seasons (Kohler 1990; Kohler and Root 1992b, 2004). Two spatially distinct and sequential components were investigated.

Area 2 is believed to date within the AD 1250–1275 period, based on ceramics and two tree-ring cutting dates of AD 1250 from two different rooms. Two sets of archaeomagnetic specimens were collected from Room 2, Fire Pit 5 (512 and 513). The sets should have recorded a single TRM, but the ellipses overlap only slightly (see Figure 66.27). The 512 result is believed to be aberrant for unknown reasons despite its slightly smaller error term. A second hearth in Room 4 (Hearth 8) was also sampled (700) and produced an extremely precise result. This VGP ellipse barely overlaps with the results from the two Room 2 samples, and its position along the Wolfman Curve is earlier than the Room 2 results. Dating conventions obscure the VGP differences somewhat, and despite the discrepancies between the set VGPs, the Wolfman-based date ranges are AD 1210–1275, AD 1235–1300, and AD 1205–1240 (sets 513, 514, and 700, respectively). The precise result (700) is too early for the tree-ring dates by a minimum of 10 years and perhaps as much as 30 years, while the inconsistent ellipses from the Room 2 hearth are both consistent with the ceramic and tree-ring dates.

SWCV2000 interpretations of the Area 2 VGPs are more consistent with all expectations, despite the lack of coincidence between the ellipses. The 700 ellipse produces a date range that spans almost the entire 13th century. When their centerpoints are adjusted to the nearest points on the SWCV2000 segments, the two Room 2 hearth ellipses produce dates that span AD 1195–1370 (512) and AD 1130–1340 (513). These dates are accurate if not precise.

Area 1 as a whole was constructed after AD 1275 (Kohler and Root 2004). Non-cutting tree-ring dates from the roomblock cluster in the late AD 1270s, and two tree-ring samples with bark dates of AD 1316 and 1317 were recovered from the Central Kiva fill. Ceramic evidence of site use extends into the early 14th century, but that last use appears to be "sporadic." An archaeomagnetic set was collected from the kiva hearth (701) and was given three possible date ranges by Dan Wolfman (AD 1040–1075, AD 1210–1250, and AD 1355– 1380). Although the last possibility is more consistent with the tree-ring dates, the 14th century portion of the Wolfman Curve is outside the error ellipse of the result and this is a less probable interpretation on strictly archaeomagnetic grounds (see Figure 66.27). The 701 ellipse substantially overlaps the VGP centerpoint and ellipse of the earlier archaeomagnetic VGP from Area 2 (set 700), despite the clear difference in their ages (stratigraphy and pottery). The 701 result also falls within the error ellipse of the Saltbush Pueblo result (DB 614), which is also suspected of dating to the Late Coalition period on the basis of pottery. The Area 1 chronology and stratigraphic contexts of the tree-ring dates are far from clear (Kohler and Root 2004:211–212), and the archaeomagnetic results both reflect and contribute to this ambiguity.

When compared with SWCV2000, the date range associated with Area 1 kiva result (701) is still somewhat problematic (see Figure 66.28). The centerpoint coincides with the curve, and the date range of the ellipse is AD 1225–1300. The later half of the range is possible given the pottery types in the collection, but the tree-ring dates (if relevant) are several decades later and the pottery types could be later as well.

Shohakka Pueblo (LA 3840)

Testing was conducted at Shohakka Pueblo (LA 3840) in 1991 (Kohler et al. 2004). Excavation was limited to three trenches, one of which encountered Room 2. At least two floors were present in the excavation, and a hearth (Feature 2) was associated with the lower surface. Pottery in the room fill and near the upper floor included Agua Fria Glaze-on-red, Cieneguilla Glaze-on-yellow, and Largo Glaze-on-yellow in addition to polychrome examples of these Glaze A and Glaze B types. The lower floor and hearth were well sealed by the later floor, and an undetermined amount of time elapsed between abandonment of the lower and upper floors. Additional testing followed in 1997 after the Dome fire, but a second archaeomagnetic sample taken from the site at that time was too imprecise for interpretation.

The archaeomagnetic VGP for the Room 2 hearth (803) is plotted in Figures 66.27 and 66.28 against the Wolfman and SWCV2000s. The centerpoint is close to the post-AD 1400 segment of the Wolfman Curve, and that association yields a date range of AD 1395–1435. The ellipse also grazes the earlier AD 1325–1375 portion of the curve, and a date range based on that segment is AD 1325–1365. The later date range is consistent with the ceramic dating of the room fill and the site as a whole, but the earlier date range is still possible if there was any significant time lag between the initial construction and the remodeling of Room 2.

SWCV2000 yields a single probable date range for the 803 result (see Figure 66.28). When moved to the closest point on the curve, the ellipse intercepts define a range from AD 1375 to the middle to late 16th century.

LA 60497

Limited testing was carried out at LA 60497 as part of investigations following the Dome fire in 1997. Archaeomagnetic specimens were collected from Feature 1.02, a hearth in a surface room (set 1094). The associated pottery was characterized as Glaze B and Glaze C, dating roughly to the early to middle 15th century. Based on these pottery types, the VGP should post-date the result from Shohakka Pueblo.

The VGP is relatively precise (α_{95} = 1.3º), and it overlaps the early 15th century portion of the Wolfman Curve (see Figure 66.27). The associated date range is AD 1405–1445, consistent with the associated pottery types. The result coincides with a slightly later portion of SWCV2000 (see Figure 66.28). The earliest of two possible date range interpretations would be AD 1455 through the middle 16th century, slightly later than would be consistent with the pottery types in the site collection.

Cochiti Area

Excavations along NM 22 between Peña Blanca and the Pueblo of Cochiti encountered components spanning pre-ceramic agricultural features and the Historic period (Post et al. n.d.). Archaeomagnetic dating results from the Late Developmental and Coalition components are relevant to the C&T Project interpretations.

The final Late Developmental period component along NM 22 was defined by the dominance of mineral-painted Socorro Black-on-white and Kwahe'e Black-on-white pottery types and the presence of a small amount of Galisteo Black-on-white pottery. Pit Structure 76 at LA 6169 appears to be the last vestige of this component, quickly followed by the construction of Coalition period structures that were associated with Santa Fe Black-on-white pottery. The abrupt transition appears to involve a population replacement, as utility vessel pottery technology shifts at the same time as the change in whiteware types. The technological shift suggests that populations who were used to using Pajarito Plateau pottery resources had moved into the area. Pottery, stratigraphy, and architectural style provide support for the chronological sequence, but there is no source of significant chronometric dating other than the archaeomagnetic dates.

One archaeomagnetic set represents the Late Developmental component (1160), while four sets represent the immediately succeeding Coalition period occupation (1159, 1103, 1156, and 1158). Sets 1158 and 1159 were collected from separate burned features within the same Coalition period pit structure. There is no stratigraphic reason why they should not reflect substantially the same time period, but both are very precise and their error ellipses do not overlap. The overall span of the Late Developmental period through Coalition period VGP results is equivalent to that of the C&T Project Coalition period VGP results.

The Late Developmental VGP (1160) has a date range of AD 1160–1250 based on the Wolfman Curve, while the four Coalition period results span the AD 1190–1280 period (Figure 66.29). Of the two contemporary features from Pit Structure 16, the early result is dated to AD 1200–1225 while the later result is dated to AD 1240–1275. Date ranges based on SWCV2000 cover a greater range of time (see Figure 66.30). The Late Developmental VGP ellipse spans the AD 1045–1180 period while the Coalition period ellipses span the AD 1155–1340 period. Using the SWCV2000, the two contemporary sets from Pit Structure 16 are assigned to the AD 1165–1185 and AD 1275–1340 date ranges.

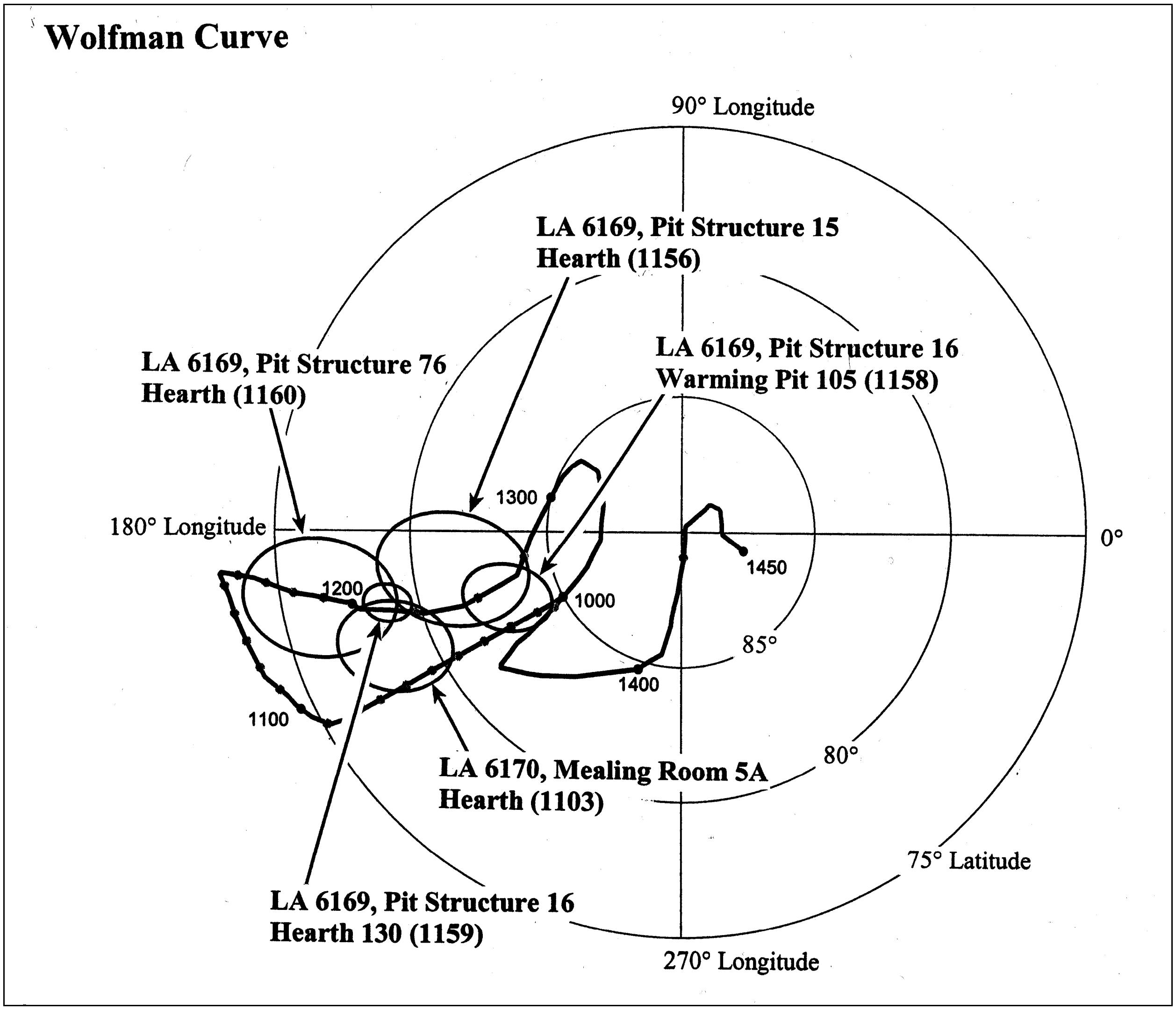


Figure 66.29. Comparative archaeomagnetic VGP results from the Cochiti area plotted against the Wolfman Curve. The Pit Structure 76 sample is from a Late Developmental period context while the other results are from Coalition period contexts.

The Late Developmental result has substantially the same pole position (and error term) as Pit House 4 at LA 3333 (see Figure 66.23) and as the early hearth in Room 2, LA 135290 of the C&T Project sites (see Figure 66.16). To the extent that the similar pole positions document contemporaneity, they define cultural differences across the geography of the northern Rio Grande region. The LA 6169 settlement represents an in situ population that maintained a previously established cultural pattern, while the C&T Project and LA 3333 sites represent the colonization of landforms by populations from elsewhere. Both LA 3333 and LA 6169 include Galisteo Black-on-white pottery, albeit in small quantities, while Galisteo Black-on-white pottery is not present in the C&T Project collections until much later within the sampled communities.

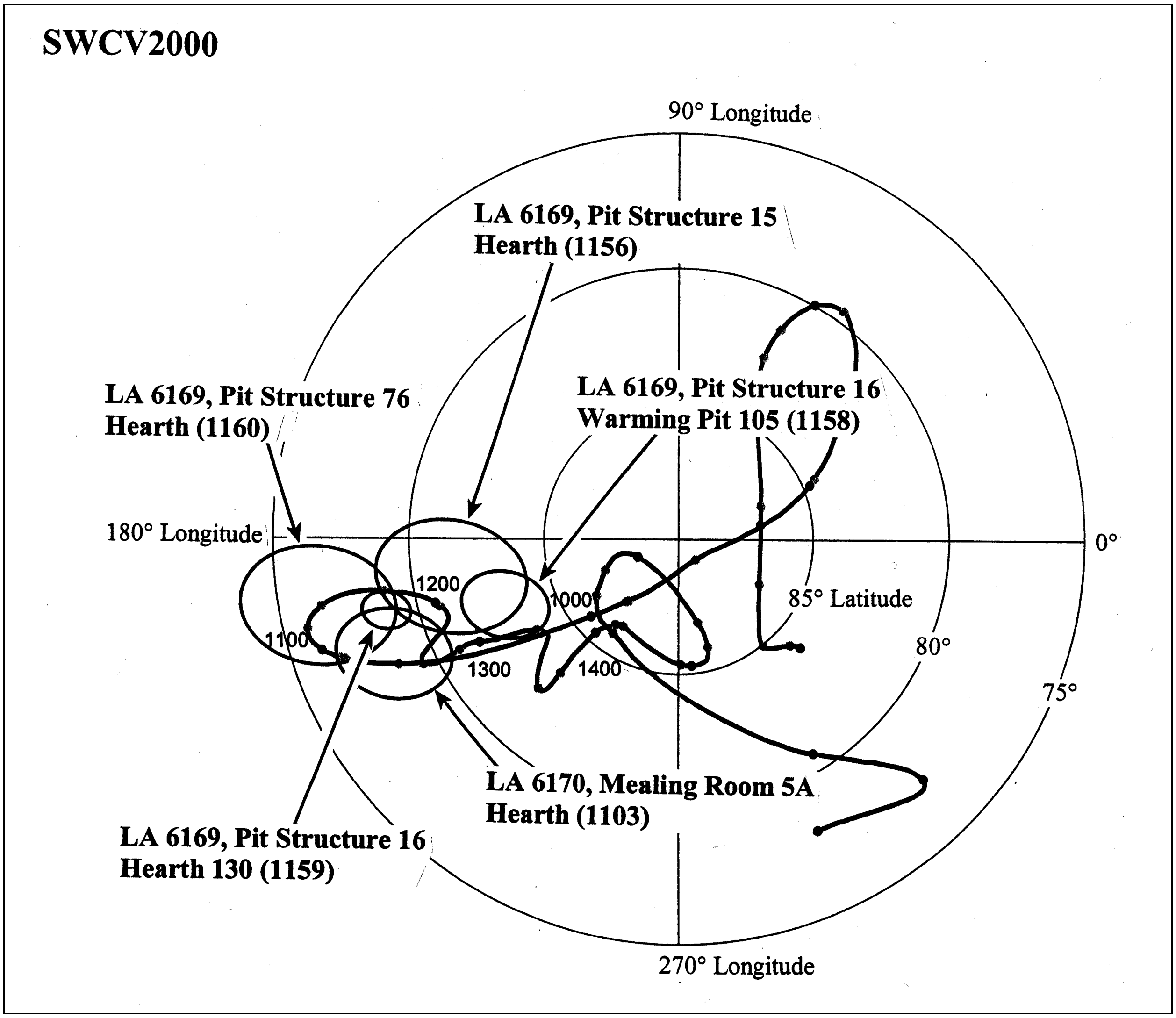


Figure 66.30. Comparative archaeomagnetic VGP results from the Cochiti area plotted against SWCV2000. The Pit Structure 76 sample is from a Late Developmental period context while the other results are from Coalition period contexts.

San Ysidro Area

Two DuBois archaeomagnetic results are available from the Albuquerque Archaeological Society excavations at AS-8 (LA 13197), part of the Cañada de las Milpas community, between the Jemez River valley and the Rio Puerco valley near the village of San Ysidro (Bice et al. 1998). The site consists of more than 40 rooms in two roomblocks joined at right angles to form two sides of a small plaza. A circular room was defined (but not excavated) adjacent to the plaza. Only a single kiva was defined. The pottery includes designs that are late Pueblo III in style, including locally produced San Ignacio Black-on-white, Santa Fe Black-on-white, and Galisteo Black-on-white. Only six tree-ring samples recovered during the excavations were datable, yielding one cutting date of AD 1273r and non-cutting dates of AD 1177, 1212 (2), 1221, and 1283. None of the tree-ring samples are from the same rooms as the archaeomagnetic dating samples.

Archaeomagnetic sets were collected from cooking features in Room W-1 (DB 1584) and Room Y-1 (DB 1585) (DB 1584 is incorrectly attributed to Room W-2 in some records). The results are relatively precise (α_{95} = 1.2º and 1.9º, respectively) and their ellipses overlap slightly (Figure 66.31). The ellipses are marginal to and appear to be later than the C&T Project ellipses of equivalent precision (see Figure 66.21).

Using the Wolfman Curve, DB 1584 intersects only one curve segment and is given a date range of AD 1245–1280. The DB 1585 ellipse overlaps two irrelevant portions of the curve (pre-AD 1040 and post-AD 1345) and barely grazes the middle 13^{th} century segment. A date range based on the latter segment is AD 1230–1290. Both interpretations are plausible but are marginally too young for the associated tree-ring dates for site construction.

Date range estimates based on SWCV2000 are more complicated due to the looping of the calibration curve at AD 1250. The ellipse for DB 1584 does not overlap any curve segment, but the centerpoint is closest to the curves at about AD 1230 and 1315. These points translate into date ranges of AD 1175–1240 or 1275–1340. The DB 1585 ellipse overlaps or is adjacent to the irrelevant pre-AD 1020 and post-AD 1650 segments. The centerpoint is close to the AD 1330 point on the curve, and the ellipse is adjacent to another segment at about AD 1230. Possible relevant date ranges would be AD 1195–1320 or 1275–1420 (intermediate ranges are also possible). In all cases, the date ranges encompass the probable dates for use of the hearths based on the tree-ring dates from the site, however the date ranges themselves have extremely low resolution (they are "accurate" but have low precision).

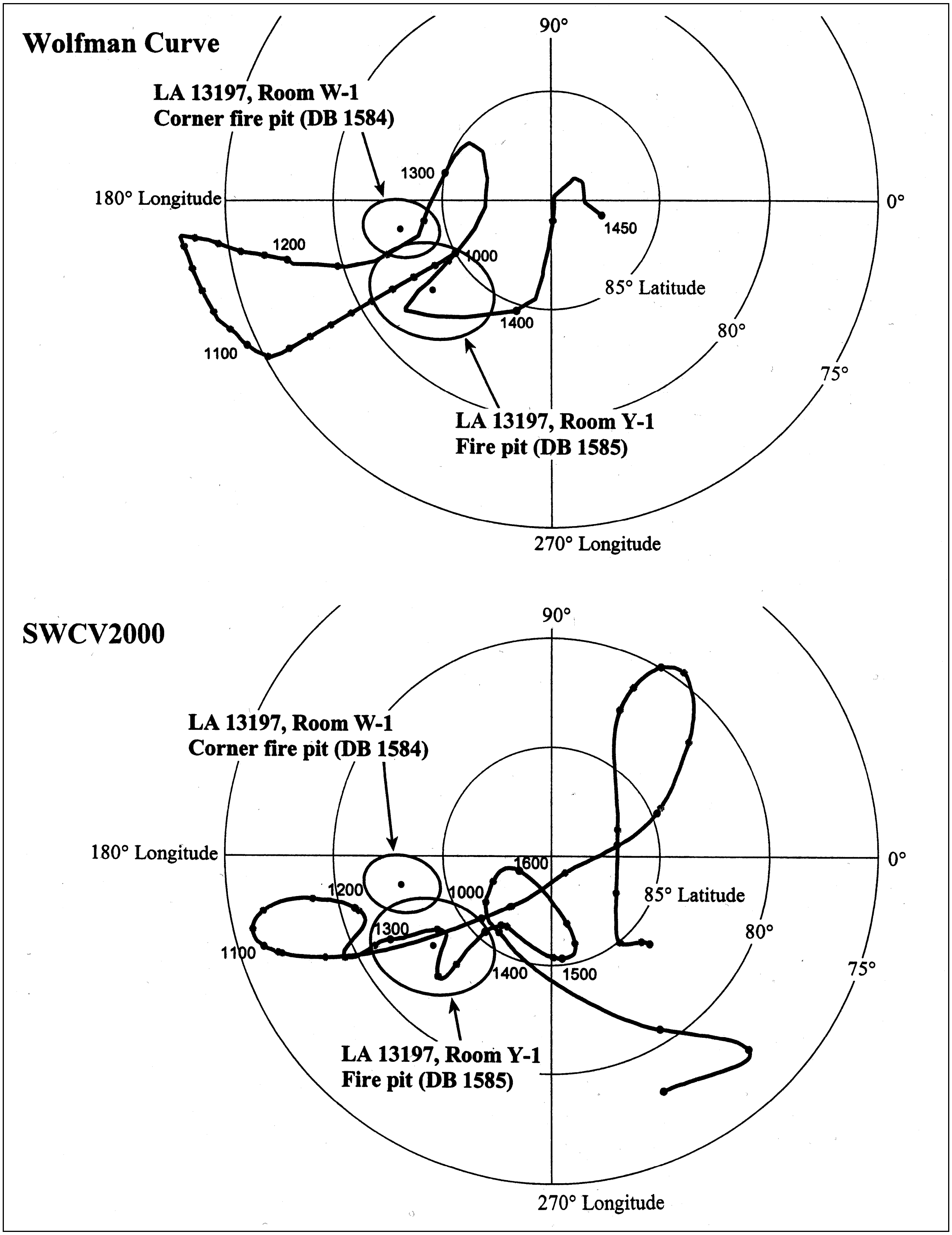


Figure 66.31. Comparative archaeomagnetic VGP results from the San Ysidro area (LA 13197) plotted against the Wolfman and SWCV2000 curves.

DISCUSSION

Regional archaeomagnetic results both validate and bracket the chronological interpretations of the C&T Project VGPs. The colonization and growth episode represented by the C&T Project sites is generally contemporary with the spread of population into the Galisteo Basin, the growth of communities in the Santa Fe area, the establishment of the Gallina communities investigated by Mackey, and the incursion of Coalition populations into the Cochiti area.

Based on the Wolfman Curve, the more precise VGP positions associated with both the C&T Project and regional components fall within the AD 1180–1265 period. These core VGP sequences are bracketed by only a few VGP positions and only a few of these are associated with independent dates. LA 3333 in the Galisteo Basin yielded a VGP at the early margin of the C&T Project results, and associated tree-ring dates suggest that structure construction and use occurred in the 1210s (slightly later than the dates suggested by the Wolfman Curve). The Late Developmental period result from LA 6169 in the Cochiti area may also be slightly earlier than the C&T Project results, but there are no independent dates to support that dating assumption other than the dominance of mineral paint in the pottery assemblage.

Several regional components that are later than the C&T Project sites are identified by pottery associations as well as absolute dates. VGPs from these apparently later sites include results from Pueblo Alamo (LA 8), Arroyo Hondo Pueblo (LA 12), the late component of Burnt Mesa Pueblo (LA 60372), LA 13197 in the San Ysidro area, and sites with glazeware on the Pajarito Plateau (LA 3840 and LA 60497). The VGPs for most of these results are at slightly higher latitudes than the C&T Project results, suggesting that the C&T Project pole positions do not extend later than the AD 1280s. However, there are two VGPs that are independently dated to the post-AD 1300 period that coincide with the C&T Project results. VGPs from Arroyo Hondo Pueblo (DB 705) and Burnt Mesa Pueblo (LA 60372; 701) fall within the later portion of the C&T Project result cluster. Both of these results are independently dated to the 1310s or 1320s, although the dating is not absolutely unambiguous.

The regional archaeomagnetic sample results were compared with both the Wolfman and the SWCV2000s. As with the C&T Project result interpretations, date ranges based on the Wolfman Curve are more consistent and usually more accurate when compared with independent dating information. However, none of the C&T Project or regional results supports the low-longitude loop of the Wolfman Curve between approximately the AD 1290 and 1325 calibration points. Also, the independently dated regional results suggest that the calibration of the Wolfman Curve may need to be adjusted in the AD 1150–1300 period. That adjustment could result in a 10 or more year increase in date estimates for ellipse intercepts along the curve path. The amount of adjustment needed appears to be greater in the vicinity of the AD 1200 calibration point and less after AD 1250. In almost all cases, such an adjustment would improve the fit between the C&T Project archaeomagnetic date ranges and the ranges of associated calibrated radiocarbon dates (see Table 66.3).

CONCLUSION

The success of the C&T Project archaeomagnetic dating program is due to an exceptionally good substrate for the formation and retention of TRM vectors, the freedom provided by the C&T Project to collect as many samples as could be accommodated by the archaeological features, and the commitment of the C&T Project staff to a broad multidisciplinary approach to chronology (Chapters 58 and 69, Volume 3).

Of the 27 sets collected, 22 produced interpretable pole location estimates (α_{95} values of 4.0° or less), one full and one partial set were unsuccessful experimental tests of the ability of hearth stones to acquire archaeological TRMs, and only four sets produced VGPs with error ellipses too imprecise for interpretation. Of the interpretable sets, one was from a Protohistoric component and the remaining 21 were from Coalition period components. Unfortunately, both of the sets collected from Classic period components were too imprecise for interpretation.

The Protohistoric period result was relatively imprecise, and the quality of the calibration curves for that time period (DuBois and SWCV2000) is weak. As a result, the contribution of the archaeomagnetic date estimate to the understanding of site chronology is far less than the other sources of dating applied to the site.

The Coalition period dates are extremely variable in precision (see Figure 66.21), but the higher precision VGPs define a several-generation span of occupation beginning in the late 12th century and extending into the middle to late 13th century. The timing of the establishment and persistence of these communities is consistent with the spread of population into new geographic niches in the region as a whole, as indicated by the comparison with the regional catalog of archaeomagnetic results.

Accuracy and precision are the major points of comparison between different dating techniques. As noted previously, the measurement precision of C&T Project samples is remarkably good. The mean error term was 1.6º and the median was only 1.3º. Whereas measurement error of the VGP can be measured and expressed statistically, the calibration curves used to estimate date ranges also contribute to apparent precision. The calibration curves are created with error and are better conceptualized as bands than lines at this point in their development. The underlying movement of the true VGP also influences apparent precision in that polar movement can be fast or slow, and the direction of VGP movement can change, creating bends, kinks, and loops. A given measurement error ellipse can encompass a short or long span of time depending on the shape as well as the rate of change of the underlying curve. Although different in location and calibration, the Wolfman and DuBois curves describe the past polar curve as relatively linear through the 13th century. In contrast, SWCV2000 characterizes the 13th century as a sharp kink. As a result, date ranges produced for the Coalition period using the Wolfman or DuBois curves are relatively precise (short). In addition to the kink, SWCV2000 assumes a relatively slower rate of VGP movement in the 12th and 14th centuries, and even ellipses with relatively small error terms can encompass long time spans. The most relevant date ranges calculated using the Wolfman Curve cover an average span of 65 years, while the same error ellipses produce and average span of 125 years when interpreted using SWCV2000.

Accuracy in archaeomagnetic dating has two dimensions. Due to the overlapping paths of VGP movement through time, accurate date estimates are dependent on the archaeologist's ability to identify the relevant portions of archaeomagnetic calibration curves. In the case of C&T Project sites, pottery and architecture of the Coalition components were key elements in focusing interpretation on the 13th century curve segments. The few cases where field assessments of feature ages were ambiguous were resolved by laboratory analysis of pottery and were confirmed by associated radiocarbon dates. The other dimension of accuracy is related to precision. As a VGP becomes less precise (the α_{95} becomes larger), the error ellipse encompasses greater lengths of the VGP paths. Date ranges based on the ellipse intercepts increase, and there is a greater likelihood that the actual date is encompassed by the range, increasing accuracy. Conversely, as VGP precision improves (as α_{95} values fall below 1.0º), the ellipse intercepts define ranges small enough to challenge the quality of curve calibrations. From whatever source, ranges of greater than 50 years decrease in usefulness in the context of interpreting Coalition period culture history, regardless of their accuracy, and ranges of less than 25 years risk encouraging an unwarranted perception of accuracy.

Another factor in considering accuracy is the relationship between precision and the TRM of interest. Standard expressions of archaeomagnetic precision consist of the dispersion of individual specimen measurements that contribute to the mean VGP. This dispersion is quantified by the α_{95} of each result, and it can be affected by the mineralogy of the substrate, the intensity of the burn, the attention to detail by the field sampling technician, and any non-systematic magnetic moments acquired by the specimens. If large ellipses were simply an expression of random variation around a mean TRM vector, a high proportion of results should significantly overlap the path of the calibration curve. There is a slight tendency for VGPs with large α_{95} values (perhaps even those with α_{95} values as low as 3.0°) to be inaccurate as well as imprecise. This is evident in Figure 66.21 where the three largest ellipses are marginal to the Wolfman Curve. This raises the possibility that systematic magnetic moments other than the TRM are influencing the apparent VGP and reducing accuracy.

Another dimension of precision can be characterized as fidelity. Multiple sets were collected from four C&T Project features. In one case (LA 12587, Hearth 6) only one of three results was sufficiently precise for interpretation, although there was overlap between the best imprecise result and the interpretable result (see Figure 66.4). The ellipses of the two sets collected from LA 86534, Room 1, Hearth 4 barely overlap despite an α_{95} of 3.7º for one of the two results (see Figure 66.7). The two sets from LA 127635, Room 1, Hearth 2 are both precise and overlap significantly, although the larger ellipse does not encompass the centerpoint of the more precise result (see Figure 66.20). The best example of fidelity from the C&T Project sampling effort is LA 12587, Room 2, Hearth 10 where two extremely precise results coincide (see Figure 66.2). In all of these cases, the paired sets were assumed to reflect the same TRM, but in only two cases do the overlaps in the error ellipses validate that assumption convincingly. This suggests that the interpretation of archaeomagnetic dates should be slightly more conservative than the date ranges derived simply from the α_{95} ellipse intercepts.

The ultimate determiner of date accuracy, assuming issues of TRM quality and measurement reliability are resolved, is the calibration curve. None of the three available curves for the Southwestern United States is fully reliable. This is reflected by the differences explored in

Blinman and Cox (see Volume 1, Chapter 9). Based on C&T Project radiocarbon dates, the date ranges based on the Wolfman Curve are accurate and consistently more accurate than date ranges based on SWCV2000. However, regional comparisons with tree-ring dated VGPs suggest that a 10 to 30 year shift in the calibration of the Wolfman Curve from AD 1150–1300 would improve the accuracy of the archaeomagnetic dates. This would effectively add 10 or more years to the beginning and end points of each date range, with the largest changes occurring around the current AD 1200 calibration point of the curve segment.

CHAPTER 67
LUMINESCENCE DATING OF CERAMICS FROM LOS ALAMOS COUNTY, NEW MEXICO – SUMMARY REPORT

James Feathers

INTRODUCTION

Over the past four years 33 ceramic samples from sites in Los Alamos County, New Mexico, have been dated by luminescence by the University of Washington laboratory. The samples have been collected from land administered by the Los Alamos National Laboratory (LANL). The results from these analyses have been presented in a series of four technical reports (Feathers 2004, 2005b, 2006, and 2007; Appendix Z). These reports also contain detailed procedures followed in the laboratory. This chapter summarizes these data in a way that will be understandable to the non-technical reader and will allow evaluation of the dates.

Luminescence dating is based on the accumulation of absorbed radiation dose in crystalline materials over time (Aitken 1985). The radiation comes from naturally occurring radionuclides within the samples and their immediate surroundings. Absorption of this radiation occurs by trapping of ionized electrons (or electron vacancies) in crystalline defects. Some of these traps are able to hold these electrons more or less indefinitely (in terms of archaeological time) and they are only released by exposure of the material to elevated heat or extended sunlight. When these electrons are released, light called luminescence is emitted. The intensity of this light is proportional to the time since the traps in the material were emptied by exposure to either heat or light. By measuring the luminescence signal and its sensitivity to radiation, producing a quantity called equivalent dose (D_e), and by assessing the natural radioactivity of the sample and its immediate surroundings (the dose rate), the time since last exposure to heat or light can be determined. The age is determined by dividing D_e by the dose rate. For the ceramic materials under consideration here, the event dated is the last exposure to sufficient heat to empty the traps. This is usually when the pottery was made, or in the case of burned adobe and floors, when this burning occurred.

Table 67.1 lists all the C&T Project samples by site. Most of the samples were retrieved from in and around adobe roomblocks. In most cases a sediment sample spatially associated with the samples was also collected. The sediment is used to assay the gamma dose rate, most of which originates in the sediment immediately surrounding the sample. It and the barely significant cosmic dose rate make up the "external dose rate," while the alpha and beta dose rates, derived from the ceramic sample itself, comprise the "internal dose rate." This distinction is due to the long ranges of gamma and cosmic radiation and the shorter ranges of alpha and beta radiation.

Table 67.1. Thermoluminescence (TL) sample numbers, sites, and proveniences.

UW Lab #	Site	FS*	Material	Burial Depth (cm)
UW1030	LA12587	1274	B/W sherd	43
UW1031	LA12587	2078	B/W sherd	32

UW Lab #	Site	FS*	Material	Burial Depth (cm)
UW1032	LA12587	4098	Burned plaster	35
UW1033	LA12587	4209	Burned plaster	63
UW1034	LA86534	1336	Burned plaster	35
UW1035	LA86534	1651	Burned plaster	45
UW1036	LA86534	2250	Burned plaster	175
UW1037	LA4618	806	Burned adobe	180
UW1236	LA135290	1424	Burned adobe	32
UW1237	LA135290	1950	Burned floor	35
UW1238	LA135290	1738	Burned wall	38
UW1239	LA135290	2400	Sherd	30
UW1240	LA135290	2259	Sherd	65
UW1241	LA135290	2379	Sherd	57
UW1242	LA135290	2458	Burned floor	50
UW1243	LA135290	2595	Hearth rim	44
UW1244	LA135290	2574	Hearth base	44
UW1245	LA85869	328	Sherd	0
UW1246	LA99396	414	Sherd	10
UW1247	LA99396	612	sherd	22
UW1416	LA87430	123	Biscuit B sherd	16
UW1417	LA127634	43	Biscuit B sherd	8
UW1418	LA127634	95	Biscuit B sherd	17
UW1419	LA127635	106	Micaceous plainware	40
UW1502	LA85411	30	Biscuit A sherd	20
UW1503	LA85411	68	Biscuit A sherd	25
UW1504	LA85417	47	Santa Fe B/W sherd	23
UW1505	LA85417	104	Burned adobe	11
UW1506	LA85417	136	Burned adobe	30
UW1507	LA85417	151	Burned floor	40
UW1508	LA85861	142	Grey ware	33
UW1509	LA85861	249	Burned plaster	30
UW1586	LA85404	92	Burned floor	29

* Field specimen number

DOSE RATES

The radiation measurements are given in the individual reports and will not be repeated here (Feathers 2004, 2005b, 2006, and 2007). The radioactivity has been measured by a combination of alpha counting, beta counting, and flame photometry. The first two methods are direct measures of radioactivity, while flame photometry is a method for measuring total potassium. The latter allows calculation of ^{40}K, one of the major contributors to the dose rate.

The radioactivity is relatively high, reflecting the geology of the region, although there is not a lot of variation among samples. Figure 67.1 shows the distribution of the total dose rate for all samples. Most samples have dose rates between 4 and 8 Gy/ka (Gy stands for gray, the international unit for absorbed dose, and ka is 1000 years). The variation mainly reflects differences among the ceramics (internal dose rates), the radioactivity of the sediments varying much less. The lower variation among the sediments is advantageous, because it means the radioactivity across the sites does not vary much, even though the environment is complicated by the presence of roomblocks and other features. The presence of such features is thus not apt to introduce systematic error in the external dose rates. Although more varied, the ceramic radioactivity is not that different from that of the sediments, suggesting most of the ceramics were constructed of local materials.

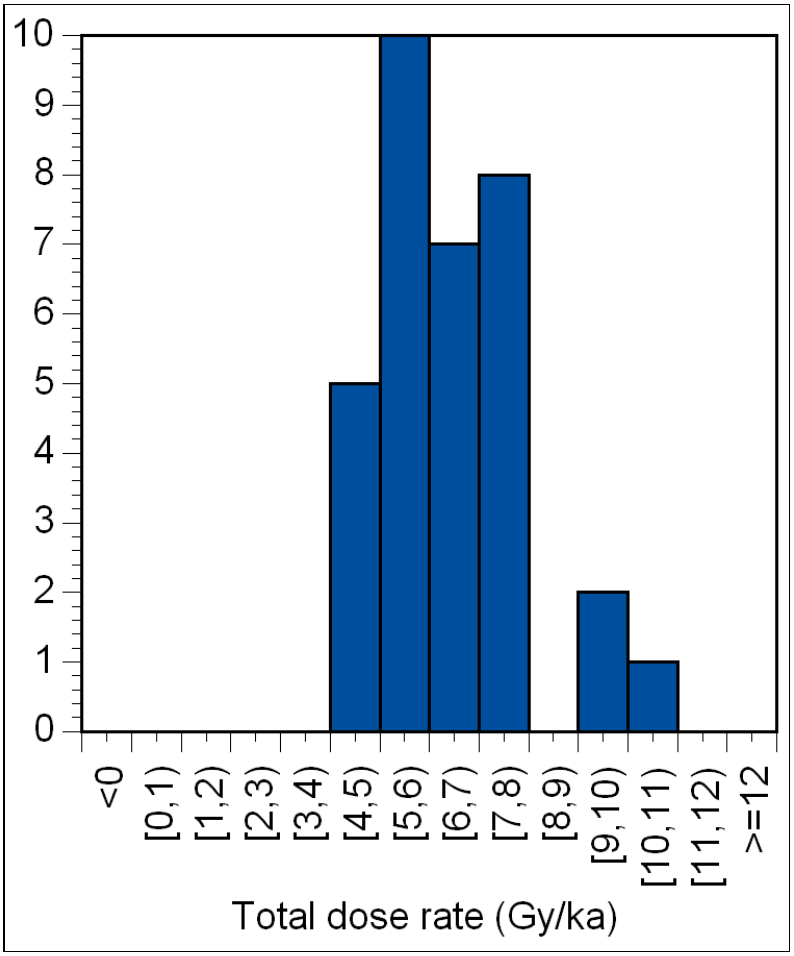


Figure 67.1. Distribution of total dose rates among ceramic samples.

A possible source of error is change in the dose rate through time. Sometimes this can be reflected in disequilibrium conditions in the uranium decay chain. The parent isotope, ^{238}U, and its daughters are a major contributor to the dose rate (the other important decay chain headed by ^{232}Th is much less likely to be out of equilibrium). Mobility of some of the elements in the decay chain can cause disequilibrium. The state of equilibrium was not measured directly, but a comparison of results from alpha counting (with flame photometry for K) and beta counting can sometimes indicate disequilibrium in the upper part of the chain. Significant differences between alpha and beta counting were measured for only five of the samples. The effect of these differences, and perhaps a reason why more differences could not be seen, is reduced by the high concentration of ^{40}K in all of these samples. The high concentration of ^{40}K (more than 2% total K in most samples) means the beta dose rate is dominated by ^{40}K, and because ^{40}K is not part of a decay chain, the effect of disequilibrium is largely confined to the alpha dose rate, only about half of which stems from the ^{238}U decay chain. In other words, although disequilibrium conditions may reflect some mobility in a few of the sherds, the effect is not likely to be strong. Of course, ^{40}K can also potentially move around, from leaching or similar processes, but the high concentrations and low variability of ^{40}K in the sediments provide no evidence of much movement. All of these considerations suggest that systematic error in the dose rate calculations is probably minimal.

EQUIVALENT DOSE

Measurement of D_e is usually the main source of error in luminescence dating. D_e is determined by calibrating the natural luminescence signal against signals produced by artificial irradiation in the laboratory. The challenge is to make sure the natural signals and the artificial signals are comparable, which can be difficult because movement of electrons among traps can alter the luminescence sensitivity of the sample.

Measurement of luminescence of ceramics in the laboratory has traditionally utilized heat as the stimulating source, i.e., heat is used to release electrons from their traps. Such luminescence is called thermoluminescence (TL). An option is to use photon stimulation, either from visible light, called optically stimulated luminescence (OSL), or from infrared light, called infrared stimulated luminescence (IRSL). OSL and IRSL have a long history of use in sediment dating (where the event being dated is last exposure to sunlight), but have just recently been applied to ceramic materials. TL, OSL, and IRSL have all been used for the ceramics in this study, but some discussion of the peculiarities of each is necessary to evaluate the results.

Many luminescence dating studies utilize sand-sized grains of quartz or feldspar, but the fine-grained nature and relatively small size of these samples limit the amount of the sand fraction available for dating. As an alternative, polymineral fine-grained dating, employing grains in the 1 to 8 μm range, is utilized in this study. These grains are retrieved from the center of the sherds by low-powered drilling and then settled in acetone to achieve the proper grain size.

Derivation of D_e for any of the stimulation methods requires construction of a growth curve, where luminescence is plotted against artificial radiation. The slope of the growth curve (i.e., how luminescence changes with dose) represents the sensitivity. Two kinds of growth curves are typically used. An additive dose curve is where differential radiation is applied to sample aliquots that still retain the natural signal. The slope of the curve is extrapolated to the dose axis to achieve an estimate of D_e, although the extrapolation is prone to error. A regeneration curve, in contrast, is where differential radiation is applied to aliquots where the natural signal has been previously removed. The natural signal is then interpolated into this curve. The problem here is that removal of the natural signal may change the sensitivity of the sample. Sensitivity change may also be a problem for additive dose if the luminescence response to artificial irradiation differs from the natural response.

The growth curves can be constructed either on multi-aliquots where different irradiations are given to different aliquots or on single aliquots, where repeated irradiations are applied to the same aliquot. TL has traditionally been measured using multi-aliquots, and in fact a viable single-aliquot method for TL has not been devised. A typical analysis uses both additive dose and regeneration techniques, taking advantage of regeneration to avoid extrapolation problems and using the additive dose to correct for any sensitivity change caused by removing the natural signal. The particular method used by our laboratory is called the slide method (Prescott et al. 1993). Any sensitivity change brought about by artificial irradiation during additive dose is not accounted for, but in practice the method has produced reasonably good dates, although sometimes there can be substantial scatter. Luminescence dating also requires the use of stable signals (i.e., traps that do not lose their electrons at ambient temperatures). For TL this is done by a plateau test, where the D_e is determined for signals from different temperature increments. Luminescence stimulated from the temperature range throughout which the D_e does not significantly differ is taken as stable signal.

A further problem with TL is the possibility of anomalous fading. This is the loss of electrons from traps that from kinetic considerations should be stable. It is thought to be caused by a process called quantum tunneling and is most often associated with feldspar minerals. Because the 1 to 8 µm fraction of ceramic materials often will contain feldspars, fading is an ubiquitous problem, and indeed many of the samples in this study exhibit fading. Fading can be detected by comparing the luminescence from aliquots that have been given equal doses but have been stored for different lengths of time. Decreasing signal with time indicates fading, although the slope of this curve can be used to correct for the effect (Huntley and Lamothe 2001). Correction, however, comes at a cost of precision.

In sum, while TL can produce reasonable results, it can also suffer from high scatter, weak or absent plateaus, fading, and problems inherent in multi-aliquot approaches. An attractive alternative is either OSL or IRSL, both developed in sediment dating. The main advantage is being able to use single-aliquots. Growth curves are commonly produced by a method called single-aliquot regenerative dose (or SAR), where repeated regeneration doses are given following measurement of the natural signal on a single aliquot (Murray and Wintle 2000). Use of equal test doses after the natural and each of the regeneration measurements allows a way to monitor and correct for sensitivity change. A preheat is used to eliminate unstable signal. The benefits of SAR are a much more precise and potentially more accurate measurement of D_e and the utilization of smaller sample amounts.

OSL has generally been used on quartz grains, and IRSL on feldspar grains. Both quartz and feldspar have an OSL signal, but only feldspar has an IRSL signal. For fine grains, where the minerals are not separated, the two have been combined in what is called the double SAR method (Banerjee et al. 2001). At each measurement step, an initial infrared stimulation is followed by an optical (usually using blue light) stimulation. The idea is that the IRSL will remove most of the feldspar signal, so that OSL is tapping mainly quartz. This would circumvent the fading problem, although not necessarily entirely because feldspar still has an OSL signal. Preliminary work from our laboratory, however, has shown that the OSL signal does not seem to fade much, while the IRSL signal often fades dramatically.

The approach in our laboratory is to use both TL and IRSL/OSL as two semi-independent means to determine D_e with the promise of much better precision and accuracy.

Before TL, OSL, and IRSL results can be compared, however, one further matter must be considered in fine-grain dating. Alpha radiation, because of its short range, is not as efficient as either beta or gamma radiation in producing luminescence—by a factor of about 10. This is taken into account by comparing growth curves using either beta or alpha irradiation. The slope ratio of the two curves is called the b-value and it is used to adjust the alpha dose rate. The b-value varies from sample to sample and from mineral to mineral, so it must be determined for TL, OSL, and IRSL for each sample. Generally, the b-value for OSL (mainly quartz) is much less than that for IRSL (mainly feldspar), with the TL value (combined quartz and feldspar) somewhere in between. Because of differential b-value, the D_e values from TL, OSL, and IRSL are not directly comparable. Rather, the age has to be calculated separately for each and then compared. Ideally the age will agree for all of them, but there are reasons why they may not. The principle reason is fading, which will affect the TL and IRSL signal, but less so the OSL signal. If fading is present, the OSL age should be greater and more accurate than either the TL or IRSL. (The OSL/IRSL b-value was not determined during the original analysis for UW1031 to UW1037. The ages were recalculated using the average OSL b-value from other sherds, 0.73 ± 0.25, as a reasonable estimate. This altered most of the ages only slightly.) D_e values and other pertinent data are given in the original reports.

AGE

Where the ages calculated from any of TL, OSL, or IRSL for any one sample are within one-sigma, a weighted average is taken as the best estimate of age. This was seldom the case for IRSL because of fading, but on 18 of the 33 samples the OSL and TL ages agreed, the latter sometimes first corrected for fading. On eight samples, the OSL was taken as the best age estimate, in seven cases because the TL signal faded and could not be corrected, and in one case (probably insufficiently fired plaster) the TL was anomalously old. On the other seven, the TL age was taken as the best estimate either because there was no OSL signal (three cases) or because the OSL signal was anomalously high (four cases).

EVALUATION

Because a luminescence dating requires the estimation of so many variables, it can be prone to error, or at least low precision. To evaluate the derived dates, I have ranked them according to the following criteria: (a) agreement in age between OSL and TL, (b) a TL plateau region extending 60°C or more, (c) OSL derivations on more than one aliquot and these derivations are consistent with a single D_e value with precision better than 15 percent, (d) precision in fitting for the TL slide of better than 15 percent, (e) no TL anomalous fading or if fading, a correction can be applied, and (f) agreement in dose rates from beta counting and alpha counting. Dates that meet all these criteria rank first (Group A). Those that deviate from only one criterion, or only slightly in two criteria are ranked second (Group B). All others rank third (Group C). Most confidence can be placed in the A and B groups, while the results from Group C should be treated with caution.

Only seven samples could be classed in Group A. Another 11 samples were assigned to Group B, and the last 15 to Group C. Most confidence can be placed in the samples from Group A and Group B. Table 67.2 sorts the samples by group, gives their age, and explains the source of uncertainly responsible for the group placement. Figure 67.2 sorts the ages by group. Except for one very young age, Group A clusters relatively tightly between AD 900–1200. The spread in ages increases for Groups B and C. This suggests the more extreme values, especially the older ages in Group C, are not too reliable.

Table 67.2. TL dates by groups.

Sample	Age (years AD)	Basis for age	Problems
Group A			
UW1031	1047±80	TL/OSL	
UW1236	1035±73	TL/OSL	
UW1237	1134±79	TL/OSL	
UW1239	1217±56	TL/OSL	
UW1242	888±62	TL/OSL	
UW1245	1859±13	TL/OSL	
UW1247	1158±63	TL/OSLi	
Group B			
UW1030	1226±68	TL	No OSL signal
UW1033	1060±109	OSL	TL anomalously old
UW1034	1188±59	TL/OSL	Poor TL plateau
UW1035	801±201	TL/OSL	OSL scatter
UW1036	1182±42	TL/OSL	Poor TL plateau
UW1037	1325±86	TL	Anomalous OSL
UW1240	1050±90	TL/OSL	TL scatter
UW1416	1383±39	TL/OSL	OSL scatter
UW1504	1284±47	TL/OSL/IRSL	Poor TL plateau
UW1507	1415±39	TL/OSL	Poor TL plateau
UW1586	1388±49	TL/OSL	OSL and TL scatter
Group C			
UW1032	682±120	TL/OSL	No TL plateau, OSL scatter
UW1238	1114±85	TL/OSL	Poor TL data, uncertain dose rate
UW1241	816±133	OSL	TL fades, uncertain dose rate
UW1243	1073±135	TL	Anomalous OSL, uncertain dose rate
UW1244	851±125	OSL	TL fades, OSL scatter
UW1246	836±134	OSL	TL fades, OSL scatter
UW1417	1464±33	OSL	Poor TL data, OSL scatter
UW1418	1494±28	OSL	TL fades, OSL scatter
UW1419	1257±107	TL	TL fades, OSL scatter
UW1502	1395±43	TL/OSL	Poor TL data, OSL scatter

Sample	Age (years AD)	Basis for age	Problems
UW1503	1205±114	TL/IRSL	Poor TL plateau, OSL scatter
UW1505	992±59	TL/OSL	Poor TL plateau, OSL scatter
UW1506	1277±58	TL	TL fades, OSL scatter
UW1508	1211±73	TL	Poor TL plateau, OSL scatter
UW1509	1193±53	OSL	TL fades, OSL scatter

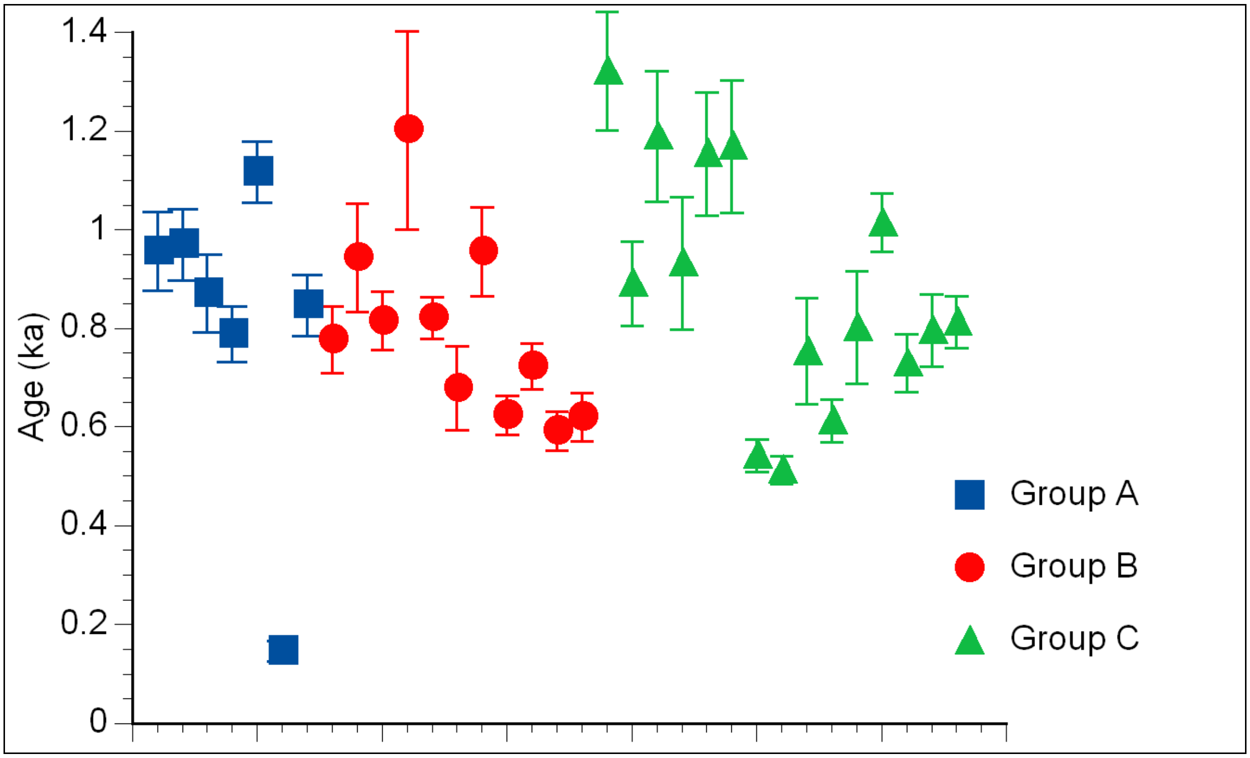


Figure 67.2. Ages of samples sorted by groups as defined in the text.

INDIVIDUAL SITES

LA 12587

Two sherds and two pieces of burned plaster were sampled from this site. Only one sample was ranked in Group C. The other three did not differ significantly from each other at two-sigma and produced a weighted average of AD 1134±47.

LA 86534

Three pieces of burned plaster were sampled for this site. All were ranked in Group B. They did not differ significantly at two-sigma and produced a weighted average of AD 1173±34.

LA 4618

Only one sample of burned adobe from a hearth was measured at this site. It was ranked in Group B and yielded an age of AD 1325±86.

LA 135290

Nine samples, including adobe, burned floor, clay hearth remnants, and sherds, were measured. Five of them were ranked in Groups A or B. Two samples from Room 4 (adobe and floor) produced a weighed average of AD 951±47, while the other three (from Rooms 6, 7, and 2/11) yielded a weighted average of AD 1161±41. A wall fragment from Room 6, but ranked in Group C, also was dated to the 12^{th} century. The other Group C samples (from Rooms 2 and 8/9) had a weighted average in the 10^{th} century. An earlier and a later occupation seems evident from this dating.

LA 85869

Only one sherd was dated from this site but it was ranked in Group A. It yielded a very young date: AD 1859±13.

LA 99396

Two sherds were dated from this site. One was ranked in Group A and one in Group C. Only the Group A date, AD 1158±63, is reliable.

LA 87430

One sherd, ranked in Group B, was dated from this site. The derived age is AD 1383±39.

LA 127634

Two sherds were dated from this site. Both were ranked in Group C, but had nearly identical ages. Weighted average is AD 1481±21.

LA 127635

Only one sherd was dated from this site and it ranked in Group C. The age is AD 1253±108.

LA 85411

Two sherds were dated from this site, but both ranked in Group C. The ages did not differ at two-sigma and the weighted average is AD 1371±40.

LA 85417

Four samples, one sherd and the others burned adobe or floor, were dated. Two ranked in Group B and the ages did not differ at two-sigma. Weighted average is AD 1362±30. The age from one of the samples from Group C did not differ significantly from this age, but the other was older and unreliable.

LA 85861

Two samples, one sherd and one burned plaster, were dated from this site. Both ranked in Group C, but were very close in age. The weighed average is AD 1199±43.

LA 85404

A sample of burned floor was dated from this site. It ranked in Group B and yielded an age of AD 1388±49.

CHAPTER 68
HYDRATION ANALYSIS OF OBSIDIAN ARTIFACTS FROM THE WHITE ROCK, AIRPORT, AND RENDIJA TRACTS, LOS ALAMOS, NEW MEXICO

Christopher M. Stevenson

INTRODUCTION

One-hundred-eighty-eight obsidian artifacts were submitted to the Diffusion Laboratory for age determination using the obsidian hydration dating method. The samples came from a total of 22 archaeological sites distributed among five land tracts. Within the White Rock Tract, six archaeological sites were dated: 12587 (*n* = 26), 86637 (*n* = 10), 127625 (*n* = 3), 127631 (*n* = 2), 128804 (*n* = 9), and 128805 (*n* = 10). The White Rock Y Track contained two dated sites: 61034 (*n* = 8) and 61035 (*n* = 8). Three archaeological sites were dated in the Airport Tract: 86534 (*n* = 14), 135290 (*n* = 7), and 139418 (*n* = 8). Within the Rendija Tract, the chronology of ten archaeological sites was investigated: 85404 (*n* = 3), 85411 (*n* = 5), 85861 (*n* = 5), 85859 (*n* = 10), 85869 (*n* = 6), 87430 (*n* = 5), 99396 (*n* = 14), 99397 (*n* = 10), 127634 (*n* = 3), and 127635 (*n* = 3). Finally, three sites were investigated in the Technical Area (TA) 74 Tract: 21596B (*n* = 2), 21596C (*n* = 3), and 117883 (*n* = 7). Analytical problems were encountered with 14 samples and this reduced the total number of dated samples to 174. These samples possessed surface flaws such as cracks, perlite inclusions or irregularities, which made the samples unsuitable for density measurement or infrared analysis.

In order to calculate the absolute date for an obsidian artifact, three analytical procedures need to be completed. First, the amount of surface hydration, or the thickness of the hydration rim formed by the inward diffusion of molecular water (Figure 68.1), needs to be measured. Second, the high-temperature hydration-rate constants for each artifact are predicted from the structural water content of the glass. Lastly, the soil temperature and relative humidity at the archaeological site is estimated so that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. The archaeological rate constants are used to convert the hydration rims to a date when the surface of the artifact was created in prehistory. Each of these analytical steps is summarized below.

HYDRATION RIM MEASUREMENTS

Once exposed to the atmosphere, an obsidian artifact will adsorb water onto its surface. This moisture diffuses into the glass structure and forms a water-rich hydration layer or rim. The obsidian hydration rim thickness in microns (*um*) can be determined by measuring the infrared absorbance of molecular water by photoacoustic spectroscopy (IR-PAS) using the procedure developed by Stevenson et al. (2001). In this method, the amount of infrared absorbance is converted to a depth using a previously established calibration.

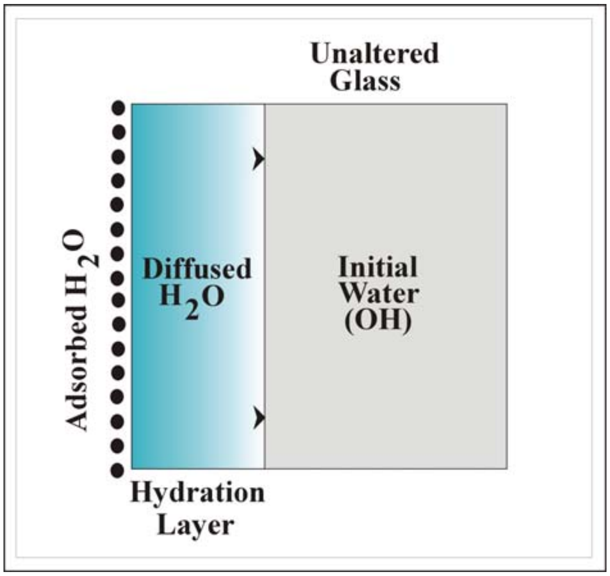


Figure 68.1. Model of the obsidian hydration layer.

In this analysis, each artifact was cut on a diamond blade saw to remove an 8-mm-square sample of obsidian, which was inserted into the photoacoustic accessory sample cup mounted on a Bomem MB-120 Fourier transform infrared spectrometer. The sample compartment was then purged with ultra-high-purity helium gas and the amount of environmental water forming the hydration layer was measured. The infrared water peak at 1630 cm^{-1} was monitored (Figure 68.2) to determine the intensity of infrared absorbance. The spectra were collected by averaging 150 scans at a resolution of 16 cm^{-1}. The height of the infrared peak is proportional to the quantity of diffused environmental water present within the glass surface (Figure 68.2). The absorbance value was converted to a rim thickness value (Table 68.1) using the regression equation [y = (10.648*ABS)-0.0413] that relates infrared absorbance to thickness in micrometers (Figure 68.3). The thickness values used to develop the calibration were measured by secondary ion mass spectrometry (SIMS) of the surface hydrogen (water) profile. The error associated with each IR-PAS measurement is estimated to be 0.1 *um* (Stevenson et al. 2001).

HYDRATION RATE DEVELOPMENT

The rates of surface water diffusion for a wide variety of obsidian compositions have been developed in the laboratory. Under conditions of high temperature and pressure (Stevenson et al. 1989, 1998), freshly flaked samples were hydrated in a saturated vapor environment (100% relative humidity) between temperatures of 150°C and 180°C for periods of up to 31 days. At the end of the reaction periods, each sample was thin sectioned and the hydration rim measured by optical microscopy. The induced rims were used to calculate the temperature dependence or activation energy (E) of reaction, and the pre-exponential factor (A) for the Arrhenius equation at 160°C. With these experimental constants, the hydration rate developed at high temperatures may be adjusted to reflect site temperature and relative humidity conditions (Figure 68.4).

Table 68.1. Obsidian hydration dates and associated environmental and chemical parameters.

Lab No.	Site No.	FS No.	Source	630cm-1	Rim (um)	Density	EHT	%rH	%OH-	Rate	Adj Rate	AD/-BC	SD
White Rock Tract: Elevation 1981 m (6500 feet)													
2003-15	12587	1183	Cerro Toledo	0.3889	3.92	2.3498	15.4	97	0.11	2.74	2.35	-4597	338
2003-16	12587	1498	Cerro Toledo	0.3515	3.55	2.3310	15.4	97	0.61	28.06	24.10	1428	30
2003-17	12587	2010-1	Cerro Toledo	0.4020	4.06	2.3453	15.4	97	0.19	6.47	5.56	-1009	148
2003-18	12587	2094	Cerro Toledo	0.5721	5.77	2.3459	15.4	97	0.17	5.66	4.86	-4903	240
2003-19	12587	2284	Cerro Toledo			N/A							
2003-20	12587	2584	Valle Grande	0.3746	3.78	2.3415	15.4	97	0.30	12.02	10.33	567	74
2003-21	12587	2628	Valle Grande	0.3616	3.65	2.3404	15.4	97	0.33	13.75	11.81	823	63
2003-22	12587	3229	Cerro Toledo	0.4175	4.21	2.3437	15.4	97	0.23	8.77	7.53	-406	113
2003-23	12587	3234-1	Valle Grande	0.3314	3.34	2.3388	15.4	97	0.38	16.18	13.90	1146	49
2003-24	12587	3655	not XRF'ed			N/A							
2003-25	12587	3701	Cerro Toledo	0.3948	3.98	2.3388	15.4	97	0.38	16.18	13.90	808	58
2003-26	12587	3780-1	Cerro Toledo			N/A							
2003-27	12587	3780-3	Cerro Toledo	0.2620	2.64	2.3463	15.4	97	0.16	5.08	4.37	351	123
2003-28	12587	3844	not XRF'ed	0.2887	2.91	2.3432	15.4	97	0.25	9.53	8.19	914	72

Lab No.	Site No.	FS No.	Source	630cm-1	Rim (um)	Density	EHT	%rH	%OH-	Rate	Adj Rate	AD/-BC	SD
2003-29	12587	4172	El Rechuelos	0.2188	2.21	2.3458	15.4	97	0.17	5.77	4.96	967	91
2003-30	12587	5094	Valle Grande			N/A							
2003-31	12587	8363-1	Cerro Toledo	0.2124	2.14	2.3436	15.4	97	0.24	8.99	7.72	1355	57
2003-32	12587	8373	Cerro Toledo	0.3412	3.44	2.3483	15.4	97	0.11	2.76	2.37	-3049	295
2003-33	12587	8376	Cerro Toledo	0.2526	2.55	2.3440	15.4	97	0.22	8.32	7.14	1041	73
2003-34	12587	8414	Cerro Toledo	0.2580	2.60	2.3311	15.4	97	0.61	27.93	23.99	1668	22
2003-35	12587	8489	Cerro Toledo	0.2319	2.34	2.3393	15.4	97	0.36	15.43	13.25	1537	36
2003-36	12587	8492-1	Cerro Toledo	0.3240	3.27	2.3329	15.4	97	0.55	25.16	21.61	1456	31
2003-37	12587	8874-1	Cerro Toledo	0.2531	2.55	2.3474	15.4	97	0.13	3.57	3.07	-176	170
2003-38	12587	8875	El Rechuelos	0.3816	3.85	2.3452	15.4	97	0.19	6.65	5.71	-646	137
2003-39	12587	8883	Cerro Toledo	0.4204	4.24	2.3457	15.4	97	0.18	5.89	5.06	-1607	170
2003-40	12587	s#2	Cerro Toledo	0.2704	2.73	2.3457	15.4	97	0.18	5.90	5.07	482	110
2003-100	86637	2	Cerro Toledo	0.3878	3.91	2.3451	15.4	97	0.13	3.67	3.16	-2215	216
2003-101	86637	11-2	Valle Grande	0.3761	3.79	2.3466	15.4	97	0.13	3.63	3.12	-2015	212
2003-102	86637	11-1	Cerro Toledo	0.4695	4.74	2.3418	15.4	97	0.13	3.77	3.24	-3996	254
2003-	86637	18	Cerro	0.3594	3.63	2.3479	15.4	97	0.12	3.59	3.09	-1710	205

Lab No.	Site No.	FS No.	Source	630cm-1	Rim (um)	Density	EHT	%rH	%OH-	Rate	Adj Rate	AD/-BC	SD
103			Toledo										
2003-104	86637	86-1	Valle Grande	0.3215	3.24	2.3437	15.4	97	0.13	3.72	3.19	-880	177
2003-105	86637	86-2	Cerro Toledo	0.4036	4.07	2.3495	15.4	97	0.12	3.55	3.05	-2726	233
2003-106	86637	181	Valle Grande			N/A							
2003-107	86637	230	El Rechuelos	0.3023	3.05	2.3506	15.4	97	0.12	3.51	3.02	-699	177
2003-108	86637	245	Cerro Toledo	0.4639	4.68	2.3447	15.4	97	0.13	3.69	3.17	-3991	257
2003-109	86637	S#3	Cerro Toledo	0.3638	3.67	2.3399	15.4	97	0.13	3.83	3.29	-1567	194
2003-61	127625	7	Cerro Toledo	0.3151	3.18	2.3424	15.4	97	0.13	3.76	3.23	-740	172
2003-62	127625	10	Cerro Toledo	0.4424	4.46	2.3494	15.4	97	0.12	3.55	3.05	-3665	254
2003-63	127625	12	Valle Grande	0.4400	4.44	2.3423	15.4	97	0.13	3.76	3.23	-3291	239
2003-59	127631	43	El Rechuelos			N/A		97					
2003-60	127631	58	Cerro Toledo	0.2393	2.41	2.3427	15.4	97	0.13	3.75	3.22	395	131
2003-68	128804	14	Cerro Toledo	0.3370	3.40	2.3296	15.4	97	0.73	34.00	29.20	1610	20
2003-69	128804	47	Cerro Toledo	0.4512	4.55	2.3484	15.4	97	0.12	3.58	3.07	-3839	257
2003-70	128804	85	Valle Grande	0.2818	2.84	2.3389	15.4	97	0.19	6.51	5.60	709	89
2003-71	128804	127	Cerro Toledo	0.7417	7.48	2.3367	15.4	97	0.31	12.79	10.99	-2429	118

Lab No.	Site No.	FS No.	Source	630cm-1	Rim (um)	Density	EHT	%rH	%OH-	Rate	Adj Rate	AD/-BC	SD
2003-72	128804	131	Cerro Toledo	0.3332	3.36	2.3394	15.4	97	0.16	5.16	4.43	-239	132
2003-73	128804	134	Valle Grande	0.3375	3.40	2.3408	15.4	97	0.13	3.80	3.27	-1098	182
2003-74	128804	181	Valle Grande	0.4043	4.08	2.3461	15.4	97	0.13	3.64	3.13	-2614	227
2003-75	128804	224	Valle Grande?	0.3438	3.47	2.3404	15.4	97	0.13	3.82	3.28	-1203	184
2003-76	128804	230	Cerro Toledo?	0.3533	3.56	2.3441	15.4	97	0.13	3.71	3.18	-1479	195
2003-44	128805	6	Cerro Toledo	0.4647	4.69	2.3416	15.4	97	0.13	3.78	3.25	-3866	251
2003-45	128805	62	Cerro Toledo	0.5795	5.85	2.3213	15.4	97	1.21	57.91	49.75	1360	20
2003-46	128805	71	Cerro Toledo	0.4090	4.13	2.3317	15.4	97	0.60	27.81	23.88	1338	30
2003-47	128805	114	Cerro Toledo	0.4311	4.35	2.3443	15.4	97	0.13	3.70	3.18	-3163	238
2003-48	128805	157	Cerro Toledo	0.4637	4.68	2.3357	15.4	97	0.37	15.79	13.57	564	60
2003-49	128805	163	Cerro Toledo	0.3877	3.91	2.3454	15.4	97	0.13	3.67	3.15	-2224	216
2003-50	128805	186	Cerro Toledo	0.4286	4.32	2.3452	15.4	97	0.13	3.67	3.16	-3140	238
2003-51	128805	247	Cerro Toledo	0.4901	4.94	2.3372	15.4	97	0.29	11.49	9.87	-177	87
2003-52	128805	253	Cerro Toledo	0.2652	2.68	2.3433	15.4	97	0.13	3.73	3.20	31	146
2003-53	128805	254	Cerro Toledo	0.2154	2.17	2.3428	15.4	97	0.13	3.74	3.22	689	119
White Rock Y Tract													

Lab No.	Site No.	FS No.	Source	630cm-1	Rim (um)	Density	EHT	%rH	%OH-	Rate	Adj Rate	AD/-BC	SD
2003-84	61034	3	Valle Grande			N/A							
2003-85	61034	4	Cerro Toledo	0.4672	4.71	2.3465	15.4	97	0.13	3.63	3.12	-4163	262
2003-86	61034	6-1	Cerro Toledo	0.4940	4.98	2.3475	15.4	97	0.12	3.60	3.10	-4943	279
2003-87	61034	18	Cerro Toledo	0.5583	5.63	2.3377	15.4	97	0.26	9.92	8.53	-1247	115
2003-88	61034	26-2	Valle Grande	0.4728	4.77	2.3413	15.4	97	0.13	3.79	3.26	-4053	254
2003-89	61034	32	Valle Grande	0.3845	3.88	2.3437	15.4	97	0.13	3.72	3.19	-2099	211
2003-90	61034	34-1	El Rechuelos	0.5674	5.72	2.3468	15.4	97	0.13	3.63	3.11	-7089	319
2003-91	61034	38	Valle Grande	0.4945	4.99	2.3415	15.4	97	0.13	3.78	3.25	-4628	266
2003-92	61035	10-1	Cerro Toledo	0.2969	3.00	2.3492	15.4	97	0.12	3.55	3.05	-574	171
2003-93	61035	19-1	Cerro Toledo	0.2896	2.92	2.3435	15.4	97	0.13	3.72	3.20	-342	160
2003-94	61035	32	El Rechuelos	0.2984	3.01	2.3534	15.4	97	0.12	3.43	2.95	-693	179
2003-95	61035	35	El Rechuelos	0.2783	2.81	2.3461	15.4	97	0.13	3.65	3.13	-211	157
2003-96	61035	38-2	Cerro Toledo	0.3575	3.61	2.3411	15.4	97	0.13	3.80	3.26	-1476	193
2003-97	61035	39-1	Cerro Toledo	0.3119	3.15	2.3405	15.4	97	0.13	3.81	3.28	-646	168
2003-98	61035	47	Valle Grande	0.2854	2.88	2.3404	15.4	97	0.13	3.82	3.28	-223	154
2003-99	61035	54	Valle	0.3052	3.08	2.3255	15.4	97	0.96	45.83	39.37	1743	14

Lab No.	Site No.	FS No.	Source	630cm-1	Rim (um)	Density	EHT	%rH	%OH-	Rate	Adj Rate	AD/-BC	SD
			Grande										
Airport Tract: Elevation 2146 m (7040 feet)													
2003-1	86534	534	Valle Grande	0.3290	3.32	2.3186	12.4	97	1.37	47.06	40.42	1716	14
2003-2	86534	706	Valle Grande	0.3260	3.29	2.3186	12.4	97	1.37	47.06	40.42	1720	14
2003-3	86534	1052	Cerro Toledo	0.3273	3.30	2.3267	12.4	97	0.89	30.23	25.96	1589	22
2003-4	86534	1237	Valle Grande	0.2616	2.64	2.3434	12.4	97	0.13	2.57	2.21	-757	209
2003-5	86534	1238	Valle Grande	0.2143	2.16	2.3415	12.4	97	0.13	2.61	2.24	161	169
2003-6	86534	1266	Valle Grande	0.4755	4.80	2.3355	12.4	97	0.38	11.54	9.92	-44	84
2003-7	86534	1422	Cerro Toledo	0.3153	3.18	2.3399	12.4	97	0.13	2.65	2.27	-1874	244
2003-8	86534	1457	Cerro Toledo	0.5169	5.22	2.3323	12.4	97	0.57	18.39	15.80	471	57
2003-9	86534	1676	Valle Grande	0.2654	2.68	2.3387	12.4	97	0.20	4.87	4.18	479	112
2003-10	86534	1745	Valle Grande	0.3448	3.48	2.3444	12.4	97	0.13	2.55	2.19	-2790	276
2003-11	86534	1873	Valle Grande	0.2358	2.38	2.3393	12.4	97	0.16	3.76	3.23	446	129
2003-12:1	86534	1984	Valle Grande			N/A							
2003-13	86534	2183	Valle Grande	0.2786	2.81	2.3417	12.4	97	0.13	2.61	2.24	-1079	219
2003-14	86534	2228	Valle Grande	0.2538	2.56	2.3439	12.4	97	0.13	2.56	2.20	-609	204
2006-41	135290	1018	Valle	0.2751	2.78	2.3431	12.4	97	0.13	2.58	2.22	-1036	219

Lab No.	Site No.	FS No.	Source	630cm-1	Rim (um)	Density	EHT	%rH	%OH-	Rate	Adj Rate	AD/-BC	SD
			Grande										
2006-42	135290	1055	Valle Grande	0.2665	2.69	2.3373	12.4	97	0.28	7.73	6.64	1015	71
2006-43	135290	1255	Valle Grande	0.4682	4.72	2.3401	12.4	97	0.13	2.64	2.27	-6500	362
2006-44	135290	1385	Valle Grande	0.4304	4.34	2.3416	12.4	97	0.13	2.61	2.24	-5277	337
2006-45	135290	2141	Valle Grande	0.2434	2.46	2.3213	12.4	97	1.21	41.54	35.68	1805	12
2006-46	135290	2142	Valle Grande	0.2549	2.57	2.3317	12.4	97	0.60	19.71	16.93	1614	27
2006-47	135290	2174	Valle Grande	0.2248	2.27	2.3443	12.4	97	0.13	2.55	2.19	-64	182
2006-48	139418	4	Valle Grande	0.3738	3.77	2.3357	12.4	97	0.37	11.10	9.54	669	69
2006-49	139418	26	Valle Grande	0.4950	4.99	2.3454	12.4	97	0.13	2.53	2.17	-7908	399
2006-50	139418	53	Cerro Toledo	0.3284	3.31	2.3452	12.4	97	0.13	2.54	2.18	-2379	265
2006-51	139418	104	Valle Grande	0.4255	4.29	2.3372	12.4	97	0.29	8.04	6.91	-341	108
2006-52	139418	109	Valle Grande	0.3579	3.61	2.3433	12.4	97	0.13	2.58	2.21	-3113	284
2006-53	139418	111	Cerro Toledo	0.3347	3.38	2.3428	12.4	97	0.13	2.59	2.22	-2460	265
2006-54	139418	116	Valle Grande	0.3143	3.17	2.3416	12.4	97	0.13	2.61	2.24	-1901	247
2006-55	139418	146	Valle Grande	0.3187	3.22	2.3459	12.4	97	0.13	2.52	2.17	-2151	259
Rendija Tract: Elevation 2097 m (6880 ft)													
2006-56	85404	6	Valle	0.4074	4.11	2.3258	12.4	97	0.95	32.20	27.66	1425	26

Lab No.	Site No.	FS No.	Source	630cm-1	Rim (um)	Density	EHT	%rH	%OH-	Rate	Adj Rate	AD/-BC	SD
			Grande										
2006-57	85404	30	Valle Grande	0.3208	3.24	2.3405	12.4	97	0.13	2.63	2.26	-2028	250
2006-58	85404	79	Valle Grande	0.2050	2.07	2.3414	12.4	97	0.13	2.61	2.25	314	162
2006-59	85411	24	Valle Grande	0.3516	3.55	2.3369	12.4	97	0.30	8.60	7.39	488	84
2006-60	85411	44	Valle Grande	0.5752	5.80	2.3318	12.4	97	0.60	19.48	16.73	221	60
2006-61	85411	91	Valle Grande	0.2050	2.07	2.3406	12.4	97	0.13	2.63	2.26	325	161
2006-62	85411	145	Cerro Toledo	0.5212	5.26	2.3270	12.4	97	0.88	29.67	25.49	1018	36
2006-63	85411	148	Cerro Toledo	0.5773	5.82	2.3208	12.4	97	1.24	42.60	36.60	1154	28
2006-64	85861	5	Valle Grande	0.2190	2.21	2.3390	12.4	97	0.18	4.29	3.68	811	105
2006-65	85861	59	Cerro Toledo	0.4657	4.70	2.3371	12.4	97	0.29	8.18	7.03	-747	116
2006-66	85861	78	Valle Grande	0.4140	4.18	2.3399	12.4	97	0.13	2.65	2.27	-4644	320
2006-67	85861	79	Cerro Toledo	0.3235	3.26	2.3452	12.4	97	0.13	2.54	2.18	-2252	261
2006-68	85861	87	Valle Grande	0.3574	3.61	2.3427	12.4	97	0.13	2.59	2.22	-3075	283
2006-1	85859	40	Valle Grande			N/A							
2006-2	85859	109	Valle Grande	0.3579	3.61	2.3186	12.4	97	1.37	47.06	40.42	1673	16
2006-3	85859	118	Valle Grande	0.4003	4.04	2.3267	12.4	97	0.89	30.23	25.96	1410	27

Lab No.	Site No.	FS No.	Source	630cm-1	Rim (um)	Density	EHT	%rH	%OH-	Rate	Adj Rate	AD/-BC	SD
2006-4	85859	144-2	Valle Grande	0.3494	3.52	2.3434	12.4	97	0.13	2.57	2.21	-2880	278
2006-5	85859	147	Valle Grande	0.3799	3.83	2.3415	12.4	97	0.13	2.61	2.24	-3673	297
2006-6	85859	148	Valle Grande	0.4788	4.83	2.3355	12.4	97	0.38	11.54	9.92	-71	85
2006-7	85859	166	Valle Grande	0.4404	4.44	2.3399	12.4	97	0.13	2.65	2.27	-5510	340
2006-8	85859	169-2	Valle Grande	0.5248	5.29	2.3323	12.4	97	0.57	18.39	15.80	426	58
2006-9	85859	172	Valle Grande	0.4441	4.48	2.3387	12.4	97	0.20	4.87	4.18	-2171	186
2006-10	85859	285	Valle Grande	0.4035	4.07	2.3444	12.4	97	0.13	2.55	2.19	-4542	323
2006-11	85869	265	Valle Grande	0.3228	3.26	2.3393	12.4	97	0.16	3.76	3.23	-869	176
2006-12	85869	266	Valle Grande	0.2925	2.95	2.3424	12.4	97	0.13	2.59	2.23	-1408	231
2006-13	85869	267	Valle Grande	0.3240	3.27	2.3417	12.4	97	0.13	2.61	2.24	-2146	254
2006-14	85869	277	Valle Grande	0.2911	2.94	2.3439	12.4	97	0.13	2.56	2.20	-1417	233
2006-15	85869	322	Valle Grande	0.2963	2.99	2.3498	12.4	97	0.12	2.44	2.10	-1711	249
2006-16	85869	324	Valle Grande	0.3402	3.43	2.3310	12.4	97	0.64	21.15	18.17	1393	33
2006-69	87430	69	Valle Grande			N/A							
2006-70	87430	107	Valle Grande	0.2590	2.61	2.3371	12.4	97	0.29	8.18	7.03	1116	65
2006-71	87430	127	Valle	0.3747	3.78	2.3306	12.4	97	0.67	22.04	18.93	1302	35

Lab No.	Site No.	FS No.	Source	630cm-1	Rim (um)	Density	EHT	%rH	%OH-	Rate	Adj Rate	AD/-BC	SD
			Grande										
2006-72	87430	131	Cerro Toledo	0.3823	3.86	2.3323	12.4	97	0.57	18.41	15.81	1142	42
2006-73	87430	145	Valle Grande			N/A							
2006-17	99396	38	Cerro Toledo	0.5509	5.56	2.3453	12.4	97	0.13	2.53	2.18	-10245	443
2006-18	99396	48	Cerro Toledo	0.3917	3.95	2.3459	12.4	97	0.13	2.52	2.17	-4244	317
2006-19	99396	54	Cerro Toledo	0.3842	3.88	2.3459	12.4	97	0.13	2.52	2.17	-4009	311
2006-20	99396	126	Cerro Toledo	0.4401	4.44	2.3415	12.4	97	0.13	2.61	2.24	-5599	344
2006-21	99396	186	Cerro Toledo	0.3289	3.32	2.3404	12.4	97	0.13	2.64	2.26	-2228	256
2006-22	99396	289	Valle Grande	0.4126	4.16	2.3437	12.4	97	0.13	2.57	2.20	-4803	328
2006-23	99396	318	Valle Grande	0.3269	3.30	2.3388	12.4	97	0.19	4.70	4.04	-365	143
2006-24	99396	354	El Rechuelos			N/A							
2006-25	99396	385	Cerro Toledo	0.2854	2.88	2.3463	12.4	97	0.13	2.51	2.16	-1350	233
2006-26	99396	397	El Rechuelos			N/A							
2006-27	99396	402	Unknown	0.3717	3.75	2.3463	12.4	97	0.13	2.51	2.16	-3646	302
2006-28	99396	430	El Rechuelos	0.2921	2.95	2.3433	12.4	97	0.13	2.58	2.21	-1422	233
2006-29	99396	501	Valle Grande	0.3362	3.39	2.3458	12.4	97	0.13	2.52	2.17	-2610	273
2006-30	99396	546	El	0.2111	2.13	2.3434	12.4	97	0.13	2.57	2.21	187	169

Lab No.	Site No.	FS No.	Source	630cm-1	Rim (um)	Density	EHT	%rH	%OH-	Rate	Adj Rate	AD/-BC	SD
			Rechuelos										
2006-31	99397	5	Valle Grande	0.3123	3.15	2.3436	12.4	97	0.13	2.57	2.21	-1914	249
2006-32	99397	12	Valle Grande	0.2689	2.71	2.3483	12.4	97	0.12	2.47	2.12	-1029	224
2006-33	99397	32	Valle Grande	0.3425	3.46	2.3440	12.4	97	0.13	2.56	2.20	-2715	274
2006-34	99397	43	Valle Grande	0.2954	2.98	2.3311	12.4	97	0.64	20.98	18.02	1527	29
2006-35	99397	50	Valle Grande	0.3504	3.54	2.3393	12.4	97	0.16	3.73	3.20	-1402	192
2006-36	99397	60	Valle Grande	0.2774	2.80	2.3329	12.4	97	0.53	17.10	14.69	1492	33
2006-37	99397	66	Valle Grande	0.3401	3.43	2.3474	12.4	97	0.13	2.49	2.14	-2778	280
2006-38	99397	67	Valle Grande	0.2666	2.69	2.3452	12.4	97	0.13	2.54	2.18	-903	216
2006-39	99397	76	Valle Grande	0.2991	3.02	2.3457	12.4	97	0.13	2.52	2.17	-1656	243
2006-40	99397	77	Valle Grande	0.3559	3.59	2.3457	12.4	97	0.13	2.52	2.17	-3156	288
2006-74	127634	8	Cerro Toledo	0.4454	4.49	2.3160	12.4	97	1.52	52.42	45.02	1565	17
2006-75	127634	19	Valle Grande	0.3105	3.13	2.3525	12.4	97	0.12	2.38	2.05	-2166	267
2006-76	127634	99	Valle Grande	0.4220	4.26	2.3421	12.4	97	0.13	2.60	2.23	-5023	331
2006-77	127635	6	Valle Grande	0.1357	1.37	2.3369	12.4	97	0.30	8.59	7.38	1732	33
2006-78	127635	43	Cerro Toledo			N/A							

Lab No.	Site No.	FS No.	Source	630cm-1	Rim (um)	Density	EHT	%rH	%OH-	Rate	Adj Rate	AD/-BC	SD
2006-79	127635	103	Valle Grande	0.4073	4.11	2.3423	12.4	97	0.13	2.60	2.23	-4556	321
TA-74 Tract													
2003-54	21596B	5	Valle Grande	0.2242	2.26	2.3416	15.4	97	0.13	3.78	3.25	597	122
2003-55	21596B	8	Cerro Toledo	0.3956	3.99	2.3459	15.4	97	0.13	3.65	3.14	-2411	221
2003-41	21596C	10-1	Valle Grande	0.2748	2.77	2.3431	15.4	97	0.13	3.74	3.21	-107	151
2003-42	21596C	10-2	Valle Grande	0.3213	3.24	2.3373	15.4	97	0.28	11.05	9.49	999	60
2003-43	21596C	12	Valle Grande	0.3279	3.31	2.3401	15.4	97	0.13	3.82	3.28	-911	176
2003-77	117883	5	Valle Grande	0.3809	3.84	2.3369	12.4	97	0.30	8.59	7.38	230	91
2003-78	117883	7	Valle Grande	0.3938	3.97	2.3394	12.4	97	0.16	3.57	3.07	-2470	225
2003-79	117883	10	Valle Grande	0.3278	3.31	2.3423	12.4	97	0.13	2.60	2.23	-2264	259
2003-80	117883	11-1	Valle Grande	0.3954	3.99	2.3439	12.4	97	0.13	2.56	2.20	-4261	315
2003-81	117883	12-1	Valle Grande	0.3188	3.22	2.3381	12.4	97	0.23	6.08	5.23	250	107
2003-82	117883	14-3	Valle Grande	0.3640	3.67	2.3502	12.4	97	0.12	2.43	2.09	-3596	306
2003-83	117883	25	Valle Grande	0.3492	3.52	2.3411	12.4	97	0.13	2.62	2.25	-2786	273

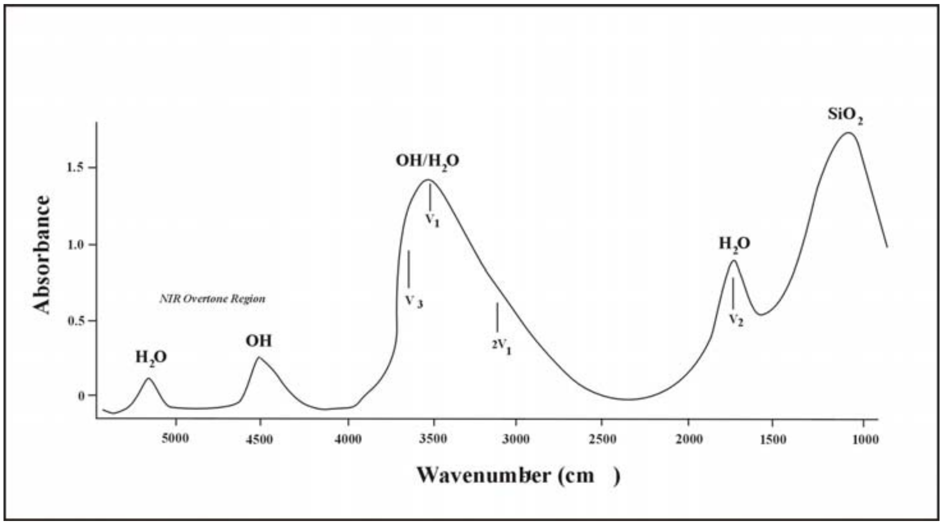


Figure 68.2. Infrared spectra of water in obsidian.

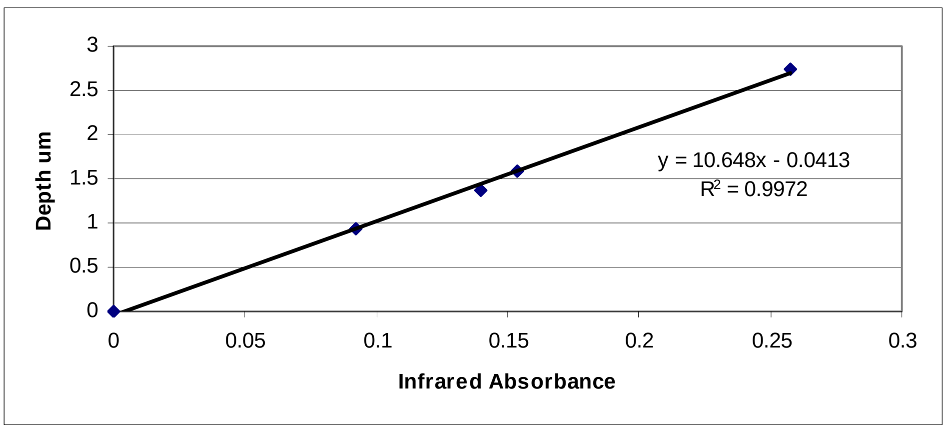
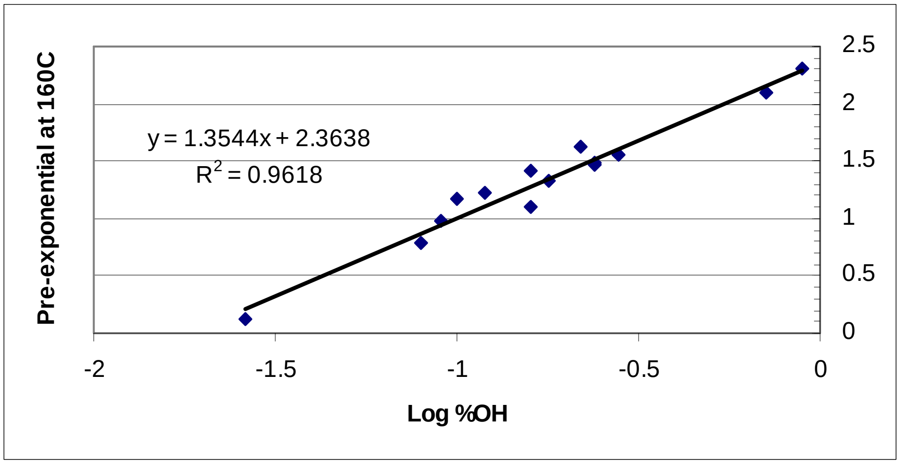


Figure 68.3. Photoacoustic calibration that relates infrared absorbance to hydration layer thickness in microns.

Further analysis has shown that the Arrhenius constants (A, E) may be accurately estimated from the composition of the obsidian; specifically the amount of initial water (OH) contained within the unweathered obsidian. This water is trapped within the glass structure during cooling from a liquid state and may be estimated from the density of the natural glass (Figure 68.5). OH values for the samples used in the density/OH calibration were determined by infrared transmission spectroscopy (Newman et al. 1986). A measure of the water concentration (OH) for the artifacts was determined by a non-destructive density measurement made using the Archimedes method (Ambrose and Stevenson 2004; Stevenson et al. 1996).



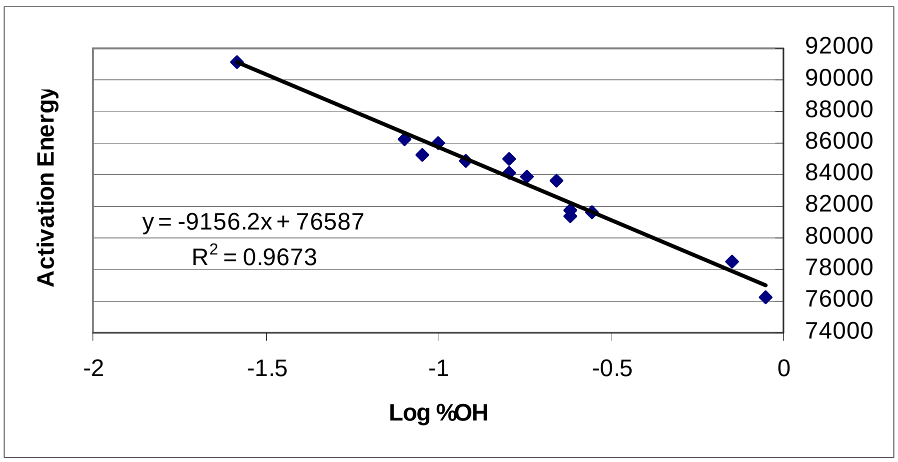


Figure 68.4. The Arrhenius constants A (top) and E (bottom) calibrated to obsidian structural water content.

In this analysis, the water content was analyzed for 176 of the total 188 samples. Fourteen samples possessed surface or internal flaws that made them unsuitable for analysis. Previous X-ray fluorescence analysis had shown that three geological sources were represented in the archaeological assemblage. The Cerro Toledo source was represented by 68 samples. The water content (OH) concentration for these items ranged between 0.12 percent and 1.52 percent with 42 of 70 samples (60%) in the 0.11percent to 0.13 percent OH range (Figure 68.6). The Valle Grande source accounted for 100 samples. The most frequent OH value was 0.13 percent with 57 of 93 samples (61%) having this value. The remaining samples exceeded this amount and ranged up to 1.37 percent OH (Figure 68.7). El Rechuelos was the last source and was represented by 11 artifacts. The OH concentration was restricted to a range of 0.12 percent to 0.19 percent with all but two samples having a value of 0.13 percent (Figure 68.8). It is clear from these descriptive statistics that a large proportion of artifacts from within the Cerro Toledo and Valle Grande sources are water rich and will have accelerated hydration rates at ambient temperatures. The small sample size from the El Rechuelos source does not allow for an accurate assessment of the flow variability with respect to water content but the presence of higher water content samples suggests that it might exhibit the same general patterning as the other two sources.

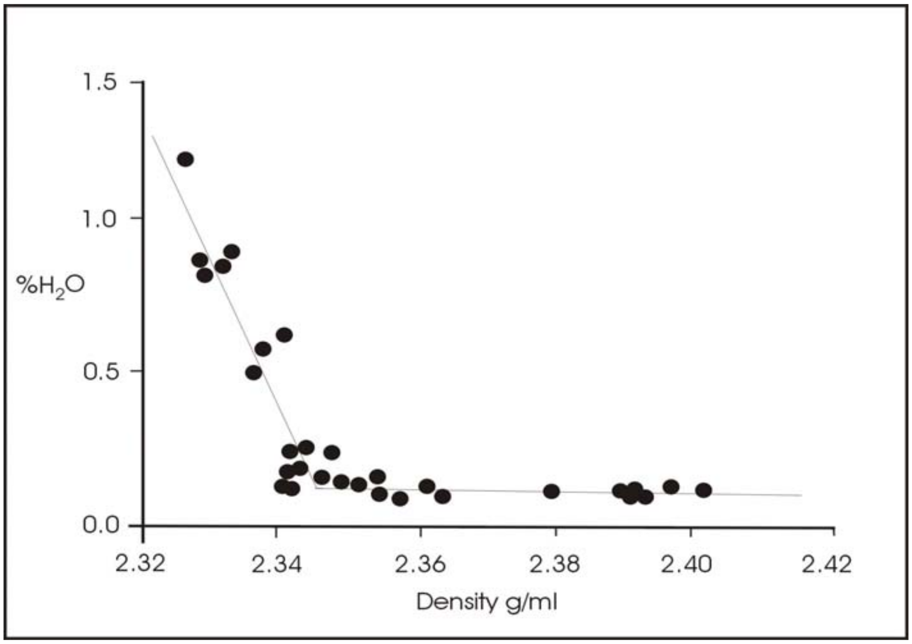


Figure 68.5. The relationship between obsidian structural water content and density (Ambrose et al. 2004).

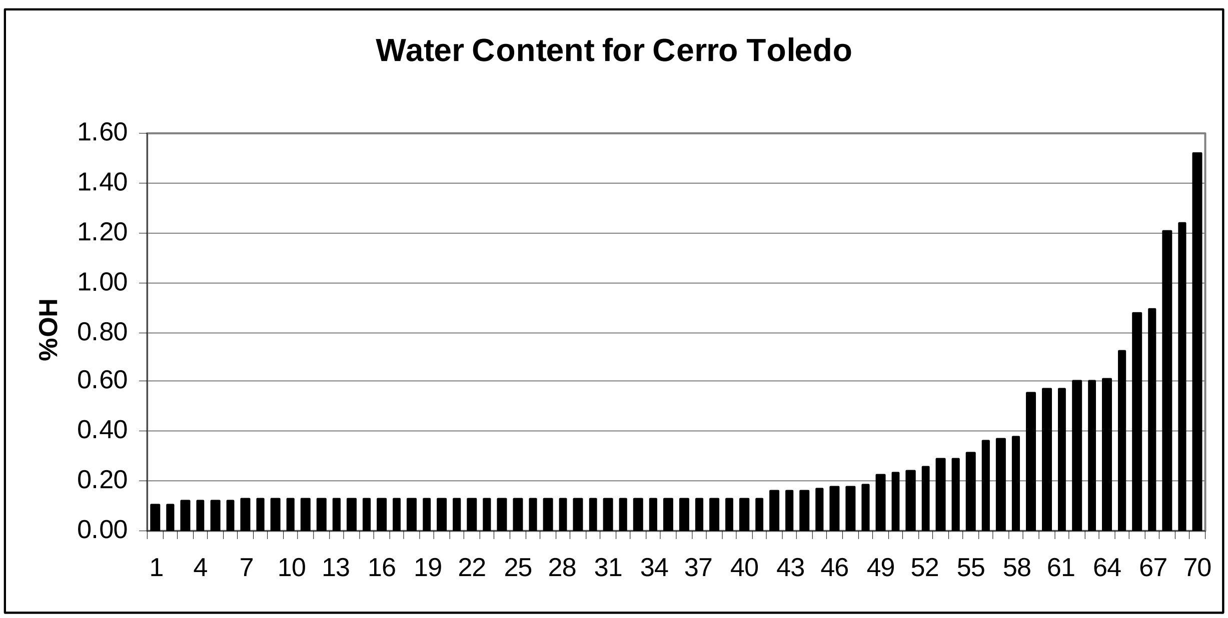


Figure 68.6. Structural water content variation in the Cerro Toledo obsidian samples.

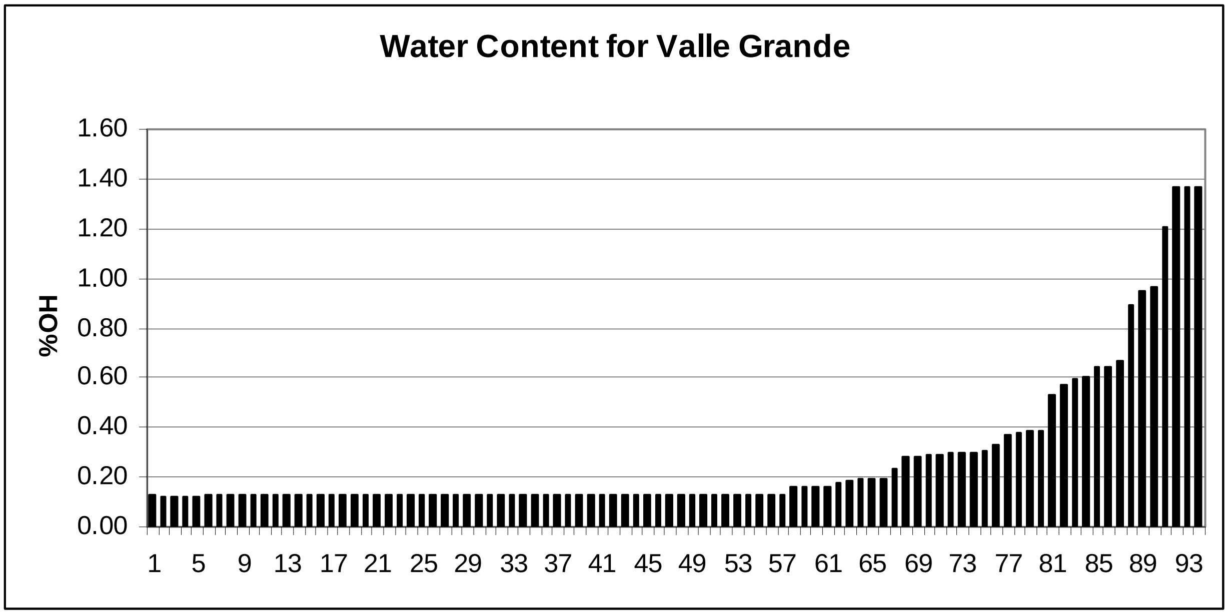


Figure 68.7. Structural water content variation in the Valle Grande obsidian samples.

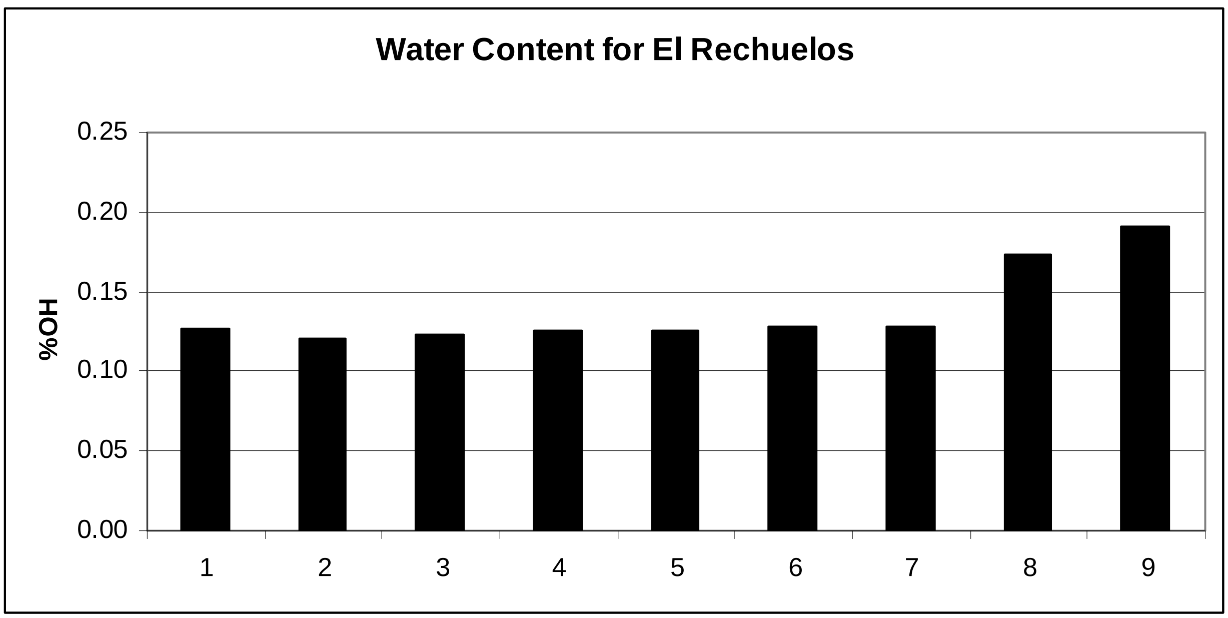


Figure 68.8. Structural water content variation in the El Rechuelos obsidian samples.

SOIL TEMPERATURE RELATIVE HUMIDITY ESTIMATION

Soil temperature and soil relative humidity significantly affect the rate of hydration. Temperature increases will accelerate the rate of hydration in an exponential manner while a decline in soil relative humidity will decrease the hydration in a linear fashion in the upper ranges (90% to 99%) (Jones et al. 1997; Mazer et al. 1991). These important parameters may be obtained through field studies using saline-based thermal cells monitors. In this project we used two versions of the thermal cell because of the changing availability of commercially available cell materials. Temperature and relative humidity measurements at the White Rock Tract used the polycarbonate cell as designed and calibrated by Trembour et al. (1988). The ground temperature at the Rendija Tract was measured with a new polystyrene cell that was identical to the Trembour cell except for the cell outer material. This change required a new calibration to be developed to establish the rate of water diffusion as a function of temperature.

Development of the calibration required timed exposures to determine the rate of water diffusion through polystyrene as a function of temperature. Four sets of cell pairs encased in their water jackets were exposed to temperatures of 25, 30, 35, and 40°C for periods up to 64 days in an incubator with a precision of +/-1°C. The weight gains of the cells were measured on a Mettler analytical balance to record the total weight gain in grams. The LOG weight gain per day was then plotted against the temperature to develop the calibration: Y = 9E-05x – 0.0014 (r^2 = 0.9874). The calibration is for temperatures between 25 and 40°C but extrapolations to lower temperatures may be made with confidence because of the high r-squared value associated with the correlation (Figure 68.9).

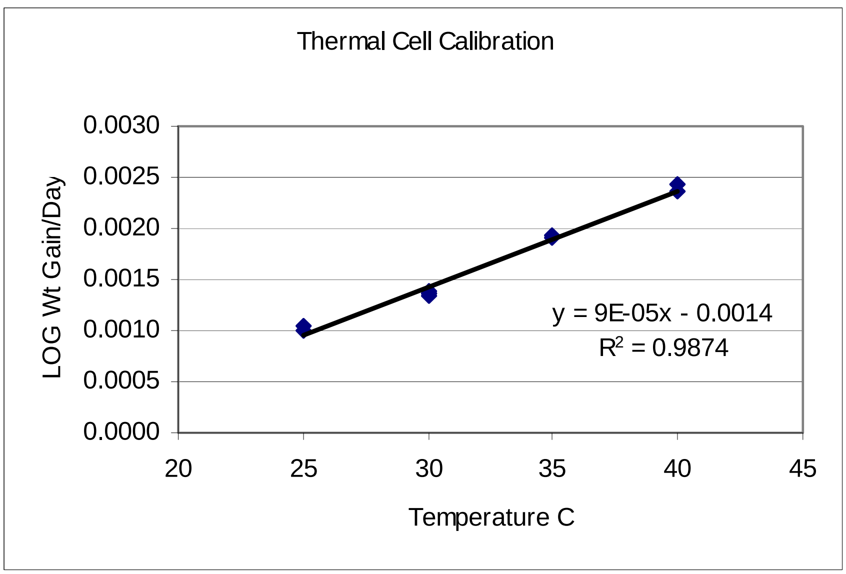


Figure 68.9. Thermal cell calibration curve that relates water weight gain per day to temperature.

Soil temperature monitoring within the project area at the White Rock (1981 m, 6500 ft) and Rendija Tracts (2020 m, 6824 ft) was completed for soil depths between 20 cm and 100 cm. The data showed the expected trends of a decreasing soil temperature with depth and a high, or increasing, relative humidity with depth. Within the White Rock Tract, the annual effective hydration temperature (382 day exposure) ranged between 15.4°C and 13.7°C depending upon the depth of the artifact below the surface of the ground (Table 68.2). The percent relative humidity was determined to be approximately 96 percent to 97 percent for all depths. At the Rendija Tract the effective hydration temperature (406 day exposure) ranged between 12.4°C and 7.5°C and the relative humidity varied between 93 percent to 102 percent (Table 68.3). We believe that the 100 cm cell pair at the Rendija Tract is in error because of the humidity that is in excess of 100 percent and the sharply lower temperature value that is 3.5 degrees lower than the 80 cm temperature value. These odd results will not be used in the age estimation process.

Table 68.2. White Rock Tract ground temperature and relative humidity.

Depth (cm)	EHT (^oC)	Percent RH
10	15.3	96
25	15.4	97
50	14.5	97
75	14.1	96
100	13.7	97

*Data collected over 382 days

Table 68.3. Rendija Tract ground temperature and relative humidity.

Depth (cm)	EHT (^oC)	Percent RH
20	12.4	96
40	11.7	97
60	11.5	--
80	11.0	93
100	7.5	102

*Data collected over 405 days

AGE ESTIMATION

Using the estimated effective hydration temperature and relative humidity, hydration rates for the obsidian artifacts was calculated. For each artifact, the estimated high-temperature hydration rate at 160^{o}C (A) was extrapolated to the hydration rate at the estimated temperature and relative humidity for the project area using the Arrhenius equation:

$$K = A\ (Rh)\ \mathrm{Exp}\ E/RT$$

where: K = archaeological hydration rate (*um*^{2}/day)
A = preexponential (*um*^{2}/day at 160^{o}C)
Rh= percent relative humidity
E = activation energy (Joules/mol)
R = universal gas constant
T = effective hydration temperature in degrees Kelvin

The hydration rate and age determinations at the estimated site temperature and relative humidity are shown in Table 68.1.

DISCUSSION AND CONCLUSION

The obsidian hydration dates presented in Table 68.1 have been calculated in a manner to compensate for most of the significant environmental and compositional parameters known to affect the rate of hydration. One of the major factors, the surface dissolution of the glass, has not been considered since this phenomenon is characteristic of tropical areas with high temperatures and alkaline soils. The client should be aware that monitoring environmental parameters is very difficult, especially for surface or near-surface artifacts where the depth of burial varies over time. This changing context can affect the temperature and relative humidity conditions and cannot be accounted for using the techniques currently available to the laboratory. However, in this study artifacts are buried within 10 to 20 cm below surface where more stable environmental conditions will be present.

The client should also be aware of the detrimental effects of forest fires or burn events on the integrity of the hydration layer. A few artifacts (e.g., 2003-18, 2003-71) have larger hydration rims in excess of five microns. These samples do not have geological surfaces and it is possible that a burn event may have impacted the hydration layer. Exposure to heat under 400°C may expand and then obliterate the hydration layer. Artifacts exposed to higher temperatures may experience accelerated re-hydration upon cooling with the result that very large hydration layers may be formed (Stevenson et al. 2004). In evaluating these dates, the context of the artifacts should be examined for evidence of burning.

It has been noticed that in almost all cases, obsidians with a structural water content in excess of 0.20 percent OH tend to have late age determinations while obsidians with a structural water content of 0.12percent to 0.13 percent OH returned ages of greater antiquity. Based upon previous experimentation, it was anticipated that water-rich glasses would have proportionally larger rims since greater structural water content would increase the rate of hydration exponentially. However, the hydration rims of most samples are within 1 to 2 microns of obsidian flakes with low water content (0.13% OH). Because the environmental parameters of the artifacts are relatively uniform within a site boundary, external environmental conditions do not seem to be a plausible explanation.

We believe there are two possibilities that may account for this patterning. First, the obsidian water content determination estimated from the artifacts may be in error. The water-rich samples may have significantly lower iron or silica contents that would reduce the artifact density and be more influential than the amount of initial water in structuring the final outcome of the density measurement. These compositional factors should be compared with the density values to see if a trend is present. Alternately, the water content assessments are correct and the explanation is a behavioral one. It is possible that at a later time in this portion of the Southwest, Native American people tended to exploit more water-rich sections of obsidian flows or utilized volcanic ejecta, a material that tends to be water rich because of the rapid cooling that prevents the release of volatiles such as carbon dioxide and water. Water-rich glasses may be easier to manipulate compared to dry obsidians.

The latter hypothesis is partially supported by the assemblage from LA 12587. Radiocarbon and archaeomagnetic dating place the use of the pueblo between AD 900–1400 with an inferred final occupation of Roomblock I at around AD 1300. The assemblage from this site tends to be water rich with 12 of 22 samples possessing structural water in excess of 0.20 percent OH and ten of these samples returned dates after AD 800. This high proportion of water-rich samples with compatible dates suggests an exploitation pattern of water-rich glasses. The presence of dates from the fifth century and back into the Archaic period also suggests that artifact scavenging and reuse was also a frequent behavior.

CHAPTER 69
AN EVALUATION OF CHRONOMETRIC DATING TECHNIQUES ON THE PAJARITO PLATEAU

Brian C. Harmon and Bradley J. Vierra

INTRODUCTION

Chronometric dating forms the backbone of archaeological research. That is, the accurate temporal placement of archaeological occupations is critical to studies that seek to understand culture change. Whether it is the transition from foraging to agricultural-based economies or the process of Ancestral Pueblo site aggregation, the accurate dating of these histories underlies our ability to identify temporal patterning and develop theory to explain this variation in human behavior. Several different chronometric dating techniques were used to develop the temporal sequence identified by the Land Conveyance and Transfer (C&T) Project archaeological excavations. Yet, the precision and accuracy of these varying techniques is still being evaluated (Nash 2000).

J. Dean (1978) provides an excellent framework for interpreting chronometric dating techniques. Obviously, archaeologists are interested in dating a specific event that occurred some time in the past (e.g., the last use of a hearth). What is sometimes forgotten is that the event that is actually being dated may actually be the death of an organism, although it is often assumed that the two incidents coincided. A more accurate statement of this relationship is provided by J. Dean (1978:226–228) who offers a set of terms to delineate the events associated with independent dates. The *dated event* refers to the age of a sample as determined by a particular dating method (e.g., AD 1170±100). The *reference event* is the event that a particular method dates (e.g., the last heating above 450°C, when an organism stopped uptaking carbon). The *target event* is the event that the archaeologist is interested in dating (e.g., the last use of a hearth). The dated event is most closely related to the reference event, but these do not necessarily coincide with the target event.

Four chronometric dating techniques were used by this project: obsidian hydration, radiocarbon, luminescence, and archaeomagnetic. Each has its own potential source of error and varying temporal precision. This chapter will therefore evaluate the accuracy of each individual dating technique and compare these to each other. Given this information, the project archaeological sites will be placed in a temporal sequence, including a comparison with the ceramic chronology.

OBSIDIAN HYDRATION DATING

Method

Stevenson (Chapter 11, Volume 1) describes the basic process of obsidian hydration dating:

> In order to calculate the absolute date for an obsidian artifact, three analytical procedures need to be completed. First, the amount of surface hydration, or the thickness of the hydration rim formed by the inward diffusion of molecular water, needs to be measured. Second, the high-temperature hydration-rate constants for each artifact are predicted from the structural water content of the glass. Lastly, the soil temperature and relative humidity at the archaeological site are estimated so that the rate of hydration determined at high temperature may be adjusted to reflect ambient hydration conditions. The archaeological rate constants are used to convert the hydration rims to a date when the surface of the artifact was created in prehistory.

There has been some debate about the reliability of obsidian hydration dating (Anovitz et al. 1999; Beck and Jones 2000; Ridings 1996; C. Stevenson et al. 1996). Recent studies have therefore focused their attention on refining this dating method. For example, more accurate techniques have been developed for measuring the thickness of the hydration layer or determining water concentration as a function of depth within the artifact (Anovitz et al. 1999; C. Stevenson et al. 1996). It has been argued that the composition of the obsidian is not the significant factor for determining the hydration rate, but rather it is the initial glass water concentration that can determine the diffusion coefficient and therefore the hydration rate. That is, obsidian that contains low quantities of structural water hydrate at lower rates than obsidian that contain high quantities of water (Mazer et al. 1992; C. Stevenson et al. 1998; C. Stevenson et al. 1996). This characteristic would also vary by obsidian source (or flow). Although hydration rates were originally calculated by cross-dating the samples with associated chronometric dates, they are currently determined through experimental (e.g., induced) laboratory procedures (e.g., Michels et al. 1983; C. Stevenson et al. 1989). This has been termed the empirical versus intrinsic approaches (Ambrose 1976; Anovitz et al. 1999). In addition, local temperature and humidity conditions also need to be measured and the effective hydration temperature calculated. This is often accomplished by placing thermal cells at varying subsurface depths at the site for a period of one year. These data provide more accurate information than weather station data for adjusting the final hydration rate formula (M. Jones et al. 1997; Lee 1969).

The nature and degree to which obsidian is hydrated can be dramatically changed by exposure to high temperatures (see Steffen 2005:32–41 for a summary of much recent work). In general, laboratory results have shown that hydration bands begin to become more diffuse/expand when exposed to temperatures of above 200°C, at temperatures between 300 and 400°C the hydration front is lost, and at temperatures above 500°C the hydration band itself is lost. Long exposure to lower temperatures appears to replicate the effects of short exposure to higher temperatures. Within this general pattern, however, there is a great deal of variability: changes in hydration band width can occur at temperatures as low or lower than 100°C and hydration bands can persist even when obsidian is exposed to temperatures as high as 900°C. Additionally, all obsidian exposed to the same conditions will not necessarily be uniformly affected.

After obsidian is heated to a high enough temperature that the hydration band is altered or lost, it will rehydrate. There is a great deal of variability in the nature of this rehydration; it can occur at rates slower, the same as, or quicker than that of unburned obsidian. In some circumstances the obsidian rehydrates poorly, with the new hydration band forming diffusely (Deal and McLemore

2002:32; Loyd 2002:138; C. Stevenson et al. 2004:564–565; Trembour 1990:177–178). The reference event for obsidian hydration dates from rehydrated artifacts will be the date of last thermal alteration; however, the obsidian hydration age may be underestimated, overestimated, or correct. There is an additional source of age overestimation. As noted above, exposure to heat can cause the hydration rim to swell, making the obsidian appear older than it really is (C. Stevenson personnel communication 2006; C. Stevenson et al. 2004).

Forest Fires

One formation process that has potentially affected all the project sites is forest fires. Between circa AD 1480 (and possibly earlier) and 1899, low intensity forest fires occurred with high frequency in the higher-elevation ponderosa pine forests of the Jemez Mountains and Pajarito Plateau, and with reduced frequencies at lower elevations and in mixed-conifer forests (C. Allen 1989:69–120, 2002b, 2004:51–54; C. Allen et al. 1996; Foxx and Potter 1984; Touchan et al. 1996). As a result "[m]any, if not most, archaeological sites at Bandelier [National Monument] have been burned repeatedly by widespread, low-intensity fires that occurred across the Pajarito Plateau in the centuries following its abandonment," (C. Allen 2004:54). Archaeological sites within the project boundaries must have been similarly affected.

Although fire effects to surface artifacts and features can be significant, fire effects are rarely found deeper than 10 cm below the soil surface (Connor et al. 1989; Lentz et al. 1996; Ruscavage-Barz and Oster 2001; Traylor et al. 1990), unless a root system allows the fire to penetrate below ground. One reason for this is that soil temperatures will not rise above 100°C so long as any moisture remains in the soil (Solomon 2002).

Sampling

Obsidian artifacts submitted for dating were not taken from obviously burned contexts (e.g., hearths) and were inspected to ensure that they were free of macroscopic signs of burning (e.g., surface sheen, crazing, cracking, and vesiculation). When possible, only obsidian artifacts from subsurface contexts were submitted for dating; however, at sites where little subsurface obsidian was recovered, surface artifacts were dated (e.g., LA 99396 and LA 99397). This selection process attempted to reduce errors and uncertainties caused by thermal alteration. Nonetheless, it is possible that a portion of the dated artifacts were exposed to heating: it is known that the Cerro Grande fire burned at 17 sites and older fires may have burned at many or all of the sites. Additionally, some sites and parts of sites were clearly burned, although not necessarily as the result of forest fires (e.g., Room 2 of LA 12587 and most of LA 135290). During analysis C. Stevenson (Chapter 68, this volume) noted at least two artifacts that he suspected of having thermally altered hydration bands from LA 12587 and LA 128804. Only about four percent of the total debitage analyzed during the project exhibited obvious evidence of having been burned.

Obsidian hydration dates were calculated in a manner to compensate for most of the significant environmental and compositional parameters known to affect the rate of hydration (Stevenson, this volume). Table 69.1 summarizes all the obsidian hydration dates obtained from the project by site. Stevenson's chapter in Volume 3 should be consulted for a list of all the individual obsidian hydration dates. Two trends become clear from a project-level examination of the data: 1) most dates fall into the Archaic period and 2) dates from any given site are scattered over thousands of years.

Table 69.1. Summary of C&T Project obsidian hydration dates (OHD) by site.

Site	No. of Samples	Earliest OHD - BC/AD	Latest OHD - BC/AD	Mean OHD - BC/AD	Mean OHD Std. Dev.
12587	12	-4903	1428	-326	2174
12587 (Area 8)	10	-3049	1668	206	1575
21596A	3	-911	999	-6	959
21596B	2	-2411	597	-907	2127
61034	7	-7089	-1247	-4032	1917
61035	8	-1476	1743	-303	920
85404	3	-2028	1425	-96	1763
85411	5	221	1154	641	420
85859	9	-5510	1673	-1704	2653
85861	5	-4644	811	-1981	2102
85869	6	-2146	1393	-1031	1256
86534	13	-2790	1720	-44	1369
86637	9	-3996	-699	-2200	1193
87430	3	1116	1302	1187	101
99396	12	-10245	187	-3361	2812
99397	10	-3156	1527	-1253	1638
117883	7	-4261	250	-2128	1755
127625	3	-3665	-740	-2565	1592
127631	1	395	395	395	--
127634	3	-5023	1565	-1875	3304
127635	2	-4556	1732	-1412	4446
128804	9	-3839	1610	-1178	1696
128805	10	-3866	1360	-859	2023
135290	7	-6500	1805	-1206	3364
139418	8	-7908	669	-2448	2530

Analysis

Tract-Level Analysis

As Early and Middle Archaic sites are, on average, located at higher elevations relative to Late Archaic sites at Los Alamos National Laboratory (LANL) (Vierra et al. 2006:186–187), it is expected that Rendija Tract dates will generally be earlier than dates from the other three tracts.

This will be particularly true if Ancestral Puebloan sites are located on a landscape that has a background scatter of Archaic artifacts, or if Ancestral Puebloans are scavenging artifacts from nearby Archaic sites. In addition to being at a higher elevation than the other tracts, the Rendija Tract also consists mostly of ponderosa pine forest, whereas the other three tracts consist mostly of piñon-juniper woodland (Chapter 4, Volume 1). Consequently, sites in the Rendija Tract would have been exposed to forest fires with a greater frequency between circa AD 1480 and 1899 (see above) and to forest fires with higher intensities than would have sites in the other three tracts (Chapter 84, Volume 4). While the implications of this fire data for tract-level obsidian hydration dating is unclear, some kind of difference is expected between the Rendija Tract and the other tracts.

Figure 69.1 and Table 69.2 show the distribution of obsidian hydration dates in each tract. Early and Middle Archaic period dates are slightly more frequent in the Rendija Tract, but the tract does not display a clear "early" signal. At the tract level, differences in Archaic period land use and/or fire effects are at best barely visible.

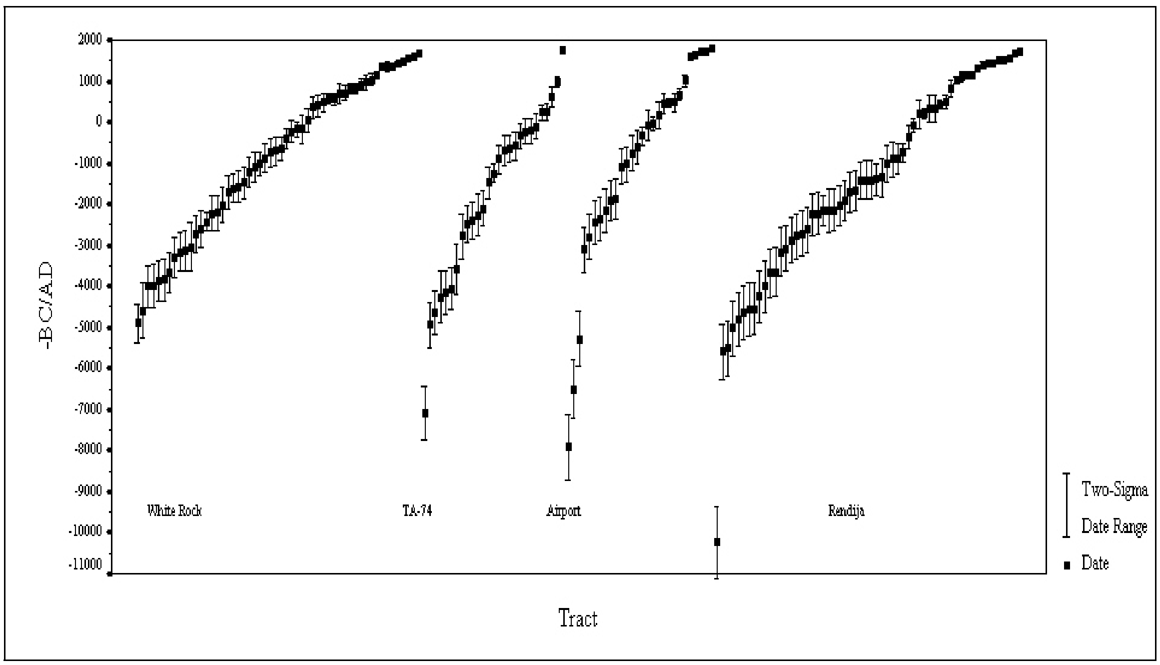


Figure 69.1. Obsidian hydration dates by tract.

Table 69.2. Frequency of obsidian hydrations dates by period per tract.

Tract	No. Samples	Paleoindian	Early Archaic	Middle Archaic	Late Archaic	Pueblo/ Modern
White Rock	54	0.000	0.130	0.315	0.481	0.370
TA-74 and White Rock Y	27	0.037	0.222	0.333	0.593	0.111
Airport	28	0.071	0.071	0.250	0.393	0.321

Tract	No. Samples	Paleoindian	Early Archaic	Middle Archaic	Late Archaic	Pueblo/ Modern
Subtotal	**109**	**0.028**	**0.138**	**0.303**	**0.541**	**0.294**
Rendija	58	0.052	0.190	0.362	0.448	0.293
Total	**167**	**0.036**	**0.156**	**0.323**	**0.509**	**0.293**

Note: Each row sums to greater than 1.000 since some dates straddle period boundaries and are counted twice.

Period-Level Analysis

Obsidian hydration dates from Coalition and Classic period roomblock and fieldhouse contexts are shown in Figure 69.2. Only 13 of 64 (20.3%) dates fall into the Coalition and Classic periods (AD 1150–1600) at two sigma (one artifact falls just short with a two-sigma late date of AD 1149). Neither artifact type nor material type appears to influence artifact dates (Table 69.3 and 69.4).

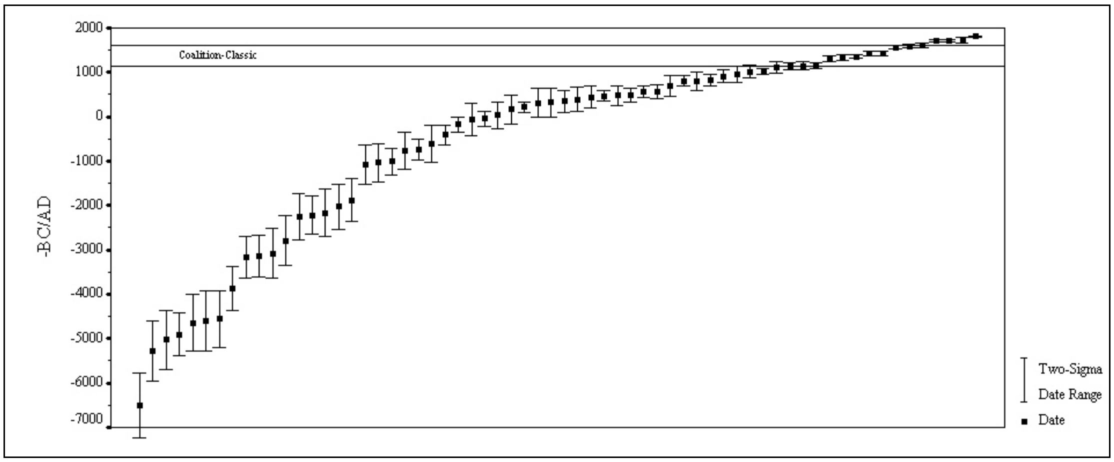


Figure 69.2. Obsidian hydration dates from roomblocks and fieldhouses.

Table 69.3. Number of hydration samples for artifact type by time period.

Artifact	Pre-Puebloan	Puebloan	Post-Puebloan	Total
Debitage	29 (61.7%)	10 (76.9%)	3 (75.0%)	42 (65.6%)
Tool	8 (17.0%)	2 (15.4%)	0 (0.0%)	10 (15.6%)
Point	10 (21.3%)	1 (7.7%)	1 (25%)	12 (18.8%)
Total	47 (100%)	13 (100%)	4 (100%)	64 (100%)

Table 69.4. Number of hydration samples for obsidian type by time period.

Obsidian	Pre-Puebloan	Puebloan	Post-Puebloan	Total
Cerro Toledo	19 (40.4%)	8 (61.5%)	0 (0.0%)	27 (42.2%)
Valle Grande	26 (55.3%)	5 (38.5%)	4 (100%)	35 (54.7%)
El Rechuelos	1 (2.1%)	0 (0.0%)	0 (0.0%)	1 (1.6%)
No Data	1 (2.1%)	0 (0.0%)	0 (0.0%)	1 (1.6%)
Total	47 (100%)	13 (100%)	4 (100%)	64 (100%)

When Coalition and Classic period obsidian hydration dates from individual sites are compared to dates derived from other methods there is weak agreement at best (Table 69.5). Clearly, obsidian hydration dating does not help to establish the date(s) of site occupation for Coalition and Classic period roomblocks and fieldhouses.

Table 69.5. Obsidian hydration dates compared to other site dates.

Site	FS*	Obsidian Hydration Date, Two-Sigma Range (AD)	Site Date[1] (AD)
135290	1055	873–1157	1160–1260
	2142	1560–1668	
86534		1545–1633	1190–1280
12587	3234	1048–1244	1275–1325
	1498	1368–1488	
85404	6	1373–1477	Early Classic
128805	71	1278–1398	1420–1500
	62	1320–1400	
85411	148	1098–1210	Early/Middle Classic
87430	107	986–1246	1430–1640
	131	1058–1226	
	127	1232–1372	
127634	8	1531–1599	1450–1650

*Field specimen 1. Based on one or more of the following: radiocarbon date(s), archaeomagnetic date(s), ceramic data.

Obsidian hydration dates from Archaic period sites are shown in Figure 69.3.

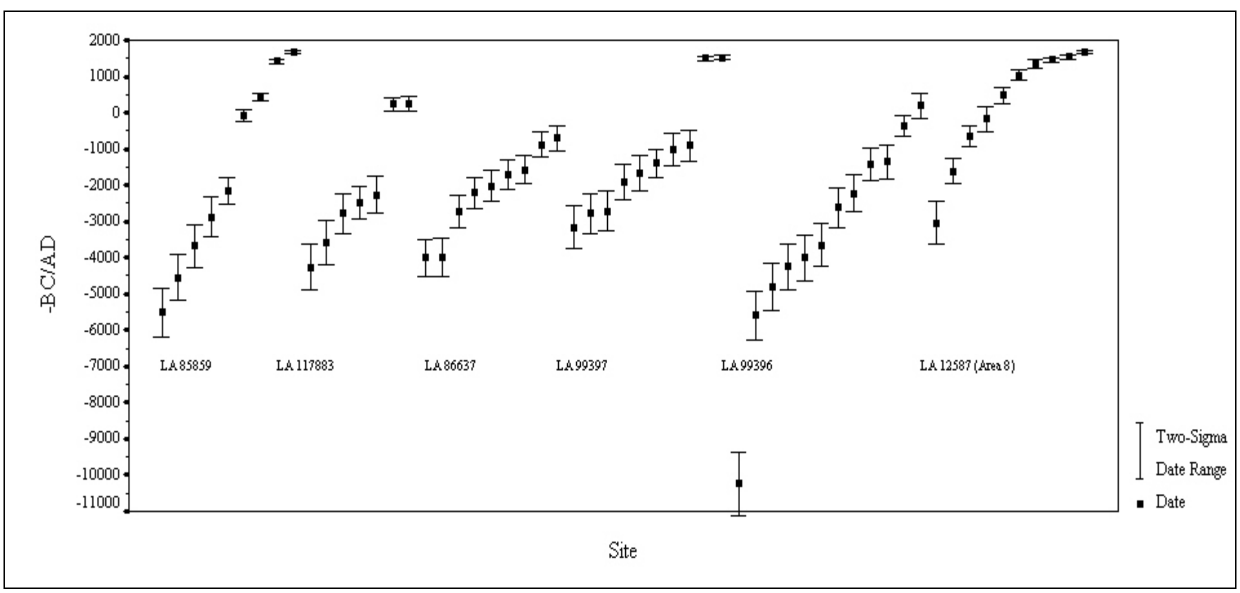


Figure 69.3. Obsidian hydration dates from Archaic period sites.

LA 117883 is situated in a secondary context and can only be dated to the Archaic period. Four Middle or Late Archaic dart points were recovered from LA 99396; obsidian hydration dates from this site fall into all three Archaic periods and there is a single earlier date. The other four sites can be assigned to a specific Archaic period based on radiocarbon dates and/or projectile point data. The obsidian hydration dates do not contradict the assessment. LA 85859 is an Early Archaic site and is thought to date to between 5300 and 4860 BC based on radiocarbon dates. If this interpretation is correct, then most of the obsidian hydration dates are too young. LA 12587 (Area 8), LA 86637, and LA 99396 are interpreted as Late Archaic sites. Obsidian hydration dates from LA 86637 and LA 99396 fall into both the Middle and Late Archaic. Of all the Archaic sites, LA 12587 (Area 8) has the latest obsidian hydration dates. This site is immediately south of the Late Coalition pueblo LA 12587 and four (40%) of the obsidian hydration dates fall into the Coalition to Classic period (curiously, only 16.7% of the obsidian hydration dates from the LA 12587 roomblock fall into the same period). Overall, however, the obsidian hydration dates from the two different parts of the site are similar (Figure 69.4).

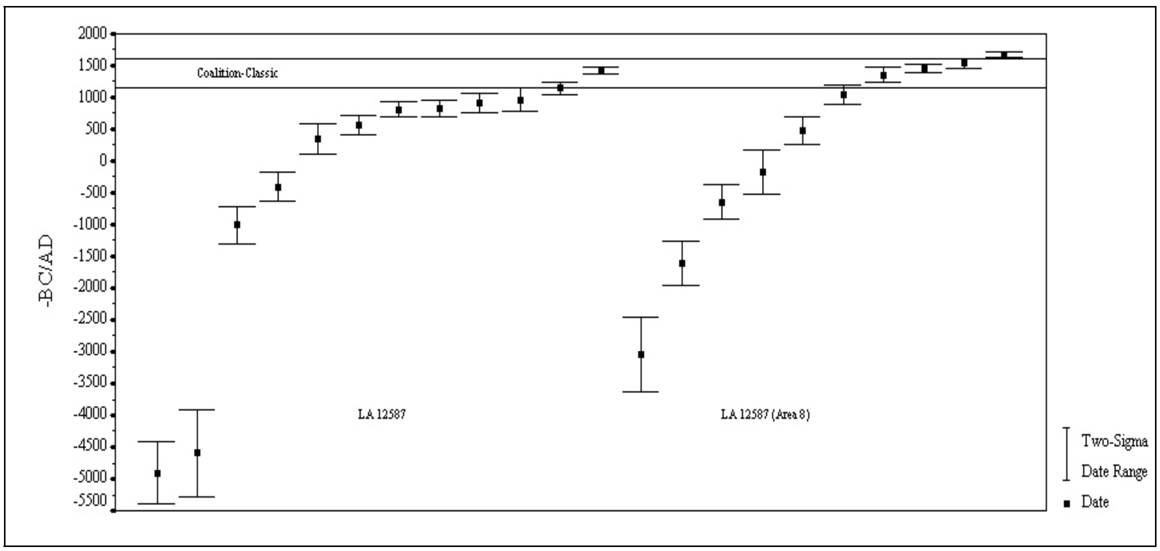


Figure 69.4. Obsidian hydration dates from LA 12587 and LA 12587 (Area 8).

Obsidian hydration dates derived from Archaic period sites generally fall into the Archaic period. However, dates from any given site span thousands of years and dates from any given site overlap many dates from any other given site. Looking at Figure 69.3 one gets the impression that LA 85859 may be slightly earlier than LA 117883, which in turn is earlier than LA 86637 and LA 99397, and that these two sites may be earlier than LA 12587 (Area 8) but this is a very weak pattern.

Table 69.6 shows the obsidian hydration dates derived from projectile points. From this small a sample size it is difficult to see much patterning, although it can be noted that eight of ten Late Archaic points do fall into the Late Archaic time span at two sigma.

Table 69.6. Obsidian hydration dates from projectile points.

Site	FS	Two-Sigma Range	Projectile Type	Base/Point Type	Period[1]
12587	2094	5383–4423 BC	Dart	Contracting Stem	Late Archaic
117883	25	3332–2240 BC	Dart	Corner-notched	Late Archaic
86637	2	2647–1783 BC	Dart	Corner-notched	Late Archaic
86534	1422	2362–1386 BC	Arrow	Corner-notched	Coalition
86637	S#3	1955–1179 BC	Dart	Armijo	Late Archaic
86534	2183	1517–641 BC	Arrow	Und.	Coalition
86637	86	1234–526 BC	Dart	Corner-notched	Late Archaic
86534	1237	1175–339 BC	Arrow	Side-notched	Coalition
86534	1266	212 BC–AD 124	Dart	Stemmed	Late Archaic
86534	1238	177 BC–AD 499	Dart	Sided-notched	Late Archaic
86534	1457	AD 357–585	Dart	Und.	Late Archaic
12587	S#2	AD 262–702	Dart	Corner-notched	Late Archaic
12587	2584	AD 419–715	Dart	Corner-notched	Late Archaic
12587	2628	AD 697–949	Arrow	Side-notched	Coalition
12587	4172	AD 785–1149	Arrow	Corner-notched	Coalition
85404	6	AD 1373–1477	Dart/Arrow	Corner-notched	Late Archaic
86534	706	AD 1692–1748	Arrow	Stemmed	Coalition

1. Based on point morphology.

Interestingly, five of these Late Archaic points were recovered from Coalition and Classic period sites and three arrow points appear to date to the Archaic period. Finally, the dart/arrow point from LA 85404 is noteworthy; during analysis it was described as resembling an arrow point, but as having a dart neck width. This artifact may be a reworked Archaic point.

Comparison to Previous Studies

Biella (1992) conducted the only previous obsidian hydration study at LANL. This was done in conjunction with the testing of a multi-component Archaic/Coalition artifact scatter (LA 70029) on Mesita del Buey. Twenty-eight obsidian artifacts were submitted for dating. Since the specific source was only determined for five artifacts, Stevenson (1992) dated the samples by using rates for both the Cerro Toledo (Obsidian Ridge) and Cerro del Medio sources. In doing so, it was determined that the artifacts dated with the Cerro del Medio rate tended to be 129 to 780 years older than when the same artifacts were dated using the Cerro Toledo rate. Nonetheless, both rates identified four separate temporal clusters at the site dating from Late Archaic and Coalition periods (Figure 69.5). This clustering is quite different from the C&T Project obsidian hydration dating results in which discreet temporal clusters are really only seen at LA 61035 and LA 139418, and to a lesser extent at LA 61034 and LA 85869. This may be the result of the relatively small sample size of dated artifacts from C&T Project sites; however, at sites where the most samples were taken the distribution of dates tends to form a curve rather than steps or clusters. Of course, it is possible that the LA 70029 clusters would break down if the all the obsidian was sourced and dated using the rates for the indicated sources.

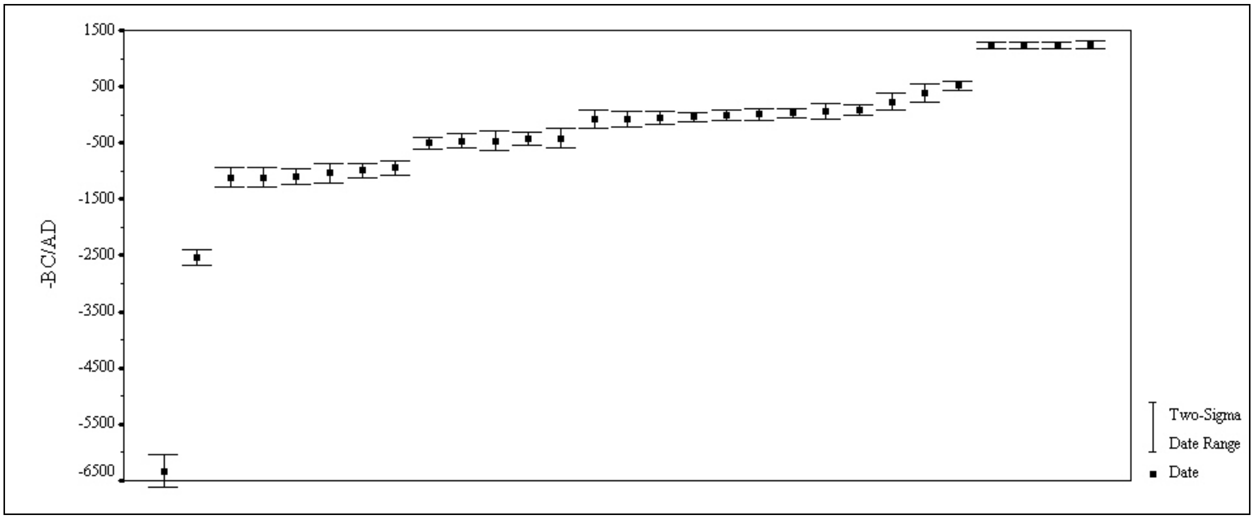


Figure 69.5. Obsidian hydration dates from LA 70025 using Cerro Toledo hydration rates for unsourced artifacts.

The largest obsidian hydration study attempted in the Northern Rio Grande was conducted by Chambers Consultants and Planners for the Abiquiu Reservoir Project (Lord and Cella 1986). Four-hundred-ninety-six obsidian samples were analyzed from 43 sites situated at an elevation of about 1890 m (6200 ft). The limited amount of pre-field time for the project precluded the use of thermal cells so temperature data derived from the nearby Abiquiu weather station were used to determine the effective hydration temperature. Two-hundred-sixteen pieces were submitted to MOHLAB for elemental source analysis and hydration dating. Four major sources were identified: El Rechuelos (Polvadera), Jemez Mountains (3525/3520), Cerro del Medio, and Cerro Toledo. The remaining artifacts were assumed to be Polvadera obsidian based on visual identification.

Figure 69.6 illustrates the relationship between obsidian hydration dates from the Abiquiu Reservoir Project projectile points and the established date ranges for projectile point types. Middle Archaic points generally date much later than expected, mostly to the first millennium AD. In contrast, the Late Archaic points span a period that includes earlier and later dates than their associated range. Arrow points date to the Late Archaic and Ceramic periods. Lord (1986) suggests that the radiocarbon and obsidian hydration dates are in general agreement. However, it is impossible to directly link any of the radiocarbon dates as listed in their report (Lord and Cella 1986:9.2) to the obsidian hydration dates because the radiocarbon dates are from subsurface contexts and the obsidian dates are mostly from surface contexts.

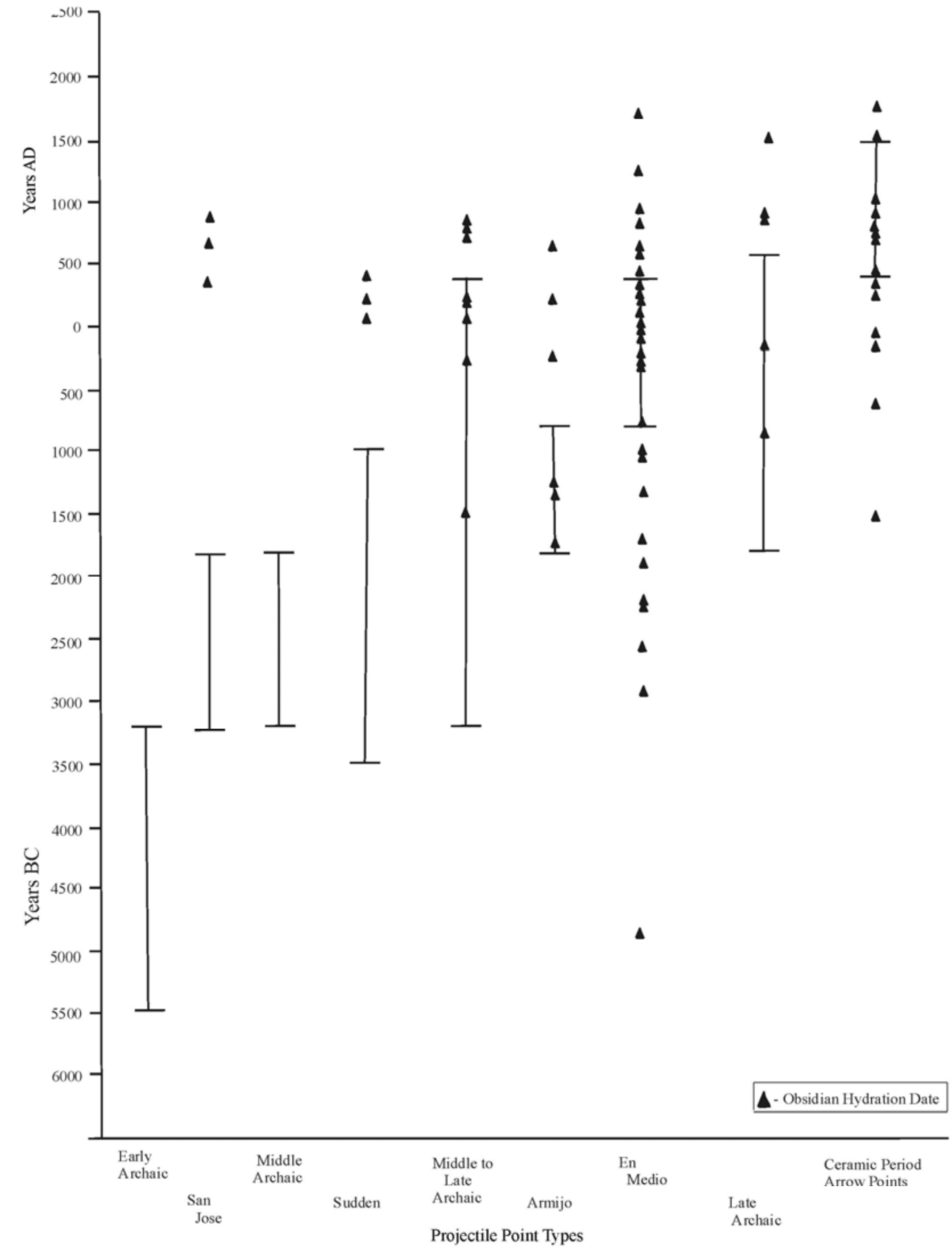


Figure 69.6. The relationship between obsidian hydration dates and the established date ranges for the projectile points.

Nonetheless, Lord and Cella suggest that the primary sources of error consist of artifact reuse, exact source determination, and effective hydration temperature calculation. That is, the source error is due to the fact that not all samples were chemically identified and that, therefore, the wrong hydration rate may have been used. In addition, information on effective hydration temperature also introduced some error as the result of using the less accurate local weather station data.

Mariah and Associates evaluated obsidian hydration dating techniques during the Ojo Line Extension Project testing (Acklen 1993) and data recovery programs (Acklen 1997). Excavations were conducted on Polvadera Mesa and Cañones Mesa, and a total of 168 obsidian hydration dates were obtained during the testing phase. Fifty-three of these were taken from 49 projectile points and 75 pieces of debitage that were mostly recovered from surface contexts. Stevenson analyzed all these samples using the then new intrinsic water content technique for separate sources. Nine thermal cells were set up to 50 cm below the surface within the project corridor from elevations ranging from 1951 to 2804 m (6400 to 9200 ft) to collect data on effective temperature and humidity. This information was then used to calculate the hydration rate for these sources using the Arrhenius equation (Acklen 1993:36).

Figure 69.7 compares the projectile point obsidian hydration dates with associated point cross-date ranges from Acklen (1993:435). As can be seen, the Early and Middle Archaic point types appear to date much later than their cross-dates, whereas, the Late Archaic types span a period that includes earlier and later dates than their associated range. Arrow points date to the Ceramic period or somewhat earlier. Most of the undetermined dart points date to the Middle and Late Archaic periods. The large side-notched dart type (e.g., Sudden) appears to date to the Late Archaic and Ceramic period, rather than the Middle Archaic. This pattern contrasts with that observed on the Baca Geothermal Project (Baker and Winter 1981), where the hydration rinds on these large side-notched points were thicker, and therefore older, than those observed on the large corner-notched points (e.g., Basketmaker II).

It is interesting that the patterning observed by comparing obsidian-dated projectile points with their associated date ranges is similar for both the Abiquiu and Ojo Line Extension Projects. That is, Middle Archaic dates seem to date much later than expected (e.g., to the first millennium AD). As suggested by Acklen (1993:438), this may represent the environmental effects of the arid Altithermal period and long-term exposure to sun, weather, and forest fires. Otherwise, the late Holocene dates for the Late Archaic and Ceramic periods are more in line with our expectations; however, some of these darts may represent lance points that were used during the later ceramic period as suggested by Bertram et al. (1989:347) (also see Vierra 1997 for a similar argument).

Archaic period dates are widely dispersed for both the Abiquiu and Ojo Line Extension Projects, as is the case with C&T Project dates. Both of these projects also reported early dates from Ancestral Pueblo projectile points, versus the early dates obtained from Puebloan contexts for the C&T Project.

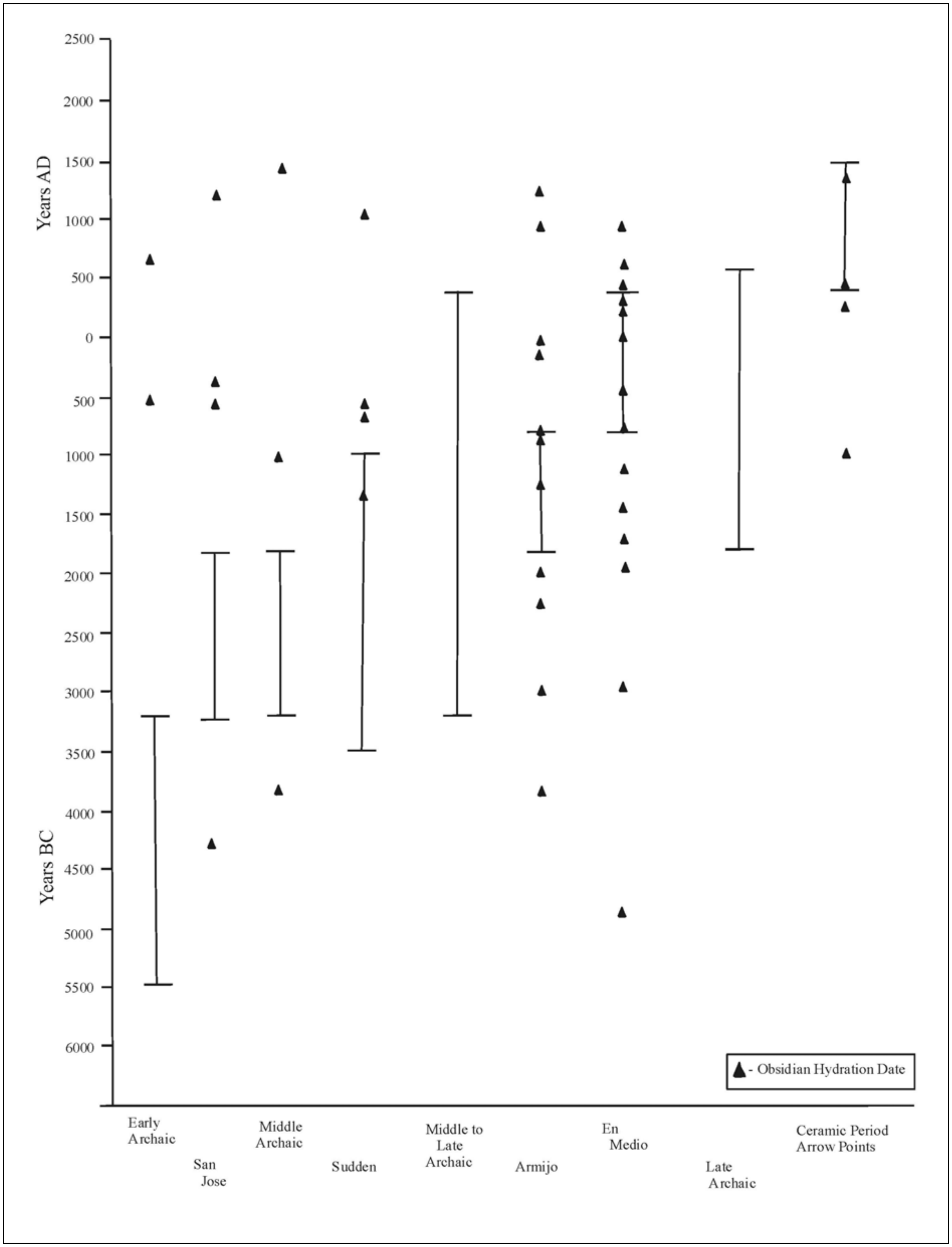


Figure 69.7. Comparison of projectile point obsidian hydration dates with associated point cross-date ranges (after Acklen 1993:435).

Discussion of Obsidian Hydration Dating

The obsidian hydration data from the C&T Project is difficult to interpret. It is possible that there is not enough control over sources of error (e.g., local temperature, humidity, artifact history, and forest fires) and that the dates are simply meaningless. A more hopeful alternative is that the dates are essentially correct. This would indicate that Archaic period sites were revisited for thousands of years. Additionally, the old dates from roomblock and fieldhouse sites raise the possibility that most (approximately 80%) of the obsidian found at Ancestral Pueblo sites was scavenged from Archaic period sites. As is usually the case, the answer probably lies somewhere in between.

Several lines of further investigation are indicated from the results of our project. In terms of controlling errors, Stevenson (Chapter 68, this volume) has pointed out that water-rich obsidians from the C&T Project returned later dates than obsidians with low water content and that, contrary to expectations, water-rich obsidians did not have proportionally larger hydration rims than obsidians with low water content. Stevenson goes on to suggest that the obsidian water content determination estimated from the artifacts may be in error and that obsidian compositional data should be compared to density values to determine if this is, in fact, the case. If the water content assessments are correct then water-rich obsidian sources may have been targeted later in prehistory, possibly due to greater ease in knapping. A final suggestion for error control is that the obsidian artifacts be subjected to finer-grained analysis aimed at detecting evidence of thermal alteration.

RADIOCARBON DATING

Radiocarbon dating is the most prevalent chronometric dating technique used in the American Southwest. The dry conditions of the region act to preserve organic remains that can be dated by this method. However, this technique has low precision, with single standard deviations often including overall periods of 100 years. Summaries of the radiocarbon dating process are presented in Michels (1973) and Taylor (1987, 2000). This discussion will therefore focus on the inherent limitations and sources of error when using this method to date archaeological contexts.

Smiley (1985:38–45) discusses a number of sources that could produce errors in the radiocarbon dating process: 1) field sampling error, which might involve the misidentification of provenience information, or sampling-mixed strata or a disturbed context; 2) built-in age, or the old wood problem, which occurs when dead wood is used during the target event (e.g., Schiffer 1982). Since the reference event occurred in advance of the target event the age of the target event will be overestimated; 3) cross-section effect, as pointed out by Long et al. (1979), samples taken from heartwood will produce older dates than samples taken from sapwood. This is a problem when there is a mixture of younger outer rings and older inner rings for a sample, which can produce an overestimation of the age of the reference event (the death of the organism) and the target event; 4) Libby half-life error, which suggests that an underestimation of the age of a sample can occur if the calculation of the Libby half-life of 5568 years is not adjusted to the more accurate figure of 5730 years. This is done by multiplying the Libby half-life date by 1.03;

5) contamination, which can affect a sample by under- or overestimating its age. Rootlets are often a source of contamination that can help underestimate the age of the sample; 6) calibration error, the amount of ^{14}C in the atmosphere fluctuates through time (Stuiver and Becker 1993). The amount of this fluctuation and its effect on radiocarbon dating was identified by comparing samples with known dendrochronologically derived dates (e.g., Becker 1993; Damon et al. 1974; Olsson 1970; Stuiver and Becker 1993; Stuiver and Seuss 1966). Thus it is necessary to convert conventional radiocarbon ages into calibrated yeas (cal yr). Calibration data sets are available for approximately the last 12,000 years. Calibrations can be made using various software programs (e.g., CALIB, OxCal); they are often also supplied by radiocarbon laboratories; 7) counting error, which generally increases as sample size decreases and as age of the sample increases. Smaller samples (e.g., 2 to 4 g of charcoal) should have extended counting times. Samples smaller than 2 g should be submitted for Accelerator Mass Spectrometry (AMS) dating; 8) lab bias, Klein et al. (1982) have shown that the analysis of the same sample by different laboratories can produce variable results; 9) isotopic fractionation, which refers to the differential metabolism of ^{14}C, ^{13}C, and ^{12}C isotopes by various plant species. Plants that discriminate against the heavier ^{14}C isotope utilize the C^3 pathway, in contrast to plants that are biased towards metabolizing ^{14}C, which utilize a C^4 pathway (trees). Radiocarbon dates from C^3 pathway plants do not need to be corrected for isotope fractionation, however C^4 pathway plants (e.g., maize) that are enriched with ^{14}C do need to be corrected. As much as 200 to 250 years could be added to the date (Bender 1968; Lowden 1969). Therefore, isotope fractionation may act to underestimate the age of a sample if not corrected. This correction needs to be made for the conventional radiocarbon dating technique, but not for the AMS technique. Additional sources of errors can be present when bone, marine samples, etc. are dated. However, no samples of these types were dated for the C&T Project.

Material quality refers to the expected degree of disparity between the dated event and the target event (Smiley 1985:68). Smiley (1985:71–72) provides a list of radiocarbon datable materials that he considers to have highest to lowest material quality. This scheme can be used in evaluating the dating potential of possible samples:

1. Annual subsistence materials, for example cultigens or charred wild seeds;
2. Samples from structural logs retaining their outer rings;
3. Sticks, twigs, or small branches;
4. Large cross-sectional pieces from beams or fuel that lack outside rings;
5. Scattered charcoal from undisturbed contexts, such as hearth fill;
6. Scattered charcoal from excavation strata or levels;
7. Unprovenienced charcoal samples.

Samples

Fifty-five samples were submitted to Beta Analytic for radiocarbon dating (Table 69.7). Fifty-two of these samples were dated using the AMS method and three samples were dated using the standard radiometric method.

Table 69.7 Radiocarbon dates from the C&T Project.

Site	FS	Beta Number	Provenience	Intercept	Two-Sigma Range	Material	Material Quality
LA 12587	--	183753	Room 7, Hearth	1190	1040–1260	Maize	1
	2632	183752	Room 4/5, Hearth	1290	1270–1320 1350–1390	Maize	1
	2644[1]	183747	Room 2, Hearth 4	1180	1020–1280	Maize	1
	2725[1]	183749	Room 2 fill	1290	1250–1410	Maize	1
	2888.C	183751	Room 2 fill	1270	1210–1290	Maize	1
	2888.K	183750	Room 2 fill	1290	1270–1320 1350–1390	Maize	1
	4138	183748	Room 2 fill	1300	1280–1400	Maize	1
LA 21596A	22	183768	Grid garden	1320 1340 1390	1290–1420	Maize	1
LA 21596B	32	183769	Grid garden	1950	1690–1730 1810–1920 1950–1960	Maize	1
LA 85403	53	215549	Room 1, Feat. 1	1530 1550 1630	1470–1660	Maize	1
LA 85404	68	215550	Room 1	1460	1430–1530 1560–1630	Maize	1
LA 85411	78	221840	Room 1, Feat 1	1310 1370 1380	1290–1410	Maize	1
LA 85413	149	221841	Room 1	1480	1440–1640	Maize	1
LA 85859	225	183757	St. 3b	4900 BC 4890 BC 4860 BC	4990–4760 BC	Piñon	5
	359	183758	St. 3a/b	5300 BC	5370–5220 BC	Piñon	5
	360	183759	St. 3a/b	1400	1300–1430	Piñon	5
	363	199370	St. 3 b/c	5050 BC	5220–4940 BC	Und. conifer	6
LA 85861	193	221842	Room 1, Hearth	1050 1100	1020–1200	Maize	1

Site	FS	Beta Number	Provenience	Intercept	Two-Sigma Range	Material	Material Quality
				1140			
LA 85864	10	199371	Room 1, Hearth	1680 1770 1800 1940 1950	1650–1890 1910–1950	Piñon	5
LA 85869	244	199372	St. 3	--	post–1950	Juniper	5
	272	199373	Feat. 8	1650	1520–1590 1620–1670 1770–1800 1940–1950	Piñon	5
	295	199374	Feat. 6	1000	910–920 960–1030	Piñon	5
	297	199375	Feat. 6	1420	1400–1450	Und. conifer	6
LA 86531	1	183766	---	1250	1180–1280	Maize	1
LA 86534	1272	183760	Room 1, Hearth 4	1190	1040–1260	Maize	1
	1321	183761	Room 2, Hearth 2	1280	1240–1300	Maize	1
	1389	183762	Room 5, Hearth 5	1250	1180–1280	Maize	1
	1508	183763	Room 4 floor	1200	1050–1100 1140–1270	Maize	1
	2172	183764	Room 7, Hearth	1200	1050–1100 1140–1270	Maize	1
	2202	183765	Kiva 9, Hearth 16	1260	1180–1290	Maize	1
LA 86605	77	215551	Room 1	1500	1440–1640	Maize	1
LA 87430	139	215552	Room 1 fill	1490	1440–1640	Maize	1
	173	215553	Room 1, Hearth	1470	1430–1530 1550–1630	Maize	1
	472[1]	199376	Feature 4	1240	1050–1100 1140–1290	Piñon	5
	493	199377	Room 1 fill	1190	1040–1260	Piñon	5

Site	FS	Beta Number	Provenience	Intercept	Two-Sigma Range	Material	Material Quality
LA 99396	608	199378	Feature 5	1170	1030–1240	Piñon	5
	753	199379	Room 1, Hearth 7	1050 1100 1140	1020–1200	Piñon	5
	758	199380	Room 1, Hearth 7	1180	1040–1260	Piñon	5
	774	199381	---	336600 BP		Juniper	5
	775	199382	---	1020	980–1060 1080–1150	Juniper	5
LA 99397	211	199383	St. 3	160 BC	360–280 BC 240 BC–AD 20	Piñon	5
	214	199384	St. 3	380 BC	400–350 BC 310–210 BC	Piñon	5
	282	202213	---	1180	1030–1250	Ponderosa	5
	292	199385	St. 2	1420	1320–1350 1390–1440	Ponderosa	5
LA 110130	26	183767	TP #2	1500	1450–1640	Maize	1
LA 127627	9	215554	Room 1	1480	1440–1640	Maize	1
	52	215555	Room 1	1460	1430–1530 1560–1630	Maize	1
LA 127631	32	183754	Room 1	1400	1300–1430	Juniper	5
LA 127634	105	215556	Room 1, Feat. 5	1510 1600 1620	1450–1650	Maize	1
	108	215557	Room 1, Feat. 5	1520 1590 1620	1450–1650	Maize	1
LA 127635	105	215558	Room 1, Hearth 2	1250	1180–1280	Maize	1
	125	215559	Room 1, Hearth 2	1270	1210–1290	Maize	1
LA 128803	21	183755	Grid garden	1420	1320–1350 1390–1440	Maize	1
LA	225	183756	Room 1	1440	1420–1500	Maize	1

Site	FS	Beta Number	Provenience	Intercept	Two-Sigma Range	Material	Material Quality
128805							
LA 135290	2103	199386	Room 2 fill	1180	1040–1260	Maize	1
	2475	199388	Room 8, Hearth 9	1220	1160–1270	Maize	1
	2564	199389	Room 2, Hearth 16	1190	1040–1260	Maize	1
LA 139418	334	199390	Grid garden	690	650–790	Piñon	5

1. Sample dated using standard radiometric method.

Since no Archaic period radiocarbon samples could be directly linked with cultural activities, their utility lies in helping to date the stratigraphy and provide bounding dates for the occupation(s). Dates from Ancestral Pueblo sites are neither unexpectedly early nor late, although in a few cases the calibrated date is early compared to other dating methods (e.g., LA 85861). This may be due to the use of old wood. Unfortunately, between about AD 1460 and AD 1640 the calibration curve flattens out; at two sigma any radiocarbon date with an AD 1440 to 1600 intercept looks almost indistinguishable from any other. There are only two samples from the tipi ring sites that can be clearly linked with the Apachean occupation. The date from LA 85864 appears to be accurate but is very imprecise. None of the date ranges from the LA 85869 sample (FS 272) are in late 19th/early 20th century, the inferred period of occupation. This sample may represent the use of old wood.

Comparison of Two Dates from a Single Specimen

A maize cob (FS 2888C) and a kernel from that cob (FS 2888K) from LA 12587 were submitted for AMS radiocarbon dating. The cob returned an age of 760±40 BP (Beta-183750) and a date of cal AD 1270 with a two-sigma date range of cal AD 1210–1290. The kernel returned an age of 690±40 BP (Beta-183751) and a date of cal AD 1290 with a two-sigma date range of cal AD 1270–1320 and AD 1350–1390. The ages of these two samples are not statistically different for a two-tailed *t*-test ($t = 1.237 < t_{0.05} = 1.960$).

Comparison of AMS Dates to Standard Radiometric Dates

Three samples were dated using the standard radiometric method rather than AMS method: FS 2644 and FS 2752 from LA 12587 and FS 472 from LA 99396. Since all three of these samples came from sites with many other dates, it is possible to compare results of the two different techniques. Not surprisingly, the AMS results were more precise. FS 2725 and FS 472 have measured radiocarbon age standard deviations of 60 years while FS 2644 has a standard deviation of 70 years. In contrast, nearly all Coalition and Classic period AMS dates (*n* = 41) have standard deviation of 40 years; the only exception is FS 26 from LA 110130, which has a standard deviation of 30 years.

FS 2752 was recovered from the fill of Room 2 and its two-sigma calibrated date range of cal AD 1250–1410 is in line with the dates of other samples from the same provenience: FS 2888C (cal AD 1210–1290), FS 2888K (cal AD 1270–1320 and cal AD 1350–1390), and FS 4138 (cal AD 1280–1400). FS 2644 (cal AD 1020–1280), recovered from the hearth of Room 2, seems slightly early but is not remarkably out of place. FS 472 from LA 99396 (cal AD 1050–1100 and cal AD 1140–1290) seems slightly later than the other dates from the fieldhouse: FS 493 (cal AD 1040–1260), FS 608 (cal AD 1030–1240), FS 753 (cal AD 1020–1200), and FS 758 (cal AD 1040–1260), but again is not remarkably out of place. In general, the radiometric dates are not out of line with the AMS dates.

Intrasite Comparison of Dates

Multiple dated samples associated with a single component exist for eight sites. Figure 69.8 shows that there is considerable intrasite overlap of calibrated date ranges. LA 12587 is a minor exception with two dates that appear slightly too early, relative to the other dates. This is somewhat surprising since the dates are derived from maize samples presumably associated with the abandonment of the roomblock. It is, however, possible that these samples reflect an older component at the site.

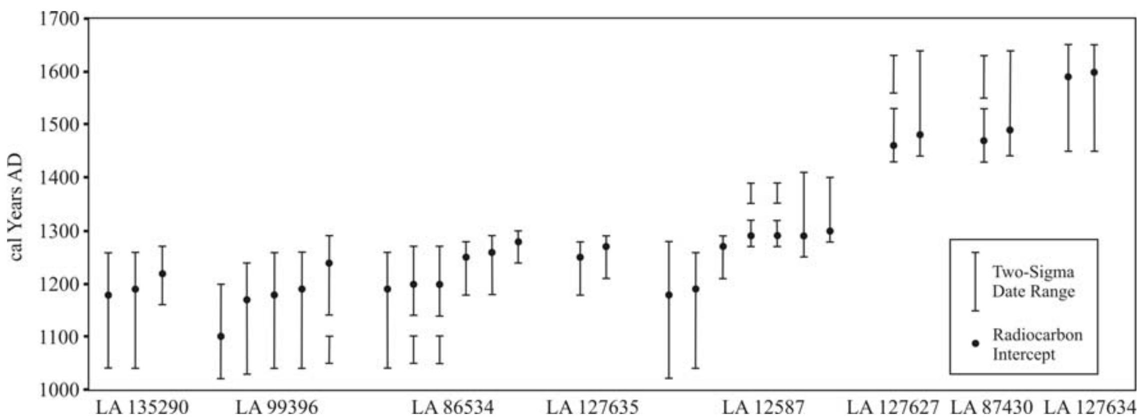


Figure 69.8. Intrasite comparison of radiocarbon dates.

ARCHAEOMAGNETIC DATING

Method

The archaeomagnetic dating method is based on two phenomena. First, that fired soils containing iron oxide minerals retain a magnetism parallel to the direction and proportional to the intensity of the magnetic field in which they cool, and second that the direction and intensity of the earth's magnetic field change through time (Wolfman 1984:364). In the American Southwest, a general curve has been calibrated using radiocarbon and tree-ring dates. The result has been the development of a curve tracing the movement of the geomagnetic pole from circa AD 600 to 1500. However, this geomagnetic field is not uniform over areas larger than about 1000 km^2. Therefore, regional refinements need to be made to this calibrated curve. Wolfman (1984:365) states that errors of ±15 to ±60 years at a 95 percent confidence level are possible when eight to ten individual samples are taken per feature (e.g., assuming a tree-ring calibrated curve). He also suggests a general error of ±25 years for the technique (Wolfman 1994:35). Given a calibrated curve, this technique can be as accurate, if not more accurate, than radiocarbon dating. Recent research has also defined that portion of the curve for northwestern New Mexico from ca. 300 BC to 75 BC (Blinman, personal communication 2000). Wolfman (1984), Eighmy (1980, 2000), and Eighmy and Sternberg (1990) should be consulted for detailed discussions of the archaeomagnetic dating technique and field collection methods.

There are several inherent problems with this dating technique. First, regional refinements are needed to accurately calibrate the curve. Second, the feature needs to be burned to a temperature that resets the magnetic orientation of the sediment. Third, the feature cannot have been disturbed since firing. Fourth, exposure to magnetic fields (e.g., lightning) could affect samples. Fifth, local magnetic anomalies could affect compass readings during field collection and thereby create an error in the calculations. Of the 12 samples taken by Wolfman (1994) on the Pajarito Plateau, only half could be accurately dated. One sample taken from a hearth within a pit structure was not sufficiently burned. Therefore, the results obtained from the samples were actually associated with the paleomagnetic orientation of the tuff bedrock within which the hearth had been cut and not the cultural use of the feature.

Indeed, Wolfman warns of the possibility of local distortions due to the presence of heavily magnetized rocks in the area. This is how he explained why two sets of samples from the same hearth yielded accurate, but different results. That is, one was affected by "magnetic material (possibly a small rock) buried in the ground below this sample" (Wolfman 1994:225). Another sample appears not to correspond with associated tree-ring dates. In this case, he suggests that the calibrated curve may need some slight revising. That is, if the curve was moved slightly west during this time period, the 95 percent confidence oval would have crossed the curve at this point. Other samples yielded poor results due to cultural and/or natural disturbance. His study would seem to indicate that features cut directly into the tuff bedrock may produce less reliable results than those that are clay-lined or dug directly into the soil. These inaccuracies might also be due to local magnetic distortion affecting the compass readings during sample collection.

Samples

Twenty-nine archaeomagnetic samples were submitted to the Archaeomagnetic Dating Laboratory (ADL) at the Office of Archaeological Studies, Museum of New Mexico. The twenty two samples that returned dates are given in Table 69.8. While the Wolfman Curve is preferred by the ADL, both Wolfman Curve and SWCV2000 dates are given. The DuBois Curve was also used for date estimation where appropriate (Chapter 66, this volume).

Table 69.8. Archaeomagnetic dates from the C&T Project.

Site	Prov.	Sample	Wolfman Curve Dates (AD)	SWCV2000 Dates (AD)	Interpretation
LA 86534	Room 1 Feature 4	1202	1170–1230	1110–1200	Late 12th to middle 13th century
	Room 1 Feature 4	1203	1035–1140 (1065–1265)	1000–1390 1010–1315	Pole position may not be representative (inaccurate)
	Room 2 Feature 2	1204	(1280–1300)	(1175–1230)	Middle to late 13th century
	Room 5 Feature 5	1205	1005–1035 1235–1270	1265–1325	Middle to late 13th century
	Kiva 9 Feature 16	1206	1020–1050 1220–1255	1185–1240 1250–1315	Middle to late 13th century
LA 12587	Room 4/5 Feature 1	1209b	1015–1130 1160–1275 1335–1410	1005–1375	Late 13th or very early 14th century
	Room 2 Feature 4	1210	925–1015 1245–1310 1315–1355	925–1015 1370–1510 1550–1700	Ambiguous but AD 1245–1310 preferred
	Room 7 Feature 6	1212	930–1025 1235–1305 1315–1360	925–1015 1260–1465	Late 13th or very early 14th century
	Room 2 Feature 20	1214	(1185–1205)	(1145–1170)	circa AD 1200
	Room 2 Feature 20	1215	(1175–1220)	1125–1185	circa AD 1200
LA 135290	Room 6 Floor 3	1226	1170–1210	1125–1175	Late 12th century
	Room 4 Floor 2	1227	1180–1205	1125–1165	Preferred interpretation is AD 1180–1205
	Room 6 west wall	1228	1185–1230	1020–1110	Preferred interpretation is AD 1180–1230
	Room 2 Feature 11	1229	1010–1070 1200–1270 1345–1390	1005–1045 1175–1325	Imprecise, possibly AD 1225–1240 or earlier
	Room 8 Feature 9	1230	1035–1070 1195–1240	1015–1050	Preferred interpretation is AD 1195–1240
	Room 2 Feature 16	1231	1105–1150 1155–1210	1035–1165	Late 12th century
	Room 4	1232	1170–1270	1010–1310	Late 12th century

Site	Prov.	Sample	Wolfman Curve Dates (AD)	SWCV2000 Dates (AD)	Interpretation
	Floor 3				
LA 99396	Room 1 Feature 7	1233	1175–1260 1020–1085	1010–1125 1155–1320	Preferred interpretation is AD 1175–1260
LA 85864	Room 1 Feature 2	1234	--	1675–1840 1850–present	Late 19th century date slightly more likely than late 18th century date
LA 127635	Room 1 Feature 2	1250	1210–1250	1170–1245	Preferred interpretation is AD 1210–1250
	Room 1 Feature 2	1251	1200–1225	1020–1045 1160–1190	Preferred interpretation is AD 1200-1225
LA 85417	Room 1 Floor	1281	1100–1235	1010–1310	

When date ranges are expressed in parentheses, the closet point on the curve segment was outside the error ellipse when the result was originally plotted.

Of the three date columns in Table 69.8, the last column (Interpretation) is probably the most accurate. The data in this column are derived from Blinman and Cox's (Chapter 66, this volume) assessment of the size and location of the error ellipses on all three curves combined with stratigraphic and artifact assemblage data. A reading of Table 69.8 and their report in Volume 3 reveals that, while archaeomagnetic dating can be accurate and precise, this accuracy and precision are best achieved by weighing the data in the context of several different curves, reliance on the date ranges derived from a single curve may give spurious results.

For example, in two instances two archaeomagnetic dates were returned from a single hearth: Feature 20 of LA 12587 and Feature 2 of 127635 (two archaeomagnetic dates were also returned from Feature 4 of LA 86534, but one of these dates is from earlier and later remodeling events). Neither the samples from Feature 20 or Feature 2 returned exactly the same dates, although in both cases there is considerable overlap, particularly of the Wolfman Curve dates. Dates from LA 12587, LA 86534, and LA 135290 are generally internally consistent (the early dates from Feature 20 of LA 12587 should not be regarded as anomalous because this is an early hearth). LA 135290 experienced several episodes of building/occupation/burning; the archaeomagnetic dates are partially successful in documenting these different episodes (see Chapter 66, this volume for additional discussion of this site).

LUMINESCENCE DATING

Method

Luminescence dating measures the last heating event for an artifact exposed to a temperature of about 450°C. This method therefore has the potential to directly date the manufacturing event for ceramic or heat-treated lithic artifacts. Feathers states that,

> [The method] is based on the accumulation of radiation effects in crystaline materials … exposure to sufficient heat or light releases the charge … and results in a luminescence signal whose intensity is proportional to the time elapsed since the previous detrapping event … measurement involves determining the amount of radiation necessary to produce the natural luminescence signal (called the equivalent dose) and the natural dose. Dividing the equivalent dose by the dose rate results in an age (Feathers 2000:152).

The direct dating of artifacts is a major advantage of this technique over radiocarbon or tree-ring dating. For example, radiocarbon dates are prone to inaccuracies involving old wood, cross-section effect, correction, and calibration factors. In addition, questions of artifact association with the dated sample can also be an issue. Tree-rings date the construction event, but not necessarily the manufacturing event, and may also be prone to inaccuracies in artifact association. The luminescence technique can therefore be used for dating surface artifact scatters in the absence of other datable materials. However, it is unclear as to how artifacts burned by forest fires might affect the reliability of this dating technique. Aitken (1985, 1989) and Feathers (2000) should be consulted for detailed discussions of luminescence dating.

Sampling

Thirty-two samples from 12 sites were submitted to James Feathers at the University of Washington for luminescence dating (Table 69.9).

Table 69.9. Luminescence dates from the C&T Project.

Site	FS	Provenience	Material	Basis for Date Determination[1]	Date[2]	Confi-dence
LA 12587	1274	Room 2 floor	Santa Fe B/w	TL	1226±68	2
	2078	Room 7 floor	Santa Fe B/w	TL/OSL	1047±80	1
	4098	Room 7 Feature 6	Plaster	TL/OSL	682±120	3
	4209	Room 2 Feature 20	Plaster	OSL	1060±109	2
LA 85404	92	Room 1 floor	Plaster	TL/OSL	1388±49	2
LA 85411	30	Room 1 fill	Biscuit A	TL/OSL	1395±43	3
	68	Room 1 fill	Biscuit A	TL/IRSL	1205±114	3
LA 85417	47	Exterior Stratum 2	Santa Fe B/w	TL/OSL/IRSL	1284±47	2
	104	Room 1 fill	Daub/Adobe	TL/OSL	992±59	3
	136	Room 1 fill	Daub/Adobe	TL	1277±58	3
	151	Room 1 floor	Plaster	TL/OSL	1415±39	2
LA 85861	142	Room 1 fill	Smeared-plain corrugated	TL	1211±73	3
	249	Room 1 wall	Daub/Adobe	OSL	1193±53	3

Site	FS	Provenience	Material	Basis for Date Determination[1]	Date[2]	Confi-dence
LA 85869	328	Surface	Cimarron micaceous	TL/OSL	1859±13	1
LA 86534	1336	Room 1 Feature 4	Plaster	TL/OSL	1188±59	2
	1651	Room 2 Feature 2	Plaster	TL/OSL	801±201	2
	2250	Kiva 9 Feature 16	Plaster	TL/OSL	1182±42	2
LA 87430	123	Room 1 fill	Biscuit B	TL/OSL	1383±39	2
LA 99396	414	Room 1 fill	Santa Fe B/w	OSL	836±134	3
	612	Room 1 fill	Incised corrugated	TL/OSL	1158±63	1
LA 127634	43	Room 1 fill	Biscuit B/C	OSL	1464±33	3
	95	Exterior Stratum 2	Biscuit B	OSL	1494±28	3
LA 127635	106	Room 1 hearth	Sapawe micaceous	TL	1257±107	3
LA 135290	1424	Room 4 east wall	Adobe	TL/OSL	1035±73	1
	1738	Room 6 west wall	Adobe	TL/OSL	1114±85	3
	1950	Room 6 floor 2	Plaster	TL/OSL	1134±79	1
	2259	Room 2 Feature 11	Smeared-indented corrugated	TL/OSL	1050±90	2
	2379	Room 2 floor	Smeared-indented corrugated	OSL	816±133	3
	2400	Room 7 floor	Wiyo B/w	TL/OSL	1217±56	1
	2458	Room 4 floor 2	Plaster	TL/OSL	888±62	1
	2574	Room 8 Feature 9 (base)	Plaster	OSL	851±125	3
	2595	Room 8 Feature 9 (rim)	Plaster	TL	1073±135	3

1. TL = thermoluminescence, OSL = optically stimulated luminescence, IRSL = infrared stimulated luminescence
2. Degree of confidence that can be placed in result; 1 is the best, 3 is the worst (see Feathers, Chapter 67, this volume, for discussion).

Evaluation of Luminescence Dates

A Room 8 hearth (Feature 9) at LA 135290 is the only feature for which two luminescence dates were obtained. Because of the large standard deviations of both samples the two dates are not statistically differentiated by a two-tailed *t*-test ($t = 1.207 < t_{0.05} = 1.960$).

Table 69.10 shows that luminescence ages are either the same as generally accepted ceramic type dates or are older than generally accepted ceramic type dates. No dated sherd returned a luminescence age younger than expected. Among the whitewares, 50 percent of the luminescence ages fell within the generally accepted ceramic type dates, 60 percent to 70 percent of the ages fell within the ceramic type dates at one sigma, and 90 percent of the ages fell within the ceramic type dates at two sigma. There are fewer utilityware sherds in the sample and the dates of utilityware types are poorly defined, making the evaluation of luminescence dates for this ware difficult. Clearly, however, the luminescence dates for utilityware sherds are not better than for whiteware sherds.

Table 69.10. Luminescence dates from ceramic artifacts.

Ceramic Type	FS	Type Date Range[1]	Luminescence Date	Luminescence With Type Date	Date Overlap At:	
					One Sigma	Two Sigma
Santa Fe	414	1175–1425	836±134	--	--	--
Santa Fe	2078	1175–1425	1047±80	--	--	X
Santa Fe	1274	1175–1425	1226±68	X	X	X
Santa Fe	47	1175–1425	1284±47	X	X	X
Wiyo	2400	1300–1400	1217±56	--	--/X	X
Biscuit A	68	1375–1450	1205±114	--	--	X
Biscuit A	30	1375–1450	1395±43	X	X	X
Biscuit B	123	1425–1550	1383±39	--	X	X
Biscuit B	95	1425–1550	1494±28	X	X	X
Biscuit B/C	43	1425–1600	1464±33	X	X	X
Smeared-indented corrugated	2379	1250–1400	816±133	--	--	--
Smeared-indented corrugated	2259	1250–1400	1050±90	--	--	--
Incised corrugated	612	Undefined	1158±63			
Smeared-plain corrugated	142	1400–1550	1211±73	--	--/X	--/X
Sapawe micaceous	106	1425–1600	1257±107	--	--	X
Cimarron micaceous	328	1750–1900	1859±13	X	X	X

[1] Ceramic date ranges from McKenna and Miles (1991). X = The luminescence date overlaps with the type date range at the given degree of precision; -- = The luminescence date does not overlap with the type date range at the given degree of precision

Comparison to Previous Studies

Several studies involving luminescence dating have been conducted in northern New Mexico. Eighteen burned rock samples were submitted from sites excavated for the Abiquiu Reservoir project (Lord and Cella 1986). They yielded dates from <35,000 BP to AD 1820. The ancient dates appear to reflect residual geologic luminescence. Radiocarbon dates were obtained from only one of the sites and four of these dates did correspond with the AD 1700 luminescence date.

Ramenofsky and Feathers (2002) used the luminescence technique to date surface-collected ceramics from historic sites in the lower Chama Valley. They were specifically interested in determining the age of abandonment for these sites and expected luminescence dating provided more accuracy than tree-ring dating. However, only nine sherds of five types were submitted for analysis: Biscuit B (n = 2), Sankawi Black-on-cream (n = 3), Potsui'i Incised (n = 1), Kapo Black (n = 1), and Casitas Red-on-brown (n = 2). Their analysis determined that most of the dates fit the expected ceramic time ranges, although one Biscuit B sherd and one Sankawi Black-on-cream sherd did exhibit slightly later dates.

Dykeman (2000; Dykeman et al. 2002) has compared tree-ring dates with both radiocarbon and luminescence dates for protohistoric Navajo sites in northwestern New Mexico. He found that the luminescence dates were within a 40-year range of the tree-ring dates. In contrast, the radiocarbon dates provided a 90- to 120-year range that was earlier than the tree-ring dates. Significantly, however, the six of 15 TL samples (40%) that were found not to correspond with tree-ring dates were all too early.

One sample from LA 4618, a Late Coalition period roomblock at LANL, was submitted for luminescence dating. The sample consisted of burned plaster/adobe from the kiva (Room 10) hearth and dated to 1318±70 (685±70BP), which is consistent with the dates derived from radiocarbon analyses (Schmidt 2006b).

MULTIPLE DATING METHODS FOR THE SAME REFERENCE EVENT

Burned plaster/adobe from eight proveniences (six hearths, one adobe wall, and one plaster floor) was submitted for archaeomagnetic and luminescence dating. Five of the hearths contained associated burned organic matter that was submitted for radiocarbon dating. Eleven proveniences could be dated by archaeomagnetic and radiocarbon methods. Archaeomagnetic dates (derived from the Wolfman Curve) and luminescence dates are particularly interesting to compare since they both date the same reference event, that is, the last burning of the hearth (or wall, or floor). There is a technical exception to this since luminescence samples need to be heated to about 450°C to "reset," whereas, archaeomagnetic samples need to be heated to about 650°C to "reset." Thus, any event that would set the archaeomagnetic "clock" would also set the luminescence clock. However, if *cooler* heating events took place late in a feature's use life, different reference events would be dated by the two methods. This does not appear to have occurred in the case of the C&T Project, as luminescence dates are either the same as, or earlier than, the archaeomagnetic dates.

Figure 69.9 and Tables 69.11 and 69.12 compare the dates returned by different dating methods for the same provenience. (Although a radiocarbon sample was recovered from Feature 20 of LA 12587, it is not believed to be behaviorally associated *with* the feature, and is thus not included.)

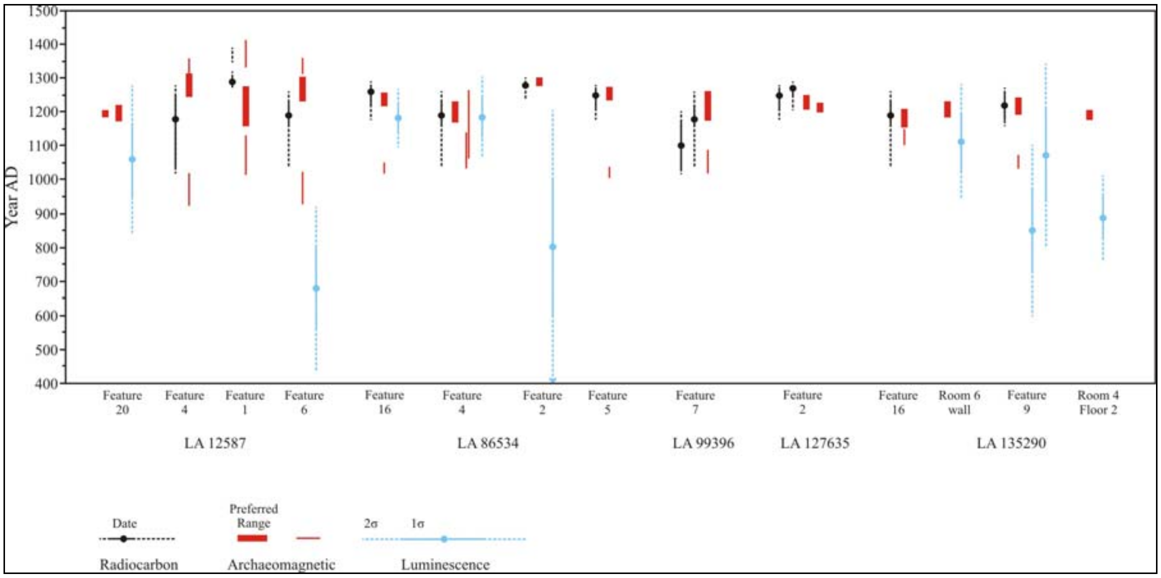


Figure 69.9. Comparison of multiple dating methods.

Table 69.11. Luminescence dates and overlap with most likely archaeomagnetic dates and one- and two-sigma radiocarbon date range.

Site	**Feature**	**Confidence**	**Archaeomagnetic**			**Radiocarbon**		
			Date	**One Sigma**	**Two Sigma**	**Date**	**One Sigma**	**Two Sigma**
LA 12587	Feature 20	2	--	--	X			
	Feature 6	3	--	--	--	--	--	--
LA 86534	Feature 16	2	--	X	X	X	X	X
	Feature 4	2	X	X	X	X	X	X
	Feature 2	2	--	--	--	--	--	--
LA 135290	Room 6 wall	3	--	X	X			
	Feature 9 rim	3	--	X	X	--	X	X
	Room 4 floor	2	--	--	--			
	Percent of L dates that overlap other method		12.5	50	62.5	40	60	60

X = The luminescence date overlaps with the archaeomagnetic or radiocarbon two-sigma date range at the given degree of precision; -- = The luminescence date does not overlap with the archaeomagnetic or radiocarbon two-sigma date range at the given degree of precision.

In general, there is considerable overlap between the archaeomagnetic dates and the radiocarbon dates. There is less agreement between the luminescence dates and the radiocarbon dates; the least amount of agreement is found between the luminescence dates and the archaeomagnetic dates. As with luminescence dates from ceramic sherds, luminescence dates from plaster/adobe features are either in agreement with other dates or are too early.

Table 69.12. Radiocarbon overlap with most likely archaeomagnetic date.

Site	Feature	Date	One Sigma	Two Sigma
LA 12587	Feature 4	--	X	X
	Feature 1	--	--	X
	Feature 6	--	--	X
LA 86534	Feature 16	--	X	X
	Feature 4	X	X	X
	Feature 2	X	X	X
	Feature 5	X	X	X
LA 99396	Feature 7	--	--	X
	Feature 7	X	X	X
LA 127635[1]	Hearth 2	--	X	X
	Hearth 2	--	--	X
LA 135290	Feature 16	X	X	X
	Feature 9	X	X	X
	Percent of C14 dates that overlap archaeomag.	46.2	69.2	100.0

1. The archaeomagnetic date range is based on the overlap of the two archaeomagnetic dates from this features (i.e., 1210–1225); X = The radiocarbon date overlaps with the archaeomagnetic two-sigma date range at the given degree of precision; -- = The radiocarbon date does not overlap with the archaeomagnetic two-sigma date range at the given degree of precision

Summary of Chronometric Dating Methods

In general, the obsidian hydration dates from Ancestral Pueblo sites are much earlier than expected, whereas, the Archaic site dates appear to be accurate, but very imprecise. It may be that the later inhabitants were scavenging obsidian from the older surface sites. Radiocarbon and archaeomagnetic dates are generally in agreement indicating that both methods are accurate. Of the two methods, archaeomagnetic dating is often more precise, with resolution of 20 to 40 years possible for a given sample. When luminescence dates are compared with dates derived from other methods they either agree with the other dates or are too early. A similar result was obtained by Dykeman et al. (2002), although late luminescence dates are not unknown (e.g., Ramenofsky and Feathers 2002).

CERAMIC ARTIFACT DATING

Wilson (Chapter 58, this volume) assigns the C&T Project sites to the various temporal periods based on the combinations of pottery types identified. Here we build on this work by attempting to define ceramic assemblages that are characteristic of the different Ancestral Pueblo periods. Subsequently, we combine the ceramic assemblage data with other chronometric data to assign sites to periods that are as fined-grained as we can reasonably make them. To provide more data about Coalition period ceramics, the recently analyzed ceramic assemblages of three LANL pueblo sites are included in our analysis: LA 4618 (Wilson 2006), LA 4619 (Wilson 2007), and LA 4624 (Curewitz and Harmon 2002).

LA 4618 is a 13-room masonry pueblo that is located on Mesita del Buey at an elevation of 2060 m (6760 ft) (Schmidt 2006b). The pueblo consists of 11 habitation/storage rooms, one square kiva, and one circular kiva. Between 1990 and 1992, nine of the rooms and both kivas were fully excavated; the remaining two rooms were only partially excavated. Additionally, limited testing was done in a sparse midden area located immediately east of the roomblock. Five maize samples from LA 4618 returned radiocarbon dates indicating a Late Coalition period occupation (Table 69.13). Burned plaster/adobe from the hearth of the circular kiva was submitted for luminescence dating. The sample returned a date of AD 1318±70. Ten-thousand-seventy sherds of the 23,236 sherds recovered from the site were analyzed.

Table 69.13. Radiocarbon dates from LA 4618 and LA 4619.

Site	Context of sample	Laboratory (Beta)#	Conventional radiocarbon age	Intercept of radiocarbon age	2-sigma calibrated result
LA 4618	Room 3 floor	199363	730±50 BP	AD 1280	AD 1220–1310 AD 1370–1380
	Room 6 floor	199364	810±70 BP	AD 1240	AD 1040–1300
	Room 13 poss. hearth	199365	720±40 BP	AD 1280	AD 1250–1300
	Room 7 hearth	199366	720±40 BP	AD 1280	AD 1250–1300
	Room 11 floor	199367	710±40 BP	AD 1290	AD 1260–1310 AD 1370–1380
LA 4619	Room 3 floor	164641	1030±40 BP	AD 1010	AD 960–1040
	Room ? wall/roof	164642	750±40	AD 1270	AD 1220–1300

LA 4619 is an 80-room-plus plaza pueblo located on Mesita del Buey at an elevation of 2070 m (6800 ft) (Hoagland 2007). Based on the size of the pueblo and ceramic analysis, it is likely that the site dates to a transitional Late Coalition/Early Classic period. In 2006, 12 test units were excavated on the northern edge of the site, about 7 to 20 m north of the roomblock. The pueblo itself remains unexcavated. One-thousand-fifty-six ceramic sherds recovered from the testing were analyzed, the remaining 120 sherds were too small to identify.

LA 4624 is a 25-room pueblo located on Mesita del Buey at an elevation of 2060 m (6760 ft) (Vierra et al. 2002). In 1993, 10 of the rooms were excavated. The ceramic assemblage indicates that the site probably dates to the Early/Middle Coalition period. Two maize fragments were submitted for radiocarbon dating; one of the returned dates seems too early while the other seems too late (see Table 69.7). A total of 27,328 ceramic sherds were recovered from the partial excavation of LA 4624. Three-thousand-seven-hundred-ninety sherds were excavated from the roomblock and 23,538 were collected from the surface of the site. Of these, 1952 sherds from 56 excavation units and 1033 sherds from two surface units were analyzed.

In his analysis of the C&T Project ceramic artifacts, Wilson (Chapter 58, this volume) classified sherds into nearly 100 categories. This is too many categories for our purpose (i.e., defining "typical" period ceramic assemblages). To reduce this variability we collapsed the most diagnostic and common of Wilson's categories into categories that are close to standard ceramic types (Table 69.14). Since so few typed glazewares were recovered, these were simply grouped as glaze-on-red, glaze-on-yellow, glaze polychrome, and undetermined glazeware. Uncommon and undiagnostic types were not included in our "analysis assemblage." The analysis assemblage consists of 35,247 out of 37,905 analyzed ceramic artifacts. Of the 2658 excluded artifacts, 1636 are unpainted undifferentiated sherds.

Table 69.14. Ceramic analysis groups from the C&T Project.

Analysis Assemblage Type	Count	Original Analysis Type(s)
Kwahe'e Black-on-white	40	Kwahe'e Black-on-white solid designs
		Kwahe'e Black-on-white thin parallel lines
		Kwahe'e Black-on-white thick parallel lines
		Kwahe'e Black-on-white hatchured designs
		Kwahe'e Black-on-white checkerboard
Santa Fe Black-on-white	3779	Santa Fe Black-on-white
Wiyo Black-on-white	214	Wiyo Black-on-white
Galisteo Black-on-white	59	Galisteo Black-on-white
		Unpainted Galisteo Paste
Biscuit A	229	Biscuit A Abiquiu Black-on-white
Biscuit B	42	Biscuit B Rim
Biscuit C	6	Biscuit C Rim
Biscuit B/C	301	Biscuit B-C Body
Biscuit unknown	347	Biscuitware Unpainted Slipped Both Sides
		Biscuitware Painted Unspecified
		Biscuitware Slipped One Side
		Biscuitware Slip and Paint Absent
Sankawi Black-on-tan	12	Sankawi Black-on-tan
Glaze Red	97	Glaze Red Body Unpainted
		Glaze Red Body Undifferentiated
		Agua Fria Glaze-on-red
Glaze Yellow	20	Glaze Yellow Body Unpainted
		Glaze Yellow Body Undifferentiated
		Cienequilla Glaze on Yellow
		Largo Glaze Yellow
Glaze Polychrome	9	Glaze Polychrome Body Undifferentiated
		Los Padillas Glaze Polychrome
		Puaray Polychrome

Analysis Assemblage Type	Count	Original Analysis Type(s)
Undetermined Glaze	24	Glaze Unslipped Body
early Plainware	523	Plainware
Plain Gray	1763	Plain Gray Rim
		Unknown Gray Rim
		Plain Gray Body
Indented Corrugated	2013	Indented Corrugated
Plain Corrugated	240	Plain Corrugated
Smeared-plain corrugated	1998	Smeared-plain corrugated
Smeared-Indented Corrugated	22072	Smeared-Indented Corrugated
Sapawe Micaceous	1397	Sapawe Micaceous
Potsuwi'i Incised-like	62	Potsuwi'i Incised
		Thin, Plain, Non Micaceous Classic Period

For our initial attempt to define period assemblages we ran a number of different cluster analyses using SPSS 11.5.1. This showed us which sites had similar assemblages. Although there was some variability in how sites clustered depending on the type of analysis and the inputs used, they tended to generally cluster in the same way. Figure 69.10 shows a typical cluster; it was generated using Ward's method with a squared Euclidian distance interval measure. For this analysis, each decorated ware type was assigned the value type count/total decorated ware count and each utilityware type was assigned the value type count/total utilityware count. The Potsuwi'i Incised-like type was not included in this analysis as it was only found at LA 21596A and B. LA 139418 was not included in this analysis because nearly 70 percent of the ceramic assemblage consists of glazeware sherds. It is not necessary to use a statistical software package to know that LA 139418 is an outlier.

In Figure 69.10, the sites form into six clusters. Cluster 1 (LA 86534 to LA 141505) consists of seven sites in which the decorated ware is dominated by Santa Fe Black-on-white and the utilityware is dominated by smeared-indented corrugated. These are clearly Coalition period sites. Five of these sites are pueblos and only one, LA 99396, is located in the Rendija Tract.

Cluster 2 (LA 85417 to LA 86606) consists of four sites at which smeared-plain corrugated makes up more than 45 percent of the utilityware. Based on a finer-grained analysis of the ceramics and on other chronometric data, each of these sites appears to date to a separate time period. Except for LA 4619, these sites are Rendija Tract fieldhouses.

Cluster 3 (LA 86637 to LA 127625) consists of four sites where the most common decorated ware is undetermined biscuitware and the most common utilityware is plain gray. These are Classic period sites. Three of the sites (LA 86637, LA 127625, and LA 128805) are located in the White Rock Tract.

Cluster 4 (LA 135291 to LA 21596B) consists of six sites with mixed decorated ware assemblages and utilityware assemblages in which smeared-indented corrugated is the most common type. Based on other chronometric data, LA 85404 and LA 127635 are probably multi-component sites; the other members of Cluster 4 may also have multiple components, or are at least in an area of a generalized Coalition period background noise.

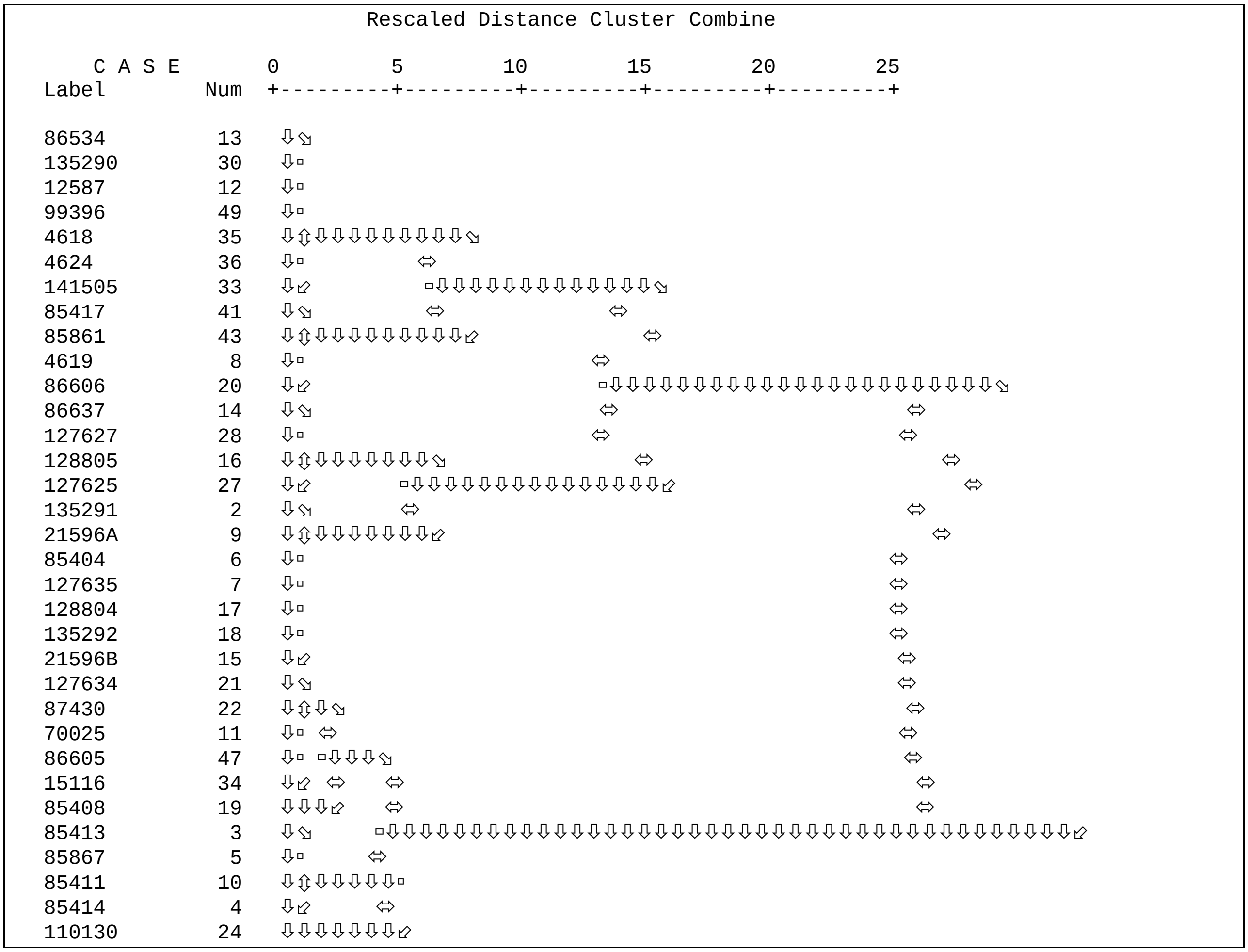


Figure 69.10. Site cluster analysis from the C&T Project.

Cluster 5 (LA 127634 to LA 85408) consists of six sites with a good deal of non-Biscuit A biscuitware and utilityware assemblages in which Sapawe Micaceous is the most common type. All of these sites are Rendija Tract fieldhouses. Most of these sites also have more decorated ware than utilityware.

Cluster 6 (LA 85413 to LA 85414) consists of four sites at which the most common decorated ware is Biscuit A and the most common utilityware is Sapawe Micaceous. All of these sites are Rendija Tract fieldhouses. LA 110130 is something of an outlier as almost 80 percent of its entire ceramic assemblage consists of Sapawe Micaceous.

Clusters 1, 5, and 6 clearly represent different temporal periods: Cluster 1 is the Coalition period, Cluster 5 is an earlier part of the Classic period, and Cluster 6 is a later part of the Classic period. Sites in Cluster 3 also date to the Classic period, although as defined by the clustering method (i.e., unidentified biscuitware and plain gray sherds) this assemblage type is not very specific. Cluster 4 also appears to have temporal significance, although in this case it is telling us that the ceramic assemblages are mixed. Cluster 2 only tells us that smeared-plain corrugated is common.

One possible drawback to the cluster analyses is that they incorporate a variety of site types and at least two periods that are characterized by distinct ceramic assemblages (i.e., the Coalition and Classic periods). Consequently, variability that exists within these categories may be obscured, especially when the number of sites included in the analysis is relatively small, as is presently the case here. It may be possible to reveal more about the chronological relationships between sites of similar types by focusing only on those site types. Here we take a closer look at the Coalition period pueblos and the Classic period fieldhouses. Table 69.15 orders the pueblo sites chronologically, from earliest to latest, based on dated materials and interpretations of the ceramic assemblages. LA 4618 and LA 12587 are nearly contemporaneous and it is possible that their positions in the table should be reversed.

Table 69.15. Percentage of whiteware and utilityware pottery by site.

Site (LA)	Whitewares				Utilitywares					
	Kwahe'e	Santa Fe	Wiyo	Galisteo	Early Plain	Indented Corrugated	Smeared-Plain Corr.	Smeared-Indented Corrugated	Plain Corrugated	Plain Gray
4624	3.69	96.30	0.00	0.00	22.19	15.28	0.08	61.12	1.31	0.00
135290	2.89	95.26	0.78	0.52	0.00	13.87	0.05	83.59	0.11	2.35
86534	0.30	95.45	2.42	0.90	0.00	19.17	0.00	74.34	0.52	5.95
4618	0.39	87.38	0.22	1.83	0.00	0.49	0.90	96.06	1.19	1.33
12587	0.07	93.16	2.94	1.91	0.00	5.67	12.16	72.79	0.43	8.93
4619	0.00	68.00	21.33	4.00	0.00	0.00	45.34	15.54	4.59	34.5

Table 69.15 shows that there are some clear temporal trends in the data. For example, over time Kwahe'e Black-on-white decreases in frequency while Wiyo Black-on-white and Galisteo Black-on-white increase. However, these three types make up only a small percentage of the decorated ware assemblages and so these patterns may not be very robust. No utilityware type shows a gradual increase or decrease overtime, although there are clear changes between the frequencies of some types. Unfortunately these changes do not happen in lock-step. For example, indented corrugated is common at LA 4624, LA 135290, and LA 86534 and uncommon at the other sites. On the other hand, smeared-plain corrugated is virtually absent from LA 4624, LA 135290, LA 86534, and LA 4618, is uncommon at LA 12587, and is common at LA 4619.

Based on the data in Table 69.15, LA 4619 clearly has a different ceramic assemblage from the other sites. LA 4624 stands out as different because of the presence of early plainware; otherwise it is very similar to LA 135290 and LA 86534. It is much more difficult to distinguish between LA 135290, LA 86534, LA 4618, and LA 12587. For example, based on the frequency of Kwahe'e Black-on-white, one might argue that LA 135290 is earliest, LA 86534 and LA 4618 are contemporaneous, and LA 12587 is latest. Based on the frequency of Wiyo Black-on-white, on the other hand, one could argue that LA 135290 is earliest, LA 86534 and LA 12587 are contemporaneous, and LA 4618 is latest. The lack of clear differences in the ceramic assemblages of these pueblo sites (excluding LA 4169) is perhaps not surprising given the small sample size.

Table 69.16 presents some aspects of the ceramic assemblages of Classic period fieldhouses. These sites are deemed to date to the Classic period based on dated material from the sites and/or impression of the ceramic assemblages. The fieldhouses can be divided into two distinct groups based on the ratio of Biscuit A to all typed biscuitware. The lowest ratio of the earlier group is 0.615385 and the highest ratio of the later group is 0.214286. Also noteworthy is the fact that the latest ceramic types, Biscuit C and Sankawi Black-on-cream, are only found at sites in the later group.

Table 69.16. Classic period fieldhouse ceramics.

Site	Cluster	Biscuit A	A2	Decorated	SIC	SPC	Plain Gray	Micaceous	Late Ware
135291	4	1.00	--	0.35	0.69	0.00	0.30	0.00	
85404	4	0.88	8.00	0.34	0.86	0.00	0.04	0.07	
127635	4	0.83	5.00	0.11	0.83	0.00	0.06	0.08	
127631		1.00	--	0.36	0.00	0.57	0.14	0.14	
85413	6	1.00	--	0.14	0.00	0.01	0.00	0.99	
85414	6	1.00	--	0.15	0.00	0.11	0.00	0.88	
85867	6	1.00	--	0.20	0.00	0.00	0.074	0.92	
85411	6	0.70	2.39	0.23	0.00	0.06	0.06	0.87	
70025	5	0.61	1.60	0.19	0.10	0.00	0.02	0.85	
135292	4	0.17	0.21	0.37	0.92	0.00	0.07	0.00	s
85403		0.00	na	0.00	0.66	0.00	0.16	0.00	
86606	5	0.11	0.13	0.10	0.40	0.53	0.06	0.00	c
128805	3	0.21	0.27	0.30	0.24	0.14	0.48	0.03	c, s
127627	3	0.00	0.00	0.24	0.30	0.00	0.43	0.25	
85408	5	0.17	0.21	0.77	0.00	0.00	0.53	0.46	s
87430	5	0.03	0.03	0.14	0.02	0.00	0.13	0.83	c
110130		0.00	na	0.04	0.08	0.00	0.08	0.82	
127634	5	0.07	0.09	0.62	0.00	0.00	0.07	0.92	s
15116	5	0.00	0.00	0.77	0.21	0.00	0.10	0.68	
110126		0.00	0.00	0.81	0.00	0.00	0.00	1.00	
86605	5	0.00	0.00	0.86	0.00	0.00	0.00	1.00	c, s

Biscuit A = Biscuit A count / (Biscuit A + Biscuit B + Biscuit C + Biscuit B/C count); A2 = Biscuit A count / (Biscuit B + Biscuit C + Biscuit B/C count); Decorated = Percent of analysis assemblage composed of decorated ware; SIC, SPC, Plain Gray, Micaceous = percent of utilityware assemblage composed of given type; c = presence of Biscuit C; s = presence of Sankawi Black-on-cream.

The earlier group can be divided into two sub-groups: one in which the utilityware assemblage is dominated by smeared-indented corrugated, and one in which it is dominated by Sapawe

Micaceous. LA 127631, with smeared-plain corrugated as the most common utilityware type, does not fit into either group. Within the smeared-indented corrugated sub-group, LA 127635 has a Coalition period component and LA 85404 may have a Coalition period component (see below). These earlier components may account for the high frequency of smeared-indented corrugated sherds in the assemblages of these sites. Alternatively, since later utilitywares (e.g., plain gray and Sapawe Micaceous) are uncommon at all three smeared-indented corrugated sites, these sites may have been used in the Classic period before these types became common (i.e., in the Early Classic).

In the later group there is a good overlap between sites with ceramic assemblages composed of more than 60 percent decorated wares and sites with utilityware assemblages dominated by Sapawe Micaceous. Both of these assemblage traits are found at LA 15116, LA 86605, LA 110126, and LA 127634. At LA 85408, most of the ceramic assemblage consists of decorated wares but the most common utilityware is plain gray. However, a little over 46 percent of the utilityware does consist of Sapawe Micaceous. Sapawe Micaceous is the most common utilityware at LA 87430 and LA 110130, although decorated ware makes up only a small part of the ceramic assemblage at these sites. LA 128805 and LA 127627 are similar in that the most common utilityware at both sites is plain gray; LA 85403 and LA 135292 are common in that smeared-indented corrugated makes up most of the utilityware, although since there are only six sherds in the LA 85403 analysis assemblage, perhaps it is best not to make too much of this. LA 86606 is the only site where smeared-plain corrugated is the most common type. It is unclear if the variation seen in this later group has a temporal component to it.

In Table 69.16, LA 70025 falls into the early group whereas in the cluster analysis (Figure 69.10) this site fell into Cluster 5 (interpreted as the latest cluster). In other cluster analyses, LA 70025 is sometimes grouped within LA 85411, LA 85413, LA 85414, and LA 85867. Typed biscuitware from this site consists of eight Biscuit A sherds and five Biscuit B/C body sherds (i.e., an approximately even split between early and later biscuitware). Perhaps LA 70025 is temporally intermediate between the earlier group and the later group in Table 69.16. A different way to consider the relationship between Biscuit A and the later Biscuitwares is given in the fourth column of Table 69.16. Here the intermediate nature of LA 70025 is shown; LA 85411 can also be interpreted as an intermediate site.

ARCHAEOLOGICAL SITE TEMPORAL SEQUENCE

In this section we combine the archaeomagnetic, luminescence, obsidian hydration, radiocarbon, projectile point, and ceramic data to assign the project sites to specific periods and dates. This includes the Archaic, Ancestral Pueblo, and Historic periods, with relevant subdivisions.

Archaic Period

Four sites have been assigned to the Archaic period, although other surface scatters appear to contain Archaic components. LA 85859, LA 99396, and LA 99397 are all lithic scatters situated in the Rendija Tract. Three charcoal dates were submitted from the lower levels of LA 85859 providing a calibrated intercept range from 5300 to 4860 BC. This site presumably dates to the Early Archaic period.

LA 99396 and LA 99397 can tentatively be assigned to the Middle to Late Archaic period. LA 99396 is a multi-component site that contains an Archaic and Ceramic period component. The Archaic component consists of a surface lithic scatter with possible Middle to Late Archaic points. Obsidian hydration dates indicate a possible Middle to Late Archaic period occupation. Lastly, LA 99397 is a surface scatter with subsurface deposits. Two charcoal dates from the upper levels provided calibrated intercepts of 380 and 160 BC, with obsidian hydration dates ranging from the Middle to Late Archaic period. A single possible Late Archaic site was identified in the White Rock Tract. LA 12587 (Area 8) contains Late Archaic projectile points.

Ancestral Pueblo Period

Table 69.17 summarizes the Ancestral Pueblo temporal sequence for the C&T Project sites. It has been separated into nine categories: Indeterminate Pueblo, Indeterminate Coalition, Coalition 1, Coalition 2, Coalition2/Classic 1, Indeterminate Classic, and Classic 1 to 3. These categories do not conform to the traditional early, middle, and late classifications used in other sections of this report; however, they do clearly define the sequence as represented by the excavated site data.

Table 69.17. Ancestral Pueblo site temporal sequence.

Indeterminate Pueblo	Indeterminate Coalition	Coalition 1	Coalition 2	Coal. 2/ Classic 1	Indeterminate Classic	Classic 1	Classic 2	Classic 3
86531	85404+?	85417	4618	4619	*85861*	85404	70025	15116
127633?	86606	86533-	12587		127625	85411	85411?	85403
	86607	86534	85861+		128803	85413	86637	85408
		99396			139418	85414		86605
		127635+			141505	85867		86606?
		135290				127631		87430
						127635		110126
						135291		110130
								127627?
								127634
								128804
								128805
								135292

Indeterminate Ancestral Pueblo

LA 86531 (Artifact Scatter)

Only one smeared-indented corrugated sherd was recovered during excavation. During the initial recording of the site (Hoagland et al. 2000:7–99), it was described as consisting of five to seven pot drops: one or two Wiyo Black-on-white vessels, one Biscuit B (Biscuit B/C?) vessel, one Sankawi Black-on-cream vessel, and one or two smeared-indented corrugated vessels. This rather odd mix of types spans the Late Coalition to Late Classic periods. A radiocarbon sample dated to AD 1180–1280 (i.e., pre-Wiyo Black-on-white) further confuses the issue.

LA 127633 (Rock Feature)

The only artifact found at this site was a plain gray sherd. No dateable samples were recovered. On the basis of geomorphic data Drakos and Reneau (Chapter 57, this volume) suggest that LA 127633 is one of the youngest Classic period sites in the Rendija Tract.

Indeterminate Coalition

LA 85404 (Fieldhouse)

Most chronometric data indicate that this site dates to Classic 1 (see below). However, the presence of 17 Santa Fe Black-on-white sherds and the domination of the utilityware assemblage by smeared-indented corrugated sherds may indicate an initial Coalition period occupation.

LA 86606 (Fieldhouse)

The ceramic assemblage at this site is puzzling. There are six Santa Fe Black-on-white sherds and nine biscuitware sherds (one Biscuit A, one Biscuit B, two Biscuit C, and five Biscuit B/C). The most common utilitywares are smeared-plain corrugated and smeared-indented corrugated. There are eight sherds of plain gray and none of Sapawe Micaceous. The presence of Santa Fe Black-on-white and smeared-indented corrugated sheds suggests an initial Coalition period occupation.

LA 86607 (Fieldhouse)

Ceramic artifacts include four Santa Fe Black-on-white sherds and three smeared-indented sherds. This indicates a Coalition period date for the site, but does not allow for finer resolution.

Coalition 1 (AD 1160–1280)

LA 4624 (Roomblock)

The ceramic assemblage of this site is discussed in detail above. Based on the ceramic assemblage, this site likely pre-dates, or partially pre-dates, LA 86534 and LA 135290.

LA 85417 (Fieldhouse)

The ceramic assemblage at this site consists almost entirely of smeared-plain corrugated sherds (89.1%); the only decorated ware is a Santa Fe Black-on-white sherd. The hearth returned an archaeomagnetic date of AD 1100–1235. Three of the four luminescence dates from the site are generally later than AD 1235. Assuming the archaeomagnetic date is correct, this site is tentatively assigned to Coalition 1, although it could well date later. The presence of 24 buffware with mica slip sherds indicates the site probably has a historic component.

LA 86533 (Artifact Scatter)

LA 86533 is primarily an Archaic period artifact scatter, however, three Santa Fe Black-on-white sherds and five smeared-indented corrugated sherds were collected from the site. Most of these sherds were found immediately south of LA 86534. This may represent use of the site by the inhabitants of LA 86534; alternatively, the sherds may have been redeposited from LA 86534 by natural processes.

LA 86534 (Roomblock)

The ceramic assemblage from this site is discussed in detail above. The archaeomagnetic data suggests that the site dates to the middle to late 13th century. Most of the radiocarbon and luminescence dates fall into this time period, although these two methods also indicate the possibility of an early 13th century use of the site. Taking into account all of the chronometric data, LA 86534 is interpreted as at least partially post-dating LA 4624 and LA 135290.

LA 99396 (Fieldhouse)

The LA 99396 ceramic assemblage largely consists of Santa Fe Black-on-white and smeared-indented corrugated sherds. An archaeomagnetic sample from the hearth returned a date of AD 1175–1260 and several radiocarbon dates from the site are similar. The AD 1175–1260 date range is similar to date ranges from other Coalition 1 period sites, particularly LA 86534.

LA 127635 (Fieldhouse)

The variety of ceramic types found at LA 127635 (Santa Fe Black-on-white, Wiyo Black-on-white, Biscuit A, smeared-indented corrugated, Sapawe Micaceous, and plain gray) suggest that it is a multi-component site. Archaeomagnetic dates from the hearth returned dates of AD 1210–1250 and AD 1200–1225; radiocarbon samples from the hearth returned dates of AD 1180–1280 and AD 1210–1290. The luminescence date from the hearth is not inconsistent with the other dates at AD 1043–1471. These dates are in line with other Coalition 1 period dates, suggesting that this was the time period for the initial occupation of LA 127635.

LA 135290 (Roomblock)

The ceramic assemblage from this site is discussed in detail above. The archaeomagnetic data suggest that the site dates to the late 12th or early/middle 13th century. The radiocarbon dates fall into this time period. Taking into account all of the chronometric data, LA 135290 is interpreted as at least partially post-dating LA 4624 and at least partially pre-dating LA 86534.

Coalition 2 (AD 1250–1325)

LA 4618 (Roomblock)

The ceramic assemblage from this site is discussed in detail above. Radiocarbon dates suggest that the site was inhabited between circa AD 1250–1300. These dates are slightly earlier than those from LA 12587 but certain ceramic indicators (see above) indicate that LA 4618 may slightly post-date LA 12587.

LA 12587 (Roomblock)

The ceramic assemblage from this site is discussed in detail above. Most of the chronometric data indicate that the site was abandoned between AD 1275–1325. LA 12587 is difficult to temporally place. Two archaeomagnetic dates from a subfloor hearth returned dates of circa AD 1200, indicating some kind of habitation of the site in Coalition 1. There is no other chronometric evidence of this component. The rest of the archaeomagnetic dates and most of the radiocarbon dates indicate the site was abandoned. The site was probably occupied from the middle/late 13th century to the early 13th century. A light scatter of later ceramics is present as the result of Classic period use.

LA 85861 (Fieldhouse)

The whiteware ceramic assemblage of LA 85861 is dominated by Coalition period types (40 Santa Fe Black-on-white sherds and two Wiyo Black-on-white sherds); however, eight biscuitware sherds are also present, including two Biscuit B sherds and one Biscuit B/C body sherd. The utilityware assemblage mainly consists of smeared-plain corrugated and smeared-indented corrugated sherds. A radiocarbon date from the hearth returned a date of AD 1020–1200 (old wood?). A sample of the wall plaster returned a luminescence date of AD 1087–1299 and one of the smeared-plain corrugated sherds returned a luminescence date of AD 1065–1357. It appears the site was initially inhabited during the Coalition period and was reused, perhaps in a different manner and/or not as intensively, in the Classic 2 and/or Classic 3 period. Noting the presence of Wiyo Black-on-white and assuming that the smeared-plain corrugated sherds are associated with the initial occupation and that the later half of the luminescence date ranges are accurate, the earlier component of LA 85861 is very tentatively assigned to the Coalition 2 period.

Coalition 2/Classic 1

LA 4619 (Roomblock)

The ceramic assemblage of this site is discussed above. There are no dated samples from LA 4619 but based on the roomblock architecture, in addition to the ceramic assemblage, this site post-dates LA 12587 and LA 4618.

Indeterminate Classic

LA 85861 (Fieldhouse)

A handful of biscuitware and Sapawe Micaceous sherds may indicate that LA 85861 has a Classic period component in addition to a Coalition 2 component (see above). Three of the eight biscuitware sherds are Biscuit B or Biscuit B/C sherds so this component probably dates to either the Classic 2 or Classic 3 period.

LA 127625 (Artifact Scatter)

Few sherds were recovered from this sparse artifact scatter. Based on the presence of one Biscuit B/C sherd, six unidentified Biscuitware sherds, and one glazeware sherd, this site is dated to the Classic period.

LA 128803 (Grid Garden)

No artifacts were recovered from this site, but a radiocarbon sample returned a date of cal AD 1320–1350 and 1390–1440.

LA 139418 (Grid Garden/Artifact Scatter).

Most of the LA 139418 ceramics were recovered from the artifact scatter. Nearly 70 percent of the ceramic assemblage consists of glazeware sherds. It is not clear if the artifact scatter ceramics are associated with the use of the grid garden.

LA 141505 (Fieldhouse)

While only 29 sherds were recovered from LA 141505, they consist of a range of types including Kwahe'e Black-on-white, Santa Fe Black-white, smeared-indented corrugated, Sapawe Micaceous, and glazewares. This combination of pottery could reflect both Coalition and Classic period occupations; however, all these artifacts were recovered from post-occupational fill and none were recovered from the floor. Therefore, the earlier ceramics may be derived from the nearby roomblock, LA 135290. If so, the Classic period ceramics would support the geomorphic interpretation that the site dates to the later time (i.e., Classic) period.

Classic 1

LA 85404 (Fieldhouse)

The presence of eight Biscuit A sherds, nine Sapawe Micaceous sherds (however, the most common utilityware is smeared-indented corrugated), and 34 glazeware sherds, indicates a Classic 1 period occupation of the site. A luminescence sample from the floor of the structure returned a date of AD 1290–1486. However, a radiocarbon sample returned a younger date than expected: cal AD 1430–1530 and cal AD 1560–1630. This site may have an earlier Coalition period component (see above).

LA 85411 (Fieldhouse)

The presence of Biscuit A and Sapawe Micaceous sherds indicated a Classic 1 period occupation. A radiocarbon sample from the hearth returned a date of cal AD 1290–1410, and two luminescence samples of burned plaster returned dates of AD 1309–1410 and AD 977–1433. The presence of 18 Biscuit B and Biscuit B/C sherds may indicate a late Classic 1 date, or perhaps that use of the site continued into the early 15th century.

LA 85413 (Fieldhouse).

The ceramic assemblage is dominated by Biscuit A and Sapawe Micaceous sherds. There are no later biscuitwares. Fifteen glazeware sherds are present, including a Cieneguilla Glaze-on-yellow sherd (AD 1325–1425). A radiocarbon sample returned a younger date than expected: cal AD 1440–1640.

LA 85414 (Fieldhouse)

The few decorated ceramics recovered from the site consist of biscuitwares and glazewares, indicative of a Classic period habitation. This conclusion is supported by the fact that Sapawe Micaceous makes up to 88.9 percent of the utilityware assemblage. On the basis of one Biscuit A sherd and no later biscuitwares, the site is tentatively assigned to the Classic 1 period.

LA 85867 (Fieldhouse)

The ceramic assemblage consists almost entirely of Biscuit A and Sapawe Micaceous sherds, clearly placing the site in the Classic 1 period.

LA 127631 (Fieldhouse)

Based on the few ceramics recovered from LA 127631, the site could date to either the Coalition or Classic 1 period. Based on a radiocarbon date of cal AD 1300–1430, this site is tentatively assigned to the Classic 1 period.

LA 127635 (Fieldhouse).

This site was initially occupied in the Coalition 1 period; however, the presence of Biscuit A and Sapawe Micaceous indicates that this site was reused in the Classic 1 period.

LA 135291 (Fieldhouse)

The ceramic assemblage consists of Biscuit A sherds, unidentified biscuitware sherds, smeared-indented corrugated sherds, and plain gray sherds. No Sapawe Micaceous sherds where found. The presence of Biscuit A indicates a Classic 1 period occupation.

Classic 2

LA 70025 (Fieldhouse)

The decorated ware assemblage of LA 70025 includes eight Biscuit A sherds and five Biscuit B/C sherds. This may indicate a temporally intermediate position for the site between the Classic 1 and Classic 3 period. The utilityware assemblage consists mostly of Sapawe Micaceous sherds.

LA 85411 (Fieldhouse)

Given the presence of seven Biscuit B sherds and 11 Biscuit B/C sherds in addition to 43 Biscuit A sherds, this site may have been occupied during the Classic 2 period. Dated samples from the site suggest that it was occupied no later than the early 15th century.

LA 86637 (Artifact Scatter/Fieldhouse)

Given the mixed ceramic assemblage of this site it may have a number of components. As biscuitwares make up most of the decorated ceramics there is clearly a Classic period component at LA 86637. Identified biscuitwares consist of three Biscuit A sherds, two Biscuit B sherds, and two Biscuit B/C sherds. On the basis of this mix of early and late biscuitwares, LA 86637 is assigned to the Classic 2 period.

Classic 3

LA 15116 (Fieldhouse)

The biscuitware assemblage does not include any Biscuit A sherds and the most common utilityware is Sapawe Micaceous. This indicates a Classic 3 period occupation.

LA 85403 (Fieldhouse)

Very few ceramics were recovered from this site. A radiocarbon date of cal AD 1470–1660 places this site in the Classic 3 period.

LA 85408 (Fieldhouse)

Although few Biscuit A sherds are present, the biscuitware assemblage is dominated by Biscuit B/C sherds. The utilityware is equally divided between plain gray and Sapawe Micaceous.

LA 86605 (Fieldhouse)

The biscuitware assemblage does not include any Biscuit A sherds and the most common utilityware is Sapawe Micaceous. A radiocarbon sample returned a date of cal AD 1440–1640.

LA 86606 (Fieldhouse)

In addition to Santa Fe Black-on-white sherds there are nine biscuitware sherds (one Biscuit A, one Biscuit B, two Biscuit C, and five Biscuit B/C). The most common utilitywares are smeared-plain corrugated and smeared-indented corrugated. There are eight sherds of plain gray and no Sapawe Micaceous sherds. On the basis of the mix of the biscuitwares, LA 86606 is tentatively assigned a Classic 3 period component.

LA 87430 (Fieldhouse)

Although few Biscuit A sherds are present, the biscuitware assemblage is dominated by Biscuit B/C sherds. The utilityware assemblage consists mostly of Sapawe Micaceous sherds. Two radiocarbon samples returned dates of cal AD 1440–1640, and cal AD 1430–1530 and cal AD 1550–1630. A luminescence sample returned a date of AD 1305–1461.

LA 110126 (Fieldhouse)

Few sherds were recovered from this site; the entire ceramic assemblage consists of seven Biscuit B sherds, two unidentified biscuitware sherds, and one Sapawe Micaceous sherd.

LA 110130 (Fieldhouse)

Nineteen Sapawe Micaceous sherds were recovered during excavation. However, during the initial site recording five Biscuit B sherds were observed (Hoagland et al. 2000:7–103). A radiocarbon sample returned a date of cal AD 1450–1640.

LA 127627 (Fieldhouse)

Identified biscuitware sherds consist of one Biscuit B sherd and one Biscuit B/C sherd. Other decorated ceramics include 14 unidentified biscuitware sherds and three glazeware sherds. The utilityware is divided between plain gray, smeared-indented corrugated, and Sapawe Micaceous (in descending order of frequency). Two radiocarbon samples returned dates of cal AD 1440–1640, and cal AD 1430–1530 and cal AD 1560–1630.

LA 127634 (Fieldhouse)

Although few Biscuit A sherds are present, the biscuitware assemblage is dominated by Biscuit B/C sherds. The utilityware assemblage consists mostly of Sapawe Micaceous sherds. Two radiocarbon samples both returned dates of cal AD 1450–1650. Two luminescence samples returned dates of cal AD 1398–1530 and cal AD 1438–1550.

LA 128804 (Check Dam/Artifact Scatter)

The decorated ware assemblage of LA 128804 includes four Santa Fe Black-on-white sherds, one Wiyo Black-on-white sherd, two Biscuit A sherds, eight Biscuit B sherds, 15 unidentified biscuitware sherds, and 22 glazeware sherds. Smeared-indented corrugated is the most common utilityware type. The later decorated ware types are indicative of a Classic period occupation. It is not clear if the earlier ceramic types are evidence of an earlier component or if they are simply part of generalized Coalition period background noise. Because there are more Biscuit B sherds than Biscuit A sherds present, this site is tentatively assigned to the Classic 3 period.

LA 128805 (Fieldhouse)

The decorated ceramic assemblage at LA 128805 includes assorted biscuitwares (including three Biscuit A sherds and 11 later biscuitware sherds) and 18 glazeware sherds. The most common utilityware type is plain gray; Sapawe Micaceous is the next most common type. A radiocarbon sample returned a date of cal AD 1420–1500.

LA 135292 (Fieldhouse)

Although few Biscuit A sherds are present, the biscuitware assemblage is dominated by Biscuit B/C sherds. The utilityware assemblage consists mostly of smeared-indented corrugated sherds.

Discussion

Coalition Period

What appears to distinguish Coalition period ceramic assemblages are the utilitywares: indented corrugated is early, whereas smeared-plain corrugated and plain gray become more frequent later (smeared-indented corrugated is always the most common type, except for perhaps at Coalition/Classic period transition sites). Kwahe'e Black-on-white is more common earlier, while Wiyo Black-on-white and Galisteo Black-on-white are more common later, although in all cases the frequency of these decorated types relative to the assemblage is very small.

Sites assigned to Coalition 1 period have dates from the late 12th century to the middle/late 13th century. This date range corresponds fairly well with the standard range of the Early Coalition (AD 1150–1250). Within this period some sites can be identified as being earlier or later than others, although there is not enough data to break this time period into finer segments. No site in this study has a whiteware assemblage that contains a large amount of Kwahe'e Black-on-white. There are sites like this in Bandelier National Monument (e.g., Orcutt 1999:Table 3.5) and it is our impression that some sites at LANL have a greater amount of mineral painted ware than does LA 4624. The question is, what time period do these sites date to. The Bandelier Archeological Survey assigns their Kwahe'e Black-on-white sites to circa AD 1150–1220 (Orcutt 1999:Tables 3.5 and 3.6). However, LA 135290, which has only a small amount of Kwahe'e Black-on-white (in an absolute sense) was probably inhabited as early as the late 12th century and LA 4624 (also with only a small amount of Kwahe'e Black-on-white) was probably inhabited slightly earlier. It is possible that the Kwahe'e Black-on-white "rich" sites at LANL actually date to the Developmental period and that Santa Fe Black-on-white replaced Kwahe'e Black-on-white at LANL earlier than at Bandelier.

Sites assigned to the Coalition 2 period have dates in the middle/late 13th century to the early 14th century. This date range corresponds well with the standard range of the Late Coalition (AD 1250–1325).

Only LA 4619 is assigned to the Coalition 2/Classic 1 period. Unfortunately, there are no dated samples from this site. However, since it contains a significant amount of Wiyo Black-on-white and very little Biscuit A, it probably dates to the early 14th century.

Classic Period

Sites assigned to Classic 1 period have a good deal of Biscuit A and few or no later biscuitware sherds; this suggests a middle to late 14th century occupation (i.e., after the introduction of Biscuit A and before the introduction of Biscuit B). However, radiocarbon dates from two of these sites—LA 85404 and LA 85413—returned dates of cal AD 1430–1530 and cal AD 1560–1630, and cal AD 1440–1640, respectively. These dates may represent a later use of the sites, or may be unrelated to cultural activities. Other dates from Classic 1 period sites do not conflict with a middle to late 14th century interpretation, but are not precise enough to confirm it.

The Classic 2 period is defined by an approximately even mix of Biscuit A and Biscuit B/Biscuit B/C sherds. The temporal ranges of these two types overlap in the early to middle 15th century.

Sites assigned to the Classic 3 period are characterized by many Biscuit B and Biscuit B/C sherds and few or no Biscuit A sherds. At most sites the most common utilityware is Sapawe Micaceous and at some sites there is more decorated ware then utilityware. Given the relative absence of Biscuit A sherds, these sites probably post-date the middle 15th century. This interpretation is supported by the radiocarbon and luminescence date ranges, few of which include dates before AD 1430. Given the imprecision of radiocarbon dates from this time period and the imprecision of luminescence dates in general, an end date for this period is more difficult to determine. Given the paucity of Biscuit C and Sankawi Black-on-cream sherds recovered from Classic 3 period sites, it seems unlikely that they were inhabited later than the early 15th century. Nonetheless, the range could extend to the middle 15th to early 16th centuries.

Historic Sites

LA 85869 is a Jicarilla Apache tipi ring site. Five radiocarbon samples were submitted from the site, however, only one returned a date that is clearly associated with the occupation. The 260±40 BP date has several calibrated two-sigma ranges, starting at AD 1520 and ending at AD 1950. A single micaceous sherd did yield a luminescence date of AD 1859±13. The historic bead and metal and ceramic artifacts also indicate a late 19th or early 20th century occupation at the site.

LA 85407 is the Serna Homestead site in Rendija Canyon. Eight wood construction elements from the cabin and corral were submitted to the Dendrochonology Laboratory at the University of Arizona for tree-ring dating. All the samples were ponderosa pine, with five of the eight yielding dates. However, none provided cutting dates due to the poor preservation of the outside rings, leading to a couple of interpretations. The simplest is that the entire structure was built sometime after 1900, based on the 1900+vv date from Room 2. The historic metal and glass artifacts indicate a late 19th to early 20th century occupation and the ceramics a post-1913 date. This corresponds with oral interviews that indicate the homestead was occupied in the early 1900s.

CHAPTER 70
GROUND PENETRATING RADAR: 2002 AND 2003 FIELD SEASONS

Kimberly Henderson, Jennifer E. Nisengard, and John S. Issacson

Surveys using ground penetrating radar (GPR) were conducted at five of the eight sites excavated in 2002 and one site in 2003 as part of the C&T Project (Table 70.1). Three of the sites (LA 127625, LA 128804, and LA 86637) were not subject to GPR survey due to time constraints, site location, and material characteristics. Each of the sites was subject to tree thinning and ground clearing before conducting the GPR survey. The 400-MHz GPR antenna used for survey must be flush with the ground surface at all times, and the operator must slide the level antenna over the surface. It is therefore important to clear all potential hazards (Figure 70.1). Once cleared, a site grid was established using a Brunton compass, an electronic theodolite, or a Nikon 521 digital station (EDM) before the survey. The grid was subsequently used during site excavation so that the GPR and excavation data could be tied together. GPR data is collected in east to west transects of varying lengths, with a 0.5-m separation between transects. The grid area is intended to be larger than the site in an effort to use GPR to delineate site boundaries. Results from the C&T Project GPR surveys varied as a result of a variety of factors discussed in subsequent sections. One of the sites, LA 12587, was surveyed five times to account for changes in soil moisture and expanding site boundaries and to identify subterranean features.

Table 70.1. Excavated C&T Project sites subject to GPR survey in 2002.

Site Number	Grid Size (m)	Goals and Results	EDM
LA 86534	32 by 25	The GPR survey of the site delineated wall alignments, but the grid area was not wide enough to include the kiva.	No
LA 12587	37 by 23	The main portion of site surveyed (the central mound). Transects ranged from 13 to 23 m in length due to the presence of large trees.	Yes
LA 127631	9 by 7	One- to three-room structure, the grid area a bit too small, and as a result the survey did not account for all subsurface features.	No
LA 128805	11 by 10	One- to three-room structure, the data were somewhat unclear although a general location of a room was possible.	No
LA 12587	28 by 19	The center of site was surveyed, including the mound. Wall alignments were visible in the reflection profiles, although they were difficult to identify using amplitude time slice images.	Yes
LA 12587	16 by 10	Northern portion of the site surveyed, grid gardens were suspected, alignments were visible although difficult to identify using the amplitude time slice images.	Yes
LA 128803	10 by 12	The site is a grid garden (a stone hoe was identified on	No

Site Number	Grid Size (m)	Goals and Results	EDM
		the surface). The agricultural features were not identified during an analysis of the GPR data.	
LA 135290 (Q-272)	24 by 22	Multiple geophysical surveys were conducted at the site; the site was excavated during the 2003 field season.	No
LA 12587	22 by 18	Eastern and southern portions of mound surveyed, alignments in the southern portion were additional rooms (as per excavation).	Yes
LA 12587	27 by 10	Further east than the earlier survey, in search of a subterranean structure. No feature was identified, and excavations revealed only wallfall and undulating bedrock in this area.	Yes

Figure 70.1. J. Isaacson, a University of Denver Graduate Student, and L. Conyers conduct a GPR survey at a pueblo roomblock. The GPR antenna is housed within the orange box, which must remain flush with the ground surface.

GPR Background

The use of GPR and other non-invasive geophysical techniques (i.e., seismic refraction, thermal remote sensing, and magnotometry) to aid archaeological research is relatively new (Conyers

1995; Conyers and Goodman 1997; De Vore 1990; Goodman et al. 1994; Hargrave 1999; Imai et al. 1987; Isaacson 1995; Malagodi et al. 1996; Scollar et al. 1990; Whitten et al. 1993; Zeidler 1997). GPR has been useful in the identification of areas of contamination, to relocate various materials, and to distinguish geological features (Smith and Jol 1995), however, its potential contributions to archaeological research have only begun to be demonstrated. GPR works using a continuously moving unit to transmit subsurface electromagnetic data to an above ground antenna (Conyers and Goodman 1997:23). These data are transmitted in real time to the surface (Figure 70.2). These real time units are capable of providing data about buried structural remains, subterranean features, and potential burials (Conyers and Goodman 1997; Malagodi et al. 1996). There is a certain amount of *noise* (i.e., masonry rubble as a result of wall collapse) in raw GPR data, and these data must be processed to make them appropriate for interpretation (Conyers and Goodman 1997:77). For this reason, data acquisition and subsequent data analysis are the central components of all GPR projects.

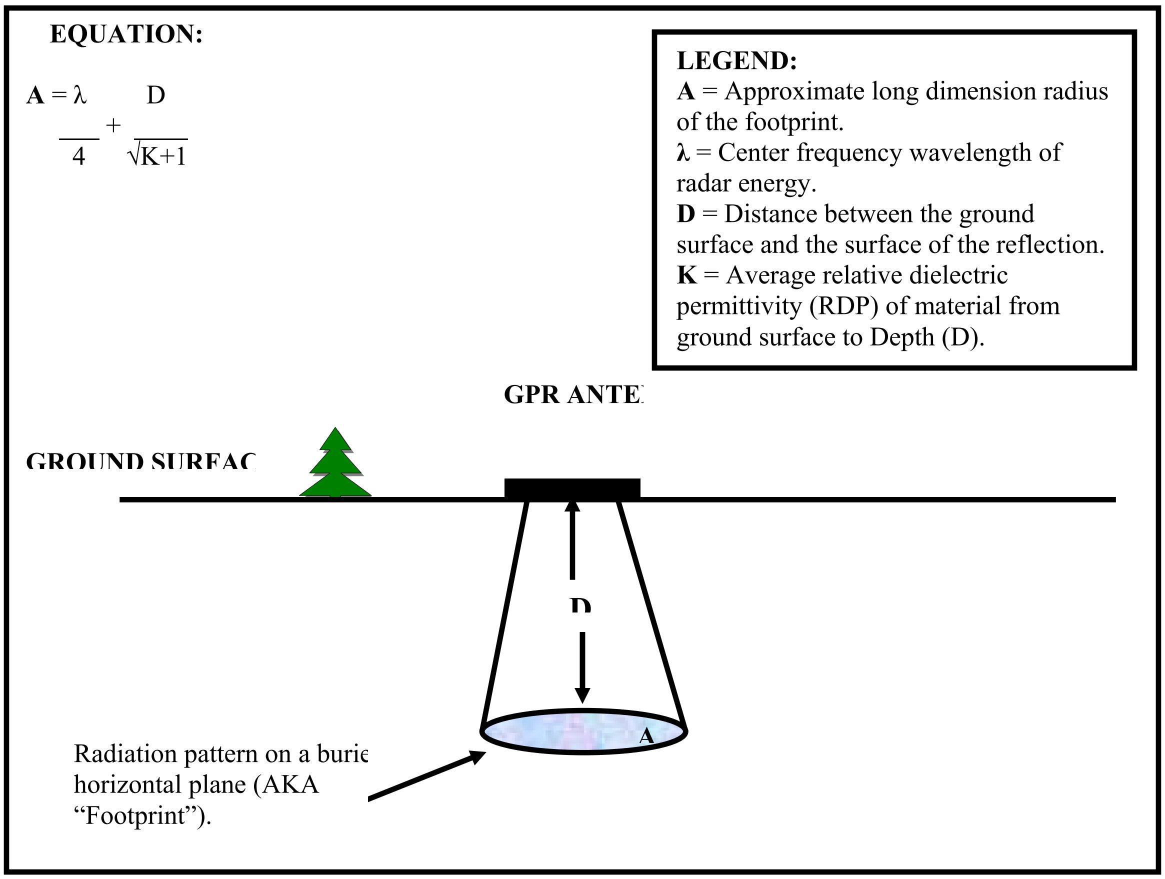


Figure 70.2. Equation and diagram demonstrating how GPR works to create a reflection of a buried item (modified from Conyers and Goodman 1997:36).

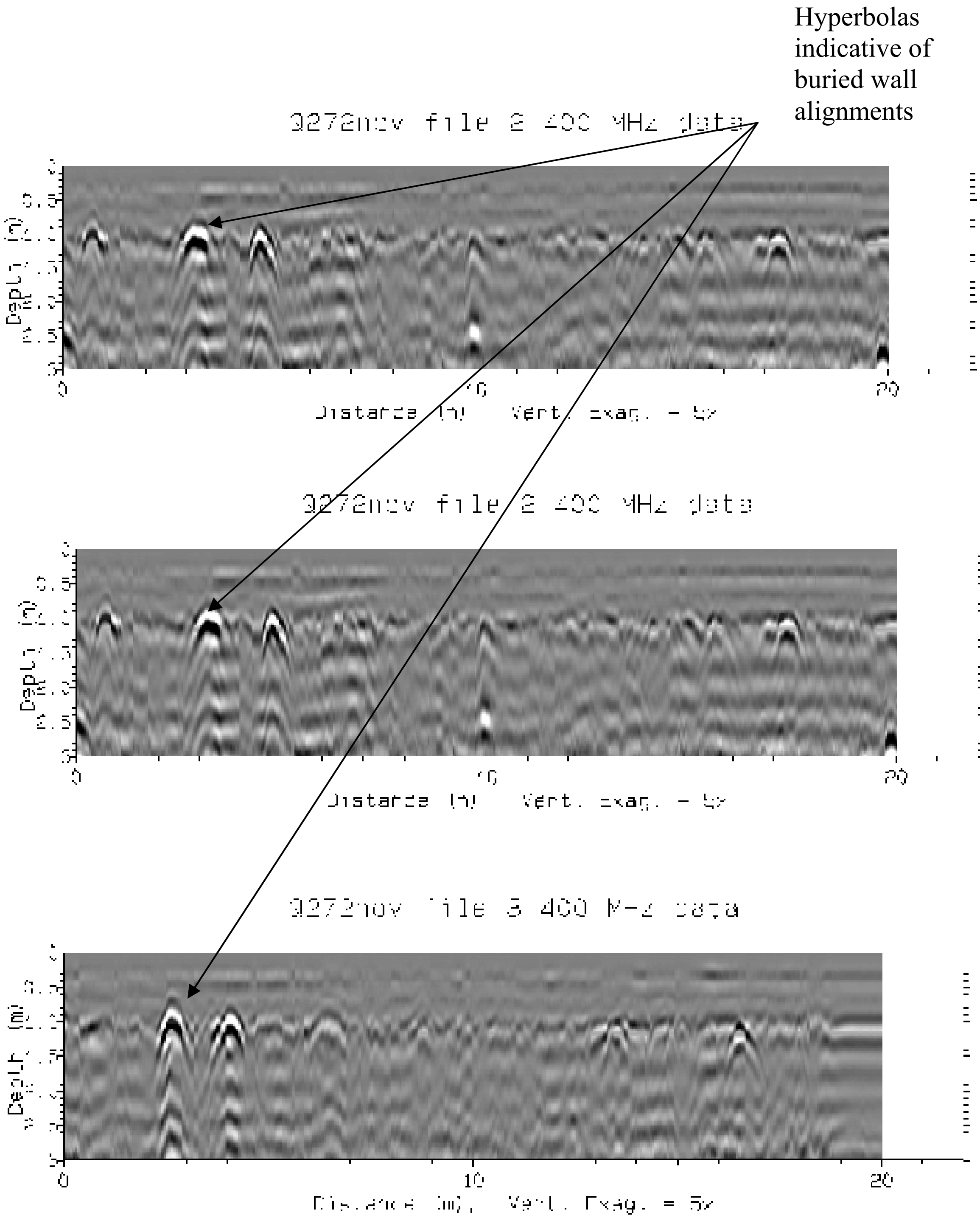
Non-invasive techniques do have limitations. For example, thermal remote sensing must be tuned to the seasonal, regional, and diurnal variations in thermal optimal conditions. GPR, on the other hand, is sensitive to the dielectric properties of soils and soil moisture. However, one important advantage of GPR surveys over other geophysical methods is that the subsurface stratigraphy, archaeological features, and soil layers at a site can be mapped in real depth. This is possible because the timing of the received radar pulses can be converted into depth once the velocity of the radar waves travel through the ground is known (Conyers and Goodman 1997; Smith and Jol 1995). The accuracy of depth calculations depends on a calibration of the electrical properties of the soil as well as its moisture content (also known as relative dielectric permitivity or RDP). When these factors are understood, a high-resolution map of the subsurface can be produced.

The three-dimensional approach discussed here is known as amplitude time-slice analysis and is relatively new, but it has potential to accurately resolve archaeological features (Conyers and Goodman 1997). The availability over the past 10 years of powerful microprocessors has revolutionized the ability to process GPR data in three dimensions (Scollar et al. 1990). Unfortunately, studies in a controlled environment to accurately calibrate the regional soils, moisture content, and optimal conditions for data acquisition remain largely unexplored (although see Isaacson et al. 1999 for an example of a controlled geophysical test bed).

Results of the 2002–2003 C&T Project Site Surveys

GPR data are processed using a program created by Larry Conyers at the University of Denver called GPR Process©. Once processed, the data can be used to create a variety of images, including amplitude time-slice maps. An amplitude time-slice image is created by assigning a specific color to each of the reflected wave amplitudes. Although colors can be manipulated, the higher amplitudes will always be more visible than are lower amplitudes (Conyers and Goodman 1997:27). Amplitude time-slice maps are relatively easy to produce and provide a colorful depiction of an entire GPR survey area. For this reason, we initially used these images as the primary tool for locating buried deposits at the C&T Project sites (see Figures 70.4, 70.5, 70.6a, 70.6b, 70.7, and 70.8). Unfortunately, the amount of surface and buried masonry rubble, or *noise*, at all of these sites made it difficult to clearly differentiate between the rubble and the intact archaeological features.

To provide a clearer picture of the buried cultural deposits at sites scheduled for excavation, we turned to the raw data reflection profiles (Figures 70.3a, 70.3b, and 70.3c). In the reflection profiles, buried objects are represented by hyperbolas of varying widths; a single hyperbola visible in only one file is usually the result of noise. Hyperbolas that are consistently visible in several adjacent profiles reflect buried architectural features (i.e., wall foundations, partially collapsed walls, or subterranean features or structures). Figures 70.3a, 70.3b, and 70.3c provide examples of reflection profiles indicative of a possible buried wall at a site scheduled for excavation during the 2003 fiscal year. In this case, the continuous hyperbolas visible on the left side of the profiles continued to be visible in 12 of the subsequent profiles not depicted here. Multiple hyperbolas in the same location in a profile are a good indication of a substantial buried feature.



Figures 70.3. A (top), b (middle), and c (bottom). Reflection profiles from a pueblo roomblock site scheduled for excavation in 2003. The continuous hyperbolas are indications of buried archaeological features.

Following excavation, in-depth data analysis of the relevant surveys was done in an attempt to understand these data in relation to the actual subsurface architecture, site development process, and the natural geology. Once excavation had been completed, the location of all of the architecture was then mapped digitally and overlaid on to the image maps and was noted on each raw data profile. This was done in order to get an idea of what the image maps represented and to determine the nature and type of radar reflection when it encountered subsurface architecture and other features.

Airport Tract

LA 86534

Conyers surveyed LA 86534 in December 2001, using a 32- by 25-m grid. The results of his survey were encouraging. Room alignments were visible in the amplitude time-slice maps; however, in some places it was difficult to differentiate the walls from the wallfall. The excavation of LA 86534 provided some degree of "ground proofing" in that room alignments did correlate to the amplitude time-slice maps (Figure 70.4).

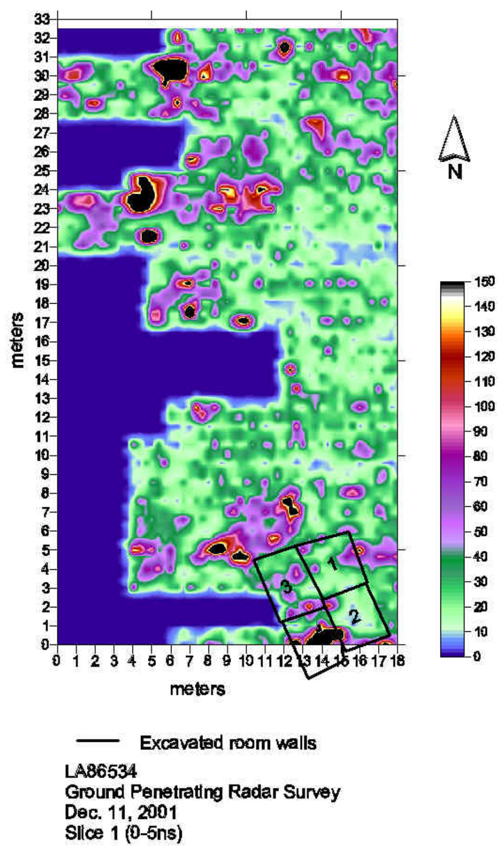


Figure 70.4. LA 86534 amplitude slice map with excavated walls noted with solid black lines.

Post excavation analysis of the raw data profiles was somewhat successful in that the location of structure walls was possible to discern but difficult due to the weakened signal in the near-field zone and the proximity of the architecture to the surface (Figure 70.5).

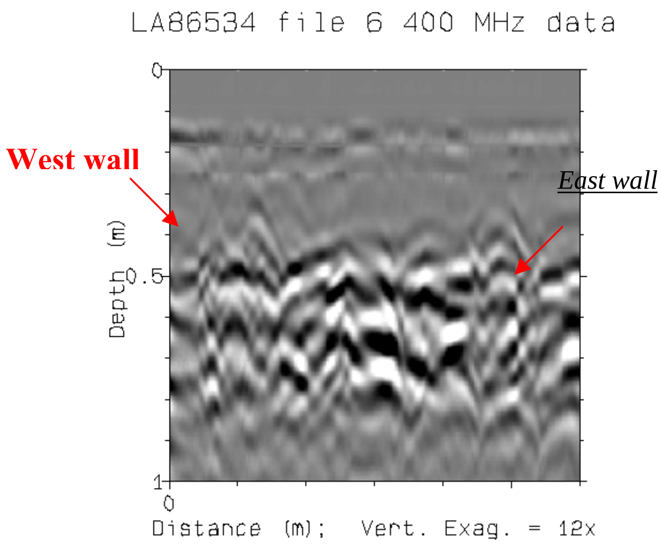


Figure 70.5. LA 86534 raw data profile of Room 1; note location of walls and relationship to hyperbolic reflections.

In Figure 70.5, there is clear reflective activity in the form of hyperbolic reflections that correlate to the subsurface architecture. Out of the 12 profiles included from this roomblock, Figure 70.5 is the only one that produced such clear reflections. The rest were somewhat obscured by room fill and site disturbance from road construction. This area of disturbance was originally thought to be the location of the roomblock and so survey parameters were limited to its boundaries and therefore, we did not survey far enough to the east or south to identify the rest of the roomblock (another 4 rooms) or kiva that was found during excavation.

LA 135290

LA 135290 (Q-272) is a pueblo roomblock site west of LA 86534 that was excavated during the 2003 season (Chapter 25, Volume 2). GPR surveys were conducted when conditions at the site were very dry and again after a storm to account for changes in the dielectric permitivity of the subsurface deposits. The site was also subjected to several geophysical surveys including seismic refraction, GPR, and magnetometry.

The GPR surveys at LA 135290 were conducted in May and December of 2002. In general, the grid parameters were the same for both surveys, covering a 24- by 22-m area that encompassed a mound with visible rock alignments on the surface. The purpose of the surveys was to identify the extent of the site, including the location of a possible kiva, and to determine location and number of rooms in the roomblock. The two surveys were significantly different in terms of moisture content in the soil. Unlike the May survey that was conducted during a dry period, the December survey was done just after a snowstorm and there was much more water content in the soil matrix. Data acquisition of these two surveys also differed in regard to the profiling direction. The May survey profiling was done along the north-south axis while the December survey was done along the east-west axis. These two factors made a big difference in radar reflection patterns and resolution (Figure 70.6a and 70.6b).

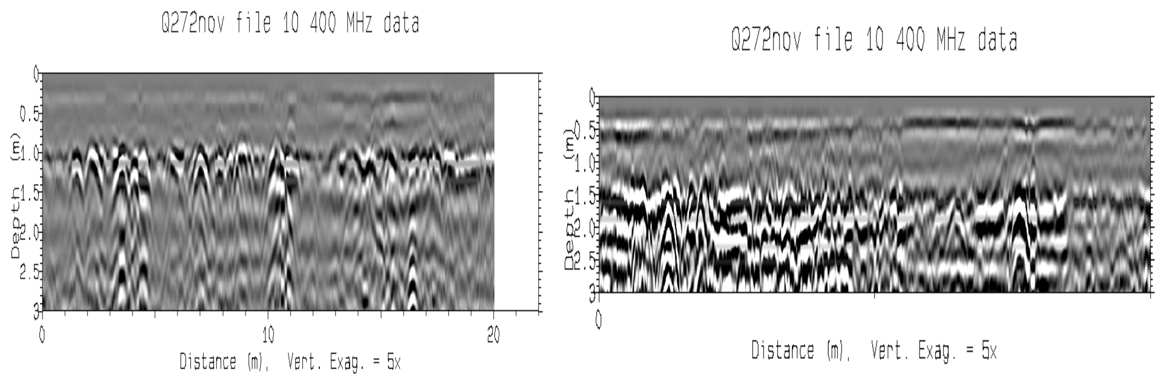


Figure 70.6. Raw data profiles from LA 135290 during a) the May survey (left) and b) the December survey (right).

Although the two profiles in Figure 70.6 are different in terms of profiling direction, each one is representative of the difference in energy reflection as the antenna traversed over the roomblock. Figure 70.6b illustrates the effects of added moisture on the overall resolution of the archaeological features. Notice that in Figure 70.6b, there are stronger reflections lower in the profile than in Figure 70.6a. As you move deeper within this soil context, the clay content increases therefore the amount of water absorption also increases. The increase in water content with depth has slowed the signal down and enhanced the materials within the rooms.

Amplitude slice maps of the December survey definitely illustrate the difficulty of imaging roomblocks with a large amount of rubble fill. Figure 70.7 shows the known location of the roomblock although the exact boundaries are still unclear. The circle in the northeast corner of the image is the proposed location, at least from this set of data, of the kiva. Other geophysical studies done at the site have located the kiva as part of the easternmost edge of the roomblock. Due to the large amount of rubble fill, it is very difficult to discern from this particular survey what could simply be another room from what might be a kiva in that area. As a whole, these other studies, magnetometer and seismic refraction, provide a map of buried deposits at the site, including features that have been interpreted as individual walls. According to these data the wall foundations are resting on the natural bedrock surface, rather than being dug into bedrock, as has been the case at other sites on the Pajarito Plateau. Excavations in 2003 did not locate a kiva at LA 135290.

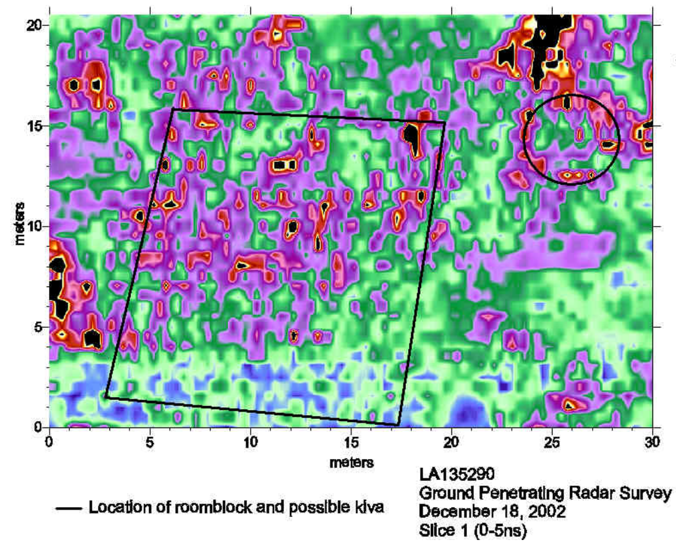


Figure 70.7. LA 135290 amplitude slice map showing general location of roomblock.

White Rock Tract

LA 12587

LA 12587 was subject to five GPR surveys over a six-month period, partially due to a desire to gain the best possible data and partially due to the fact that the site's boundaries increased as excavations proceeded. The initial survey encompassed a 37- by 23-m area. The west to east transects, however, varied in length from 13 to 23 m. This grid area included the central mound, the circular rock features to the west of the mound, and the linear agricultural features to the north of the mound (see map of LA 12587). The second survey was 28 by 19 m, had varying transect lengths, and focused on the central mound area. At this point, a Nikon EDM was used to gather point location data for more than 200 masonry rubble blocks on the surface of the site. These data were overlaid onto the amplitude time-slice maps to distinguish surface rubble from buried deposits. The success of this process was limited.

As the site boundary expanded and more trees were cleared, we conducted a third survey of a 16- by 10-m area in the northern portion of the site where surface indications suggested the presence of agricultural features. The fourth survey included areas to the south and east of the central mound to determine whether or not additional architectural features, including a possible kiva and masonry rooms, were present. Although no kiva was detected, several wall alignments to the south were identified during the processing of these data. Subsequent excavations in the southern portion of the site exposed an additional roomblock. The fifth and final survey at LA 12587 expanded the area further to the east in search of a kiva. Interestingly, the fourth and fifth surveys provided data to suggest that there was some kind of circular feature to the east of the roomblock. Excavation of this area revealed undulations in the natural bedrock that were incorrectly interpreted as architectural features. Undulating bedrock is another unanticipated aspect of the natural geology that will need to be accounted for in future GPR surveys.

Once excavations were completed, further analysis of the first survey was done, which included plotting and drawing the results of the excavation on each of the slice maps. It should be noted that improved processing techniques were applied to the original data at this time, therefore the image maps reveal much more than the images used to interpret the site previously. The improved images do reveal wall alignments but they are not obvious without the "guidance" of the drawn architecture (see Figure 70.8a and b).

a)

b)

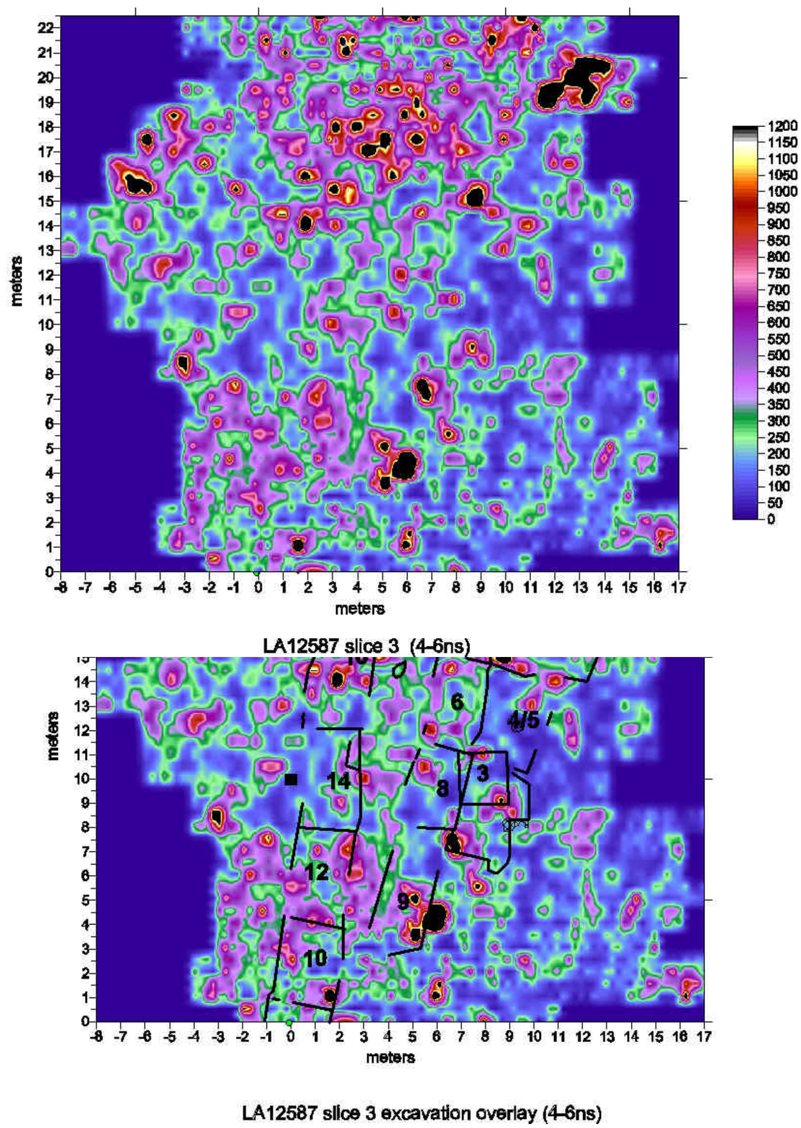


Figure 70.8. LA12587 amplitude slice maps a) without plotted excavation and b) with plotted excavation.

Figure 70.8a does not reveal any obvious wall alignments. After the location of the excavation was drawn on the map, these alignments become more visible. For example, the wall alignments of Rooms 2 and 6 are particularly visible, although somewhat intermittent in the imaging (refer to Figure 70.8b). Clear associations between the imaging results and the excavation results vary from room to room and across the entire site in these particular images for several reasons. First of all, these amplitude slice maps are sliced at particular intervals that do not correspond with changes in topography or varying depth of the cultural features, therefore clearly distinct wall alignments cannot be expected. Without topographic correction at a very small scale, different amplitude slices will image different parts of the wall according to their depth so intermittent imaging of these walls is not that surprising. Software programs for topographic correction of radar data during analysis are still under development.

Another reason for the discontinuous appearance of the wall alignments is that the remaining architecture also varies in construction. For example, in some of the rooms all that remains are the foundation stones without any capstones or courses and in other rooms there are up to two courses still standing. This would definitely create a difference in signal reflection with the more significant walls having much higher amplitudes than the others, therefore also contributing to the intermittent appearance of the wall alignments. In some cases the walls are simply not there any longer. Further complicating the matter is the simple fact that, during site formation processes, the once intact walls have collapsed in different directions making it very difficult to discriminate actual wall from wallfall and room fill. This type of event is particularly detrimental to radar interpretation especially in cases where the construction materials are identical to the natural geology, which is the case here. The less contrast there is between the cultural materials and the natural geology of the area, the more difficult it is to differentiate those materials.

Lastly, interpreting these data is also complicated by the limitations of radar technology itself. As mentioned before, different antenna frequencies emit radar pulses that penetrate at different depths and speeds depending on the type of context and moisture content. A dual 400-mhz antenna was used on all of the surveys in this report. This antenna can generally penetrate to approximately 3 m in depth and produces a pulse to about 25 to 45 cm in wavelength depending on the context (Conyers and Goodman 1997:45). The average width of the walls at this site ranges between 20 to 30 cm with top depths no greater than approximately 10 to 15 cm below the surface and bottom depths at approximately 40 cm. Depending on the relative dielectric permitivity (not determined at the time of survey, therefore only estimates can be made) of the soil in combination with the "near-field" effect (see Conyers and Goodman 1997:55), it is possible that the 400-mhz antenna was unable to resolve features this small at such shallow depths.

Due to the fact that the amplitude maps did not give a clear idea of where the wall alignments were, we began to look closely at the raw data profiles. The location of each wall was annotated on each profile and then studied for patterns that could be recognizable. This process was somewhat successful using a program called GprViewr version 1.1 created in July of 2003 by Jeffrey Lucius and Larry Conyers. This program allows you to view the individual profiles and filter out the background noise and adjust the gains as necessary. This process was quite helpful in interpreting these data and we soon discovered that most of the important reflections are in the first few nanoseconds including the near-field zone.

In Figure 70.9, hyperbolic reflections are slightly visible indicating the exact locations of the west and east wall in Room 16. This is a good example of how the near-field effect can weaken the signal as it couples with the ground surface. During excavation, the walls were found just 6 cm below the surface and it was noted that only the foundation remained of what used to be at least a couple of courses high at abandonment. It was also noted that there was considerable amounts of wallfall in the room fill. This is very apparent in the raw data profile as there are stronger reflections indicating the contrast between inside and outside of the room.

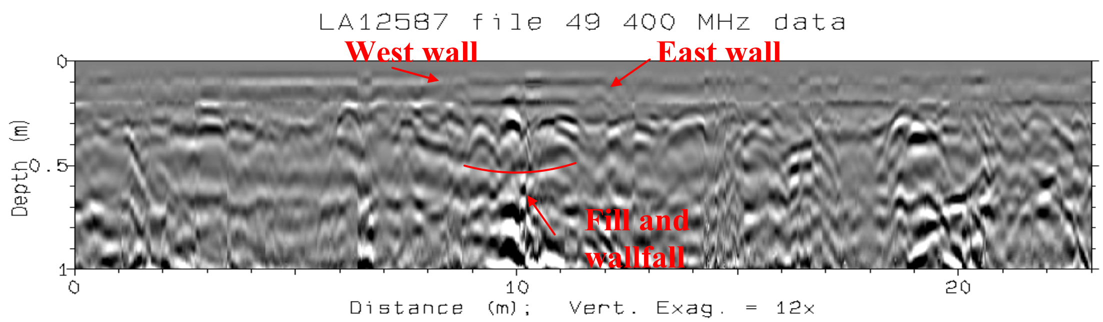


Figure 70.9. LA12587 profile of Room 16 with shallow hyperbolic reflections indicating walls with room fill and wallfall.

All of the known architecture was plotted on each data profile and analyzed in this fashion. Due to many of the limitations discussed above, we were not able to clearly discern each room in each profile as well as what is found in Figure 70.9. Consequently we were also unable to resolve any other cultural features, such as floors or hearths that were further complicated by the large amounts of wallfall and rubble in many of the rooms. Nonetheless, the complete analysis process did provide a good test for equipment, collection methods, and processing improvements for later surveys.

LA 127631

LA127631 is a small one-room structure that was surveyed using a 9- by 7-m grid in May 2002 (Figure 70.10a and b). Data reflected in amplitude time-slice maps for this site were relatively ambiguous. Surface indications suggested that there was one small triangular structure at the site. Amplitude time-slice maps did not provide clearly defined indications of wall alignments. We did manipulate the amplitude time slice by smoothing it, however, the proposed room location did not change (Figure 70.10a and b). The size of the grid, or the integrity of the architectural remains, may have impacted the results.

Excavation of this small site revealed a one-room fieldhouse encountered within grid coordinates 104N/104E, so the proposed location was just north of the actual structure and only encompassed a small part of the northwest corner.

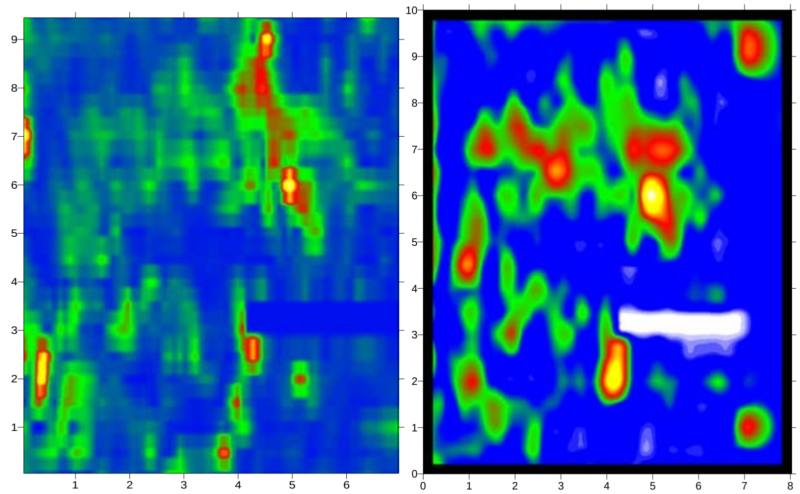


Figure 70.10a and b. LA 127631, with room locations based on the amplitude time-slice map and on the profiles from the site (scale is in meters). The data have been smoothed in the image on the right; however, the proposed room location remains approximately the same.

Further processing of the data after excavation was complete shows the actual location of the structure (Figure 70.11). The amplitude slice in Figure 70.11 has been processed with less interpolation between profiles improving resolution of each reflection providing much less distortion of the data. Even with the improved accuracy of reflection imaging, the location of the structure is still not readily visible. Reasons for this relate directly to the depth of the structure, which is only 20 cm below the surface. Again, this is a result of the inability of the 400-mhz antenna to clearly resolve 20-cm-wide walls at shallow depths.

Resolution was also limited by transect spacing. Due to the elliptical pattern or cone shape of the radiation as the signal penetrates the soil, there is some overlap of this cone between transects. This overlap is limited by many factors, but the most important of those is depth and relative RDP (Conyers and Goodman 1997:36). To summarize briefly, the cone's footprint is generally smaller in diameter at shallower depths. The structure at LA127631 is only 2 by 1.5 m in size.

Fifty-centimeter transects were used to collect the data and were too large to achieve good repeatability of the reflection from profile to profile, therefore limiting resolution and imaging capabilities. As it turns out, the environment in which the site is located is undergoing active erosion, including a small arroyo just west of the structure. The strong reflections seen in Figure 70.7 are essentially a visual of those erosional activities.

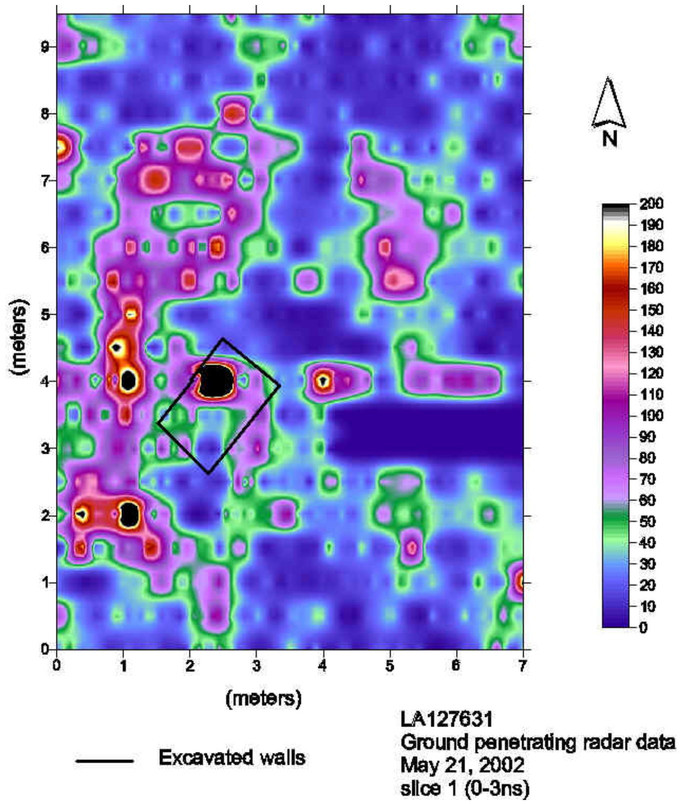


Figure 70.11. LA127631 Amplitude slice map (0 to 3 ns) with excavation overlay.

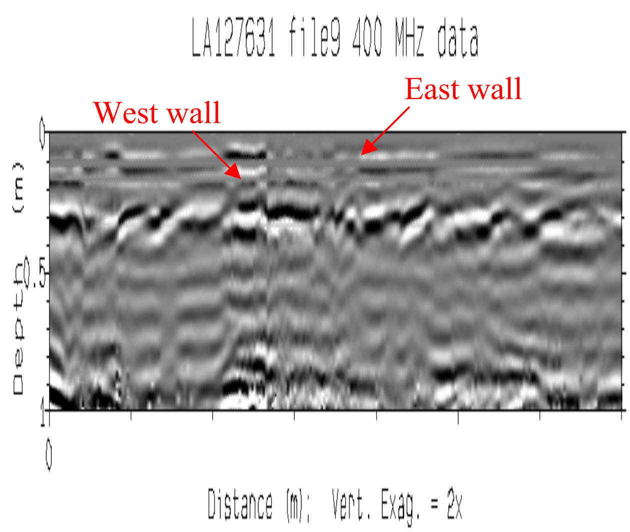


Figure 70.12. LA127631 profile with annotations indicating structure walls.

The raw data profiles were also analyzed after excavation was completed. Although the analysis of these data was limited due to the factors mentioned previously, they did yield some results. Out of the four profiles that the structure was located in, there were only two that actually crossed the walls at an angle good enough to produce hyperbolic reflections. The profile shown in Figure 70.12 does reveal the actual location of the west and east wall, respectively. The hyperbolic reflections are a bit vague due to the near-field effect but they are there.

Again, this site is another example of how collection methods and limitations of the equipment have affected the success of amplitude slice imaging and resolution of the archaeology.

LA 128803

LA128803 is a Classic period grid garden. A stone hoe found on the surface lent further support to this contention. The site is composed of several basalt rock alignments located on a northeast-facing slope. The GPR grid used at the site was 10 by 12 m and the original amplitude time slices did not reveal identifiable features. After excavation was completed, further analysis and processing was done. After applying improved processing techniques that limit the amount of interpolation between data profiles, the grid feature was much more visible in the slice maps. Surprisingly, the results of the image map not only revealed the actual location of the grid garden feature that was excavated but it also suggests other areas in which the feature may continue (Figure 70.13). Soil samples for pollen and flotation analysis were taken from inside and outside of the feature so further study of those materials will verify whether or not the imaging successfully revealed a continuation of the cultural deposit. The shallow nature of this feature and the angle at which the radar signal crossed the alignments has made it difficult to clearly identify them in the raw data profiles consistently. Nevertheless, there are some profiles in which the alignments can be located by the hyperbolic reflections in the near-field zone (Figure 70.14).

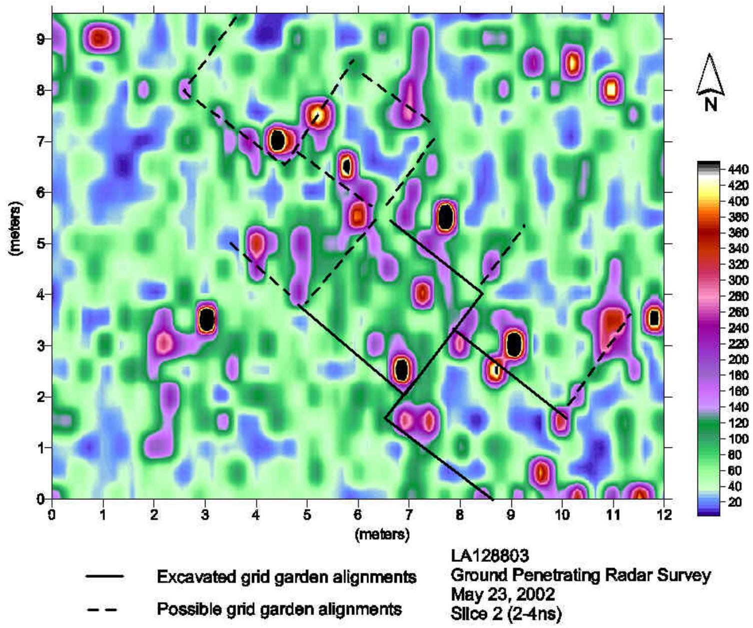


Figure 70.13. LA 128803, a grid garden. Actual excavated features are identified with solid lines and the potential linear features are indicated by a dotted line.

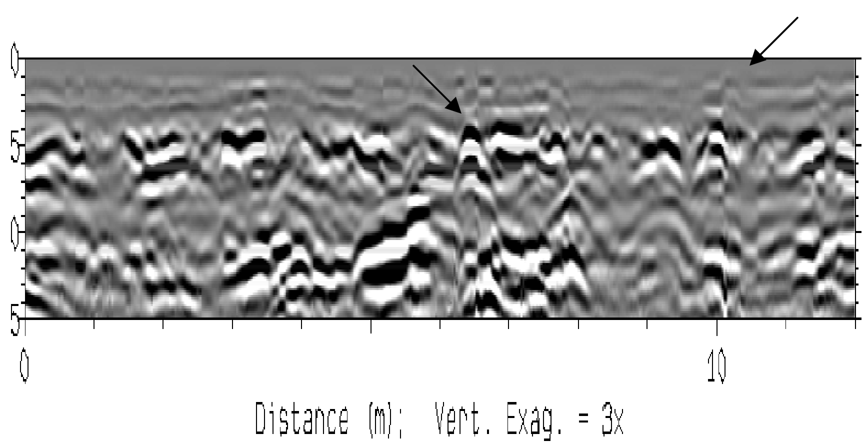


Figure 70.14. LA128803 raw data profile. Note hyperbolic reflections indicating locations of rock alignments.

The overall success of radar prospection at this site is largely a result of the original site development at the time of occupation. It is still subject to many of the limitations and problems of the previously discussed sites in terms of depth and size of the archaeological features, but where it differs is in the material and construction. Unlike the other sites, the feature was constructed out of basalt from local outcrops instead of the natural tuff. It also appears, according to the geomorphologic analysis of the site, that the native fill was removed from inside of each grid and replaced with a more arable mixture of soil. A more arable soil would have been more effective for retaining water making it significantly different than the surrounding soil on the surface. This difference has certainly impacted the ability of the radar signal to detect a more distinct contrast between the natural context and the culturally constructed one, therefore improving the imageability of the data.

LA 128805

LA128805 is a one-room structure that was surveyed using an 11- by 10-m grid (Figure 70.15). There was a great deal of surface rubble at the site when it was surveyed and as a result the antenna was not coupled with the ground surface at all times. When decoupling occurs, the resulting data are impacted; this was the case at this site. The initial interpretation for the site was that it was a two-room structure. Excavation of the site revealed a one-room structure built of tuff blocks up to two courses high. It is likely that the extensive amount of surface rubble at

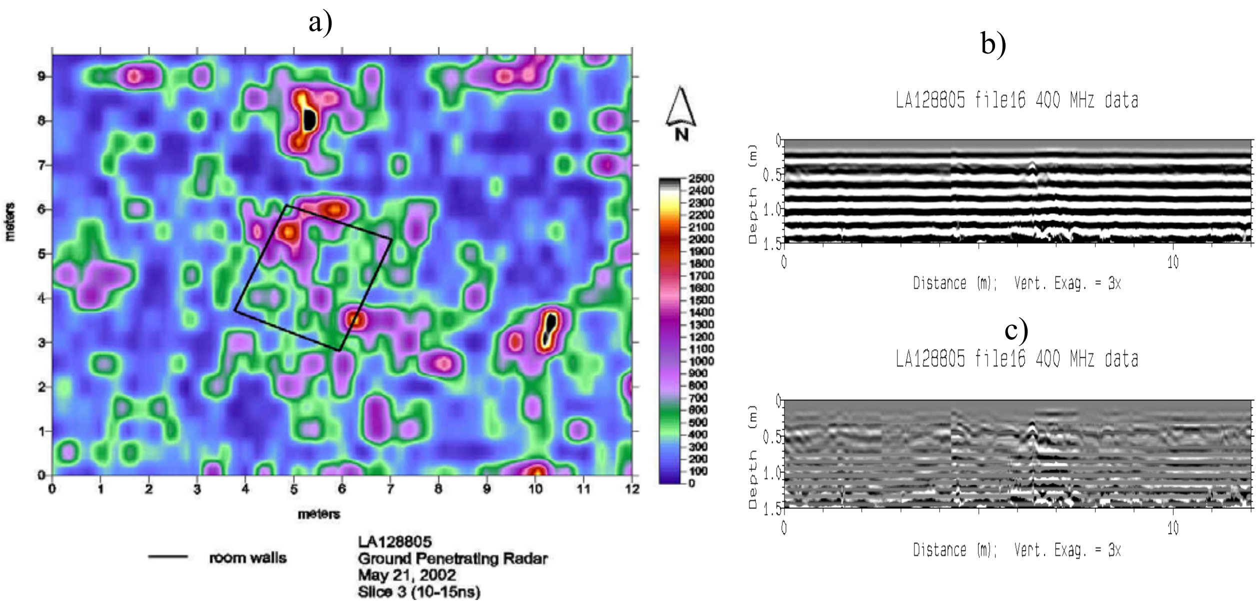


Figure 70.15. LA 128805 a) amplitude slice map with location of excavations indicated by black line, b) raw data profile with severe banding due to frequency interference and decoupling, and c) raw data profile.

the site created so much noise that it was not possible to distinguish wall alignments from the amplitude slice maps. These data were further analyzed after excavation was completed and new slice amplitude maps were created. The new slice maps (Figure 70.15a), however, did not provide any clear indications of wall alignments either. The most significant reason for this is most likely due to a shallow deposition to the floor of the feature of only 31 cm and most of the fieldhouse was already visible on the surface. These data were collected with a 400-mhz antenna, which has limited resolution capabilities at shallow depths. Other factors that further complicated the data include impacts to the structure from heavy erosion, the presence of a small drainage along the southern edge of the structure, and significant amounts of decoupling that caused high reflections as a result of the signal traveling through air.

During examination of the raw data profiles it was immediately evident that there was significant signal interference that resulted in the severe banding of the recorded data shown in Figure 70.15b. This type of interference is a result of FM radio transmission or other electronic devices that are in use at the time of data collection (Conyers and Goodman 1997:75). Background filtering was applied (Figure 70.15c), but there was still subsequent impact to reflection clarity, therefore limiting the analysis of the raw data in comparison to the amplitude slice imaging results.

Future Directions

In the initial year of GPR research at Los Alamos National Laboratory, the Cultural Resources Management Team surveyed five sites as part of the C&T Project as well as three additional sites. Results from these surveys have provided several lessons learned. First, there are several environmental and geological issues to consider when doing GPR. One of the most important concerns is that soil moisture has a great impact on the speed at which GPR can move through local sediment. The dielectric permitivity of the sediment changes as the amount of moisture absorption and retention changes with increased depth. The survey done at LA 135290 illustrated how this dynamic directly affects the quality of signal resolution. Our results were greatly impacted by this factor, as many of the surveys were conducted during a period of severe drought, therefore limiting resolution of architectural detail. A different problem, although somewhat related, is that the dielectric permitivity of the tuff blocks used to construct site architecture can be almost identical to that of the surrounding sediments, particularly during times of drought. The less contrast between the cultural materials and the natural geology, the more difficult they are to segregate. Several of the surveys in this study demonstrate this difficulty. Perhaps the addition of water would help to solve this particular problem, but further research needs to be done first to determine its consistent effect on sites in this area. There are still many questions that need to be answered with regard to how GPR works in this environment especially with regard to signal absorption by the native tuff. Attention to these issues will certainly make future surveys much more successful.

Second, many of the other problems that were discovered during post-excavation data processing deal mostly with collection methodology and equipment limitations in relation to signal resolution. The inadequacy of the 400-mhz antenna to resolve much above 40 cm at these sites is the most glaring constraint that needs to be addressed in further surveys. Soil velocity and approximate depth of the architecture needs to be assessed before survey to select the most adequate antenna that will provide the desired results. Many of the 2002 surveys might have been much more successful if a higher frequency antenna was used to achieve better resolution at shallow depths. It is not to say, though, that these other antennas do not have their own limitations to consider but it would be beneficial to survey each site with at least two different frequencies to get a better data sample, especially if the velocity of the material is unknown. Transect spacing also affects resolution and should be adjusted when doing surveys at many of the archaeological sites on the plateau. All of the 2002 surveys were collected with 50-cm transects. In general, 50-cm spacing is usually adequate when you are trying to resolve features that are at least a meter in depth and are at least 50 cm in size. Many of the features in these surveys measure under these parameters, therefore 25-cm spacing would be much more appropriate for better data acquisition and consistency.

We have also learned that attention to grid set up and parameters is very important for good surveying results. First and foremost, the grid boundaries at a site should be substantially larger than those based on visual surveys of where the majority of the site architecture is located. At LA 12587, rooms were discovered in areas where there were no surface indications of architecture. At LA 86534 the kiva was encountered in a roadbed also exhibiting no surface indications of a subterranean feature. Larger grid dimensions would have been much more beneficial at both of these sites. The angle of the grid should also be thought out in terms of how the energy will come into contact with the size and shape of the archaeological features. Diagonal profiling in respect to linear architecture is usually recommended, but unfortunately it makes clear recognition of point sources, which produce hyperbolic reflections, more difficult to determine in the raw data. This collection method causes the reflection to sort of stretch out and become less enhanced making raw data analysis much more complicated than necessary. When time and money are available, surveys in both directions in which the signal is directly perpendicular to the linear architecture would be more advantageous especially in contexts where there is very low contrast and image interpretation is limited. Although doing this would make it a little more difficult to correlate the GPR grids to the excavation grids, it would not be impossible if the exact bearing of north was known.

There are some smaller suggestions that should be considered when doing further surveys that could also make a difference in post-acquisition data processing and interpretation in future surveys. Some of these include surface mapping of all of the vegetation, geologic formations, and surface debris; slowing down data acquisition to limit problems with decoupling; adjusting the low-pass filter to guard against signal interference from radio frequencies; and profiling in one direction only to limit inconsistencies in data reflection from profile to profile.

Overall, we hope that our effort to combine GPR and archaeology will help guide excavations at sites like LA 135290 (Q-272) and others. Excavation allows us to ground truth our interpretations of the GPR data and to develop a better understanding of what buried cultural features should look like in reflection profiles and amplitude time-slice images. Once that understanding has been achieved, then future GPR surveys will not only guide site testing and excavation but they will also provide a foundation for project planning, which would include budgeting time and funding and ultimately improving estimates for approximate project completion.

CHAPTER 71
INTRASITE SPATIAL ANALYSIS

Brian C. Harmon, Gregory D. Lockard, and Bradley J. Vierra

INTRODUCTION

This chapter presents a preliminary study of the spatial organization of the C&T Project sites. These data may provide some important insights into site function, occupying group size/structure, and settlement history. As defined by Binford, site structure is the "spatial distribution of artifacts, features, and fauna on archaeological sites" (1983:144). It is the spatial relationships between facilities and artifact distributions that provide information on internal site organization and activities. On hunter-gatherer sites, this might be as simple as the distribution of artifacts around a campsite. In contrast, agricultural communities may include architectural floor plans, construction sequences, and associated midden deposits. Together, this spatial information provides a productive avenue of research for understanding past settlement organization.

ARCHAIC SITE STRUCTURE

Three of the Archaic period sites excavated during the C&T Project are in eroded contexts (LA 12587 [Area 8], LA 99396, and LA 99397). It is hardly surprising that features were not found at any of these sites. Site structure data, such as variations in the distribution of different artifact types, are unlikely to be preserved at these sites. Nevertheless, artifact distribution data from LA 99396 were examined. The large size of the site (1385 m^2) and the fact that all artifacts recovered from the site were analyzed suggested that if intrasite patterning could be detected it would most likely be detected at LA 99396. No patterns were found in the distribution of chipped stone debitage, although some patterning was seen in the distribution of chipped stone tools. Geomorphic evidence suggests that the habitation surface at LA 85859 has not been eroded away, although the soil horizon is highly bioturbated and the precise depth of the occupational surface is unknown.

LA 12587 (Area 8)

The Archaic period component of LA 12587 is distributed within the 5200-m^2 site area. However, it probably represents a remnant lag deposit due to the erosion of an unknown amount of mesa top soils. The artifact scatter is located in an area of thin soils that overlie tuff bedrock. Soils in the vicinity of the artifact scatter lack Bw horizons and instead exhibit A-BC or A-C horizons. This weak soil development is consistent with a possibly less than 500-year age for the colluvium. The site is in an actively eroding surface with minimal potential for the preservation of intact archaeological deposits (Chapter 57, this volume).

LA 85859

LA 85859 is a 368-m^2 Archaic lithic scatter on a northeast-facing hillslope underlain by Qct pumice. The Qct pumice is overlain by a buried soil in colluvium up to 80 cm thick that has an inferred middle Holocene age of 6.7 to 7.4 ka. The middle Holocene soil profiles are truncated, and are overlain by a late Holocene colluvial deposit less than 25 cm thick. The distribution of the artifacts at the site suggests that they were not transported from upslope areas; that is, there appears to be little or no horizontal displacement of the assemblage. However, there is evidence for substantial bioturbation and vertical transport of artifacts since site abandonment. The precise depth of the original occupation surface could be not isolated, but probably occurs in the upper portion of the middle Holocene deposit (Chapter 57, this volume).

Although the Archaic period occupation surface at LA 85859 has been significantly disturbed, it has not been removed. The absence of features at this site may, therefore, indicate that no archaeologically detectable features were present when LA 85859 was occupied. Artifacts from eight 1- by 1-m excavations units have been analyzed. While this sample represents 37 percent of the artifacts recovered from the site it only reflects a 24 percent areal sample of the excavated units, which may not be sufficient artifact distribution analysis. However, given the *relatively* intact nature of Archaic period deposits at LA 85859, a future analysis of the distribution of artifact types within the upper portion of the middle Holocene deposit (i.e., Strata 3A and 3B) may be warranted.

LA 99396

LA 99396 is a 1385-m^2 multicomponent site consisting of an Archaic period lithic artifact scatter and a Coalition period one-room fieldhouse. The site is situated on the broad, open, southeast-facing slope of a saddle. Headwater cutting of several small washes has created an area of shallow erosion across much of the southeastern portion of the site. The local stratigraphy consists of late Holocene eolian or slopewash deposits generally less than 15 cm thick that overlie late Pleistocene or early Holocene eolian deposits, late Holocene (1 to 2 ka) swale fill deposits, or pumice. Most of the artifacts at LA 99396 appear to have been reworked into the less-than-1000-year-old late Holocene colluvium. It is possible that the Archaic artifacts in the late Pleistocene to early Holocene deposits are in a somewhat better context; however, it is likely that much of the Archaic site component, including the occupation surface, has been eroded away, with the artifacts transported downslope and concentrated in a shallow gully below the site (Chapter 57, this volume). Figure 71.1 shows how the distribution of surface artifacts has been shaped by erosion and topography.

While there is no evidence of *in situ* Archaic period deposits at LA 99396, although it was thought that the different lithic debitage types might exhibit some spatial patterning across the site. Figure 71.2 illustrates that there is no difference in the surficial distribution of angular debris, core flakes, biface flakes, and microdebitage across the site; however, the artifacts are distributed in roughly two clusters. One is situated in the northeastern section and the other in the south-central section of the site. Both contain evidence of core reduction and tool production/maintenance activities.

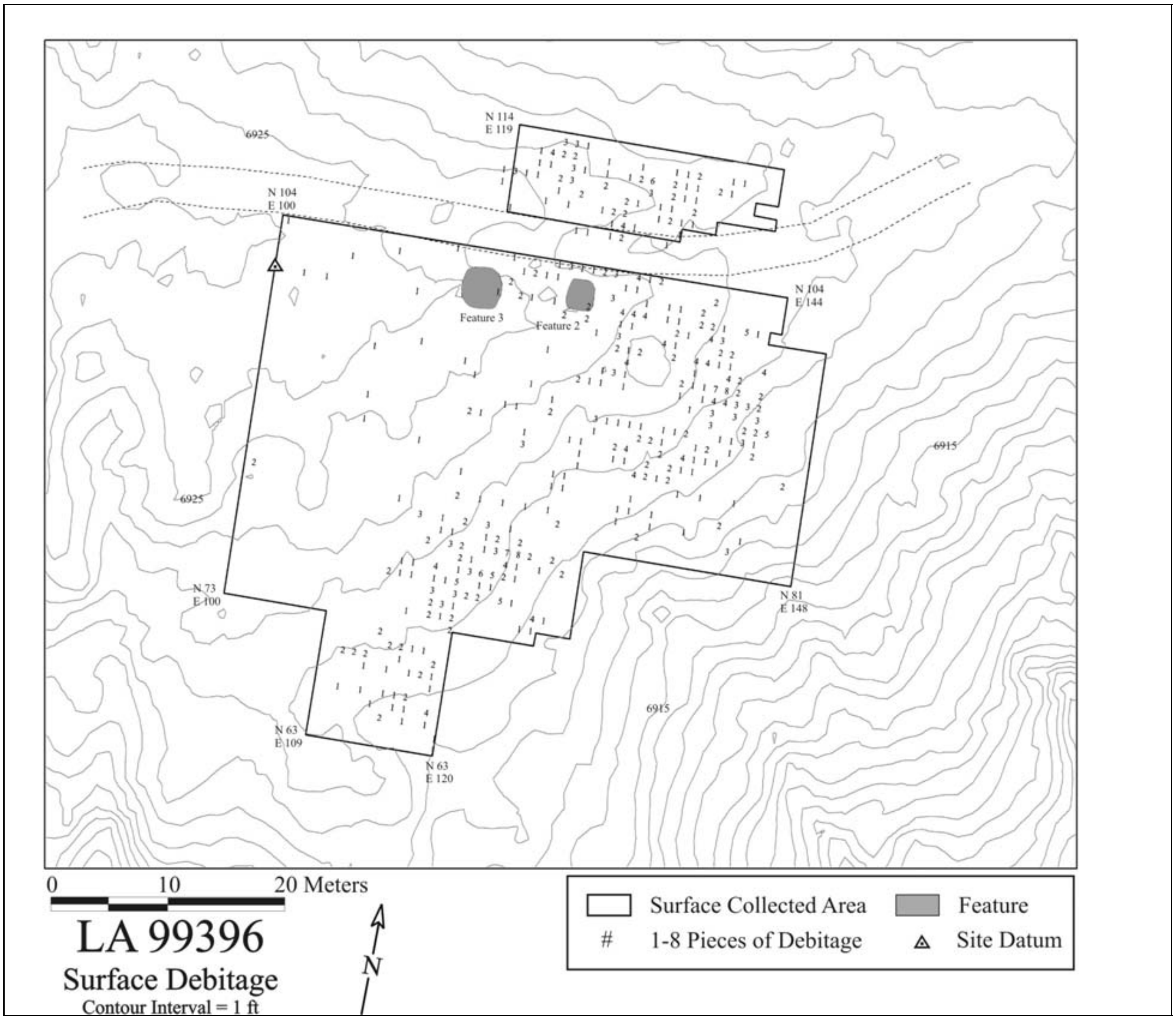


Figure 71.1. LA 99396 surface distribution chipped stone debitage.

The northeastern cluster also includes a few ceramic artifacts and a possible Coalition period fieldhouse, so this area is presumably multi-component. There is, however, some patterning in the distribution of chipped stone tools (Figure 71.3). The tools spatially cluster into these two groups: the northeastern cluster which consists mostly of bifaces, but also includes projectile points and retouched pieces; and the south-central cluster that consists of fewer, but more diverse tools. Both areas presumably contain Archaic materials, but the south-central cluster may be less contaminated by the subsequent Ceramic period occupation.

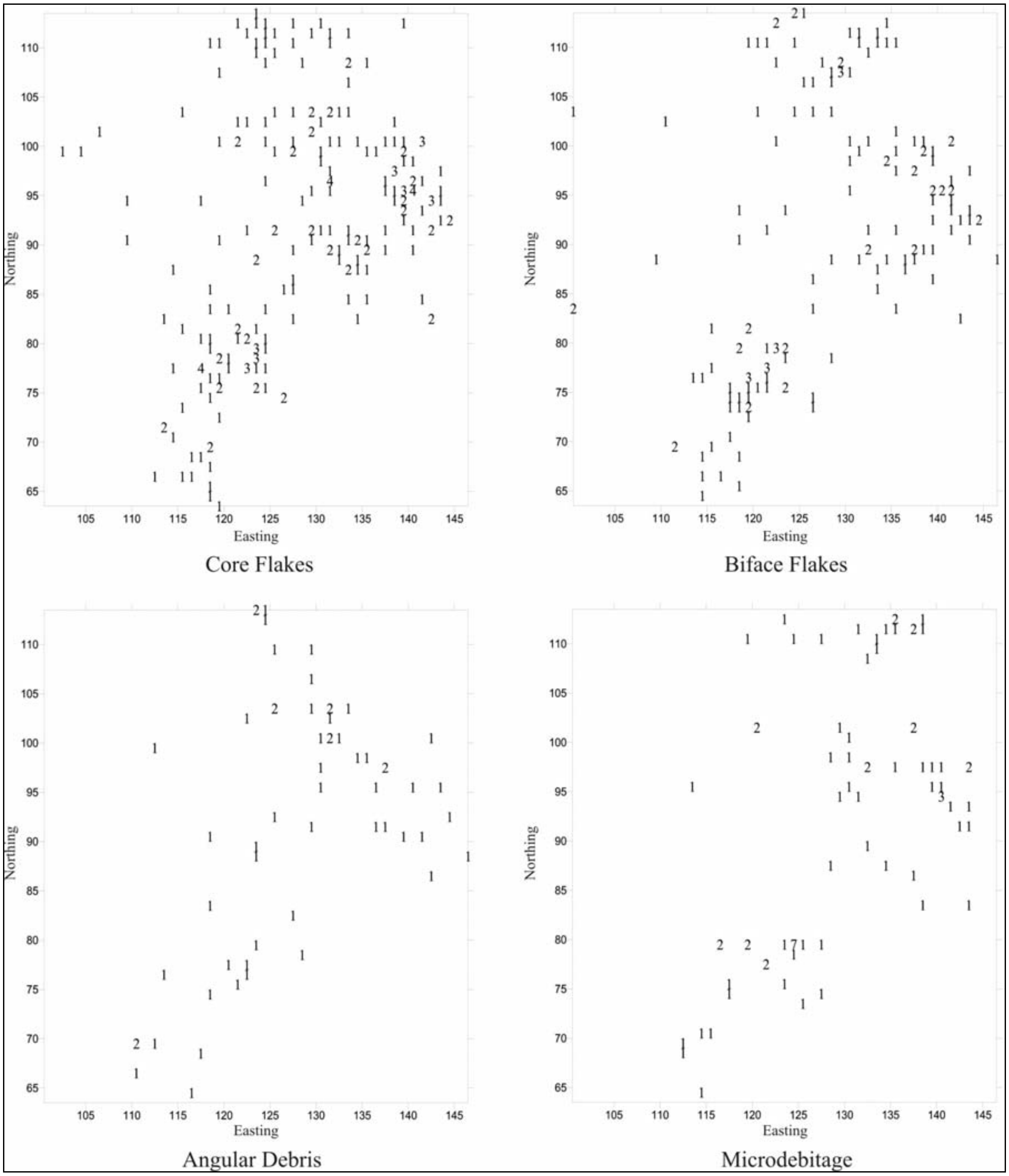


Figure 71.2. LA 99396 surface distribution of core flakes, biface flakes, angular debris, and microdebitage (numbers represent artifact count in a given grid unit).

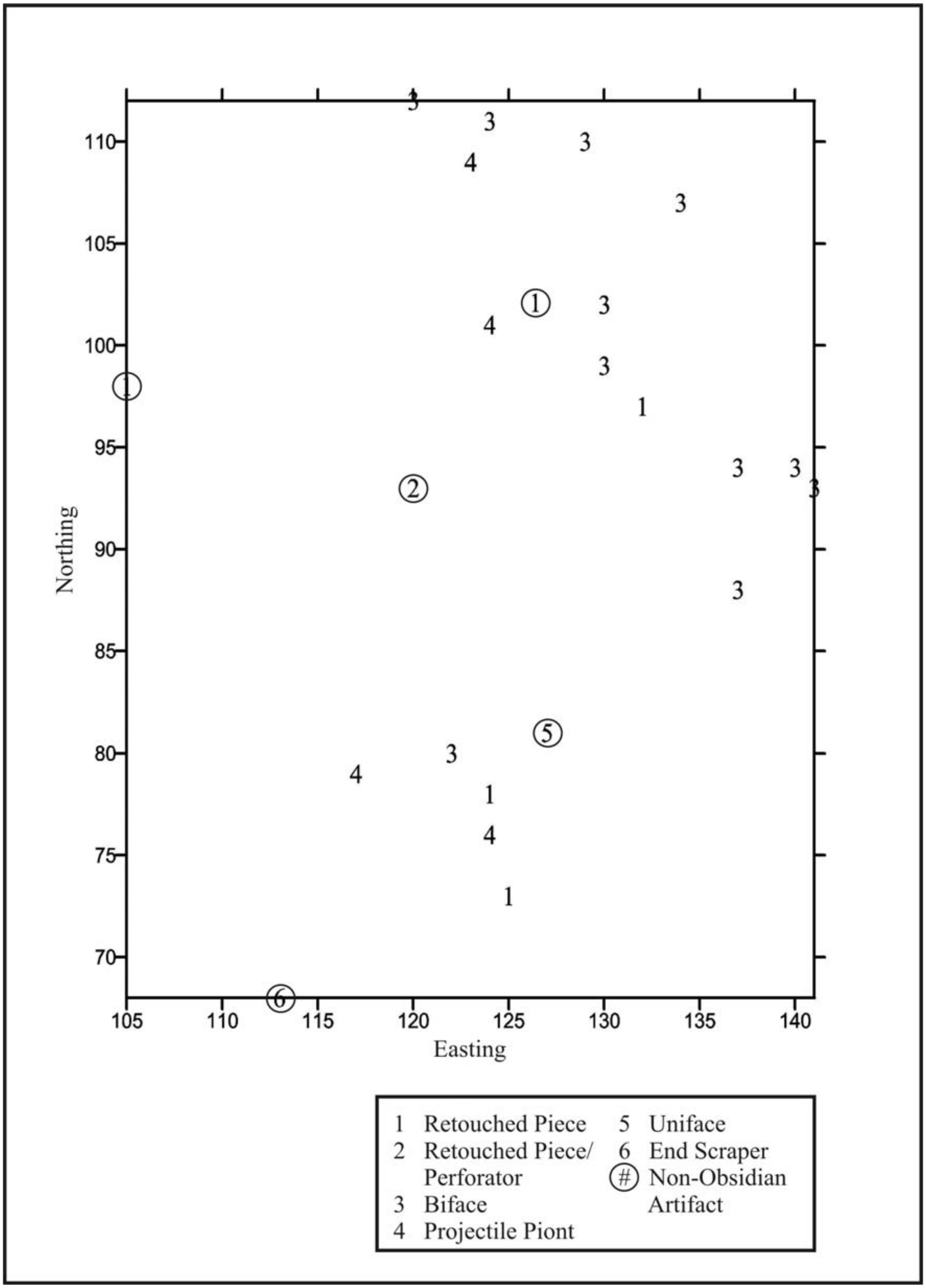


Figure 71.3. LA 99396 distribution of all chipped stone tools.

LA 99397

The LA 99397 lithic scatter is distributed over a 1500-m^2 area. It is situated on a northeast-facing hillslope that forms the shoulder of a generally southeast-to-northwest-trending ridge crest. Site stratigraphy includes thin late Holocene colluvial and eolian deposits less than 25 cm thick that overlie late Pleistocene to early Holocene colluvial deposits or late Holocene (1 to 2 ka) swale fill deposits. Several areas of the site exhibit a late Holocene surface gravel cap or weak desert pavement. Most of the artifacts at LA 99397 appear to have been reworked into the less-than-1000-years-old late Holocene colluvium and the approximately 1 to 2 ka late Holocene swale fill deposits. It is possible that the Archaic artifacts in the late Pleistocene to early Holocene deposits are in a somewhat better context; however, it is likely that the occupation surface has eroded away (Chapter 57, this volume). Figure 71.4 shows that a majority of the surface artifacts from LA 99397 are clustered in a drainage and drainage head in the eastern part of the site.

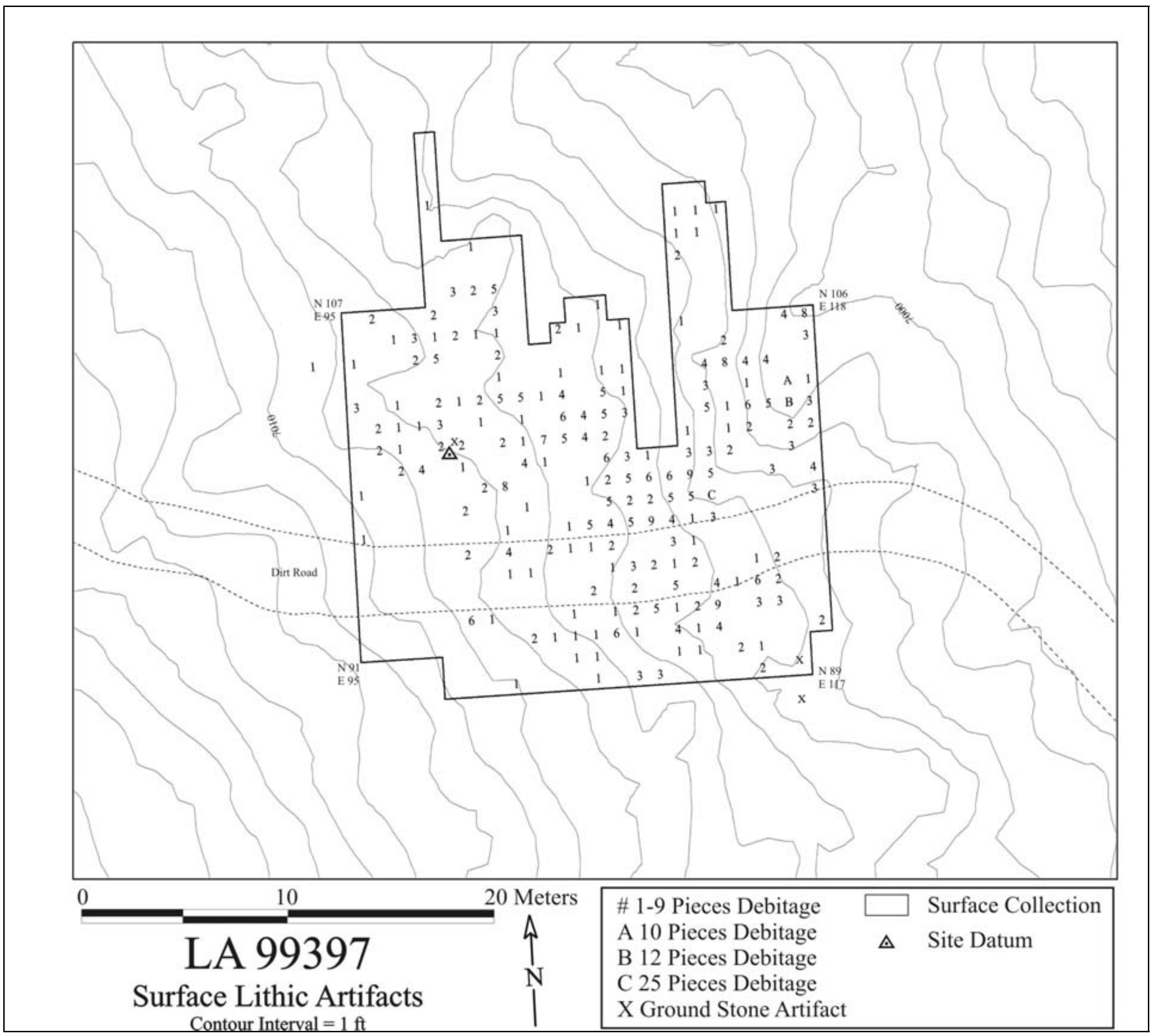


Figure 71.4. LA 99397 surface artifact distribution.

ANCESTRAL PUEBLO SITE STRUCTURE

Information on the site structure analysis of the three Coalition period roomblock sites excavated during the C&T Project is presented in this chapter. Site structure data for two additional excavated sites will also be included for comparison (LA 4618 and LA 4624) (Schmidt 2006b and Vierra et al. 2002, respectively). All of these roomblock sites have a broadly similar site structure (Figure 71.5). That is, they consist of multiple-row roomblocks that are oriented roughly north-south and a midden, or at least a diffuse artifact scatter, which is located to the east of the roomblock.

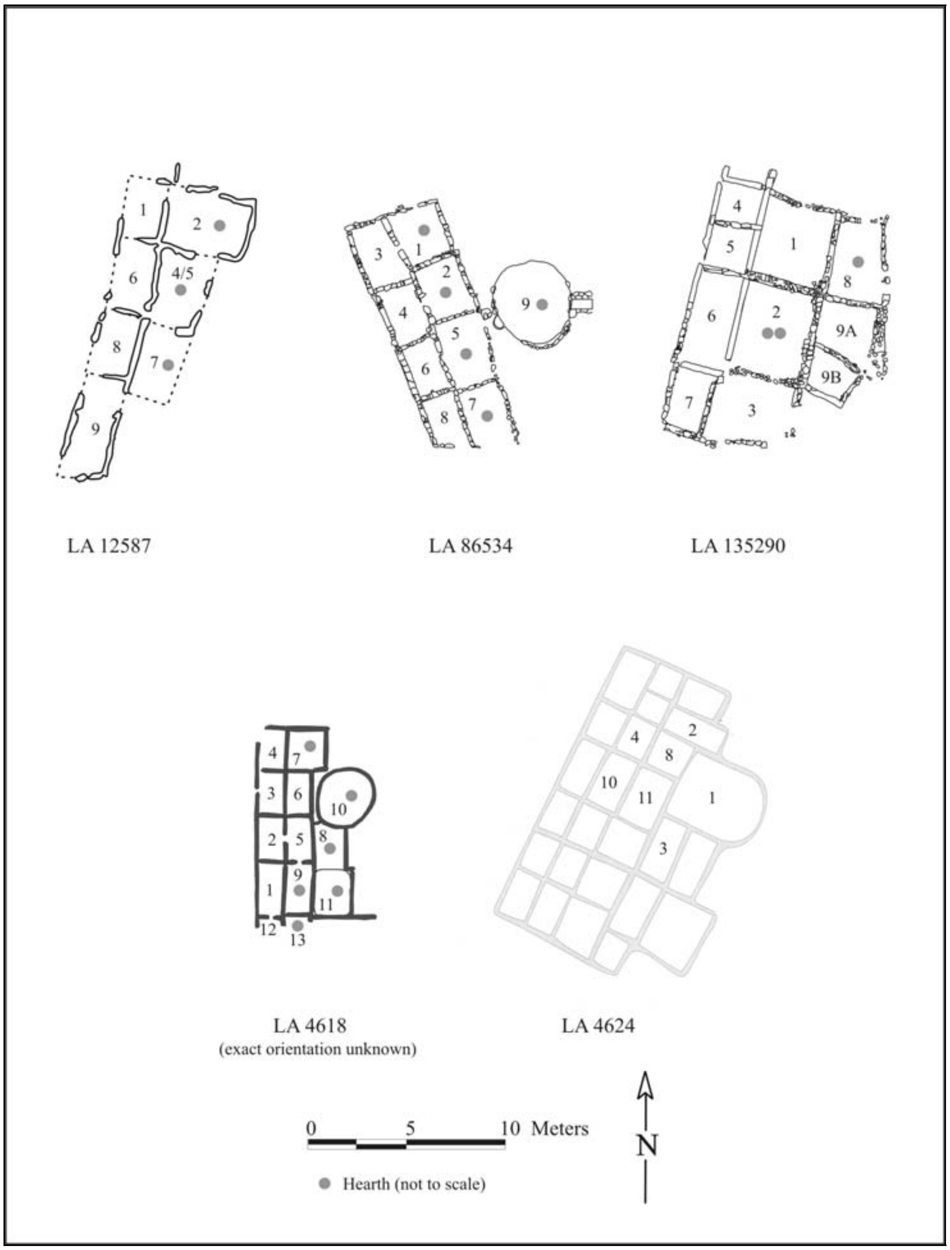


Figure 71.5. Roomblock ground plans.

Ceremonial rooms, when present, are the sole easternmost rooms or are in the easternmost row of rooms. Habitation rooms tend to be located in the front of the roomblock (east) and the storage rooms in the back of the roomblock (west). This general site layout is widespread across the Pajarito Plateau and is common before the Late Coalition/Early Classic period transition (Carlson and Kohler 1990:9–10; Steen 1977:10–11; Van Zandt 1999).

Within this broad pattern, however, there is variation in roomblock orientation, construction methods, number and nature of rooms, number and nature of ceremonial rooms, and amount of remodeling/number of building episodes that is described below. Each of these sites is presented in chronological order from earlier to later Coalition period.

LA 4624

LA 4624 is a 26-room pueblo that was probably inhabited in the late 12th and possibly early 13th century (Vierra et al. 2002). The back (west) of the roomblock is formed by three regular rows of rectangular rooms; whereas, the front (east) of the roomblock is formed by two irregular rows of rooms. The roomblock is oriented northeast-southwest. A 3300-m^2 midden is located to the east of the roomblock.

The rooms can be grouped into three categories, based on size: there are 13 rooms smaller than 5 m^2, 11 rooms between 5 and 7 m^2, and two rooms larger than 10 m^2 (Nisengard 2002). Most of the smallest rooms are located in the back two rows of the roomblock; most of the 5- to 7-m^2 rooms are located in the front three rows of the roomblock; and the two largest rooms are both located in the front row. All rooms are square or rectangular in shaped except for the largest room, which is D-shaped. The pueblo was only partially excavated and the single floor feature encountered was a hearth in the D-shaped room.

Most of the walls at LA 4624 are constructed of shaped and unshaped tuff blocks. One of the best preserved walls is the north wall of Room 3. This wall consists of a foundation of large tuff slabs (approximately 54 by 37 cm) and upper courses of smaller unshaped tuff blocks (20 by 10 cm to 20 by 20 cm). Preserved plaster, up to 2 cm thick, is present on some walls. In at least one case, the wall plaster is coped with the floor plaster. In addition to tuff block masonry, some wall segments consist of hard-packed adobe set with small chinking stones and potsherds.

Recovered roofing material consists of chunks of adobe and pieces of charcoal. These materials were often found lying directly on the floor. Ponderosa pine, piñon pine, and juniper are the most common species in the charred macrobotanical assemblage recovered from rooffall strata. Floors consist of hard-packed sediments with intermittent areas of ash and smoke staining. In some instances, the dark charcoal staining is likely the result of burned roof materials that had collapsed onto the floor. The construction history of the roomblock is unknown. No outside activity areas were found during the excavation of LA 4624, although four rock alignments of unknown association are present on the periphery of the site.

LA 135290

LA 135290 is a 10-room pueblo that was inhabited sometime between the late 12th and early/middle 13th century. When the roomblock was initially constructed it consisted of six rooms arranged in a blocky L-shape. At a later date, three additional rooms were added causing the roomblock to have a rectangular footprint. At some point a wall was constructed in one of the original rooms, transforming it into two smaller rooms (see Figure 71.5, Rooms 4 and 5). The roomblock is oriented northeast-southwest. There is no midden at LA 135290, although some surface artifacts were found to the southeast and east of the roomblock.

Rooms range in size from 3.96 to 15.66 m^2, but there are no classes of room size, as there are in LA 4618. Both the largest room and third largest room contain hearths. One of these rooms (Room 8) is in the front row of rooms, whereas the other (Room 2) is in the second row of rooms. It is likely that the east (front) walls of Rooms 9A and 9B (and possibly Room 8) were never full-standing walls, indicating that these rooms might have been ramada-like structures.

The initial wall construction at LA 135290 included both the use of puddled adobe and coursed tuff block masonry. Most of the masonry exhibits little or no shaping. While 15- to 20-cm-thick subfloor adobe footings are present under most walls, there are instances of basal upright stones set into adobe mortar at floor level (e.g., the north wall of Room 1) and of basal masonry set into adobe-lined depressions below floor level (e.g., the south wall of Room 2). The lower 40 to 60 cm of the back room walls are built of puddled adobe. Two courses of unshaped tuff block masonry cap the west adobe wall of Room 6 and wallfall indicates that the upper portion of the west wall of Room 1 (i.e., the east wall of Rooms 4 and 5) was also built of masonry. It is possible that all of the back room walls were built this way. The south wall of Room 8, while not a back room wall, was also built in the coursed masonry-over-adobe style. The back rooms appear to have been intentionally burned, perhaps with the intention of fire-hardening the wall and floor adobe, making it difficult for rodents to burrow into the rooms.

The remaining initial construction walls consist of masonry. The basal course of most walls consists of large tuff blocks (20 to 30 cm high by 10 to 30 cm wide) and adobe mortar. However, the basal courses of the north wall of Room 1 and the south wall of Room 9A are distinct. The base of the Room 1 wall consists of 40- to 45-cm-high and 15- to 20-cm-wide uprights staggered at 20- to 40-cm intervals. The long axes of these uprights are perpendicular to the length of the wall. Adobe mortar set with smaller tuff pieces (10 to 20 cm) fills the space between uprights. The south wall of 9A consists of a double row of tuff uprights. Upper courses of all walls consist of horizontally placed tuff blocks (20 to 50 cm long and 10 to 20 cm wide) and adobe mortar. Small adobe buttresses (approximately 50 cm long) are present on the outside northeast and northwest corner of Room 4 and the outside southeast corner of Room 6. Fragmentary remains indicate that masonry walls were covered with plaster and in some instances up to 10 cm of adobe.

The walls of later rooms are more fragmentary than the walls of the initial construction. Earlier and later construction methods appear to be similar although the lower portions of the Room 7 walls, a new back room, were built with masonry instead of adobe. Similarly, the later wall that divided Room 4/5 into two rooms was built entirely of masonry.

No roofing materials were identified. Floors associated with the initial construction of LA 135290 consist of 3 to 7 cm of compact adobe often overlain by a thin plaster wash. Multiple flooring and multiple floor repair episodes took place in the back rooms. Coping between wall and floor plaster is present in Room 2. Room 9A is the only room of the initial construction that does not have a formal floor. In this room the floor consists of compacted sediments. The floors of the later rooms are similarly informal, consisting only of a compact surface.

The initial occupation of LA 135290 involved the construction of Rooms 1, 2, 4, 5, 6, 8, and 9A. Three separate remodeling/reoccupation episodes are evident by the presence of multiple floors in Rooms 4/5 and 6, multiple features in Room 2, and a remodeled hearth in Room 8. Lastly, Rooms 3, 7, and 9B were added on to the existing roomblock.

The top of the Bwb1 soil horizon to the east of the pueblo is much more compact than elsewhere on the site. This presumably is due to trampling and foot traffic within the area. Also present to the east of the pueblo are two north-south oriented rock alignments. Each alignment forms a low berm about 7.50 m long and 0.50 m wide. It is unclear if this feature is contemporaneous to the pueblo or post-dates it. No other outdoor activity areas were found.

LA 86534

LA 86534 is a nine-room pueblo that was inhabited sometime between the late 12th century and the middle/late 13th century. The roomblock consists of a double row of four rooms fronted by a subterranean circular kiva. The roomblock is oriented north-northwest by south-southeast. A diffuse artifact scatter is located to the northeast and east of the roomblock and covers an area roughly 250 and 550 m^2, respectively. The back rooms are between 5.31 and 6.40 m^2 in size and contain few features, none of which were hearths. The front rooms range in size from 6.45 to 8.05 m^2 and all contain hearths. The kiva is 17.63 m^2 in size and contains eight different feature classes.

At LA 86534, the walls were built of unshaped and shaped tuff blocks and adobe mortar. Wall foundations at the site consist of upright tuff blocks set in shallow adobe mortar-filled trenches. These blocks are roughly shaped and are slightly smaller than the tuff blocks used in wall construction. The general size of the basal upright stones is approximately 25 by 15 by 10 cm, while the general size of wall blocks is approximately 40 by 20 by 10 cm. The upper walls consist of regular courses of horizontally laid shaped and unshaped tuff blocks. In several isolated places in each room a tan clay plaster covered the interior walls. It is likely that the entire wall face was originally plastered over. In general there is little architectural variability between one wall and another.

The fill of all rooms contained abundant, but usually small, fragments of adobe similar to that observed in the walls. Although these fragments could represent rooffall, wall debris, or both, it is most likely that they represent rooffall given the presence of [beam] impressions and fingerprints on several of the chunks. No postholes were identified in the rooms, suggesting that the walls were load-bearing and indicating that the roof was not substantial.

Room floors were thinly plastered with fine clay mud, identical to and occasionally coping into the surviving wall plaster. Where they were well preserved, the floors are compact and appear to have been burnished. It is probable that all eight rooms of the roomblock were built within a short period of time and possibly in a single building episode. It is not clear when the kiva was built, but it is likely that it was built at the same time as the rest of the roomblock given the connecting feature between it and one of the other rooms. There is no evidence of subsequent remodeling of the roomblock. In summation, LA 86534 appears to have been built in a single building episode and with a single architectural style. No evidence of exterior activity areas was found at LA 86534.

LA 4618

LA 4618 is a 13-room pueblo that was inhabited between the middle and late 13th century (Schmidt 2006b). The roomblock consists of two rows of five rooms fronted by a subterranean circular kiva. A second episode of construction added two rooms to the south of the kiva, creating a new (third) front row of rooms. One of these new rooms is an aboveground square kiva. The roomblock is aligned more-or-less north-south; however there are no data on the exact orientation. A sparse midden is located immediately east of the roomblock. A denser midden is expected at a pueblo of this size and the density of the midden may, in fact, be underestimated (Schmidt and Vierra 2006:233). An opening in the back wall of Room 3 and an artifact scatter below it may indicate that trash was also disposed of to the west of the roomblock.

The rooms can be grouped into three sizes: six rooms are smaller than 6.5 m^2, four rooms are between 7.4 and 8.7 m^2, and one room (the circular kiva) is 14.4 m^2 (two rooms were only partially excavated and their size could not be determined). Rooms 7 and 8 and possibly Rooms 9 and 13 contain hearths. However, only Rooms 7 and 9 are in the middle size category. Room 8 is a "small" room and the size of Room 13 is unknown. Rooms 1 (in the middle size category), 2, 3, and 5 (in the small size category) each contain a single small subfloor pit. Rooms 10 and 11 are both clearly ceremonial rooms as they each contain a suite of features that includes a hearth, an ash box, a deflector, a vent shaft, a possible sipapu, and wall niches. Room 11, however, is in the middle size category.

The walls are built of shaped and unshaped tuff blocks and adobe mortar. Wall foundations were not recorded, but upper walls consist of regular courses of horizontally laid shaped tuff blocks and chinking stones. Basal courses consist of large upright tuff blocks in at least some rooms. On average, tuff blocks are 40 by 20 by 10 cm in size. In several isolated places in each of the rooms, a tan clay plaster covered the tuff blocks of the interior walls. It is likely that the entire wall face was originally plastered over. In general there is little architectural variability between one wall and another.

The fill of all rooms contained abundant, but usually small, fragments of adobe similar to that observed in the walls. Although these fragments could represent rooffall, wall debris, or both, it is most likely that they represent rooffall given the presence of both plant and finger impressions on several of the chunks. No postholes were identified in the rooms, suggesting that the walls were load-bearing and indicating that the roof was not substantial. Room floors were thinly plastered with fine clay mud that is identical to, and occasionally copes into, the surviving wall plaster.

It is likely that Rooms 1 through 7, Room 9, Room 12, and Room 13 were all built during a single episode of construction; Room 10, the circular kiva, may also have been built at this time. Rooms 8 and 11 were added to the roomblock at a later time as is evidenced by the fact that their walls are abutted to the original front wall. The eastern and northern walls of Room 8 abut the circular kiva, suggesting it was built after Room 10. However, there is no evidence to show how much time elapsed between the first and second episodes of building. Instances of remodeling include a possible enlargement of Room 1 and the sealing of a doorway between Rooms 2 and 5. No outside activity areas were identified; however, this may be the result of the excavation plan, which focused on the roomblock itself.

LA 12587

LA 12587 is a seven-room pueblo that was inhabited sometime between the middle 13th century and early 14th century. The roomblock consists of two rows of rooms: four back rooms and three front rooms. The roomblock is oriented north-northeast by south-southwest. A 1350-m^2 midden is located to the east of the roomblock. Before the abandonment of this roomblock, construction began, but was not finished, on a second roomblock immediately to the west of the original roomblock. Several Classic period agricultural features are also present at LA 12587, including a fieldhouse that is situated on top of the original roomblock. Only the original structure is described here.

The four back rooms are between 6.1 and 9.3 m^2 in size and contain few features, none of which are hearths. The smallest front room is larger than the largest back room; the three front rooms range in size from 9.9 to 11.2 m^2 and all contain hearths and postholes. One of the front rooms also contains an ash box and deflector.

Walls are built of shaped and unshaped tuff blocks, adobe mortar, and chinking stones. Additionally, dacite cobbles are occasionally used as masonry and one adobe block was encountered during excavation. Most basal courses consist of large tuff uprights set into adobe and/or sunk beneath the floor surface. In one wall these uprights are covered with multiple layers of adobe (turtlebacks) forming a thick platform upon which the overlying course is laid. In several walls the basal course consists of core and veneer segments separated by upright tuff blocks that are perpendicular to the length of the wall. The veneer consists of a thick layer of adobe set with small tuff stones. The core consists of sediment and rubble. The basal course of one wall consists of two parallel rows of upright tabular tuff blocks. Sediment and rubble probably filled the space between these uprights. The few upper courses still present consist of coursed shaped and unshaped tuff blocks set in adobe and reinforced with chinking stones. In several isolated places a layer of plaster is present on the walls. It is likely that the entire wall face was originally plastered over.

Little rooffall was found at LA 12587 save in the southwest corner of the Room 2. Here rooffall consists of reed-impressed adobe chunks, chunks of burned adobe, and a partly charred juniper beam fragment.

Formally prepared floors were found in all rooms. Floor construction was often initiated with the deposition of small tuff rocks over the irregular Bw or Btk horizon or the bedrock surface. Next a thick layer of adobe was placed over the rocks to create a level surface and allowed to dry. Finally, one or more layers of plaster were then applied to the surface of the adobe and smoothed, resulting in an even floor surface. In many instances coping is present between the floor and the wall.

The six matching front and back rooms appear to have been built during a single construction episode. Because of poor corner preservation it is not clear if Room 9 was also built as this time or was added at a later date. Up to three floors (i.e., discrete layers of adobe) are present in the front rooms and several floors have multiple layers of plaster (possibly indicating seasonal rejuvenation of the floor).

While no clearly defined exterior activity areas were found at LA 12587, several features were found that may be associated with exterior activities. These features consist of an ashy stain in the midden that may be the remains of an informal hearth (Feature 3), a small cist built against the exterior of the east wall of Room 2 (Feature 5), a northern extension of the central wall of Roomblock 1 and an associated floor surface and ash stain (Feature 21), and a set of six bedrock grinding slicks immediately west of Roomblock 1 (Feature 13). Feature 21 may not be an exterior activity area; instead it may represent a remodeling episode. It is not clear which component of the site Feature 13 is associated with.

Room Function

Within linear Coalition period pueblos on the Pajarito Plateau the larger front rooms have traditionally been interpreted as habitation rooms and the smaller back rooms as storage rooms (e.g., Carlson and Kohler 1990:10). Ceremonial rooms are a third functional class. Figure 71.6 shows the distribution of room sizes for LA 4618, LA 12587, LA 86534, and LA 135290. The figure also indicates whether or not a room is a formal ceremonial room, how many types of features are in each room, and whether or not a hearth is present in the room (LA 4624 is not included in the figure due to lack of room feature data). Several patterns are apparent in this illustration. First, within any given roomblock the larger a room is the more likely it is to contain a hearth; larger rooms are also more likely to contain more types of features. These larger rooms with hearths are often in the front row of rooms and never in the back row (see Figure 71.5).

Table 71.1 shows how many and what types of features are present in each room of the four pueblos depicted in Figure 71.5. Formal ceremonial rooms are the largest, or nearly the largest, rooms in a roomblock and contain the most types of feature. All three ceremonial rooms in Table 71.1 contain a hearth, an ash box, a deflector, a vent shaft, a sipapu, two wall niches, and at least one other type of feature. Rooms with hearths are larger than rooms without hearths and contain at least one other feature type half the time (most often one or more postholes). Rooms without hearths rarely contain more than one type of feature and contain no features about half of the time. The most common small room feature is a subfloor pit.

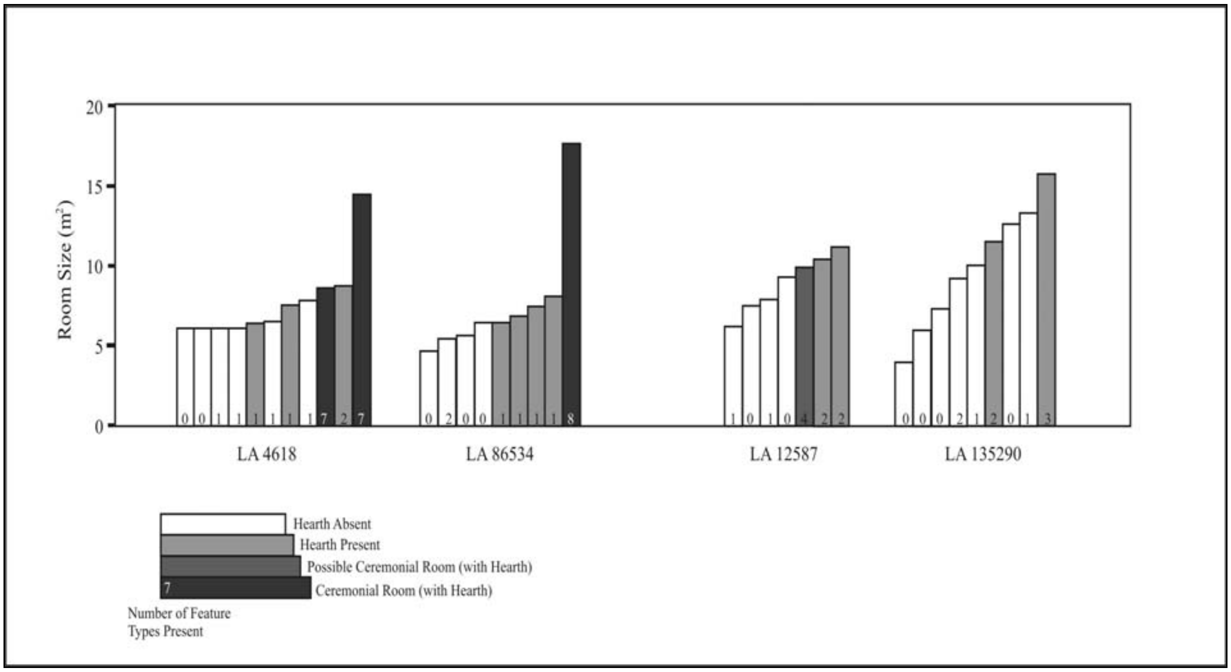


Figure 71.6. Room size at several Pajarito Plateau roomblocks.

In general, the tripartite ceremonial/habitation/storage room classification holds, however there is clearly more variability than this. Room 7 of LA 12587 appears to be “intermediate” between the ceremonial and habitation class. Like the formal ceremonial rooms it contains an ash box and deflector, but it does not contain any other “ceremonial” features. While Room 7 is the smallest habitation room at LA 12587, the east wall is absent causing uncertainty in estimating the room size; however, it is possible the room was up to 12 m^2, which would make it the largest room at the site. Further, use of the terms “habitation” and “storage” should, perhaps, be treated as classification terms, and not taken as literal interpretations of room function. For example, a massive amount of charred maize was recovered from Room 2 of LA 12587 indicating that cobs were stored in, or on the roof of, the room. The presence of a milling bin in Room 6 of LA 86534 indicates that milling activities also occurred in smaller back rooms. It is possible that there are functional differences between “storage” rooms that have features and those that do not. Finally, Rooms 9A and 9B of LA 135290, ramada-like rooms, may be in another functional category.

Table 71.1. Room feature information for selected roomblock sites.

Type	Site-Room	Loom Holes	Upright Block	Floor Groove	Floor Niche	Wall Niche	Sipapu	Vent Shaft	Deflector	Ash Box	Hearth	Posthole	Small Pit	Pot Rest	Milling Bin	Adobe Basin	Rock Feature	No Feature
C	4618-10	4				2	1	1	1	1	1							
	4618-11		6			2	1	1	1	1	1							
	86534-9			5	1	2	1	1	1	1	1							
C/H	12587-7								1	1	1	4						
H	4618-7										1	1						
	4618-13										1	1						
	12587-2										1	6						
	12587-4/5										1	4						
	135290-2										2	3	3					
	135290-8										1			1				
	86534-5										2							
	4618-8										1							
	4618-9										1							
	86534-1										1							
	86534-2										1							
	86534-7										1							
S	135290-6											11						
	135290-4/5											12	1					
	4618-1												1					
	4618-2												1					
	4618-3												1					
	4618-5												1					
	12587-6												1					
	86534-6												1		1			

Type	Site-Room	Loom Holes	Upright Block	Floor Groove	Floor Niche	Wall Niche	Sipapu	Vent Shaft	Deflector	Ash Box	Hearth	Posthole	Small Pit	Pot Rest	Milling Bin	Adobe Basin	Rock Feature	No Feature
	135290-1															2		
	12587-1																1	
	4618-4																	X
	4618-6																	X
	12587-8																	X
	12587-9																	X
	86534-3																	X
	86534-4																	X
	86534-8																	X
	135290-3																	X
	135290-7																	X
	135290-9A																	X
	135290-9B																	X

C = Ceremonial, C/H = Ceremonial(?) and Habitation, H = Habitation, S = Storage

Regardless of how many room classes one wishes to make it is always possible to differentiate between storage (smaller, no hearth) and habitation (larger, with hearth) rooms within a roomblock. However, across roomblocks there is no standard size range for either type of room. One pattern that is evident is that at sites with formal ceremonial rooms, habitation and storage rooms tend to be smaller than habitation and storage rooms at sites without formal ceremonial rooms (see Figure 71.6). LA 4624, although not depicted in Figure 71.5, also fits this pattern; the largest non-ceremonial room at the site is 7.0 m^2 in size. This raises the possibility that there are functional differences between sites with and without formal ceremonial rooms (aside from obvious ceremonial functions). For example McBride (Chapter 62, this volume) has noted that maize kernels are more common at sites without formal ceremonial than at sites with ceremonial structures. That is, maize kernels were recovered from 52 percent and 41 percent of the flotation samples from LA 12587 and LA 135290, respectively, versus, 23 percent and 15 percent of the flotation samples from LA 4618 and LA 86534, respectively. McBride suggests that the non-kiva sites may reflect a greater emphasis on agricultural activities.

FIELDHOUSE SITE STRUCTURE

Twenty of the fieldhouses consist of a single room, with only one having two rooms. Seventeen of the one-room fieldhouses are rectangular in form and one is circular. The form of the two remaining one-room fieldhouses could not be determined due to extensive disturbance of their wall foundations. Enough of the wall foundations remained at one of these sites, however, to indicate that it was probably rectangular. The two-room fieldhouse was composed of a rectangular room and a smaller attached (and probably later) room that was trapezoidal in shape.

The wall foundations of the fieldhouses are generally constructed of dacite cobbles and/or slabs. In the case of 17 of the fieldhouses, the entire wall masonry consists of only dacite cobbles. The remaining fieldhouses have masonry that consists of a mix of dacite cobbles, tuff cobbles, and/or shaped blocks.

The height of the masonry was estimated for 16 of the fieldhouses. Estimated masonry heights were calculated based on the volume of wallfall removed during excavation and the overall length, average thickness, and average height of the extant portions of the walls. Estimated masonry heights for all 16 fieldhouses ranged between 0.94 and 1.63 m, with an average of 1.17 m. An examination of the distribution, however, indicates that there are several outliers. The calculated masonry heights of two sites (LA 85408 and LA 85417) are significantly higher than the average. Both of these sites were located in rocky areas. As a result, a significant amount of natural rock surrounding the fieldhouses was most likely included in the calculation of wallfall volume.

The estimated masonry heights of three other sites (LA 127635, LA 86607, and LA 15116) were significantly lower than the average. Much of the rock from the site with the lowest height (LA 127635) appears to have been utilized to construct a later fieldhouse located nearby (LA 127634). This may also be the case for the site with the second lowest height (LA 86607), which is located near a fieldhouse with ceramics of the same phase (LA 86606). The site with the third lowest height (LA 15116) is the only circular fieldhouse. This fieldhouse had very haphazard and poorly constructed walls and may have had a different function than the better-constructed, rectangular fieldhouses (e.g., it may have been a hunting blind rather than an agricultural fieldhouse). Excluding these potential outliers, the average estimated masonry height is 1.17 m, which is virtually identical to the overall average. The exclusion of the outliers, however, produces a tighter range of 0.94 to 1.63 m, which probably more accurately reflects the actual range in variation of the masonry heights of Ancestral Pueblo fieldhouses on the northern Pajarito Plateau.

There are no gaps in the wall foundations of most of the fieldhouses. This indicates that the entryways to these structures included a doorsill, which was most likely designed to keep out dust. Consequently, the location of the entryway could only be definitively determined for six of the fieldhouses. An educated guess as to the location of the entryway, however, was possible for an additional 11 fieldhouses. These data indicate that entryways were most commonly located to the east (n = 8), followed by the south (n = 4), and north (n = 2). East entryways were presumably popular because they took the greatest advantage of morning light from the rising sun. In those situations where it could be determined with certainty that the entryway did not face east, the decision to place it elsewhere appears to be a result of the structure's location. For example, if the fieldhouse was located on a slope, the entryway often faced downhill.

The upper portions of the walls and the roofs of the fieldhouses were most likely composed of wattle and daub. At most of the sites, however, only a few pieces of burned adobe, if any, were recovered. At one site (LA 85417), on the other hand, hundreds of pieces of burned adobe were encountered, many of which still had well-preserved wattle impressions. The preservation of daub at this site appears to be the result of a fire, which most likely destroyed the fieldhouse during or shortly after the site's occupation. The architectural remains from this site, together with the few pieces of burned adobe found at many of the other fieldhouses, indicate that the superstructures of Ancestral Pueblo fieldhouses on the northern Pajarito Plateau were constructed of wattle and daub.

No prepared floors were encountered within 13 of the fieldhouses. Excavation of most of these fieldhouses terminated at the top of the sterile and compact Bt horizon. Based on the height of this soil horizon relative to wall foundations, it most likely served as the foundation for the structures' floors, which are not preserved. Small patches of a thin clay floor were encountered directly on top of the Bt horizon in five fieldhouses. In all cases, these patches of floor were preserved as a result of exposure to heat. Large portions of a thin clay floor are preserved in three fieldhouses. In all three cases, the extant portions of the floors are concentrated around, and preserved as a result of the heat produced by, internal hearths. Finally, a well-preserved clay floor was encountered throughout the interior of a single fieldhouse (LA 85417). This is the same fieldhouse that was associated with hundreds of pieces of adobe that burned during a fire that destroyed the structure. Fortunately, the heat from this fire also preserved the floor. The floor is composed of a layer of clay a few centimeters thick on top of the Bt horizon. It does not appear to have been plastered. Most if not all of the fieldhouses probably had a similar floor.

Hearths were encountered at six of the fieldhouse sites. Three of these had a single internal hearth, one had a single external hearth, and one had both an internal and external hearth.

Finally, the two-room fieldhouse contained an internal hearth in each room. All of the hearths were simple pits with dacite cobbles and/or slabs forming all or part of their walls and/or bases. All of the hearths appear to have been lined with adobe, which was in various states of preservation. Some of the hearths also had evidence of an adobe collar around the hearth. In all cases, however, this adobe collar was in a very poor state of preservation. Maize was recovered from flotation samples from the hearths at five of the six sites, tobacco from the hearths at three of the six sites, and beans from a single hearth. A number of other species were also recovered from these hearths, which were presumably wild plants collected from nearby.

The number of artifacts recovered from the fieldhouse sites ranges from 9 to 772, with an average of 253. These artifact counts include ceramics, chipped stone, ground stone, faunal remains, and shell. The numbers do not include an Archaic component at LA 99396, which dramatically inflates the chipped stone artifact count. An above average number of artifacts were recovered from all five of the sites that contained hearths. All but two of the 15 sites without hearths, on the other hand, contained a below average number of artifacts. This suggests that the sites with hearths were more intensively occupied or occupied for a longer period of time than sites without hearths.

TIPI RING SITE STRUCTURE

Two late 19th or early 20th century tipi rings sites were excavated during the C&T Project. LA 85869 consists of two rock rings that are approximately 33 m apart on a northwest to southeast bearing. LA 85864 consists of a single rock ring that is located approximately 100 m to the north of LA 85859. Given the spatial proximity of both sites, it is possible that all three tipi rings are contemporaneous. Based on site type, the presence of *coscojo* fragments, glass trade beads, possible cone tinklers fragments, and micaceous ceramics (including sherds from at least one Cimarron Micaceous vessel), the cultural affiliation of LA 85864 and LA 85869 is interpreted as being Jicarilla Apache (see Appendix N).

Anschuetz (2000:22–23) notes that middle to late 19th century Jicarilla Apache tipi rings in the Rio del Oso Valley vary in size from 2.5 to 5.0 m in diameter (average and standard deviation = 3.9±0.8 m) and are composed of 4 and 60 stones (average and standard deviation = 14.0±9.0 stones). Many of these tipi rings have a central ash stain in their interiors and at least one ash and fire-cracked rock concentration a short distance to the east. The interior features include shallow, unlined earthen basin and rock-lined variants. In size and stone count, the LA 85864 and LA 85869 tipi rings are similar to the Rio del Oso Valley tipi rings (Table 71.2). Each C&T Project tipi ring has a central shallow unlined thermal feature; however, the only exterior thermal feature recorded is a possible hearth of unknown temporal affiliation at LA 85869. This feature is located approximately 15 m to the northwest of the nearest tipi ring.

Table 71.2. Tipi ring dimensions and stone counts.

Tipi Ring	Size (interior dimensions in m)	No. of Stones
LA 85864		
Feature 1	4.50 m north-south by 5.00 m east-west	13

Tipi Ring	Size (interior dimensions in m)	No. of Stones
LA 85869		
Feature 2	4.23 m north-south by 3.92 m east-west	22
Feature 4	3.25 m north-south by 3.75 m east-west	11

While structurally similar, each tipi ring has a different artifact assemblage associated with it. The LA 85864 artifact assemblage consists of three micaceous ceramic sherds from two vessels. Although three Coalition and/or Classic period sherds were also recovered, these are probably not associated with the Apachean occupation. Subsistence remains consist of four unidentified burned bone fragments recovered from the hearth and a charred and badly eroded possible wheat caryopsis (or seed). The paucity of artifacts may be due in part to the significant amount of erosion that has occurred to the immediate south and east of the tipi ring. The LA 85869 Feature 2 assemblage (i.e., artifacts found in and around the tipi ring) consists of 156 glass beads, 13 pieces of chipped stone debitage, three micaceous ceramic sherds from a single vessel, a .50 cal lead rifle ball, a split-shot lead sinker, and a small fragment of metal. The LA 85869 Feature 4 assemblage consists of a sandstone mano fragment, a dacite millingstone, three *coscojo* fragments, three possible cone tinkler fragments, a .50-caliber lead/alloy rifle ball with an impact surface, a straight pin or round wire fragment, and a can fragment cut into a 3.0 cm long strip. There is a 20- by 12-m chipped stone debitage scatter composed predominantly of obsidian artifacts immediately to the east of Feature 4. The debitage assemblage reflects a primary emphasis on the later stages of core reduction and a secondary emphasis on tool production/maintenance. A charred goosefoot seed was recovered from the thermal feature of this tipi ring; however, it is unknown if this seed is present due to food processing or of a wind blown seed.

Anschuetz (2000:23) notes that one-hand manos frequently occur in the northeast quadrant of the Rio del Oso Valley tipi ring interiors. This is where the senior woman of a household characteristically sat, worked, and slept (Felipe Ortega, personal communication 1998 in Anschuetz 2000:23). A mano fragment was located in the northeast quadrant of Feature 4, while a millingstone was located in the southeast quadrant of the ring. In general, most of the artifacts were found in the southeast quadrant of Feature 4 and nearly all the artifacts were found in the east half of the feature. In Feature 2 most of the lithic artifacts were found in the southern third and most of the beads were found in the eastern half of the feature.

CHAPTER 72
THE NATIVE AMERICAN CONSULTATION AND COMPLIANCE PROCESS FOR THE LAND CONVEYANCE AND TRANSFER PROJECT

W. Bruce Masse

INTRODUCTION

Native American compliance and consultation activities formed a significant component of the Land Conveyance and Transfer (C&T) Project archaeological excavations. This chapter outlines aspects of the compliance and consultation process. Specific highlights include (1) the determination of cultural affiliation for Los Alamos National Laboratory (LANL) lands with respect to the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA); (2) Traditional Cultural Properties (TCPs); (3) consultation field visits and educational outreach for culturally affiliated tribes; (4) the development of the NAGPRA Intentional Excavation Plan and its implementation during and after project excavation, including the hiring and use of Tribal Monitors; (5) the repatriation of NAGPRA remains and objects to the Pueblo of San Ildefonso. Issues relating to the Tribal Monitor program and its ultimate success are further discussed in Volume 4 (Chapter 84). Because of the importance of NAGPRA cultural affiliation and the Intentional Excavation Agreement not only to the C&T Project itself but to the overall conduct of Native American tribal consultation and compliance at LANL, the text of these documents is provided below.

Figure 72.1. Laboratory Director Pete Nanos, Pueblo of San Ildefonso Governor John Gonzales, and Elmer Torres of the Laboratory Tribal Relations Team meet with C&T Project leadership at LA 135290 (October 16, 2003).

LEGAL BACKGROUND

Two laws provide the bulk of the federal requirements and guidance pertaining to Native American compliance and consultation activities associated with large-scale archaeological excavation on federal lands. These are the National Historic Preservation Act of 1966 (NHPA) and its subsequent amendments and NAGPRA. Other laws, regulations, Executive Orders, and policy directives also touch upon aspects of Native American compliance and consultation with regard to archaeological excavation at LANL, but NHPA and NAGPRA are the primary drivers.

Native American compliance and consultation associated with NHPA took three specific forms for the C&T Project archaeological excavations. The first was that of the review of the C&T Project survey report (Hoagland et al. 2000) in accordance with Section 106 of NHPA. The second was that of the identification and evaluation of potential TCPs. Although this action is typically conducted as part of the Section 106 process for the review of the survey report, as described below much of the actual consultation process was accomplished separate from the C&T Project itself. The third action in support of the NHPA was that of the development and review of the C&T Project data recovery plan (Vierra et al. 2002), which in addition to the Los Alamos Site Office (LASO) was approved by the Pueblo of San Ildefonso, the State Historic Preservation Officer (SHPO), and the federal Advisory Council on Historic Preservation (ACHP).

Native American compliance and consultation associated with NAGPRA took four specific forms for the C&T Project archaeological excavations. The first was the preparation of a study to assist in the formal determination by LASO of NAGPRA cultural affiliation with respect to human remains, associated funerary items, sacred objects, and objects of cultural patrimony (LANL 2007a). The second was the preparation of an Intentional Excavation Plan (NAGPRA Excavation Plan) for use by LASO and project excavators with culturally affiliated tribes (LANL 2007b). The third was the establishment of a Tribal Monitor program to assist during project excavations (encouraged but not required by NAGPRA). The fourth and final action was that of the actual NAGPRA repatriation process itself after the completion of the excavations.

NAGPRA CULTURAL AFFILIATION AT LOS ALAMOS NATIONAL LABORATORY

Background

NAGPRA is designed to develop a systematic process for determining the right of lineal descendants, Native Hawaiian organizations, and Indian tribes to certain Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony with which they are affiliated. This law is particularly relevant to cases of intentional excavation and inadvertent discovery on federal lands, such as LANL.

In order to determine the rightful ownership of human remains and objects covered by NAGPRA, it is necessary for the federal agency to identify lineal descendants or Indian tribes who may be culturally affiliated with such discovered remains and objects.

Ownership under NAGPRA is stated as follows:

> *The ownership or control of Native American cultural items which are excavated or discovered on Federal or tribal lands after [1990] shall be (with priority given in the order listed)—*
>
> > *(1) in the case of Native American human remains and associated funerary objects, in the lineal descendants of the Native American; or*
> > *(2) in any case in which such lineal descendants cannot be ascertained, and in the case of unassociated funerary objects, sacred objects, and objects of cultural patrimony—*
> >
> > > *(A) in the Indian tribe…on whose tribal land such objects or remains were discovered;*
> > > *(B) in the Indian tribe…which has the closest cultural affiliation with such remains or objects and which, upon notice, states a claim for such remains or objects; or*
> > > *(C) if the cultural affiliation of the objects cannot be reasonably ascertained and if the objects were discovered on Federal land that is recognized by a final judgment of the Indian Claims Commission or the United States Court of Claims as the aboriginal land of some Indian tribe—*
> > >
> > > > *(1) in the Indian tribe that is recognized as aboriginally occupying the area in which the objects were discovered, if upon notice, such tribe states a claim for such remains or objects, or*
> > > > *(2) if it can be shown by a preponderance of the evidence that a different tribe has a stronger cultural relationship with the remains or objects than the tribe or organization specified in paragraph (1), in the Indian tribe that has the strongest demonstrated relationship, if upon notice, such tribe states a claim for such remains or objects.*

Cultural affiliation as defined under NAGPRA:

> *…means that there is a relationship of shared group identity which can reasonably be traced historically or prehistorically between members of a present-day Indian tribe or Native Hawaiian organization and an identifiable earlier group. Cultural affiliation is established when the preponderance of the evidence – based on geographical, kinship, biological, archaeological, linguistic, folklore, oral tradition, historical evidence, or other information or expert opinion – reasonably leads to such a conclusion.*

In brief, the three key steps for determining ownership of human remains and associated and unassociated objects under NAGPRA are first, to determine if there are known lineal descendants; second, in those cases where lineal descendants cannot be identified, to determine which Indian tribes are culturally affiliated; and third, in those cases where both lineal descendants and cultural affiliation cannot be ascertained, to determine which Indian tribes have the strongest claim based on a preponderance of the evidence for such remains.

While possible, it seems very unlikely that a direct lineal relationship can be established between living tribal members and specific Native American human remains discovered on LANL lands, including those that have been previously recovered. Therefore, on LANL lands the ownership of human remains and associated and unassociated objects under NAGPRA will rely heavily on the evidence for cultural affiliation.

The purposes of the cultural affiliation study are (1) to summarize the documentation collected to date for determining potential cultural affiliation for those Native American human remains that may be encountered during ground-disturbing activities at LANL and (2) to make recommendations as to which Indian tribes should have standing with respect to the purpose and intent of NAGPRA.

It is noted that since around 1994, LANL has consistently consulted with five tribes on issues relating to cultural resources management, which includes informing them of proposed construction projects and other issues surrounding cultural resources management at LANL. These include the "Accord Pueblos" of San Ildefonso, Santa Clara, Cochiti, and Jemez, each of which have signed agreements with the Department of Energy (DOE) and LANL, along with the Mescalero Apache Tribe. In addition, the Pueblo of Acoma and the Jicarilla Apache Nation have been recognized as having an active interest in cultural resources management at LANL.

In January 2002, a draft version of the present document was prepared (Masse 2002) and sent by LASO to all New Mexico Pueblos and to the Hopi Tribe in Arizona and Pueblo of Ysleta del Sur in Texas, as well as to the Jicarilla Apache Nation, the Mescalero Apache Tribe, the Navajo Nation, and the Ute Mountain and Southern Ute Tribes. The purpose of this action was to help initiate dialog and government-to-government consultation regarding the draft document and to elicit any recommendations for additions to, or changes in, the document based on oral traditions and other knowledge that might be applicable to the determination of NAGPRA cultural affiliation at LANL. While it is understandably difficult for tribes to share many aspects of their tribal knowledge with federal agencies, organizations, and individuals outside of their own tribe, some general information was passed on to LASO that is reflected in this document and discussed where appropriate.

It is understood that the subject of "cultural affiliation" can be a difficult and sometimes emotional topic for Native American tribes and for the agencies that attempt to define cultural affiliation and apply it to the myriad of laws and situations demanded by federal cultural resources management. It is based on at least partially conflicting principles and goals among the various laws. It forces tribes to categorize and think about their world in ways that do not necessarily mesh with traditional concepts of identity and boundaries. The concept of cultural affiliation does not necessarily remain static and may evolve and change in response to legal challenges and changing paradigms in academic anthropology and archaeology. It may contain social and political implications that can become divisive for the dynamics of tribes and cultural resource managers. And finally, the attempt to deal with cultural affiliation can seem like an unnecessary burden or even a barrier to some tribes and tribal members, particularly when applied inconsistently or poorly, without regard to the participation of all tribes and tribal members who may have opinions and views that should be heard.

There are a number of recently published studies that review the conflicts surrounding the definition and application of "cultural affiliation" and other related legal requirements by federal agencies (e.g., Biolsi and Zimmerman 1997; Ferguson 2004; Fine-Dare 2002; James 2001; Mihesuah 2000; Swidler et al. 1997), but they also provide thoughtful insights as to how to help resolve or avoid the painful aspects of conflicts. Other studies highlight the importance for agencies to work with tribes in order to recognize and preserve traditional cultural landscapes and their features (Feld and Basso 1996; Gulliford 2000; King 2003).

It is noted that this cultural affiliation determination document supports all other NAGPRA-related activities and documents at LANL including the LANL NAGPRA Inadvertent Discovery Plan issued in 2007 (LANL 2007b; LA-UR-06-6712) and any specific NAGPRA Intentional Excavation Agreements that may be prepared due to future mission requirements at LANL.

Definitions

- **Burial site** means *"any natural or prepared physical location, whether originally below, on, or above the surface of the earth, into which, as a part of the death rite or ceremony of a culture, individual human remains were deposited, and includes rock cairns or pyres which do not fall within the ordinary definition of grave site"* [43 C.F.R. 10.2(d)(2)].

- **Cultural affiliation** means *"that there is a relationship of shared group identity which can reasonably be traced historically or prehistorically between members of a present-day Indian tribe…and an identifiable earlier group"* [43 C.F.R. 10.2(e)].

- **Funerary objects** mean *"items that, as a part of the death rite or ceremony of a culture, are reasonably believed to have been placed intentionally at the time of death or later with or near individual human remains. Funerary objects must be identified by a preponderance of evidence as having been removed from a specific burial site of an individual affiliated with a particular Indian tribe…or as being related to specific individuals or families or to known human remains"* [43 C.F.R. 10.2(d)(2)].

- **Sacred objects** mean *"items that are specific ceremonial objects needed by traditional Native American religious leaders for the practice of traditional Native American religions by their present-day adherents. While many items, from ancient pottery sherds to arrowheads, might be imbued with sacredness in the eyes of an individual, these regulations are specifically limited to objects that were devoted to a traditional Native American religious ceremony or ritual and which have religious significance or function in the continued observance or renewal of such ceremony"* [43 C.F.R. 10.2(d)(3)].

- **Objects of cultural patrimony** mean *"items having ongoing historical, traditional, or cultural importance central to the Indian tribe or Native Hawaiian organization itself, rather than property owned by an individual tribal or organization member. These objects are of such central importance that they may not be alienated, appropriated, or conveyed by any individual tribal or organization member. Such objects must have been considered inalienable by the culturally affiliated Indian tribe…at the time the object was separated from the group"* [43 C.F.R. 10.2(d)(4)].

- **Indian tribe** means *"any tribe, band, nation, or other organized group or community of Indians, including any Alaska Native village or corporation as defined in or established by the Alaska Native Claims Settlement Act (43 U.S.C. 1601 et seq.), which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians"* [43 C.F.R. 10.2(b)(2)].

- **Intentional excavation** means *"the planned archaeological removal of human remains, funerary objects, sacred objects, or objects of cultural patrimony found under or on the surface of Federal or tribal lands pursuant to section 3(c)"* of NAGPRA [43 C.F.R. 10.2(g)(3)].

- **Inadvertent discovery** means *"the unanticipated encounter or detection of human remains, funerary objects, sacred objects, or objects of cultural patrimony found under or on the surface of Federal or tribal lands pursuant to section 3(d)"* of NAGPRA [43 C.F.R. 10.2(g)(4)]. For the purpose of this procedure, inadvertent discoveries are also assumed to include the discovery of potentially intact archaeological deposits in locations not previously identified as archaeological sites. Such deposits must be evaluated for their archaeological significance and for the possibility that they may contain unexposed human remains or NAGPRA-related objects.

- **Isolated remains and cultural objects** are individual human elements and NAGPRA-related cultural objects that when discovered are not located in the context of a burial site.

For the purposes of the C&T Project and other NAGPRA-related activities and planning at LANL:

- **Cultural objects** refer specifically to NAGPRA funerary objects, sacred objects, and objects of cultural patrimony.

- **Archaeological deposits** refer to intact archaeological contexts that require evaluation for their potential to yield human remains and cultural objects.

- **Tribal contacts** mean the designated representatives of the Indian tribes discussed in the section on Cultural Affiliation.

- **Government-to-government consultation** refers to consultation between the federal agency (LASO) and Indian tribes in compliance with federal historic preservation laws and regulations.

- **LASO Cultural Resources Program Manager** is the individual designated by LASO to oversee LASO's compliance with federal historic preservation laws and regulations, the LANL Cultural Resources Management Plan (CRMP), and cultural resources government-to-government consultation between Indian tribes and LASO.

- **LANL Cultural Resources Team (CRT)** refers to the internal organization and associated subject matter experts assigned by the Laboratory Operations Management Contractor to assist LASO with implementation of the LANL CRMP. As of June 2006, the LANL CRT is part of the Ecology and Air Quality Group within the Environmental Protection Division.

- **LANL CRT Native American Consultation Lead** refers to that person on the LANL CRT who is designated by the Team Leader to assist the LASO Cultural Resources Program Manager with facilitating cultural resources government-to-government consultation between LASO and Indian tribes.

- **NAGPRA Intentional Excavation Agreement** is a document prepared in compliance with NAGPRA in support of planned archaeological excavations on federal lands.

NAGPRA Cultural Affiliation Evidence

For convenience, this cultural affiliation documentation and evidence summary is divided into four basic categories: Geography and Historical Evidence; Tribal Knowledge and Oral Tradition; Archaeological Evidence; and Physical Anthropological Evidence. These categories are meant to be inclusive of all the various evidentiary classes noted in the NAGPRA law.

Geography and History

The Pajarito Plateau is a large, southeastward-sloping tableland perched on the eastern margin of the Jemez Mountains in northern New Mexico. It represents the erosional remnant of consolidated ash deposits (tuff) that erupted more than one million years ago from the Valles and Toledo volcanoes. The Pajarito Plateau is bounded by the Jemez Mountains to the west, Cañada de Cochiti to the south, the Rio Chama Valley to the north, and on the east by the Rio Grande. The approximately 27,000 acres within the boundaries of LANL are perched in the virtual center of this peculiar geological formation (Powers and Orcutt 1999b:7–11).

LANL manages three tracts of land, including two parcels that are discontiguous from the large tract situated between Bandelier National Monument and the Los Alamos town site. One of the discontiguous parcels is situated in Rendija Canyon immediately north of the Los Alamos town site. The second is a small parcel situated at Fenton Hill, about 25 miles west of the Los Alamos town site and some 15 miles to the northeast of Jemez Springs. It is noted that in the discussion that follows, the term "LANL" will refer to just the two tracts on the Pajarito Plateau immediately adjacent to the Los Alamos town site (LANL proper and Rendija Canyon).

There are 19 federally recognized tribes whose reservations are situated within 100 miles (160 km) of LANL. Eighteen of these are New Mexico Pueblos whose members speak five different languages that fall into three language groups (Cordell 1994; Hale and Harris 1979). The largest Pueblo language group is the Tanoan, which includes the Tiwa (divided into southern and northern dialects), Tewa, and Towa languages. The second is Keresan (divided into the western and eastern dialects). Zuni is the third Pueblo language group, which is spoken by only a single Pueblo. The remaining New Mexico tribe within 100 miles of LANL is the Jicarilla Apache, who belong to the Apachean family of languages in the overall Athapaskan language group. According to language specialists, there are seven Apachean-speaking tribes in the Southwest (Opler 1983a; Young 1983). In addition to the Jicarilla Apache, there are the Chiricahua, Kiowa-Apache, Lipan, Mescalero, Navajo, and Western Apache. Of these seven groups, the Navajo, Jicarilla, and the Western Apache had the greatest degree of interaction with the Pueblos (Opler 1983a:380).

In terms of proximity to Los Alamos, the 19 New Mexico tribes within 100 miles are the Tewa-speaking Pueblos of San Ildefonso, Santa Clara, and Tesuque; the eastern Keresan-speaking Pueblo of Cochiti; the Tewa-speaking Pueblos of Pojoaque, Nambe, and San Juan; the Towa-speaking Pueblo of Jemez; the eastern Keresan-speaking Pueblos of Santo Domingo, San Felipe, Santa Ana, and Zia; the northern Tiwa-speaking Pueblos of Picuris and Taos, the southern Tiwa-speaking Pueblos of Sandia and Isleta; the western Keresan-speaking Pueblo of Laguna; the Jicarilla Apache; and the western Keresan-speaking Pueblo of Acoma. In addition, there are six tribes (Hopi, Navajo, Mescalero Apache, Ute Mountain Ute, Ysleta del Sur, and Zuni) which, although beyond this 100-mile radius, nevertheless have some historical connections to northern New Mexico.

In the period of 1540 through 1598, at the time of expeditions of Francisco Vásquez de Coronado through that of Juan de Oñate, the geographical configuration and placement of Native American tribes largely approximated that which we see today (Ortiz 1979a), at least for northern New Mexico. This situation is true despite the subsequent depredations of the Spanish explorers and colonists, which resulted in the destruction or relocation of a number of individual Pueblo villages (Snow 1981:366), and despite the impact of more recent Euroamerican influences. Such geographical stability is particularly marked for the Rio Grande in the vicinity of the Pajarito Plateau, in part because the Spanish saw little economic or commercial value in the resources of the Pajarito Plateau.

Among the Native American groups noted in their present locations by these early (1540–1598) explorers were the four pueblos currently sharing accord agreements with LANL and LASO: Cochiti, Jemez, San Ildefonso, and Santa Clara. At least some scholars make a reasonable argument that the Jemez and Tewa Pueblos (including the large Classic period pueblos on the Pajarito Plateau such as Tsirege and Tsankawi) were visited or otherwise noted in 1542 during the Coronado Expedition (e.g., Schaafsma 2002:201–203). Schroeder (1979:250) provides the following general description of the Tewa Pueblos based on Castaño de Sosa's visit in 1590:

> Castaño de Sosa, the next to visit the Tewas, stopped at a small Pueblo (Tesuque), where he noted tortillas, maize, and turkeys. Four other Pueblos, one league apart and two to three stories high, were heavily populated (Cuyamungue, Nambe, Pojoaque, and Jacona). Maize, flour, beans, squash, tortillas, turkeys, and bows and arrows were seen at the second one. Two leagues beyond was large Pueblo (San Ildefonso) with four houseblocks of adobes (apparently coursed adobe), two to three stories high, well whitewashed, with ovens and very large plaza with exits at each corner. In its center was a big round house (kiva), half above and half below ground, containing many idols as in the previous Pueblos, wherein the people gathered on certain occasions to perform ceremonies. A large area was under irrigation, as in the previous Pueblos, and the people dressed the same as at Pecos. Upriver were two more Pueblos (San Juan and Pioge), across the river another (Yunque), one league from which was another (Teewi), and downstream the last of these Pueblos was Santa Clara.

The timing and nature of the entrance of Apachean-speaking groups into the Southwest has been a matter of considerable controversy (Towner 1996a; Vierra 1992a; Wilcox and Masse 1981). They clearly were already present at the time of the initial Spanish explorations in the 16th century (Gunnerson 1979; Opler 1983a; Wilcox 1981). However, in the past most scholars have argued that the Apachean-speaking groups arrived from the Plains only a few years before the Spanish (e.g., Cordell 1997:376–377). More recent archaeological research in northwestern New Mexico (e.g., Brown 1996; Brugge 1992, 1996; Hancock 1992; Winter and Hogan 1992) suggests that at least some Apachean groups were present no later than the middle of the 15th century, and perhaps earlier, although there are some notable dissenters to such early dating (e.g., Schaafsma 1996, 2002).

Also somewhat problematic is the presence of the Southern Numic-speaking Utes, a member of the Numic group of Uto-Aztecan languages shared by most of the Great Basin tribes. The Ute Mountain Utes and the Southern Utes currently live on two reservations on the border between Colorado and New Mexico. During the late prehistoric and early historic periods the Utes were nomads who ranged across much of the northern Colorado Plateau. It is believed that they had arrived in the Four Corners area by no later than the beginning of the 16th century, and perhaps as early as the beginning of the 14th century (Schaafsma 1996:31). A few scholars have argued that at least some of the population dislocation and possible warfare present in the Four Corners during the 12th through 15th centuries was due to the Utes (Cordell 1997:376–377), although the evidence is currently problematic. The San Juan River and the Continental Divide have been identified as the southern and eastern boundaries for the Historic period Utes (Schaafsma 1996:33), but this does not preclude hunting or raiding trips into the area around the northern Jemez Mountains.

The 1680 Pueblo Revolt against the Spanish and a subsequent smaller revolt in 1696 were in part inspired by Tewa-speaking political and religious leaders. These revolts led to a number of changes as individual village members and indeed in some cases whole Pueblo communities fled to the protection of other villages and tribes in the attempt to escape Spanish retaliation. It was at this time that Tewa villagers from the Galisteo Basin near Santa Fe left New Mexico to live among the Hopi of Arizona. Their descendants are still present as the village of Hopi-Tewa at First Mesa on the Hopi Indian Reservation (Dozier 1966; Stanislawski 1979). Likewise, a sizable number of Tiwa-speaking occupants of Isleta Pueblo fled to the vicinity of El Paso, Texas, along with a number of displaced Piro and Tompiro language speakers (now extinct Tiwa-speaking populations that had been along the Rio Grande south of Albuquerque), and a few refugees from Jemez. Most of the Isleta Tiwa-speaking refugees eventually settled at what is now called Ysleta del Sur ("Southern Isleta") Pueblo (Beckett and Corbett 1992; Ellis 1979:353–354).

The movement of individuals and villages in northern New Mexico during and after the Pueblo Revolt is symptomatic of the considerable fluidity between tribes throughout the period of 1540 to 1850 (Lange 1979a). This fluidity seemingly represents in part the Spanish encouragement of regional trade and in part patterns of warfare stemming from conflicts between the Spanish and the French, the latter which played a significant role in encouraging the 18th century raiding by Comanches from the southern Great Plains throughout much of northern New Mexico. The Comanche are a Numic-speaking people closely related to the Utes. The Comanche were among the first Native Americans to adapt the use of horses (introduced by the Spanish during the 16th century) as a key element of their nomadic hunting and raiding lifestyle. The Comanches and Utes together and separately are known to have conducted raids from Pecos to Abiquiu (Towner 1996b:166), an area that would have touched upon the Pajarito Plateau. Indeed, as noted below a Tewa place name in Guaje Canyon just north of LANL commemorates a historic encounter with a Comanche raider.

Ultimately, the Utes and the Jicarillas entered into an alliance against the Comanche and Kiowa. In 1779, a campaign was mounted by the Spanish against the Comanche that included Pueblos, Utes, and Jicarillas as allies against the Comanche (Tiller 1983). However, even this alliance vacillated. In 1786, a treaty between Comanches with the Spanish and Puebloan tribes was used as a device to host a campaign by Comanches, Utes, Navajos, Puebloans, and Jicarillas against the Gila Apache (Western Apache).

It is likely that during this period (the 18th century) the Utes came to view the northern Jemez Mountains to be within the limits of their hunting and raiding excursions, and it was likewise at this time or slightly earlier that the Jicarilla Apache established camping grounds just to the west of San Juan Pueblo and also near Abiquiu, a pattern evident by 1850 (Figure 1 in Tiller 1983). The Jicarillas living in the vicinity of San Juan Pueblo were known as the Olleros (Potters), a band distinct from the Llaneros (Plainsmen) who lived to the east of the Rio Grande. As a matter of practicality, the Jicarilla adopted the material culture of the Plains Indians, including the use of the tipi.

At this time it is appropriate to address the relationship between the Jicarilla and the Mescalero Apache. It is generally thought that the aboriginal range of the Mescalero Apache never extended much to the west of the Rio Grande nor north of Albuquerque (Opler 1983b), and thus seemingly the Mescalero were unlikely to have much of a presence in the Jemez Mountains. However, it is noted that the Mescalero did take part in the Pueblo Revolt, and they did maintain relations with other Apachean groups. The mobility of these groups, particularly during the middle and late 19th century in response to changing climatic conditions and pressures from the U.S. government (e.g., Bourke 1971; Geronimo 1971) suggests that small numbers of Mescaleros and Jicarillas and perhaps even other Apachean groups could have been present on brief occasions in the Jemez Mountains and the Pajarito Plateau.

Navajo history during the period of 1540 through 1850 is largely mingled with that of their Puebloan and Apachean neighbors, which is not surprising given the vast range of Navajo settlement and activities throughout the Four Corners area. According to Brugge (1983:Figure 1), as early as 1600 Cerro Pedernal, at the northern end of the Jemez Mountains, was at the eastern edge of the range of Navajo settlement. By the 1700s, this range had extended along the western flanks of the Jemez Mountains and almost as far to the east as to Abiquiu, but it apparently did not extend to the Pajarito Plateau itself. By the 1800s, the range of Navajo settlement had contracted back further to the west. Although actual Navajo settlement was not documented for the Pajarito Plateau and along the Rio Grande, it is possible that brief raids and hunting trips did occur in the area from time to time. Wilcox (1981:231) also points out that early Navajo may have occupied ancestral Tewa territory in the Piedra Lumbre Valley in the Upper Chama valley, a location near Cerro Pedernal.

Oral Historical Evidence

Ethnographers and archaeologists did not start gathering traditional knowledge from the northern New Mexico tribes until the late 19th and early 20th centuries, in some cases long after Euroamericans had greatly altered the configuration and boundaries of traditional tribal lands. The earliest attempts to gather tribal oral histories regarding the use of the Pajarito Plateau, including the area now occupied by LANL, were those by Adolph Bandelier and Edgar L. Hewett, which were summarized and amplified in John Peabody Harrington's now classic *The Ethnogeography of the Tewa Indians* (1916). Other notable related collections include Robbins et al. (1916) *The Ethnobotany of the Tewa Indians*, Henderson and Harrington's *The Ethnozoology of the Tewa Indians* (1914), and the Hewett et al. (1913) treatise on Rio Grande physiography in relation to Pueblo peoples.

A quote from Hewett (1906:12) provides a good starting point for dealing with oral traditions relating to the Pajarito Plateau:

> The ruins herein described were the ancient habitations of Indian tribes some descendants of which are doubtless now living in the adjacent valley of the Rio Grande and its tributaries, but most of whom are probably dispersed widely over the southwest. In every existing Tewa tribe (San Juan, Santa Clara, San Ildefonso, Nambe, and Tesuque) it is claimed that certain clans may be traced back through one or more migrations to the ruined pueblos and cliff-villages of the Pajarito plateau. The same may be said of the Keres villages (Cochiti, Santo Domingo, San Felipe, Santa Ana, and Zia), while it is known that the earlier Jemez people and their kindred occupied sites farther up the valley well into the historic period.
>
> ....It must be remembered that the foregoing statements refer to the period of continuous residence on the plateau. There have been from time to time in comparatively recent years sporadic reoccupations of these ancient villages by clans from the valley, as that of Puyé by the Santa Clara Indians, and of Kotyiti, or Pueblo Viejo, above the Cañada de Cochiti, by the Keres after the Pueblo rebellion of 1680. These reoccupations were attended with considerable rebuilding and repairing of ancient structures....

In treating the topic of oral traditions, four aspects are considered here. The first includes those traditions relating specifically to the peoples who constructed and used the Ancestral Puebloan remains at and around LANL. The second treats traditions relating to multi-tribal shrines (sacred places) on and near the Pajarito Plateau. The third deals with traditions regarding the migrations and origins of the Tewa and Keresan populations in the vicinity of the Pajarito Plateau, as well as similar traditions by non-Puebloan tribes. The fourth includes statements gathered from various tribes as part of the 1999 Department of Energy Site-Wide Environmental Impact Statement for continued operations at Los Alamos National Laboratory (DOE SWEIS).

LANL/Bandelier National Monument Oral History

It was clear from Harrington's work, which he largely conducted in 1910, that the area now occupied by LANL was considered by the people of San Ildefonso Pueblo to have been a critical part of their aboriginal territory. It is also noted that in 1919, and thus somewhat contemporary with Harrington's study, "*the Board of Indian Commissioners reported that San Ildefonso had probably suffered greater land loss through squatters than had any other Pueblo. In addition, commercial (non-Indian) timber removal on the hills above the Pueblo drastically affected the terrain and watershed*" (Edelman 1979:312). This statement obviously refers to the establishment of Hispanic and Anglo homesteads, beginning in the 1890s, on the Pajarito Plateau in and around the present location of LANL, along with the widespread and wholesale commercial cutting of juniper, the stumps of which are still visible in large numbers throughout the piñon-juniper woodlands at LANL.

In Harrington's study, residents of San Ildefonso Pueblo were able to identify and name a large number of specific places throughout the central Pajarito Plateau between Chupaderos Canyon to the north of the modern Los Alamos town site and Frijoles Canyon to the south in modern Bandelier National Monument (1916:Maps 16, 17). This area encompasses all of LANL, including the DOE property in Rendija Canyon immediately south of Guaje Canyon, with the single exception of the Fenton Hill property near Jemez Springs.

Harrington (1916:Map 14) depicts the southern boundary for Santa Clara Pueblo and thus the northern boundary for San Ildefonso Pueblo as being between Garcia Canyon and Chupaderos Canyon immediately north of Guaje Canyon. The large Classic period (AD 1325–1600) Ancestral Pueblo villages of Puye and Shufinne located in or adjacent to Santa Clara Canyon, along with the cavate structures associated with these villages, are attributed at least in part to the ancestors of Santa Clara village (see also Arnon and Hill 1979:296). However, Harrington (1916:237–238) notes that Frederick Hodge felt that other Tewa Pueblos in addition to Santa Clara also had ancestors at Puye and Shufinne.

The largest known Coalition period (AD 1200–1325) Ancestral Pueblo village site on the Pajarito Plateau, Guaje Pueblo, is presently situated on US Forest Service land on the north side of Guaje Canyon. Although the canyon is within the aboriginal boundaries of San Ildefonso Pueblo, apparently in the early AD 1800s a group of Santa Clara Indians lived in the canyon bottom close to Guaje Pueblo (Harrington 1916:266).

Guaje Pueblo is also situated along a trail that originally was used by the Tewa when traveling to Jemez Pueblo (Harrington 1916:265). Along a tributary wash of Guaje Canyon is the location named "where the Comanche fell down." This spot commemorates the time that a Comanche Indian, pursued by the Tewa, fell over a cliff and died (Harrington 1916:267). On a mesa west of the beginning of Pueblo Canyon is a spot called "mesa where the donkey was killed" (Harrington 1916:269). This spot is said to commemorate the location of where a Tewa donkey, stolen from a corral by a Navajo, fell off of a cliff after the Navajo was pursued by armed Tewa.

Otowi (Potsui'i) is a large Classic period Ancestral Pueblo village that is situated on lands transferred to the Pueblo of San Ildefonso in 2002 as part of the Congressionally mandated C&T Project (Public Law 105-119). Otowi contains five major multistoried roomblocks, with an estimated combined total of around 450 individual ground floor rooms. Archaeological evidence suggests that Otowi was initially founded in the transition between the Coalition and Classic periods (ca. AD 1300–1350). Hewett (1906:20) notes:

> The traditions of Otowi are fairly well preserved. It was the oldest village of Powhoge clans of which they have definite traditions at San Ildefonso. They hold in an indefinite way that before the building of this village they occupied scattered "small house" ruins on the adjacent mesas, and they claim that when the mesa life grew unbearable from lack of water, and removal to the valley became a necessity, a detachment from Otowi founded the pueblo of Perage in the valley on the west side of the Rio Grande about a mile west of their present village site.

The "small house" ruins noted by Hewett is a clear reference to the many Coalition period roomblocks and plaza pueblos scattered throughout the mesa tops within the boundaries of LANL and elsewhere on the Pajarito Plateau.

About two miles southeast of Otowi is Tsankawi (Saeewi'i), another large Classic period Ancestral Pueblo village situated on land now operated by the National Park Service as a noncontiguous parcel of Bandelier National Monument. Harrington notes that he was emphatically told that the people living at Otowi and at Tsankawi were ancestors specifically to the people of San Ildefonso and not to any of the other Tewa villages. Hewett (1938:48) notes that for Tsankawi,

> The inhabitants, it is claimed were Tewa, related to the people of Otowi. They are alleged by some informants to have migrated to the region south of Santa Fe; by others, to have merged with Otowi clans to form the San Ildefonso community.

On LANL property, just west of the town site of White Rock, is the large Classic Ancestral Pueblo period village of Tsirege. Hewett (1938:50) states:

> It was the largest pueblo in the Pajarito district, and with the cliff villages [cavates and associated talus rooms] clustered about it, the largest aboriginal settlement, ancient or modern, in the Pueblo region, of which I have personal knowledge, with the exception of Zuñi. The ruin shows a ground plan of upward of six hundred rooms.... Tsirege is said to have been the last of the villages of Pajarito Park to be abandoned.

Harrington (1916:283) was told by residents of San Ildefonso that, as with Otowi and Tsankawi, only the ancestors of San Ildefonso and not the other Tewa villages lived at Tsirege. Harrington also notes that a Cochiti informant confirmed that the Tewa lived at Tsirege.

Harrington (1916:278) suggests that the ancestral boundary between San Ildefonso Pueblo and Cochiti Pueblo is situated immediately north of Frijoles Canyon near the present southern boundary of LANL. As cited in Powers and Orcutt (1999b:575), the boundary may coincide with Ancho Canyon immediately south of Water Canyon and within the boundaries of LANL. The analysis conducted by Powers and Orcutt (1999b:575–576) suggests that this cultural boundary was "permeable" and may have shifted to the northeast during the Classic period. Recent government-to-government discussion by the LASO Cultural Resources Program Manager and the LANL CRT with cultural specialists from the Pueblos of San Ildefonso and Cochiti suggests that there may be some overlapping tribal claims between Frijoles Canyon to the south and Water Canyon to the north.

Cochiti oral history appears to be very specific in regards to their relationship with the Pajarito Plateau. Lange (1959:7) notes:

> ...some claim to have lived …at Frijoles Cañon 'along with all the other Pueblo Indians.' Although this latter claim is overly inclusive in light of present anthropological research, there does appear to be a general inclination to agree that the Cochití and probably other Keresans (and perhaps other linguistic groups as well?) occupied Frijoles until a few centuries before the advent of the Spanish in 1540...
>
> In the vicinity of the reservation and within the pueblo itself potsherd collections show a sequence extending from the present back to Glaze 1 red and yellow wares, with dates as early as A.D. 1225. Other sites, such as Pueblito, west of Cochití in the Santa Fe National Forest, show pottery types of the period 1050-1250. The Cochití, however, claim no direct association with the majority of these ruins other than those in and adjacent to Frijoles Cañon, including those in association with the well-known Stone Lions of Cochití, and those above and in Cañada de Cochití.

These claims are of interest both from the perspective of the ancestral affiliation that Cochiti shares with the cultural resources of Bandelier National Monument, and with the acknowledgment that other Keresan villages and potentially other language groups (such as the Tewa) occupied areas immediately adjacent to Frijoles Canyon and Cañada de Cochiti on the Pajarito Plateau. Apparently, Santo Domingo viewed their relationship to Frijoles Canyon and surrounding areas in a manner very similar to that of Cochiti (Lange 1979b:379).

Of particular interest are the traditions surrounding the Ancestral Pueblo village site of Kuapa whose ruins are situated in Cañada del Cochiti about five miles north of Cochiti Pueblo. According to Adolph Bandelier, the ancestors of Cochiti Pueblo and San Felipe Pueblo lived in Kuapa as one people sometime before the advent of Coronado expedition in 1540 (Strong

1979:392). Bandelier's version of this tradition is as follows (cited in Haas and Creamer 1992:25):

> [T]he village of Kua-pa was once attacked by the Tehuas [Tewas] and captured. The survivors retreated to the Portrero Viejo; the Tehuas pursued, but their attack upon the lofty cliff signally failed. They were defeated and driven back across the Rio Grande, many of them are said to have perished in that river, and the Tehuas never troubled the Queres [Keresans of Kuapa] again. In consequence of these hostilities, the survivors established themselves on the potrero [high cliff] for a short time, whence they descended to settle where Cochiti stands to-day.

This story and other traditions, including information from current cultural specialists at Cochiti and San Ildefonso, indicate that the approximate location of the boundary between Cochiti and San Ildefonso in the vicinity of Frijoles Canyon and Water Canyon goes back at least as early as the 15th century. However, more recent interviews (e.g., Martinez and Suina 2005) illustrate how difficult it is to draw precise boundaries.

Multi-Tribal Shrines

Shrines are an important part of traditional cultural landscapes (Anschuetz 1998), being associated with trails, cultural boundaries, important resource locations, and the locations of important tribal or clan events.

The Coalition and Classic period resources of the main unit of Bandelier National Monument in and around Frijoles Canyon are attributable to the ancestors of Cochiti Pueblo and perhaps other Keresan Pueblos. Notable, however, is the fact that although Keresan ancestors are said to have constructed the famous shrine of the "stone lions" immediately west of the ruins of Yapashi village, other tribes have also historically come to venerate this particular shrine. For example, Hewett (1938:55) states:

> This was the most important hunting shrine in the entire Pueblo region. Until very recent times it has been visited by Indians from as far away as Zuñi.

It is unclear as to what degree the historic publicity surrounding the Stone Lions, since at least the time of Adolph Bandelier's studies in 1880s, may have contributed to the interest and claims by tribal groups other than Cochiti Pueblo and other Keresan pueblos.

The presence of notable shrines on the Pajarito Plateau and adjacent regions that serviced more than one Pueblo and even perhaps members of different language groups is of considerable interest. There are at least two other known shrines utilized by Tewa speakers that crossed ethnic/linguistic boundaries. One is on Cerro Toledo in the Jemez Mountains. The Cerro Toledo example is a so-called "world quarter" shrine that apparently was used by people from the Pueblos of Taos, San Juan, Santa Clara, San Ildefonso, Cochiti, and Jemez (Douglass 1912). The other multi-tribal shrine is an alleged Keresan "emergence shrine," also seemingly utilized by Tewa-speakers, that was reported along the Rio Caliente some 55 miles north of Santa Fe (Devereux 1986).

Such potential multi-tribal shrines are not known at LANL. It is noted that ongoing consultations will likely identify several locations at LANL that have traditional cultural and/or religious significance for specific pueblos, particularly San Ildefonso, and possibly for specific non-Puebloan tribes as well. However, historic records and the ongoing discussions thus far make it seem unlikely that multi-tribal shrines are present at LANL.

Origin and Migration Traditions

The Tewa Pueblos have a widespread tradition that they migrated to the Pajarito Plateau from the north and west of their present locations along the Rio Grande (e.g., Whitman 1947:4). For some Tewa their original homeland and place of emergence was from a lake in the general region of southern Colorado (Arnon and Hill 1979:296; Ortiz 1979b:278; Parsons 1994). The Tewa were led in this migration by the Hunt chief, a man who had been given supernatural powers and assumed the shape of a mountain lion (Ortiz 1969:14–15):

> [T]he Hunt chief divided the people between the Summer chief and the Winter chief. Those who were to follow the Summer chief would proceed south along the mountains of the west side of the Rio Grande. The Winter chief and his group would proceed along the mountains on the east side of the river. The Summer People, as the former group came to be called, subsisted by agriculture and by gathering wild plant foods, while the Winter People subsisted by hunting. Each group "took twelve steps" (made twelve stops) on this journey, and after each step they built a village....

Although Alfonso Ortiz (1979b:280), a member of San Juan Pueblo and noted 20th century anthropologist, was hesitant to directly link the Tewa with the people who built the spectacular cliff dwellings in the Mesa Verde area of southern Colorado, at least some modern Tewa, including those at San Ildefonso, believe that at one time they indeed lived in vicinity of the Mesa Verde area (Edelman 1979:312). They claim affinity to the cultural resources of the Mesa Verde National Park, a claim recognized by the National Park Service. Archaeologists have long speculated that the large increase in population during the Late Coalition and Classic periods on the Pajarito Plateau is linked with widespread abandonment of the San Juan Basin and the northern San Juan (including both Chaco Canyon and Mesa Verde) during the period of AD 1150–1300 (Cordell 1979; 1997:359–360; Powers and Orcutt 1999b:551–589). Santa Fe Black-on-white, the most prevalent Coalition period decorated pottery type on the Pajarito Plateau, has definite affinities to pottery produced earlier in Chaco Canyon, and, similarly, Galisteo Black-on-white to Mesa Verde.

The Keresan-speaking pueblos, including Cochiti, uniformly consider that they migrated to the Rio Grande from the north, which includes links to both Chaco Canyon and Mesa Verde. For example, the following traditional history issued by the tribal council of San Felipe Pueblo in the late 1960s is typical of the Keresan view of their origin and migrations (cited in Strong 1979:390):

> Age after age the Spirit, the guardian and leader of the Pueblo Indians, took the ancient people across this great continent southward, until they came to settle temporarily in the places of today's National Parks and National Monuments.

> Everything they planted was harvested and was eaten along the route. Maybe to preserve the human race from total annihilation of any attack which may befall them, the Spirit caused the people to migrate in groups in separate directions from these places of historic settlements. He continued to guide each group on their trek until he brought them to a region [the Rio Grande Valley] where they can readily be safe and begin their tribal settlement.

Hewett was one of the early champions of the notion that the Classic period pattern of settlement aggregation and some abandonment on the Pajarito Plateau was due to the depredations of nomads, presumed to be Navajos (1904:658):

> If students of the Navaho will tell us at what time that tribe poured into the intermontane region and commenced to worry the peaceful Pueblos, we can approximately date the construction of the great Pueblos and cliff-villages of Pajarito Park. Tewa traditions tell of long undisturbed peace before the coming of these marauders; after this a tendency to concentration for some time, and then a throwing off of detachments by emigration, amounting at last to a complete abandonment of these sites.

This brings us to a discussion of the Navajo view of their origins and early interactions with Puebloan populations in northwestern New Mexico. One of the more elaborate myths associated with the Navajo creation and events that according to tradition took place early in the present Fifth World, is that of the Great Gambler (Levy 1998:99, 107–109; Matthews 1994:81–87; O'Bryan 1993:48–62; Zolbrod 1984:98–112). In the myth of the Great Gambler, the Navajo are described as being contemporaneous with Pueblo Indians living in Chaco Canyon, including during the time of the 10th and 11th century construction of the Chaco Great Houses, such as Pueblo Bonito.

It is clear that this myth is not a modern fabrication, but rather has some time depth—and certainly before the 20th century concerns regarding competing land claims, and before the creation of Chaco Canyon National Monument in 1906. However, our current archaeological and historic documentary evidence does not support the presence of Navajo before the 15th century. It is possible that this myth had its genesis after the Pueblo Revolt of 1680 during which time there was considerable co-residence and even intermarriage between Puebloan and Navajo populations. The Great Gambler story may reflect a natural blending of Pueblo and Navajo traditions at a period of time during which both groups were experiencing considerable upheaval and turmoil due to Spanish, Comanche, and Ute depredations.

A final point to make about migration stories is the fact that Indian perceptions of time and space within such stories is not necessarily the same thing as the more materialistic view of anthropologists and archaeologists. For example, Tessie Naranjo (1995) from the Pueblo of Santa Clara reminds us that their traditional view of the Tewa migration is really about general aspects such as movement and directional orientation, and is layered with multiple meanings.

DOE SWEIS Statements

In 1999, DOE published a SWEIS for the continued operation of LANL. In order to evaluate the possibility that TCPs as defined by the NHPA are present at LANL, DOE commissioned an ethnographic study, the results of which are included in Appendix E of Volume III, Part B of the SWEIS document (U.S. Department of Energy 1999). The only other TCP study that had been previously conducted for DOE and LANL lands had been that conducted in the early 1990s in Rendija Canyon as part of the then proposed Bason Land Exchange (Peterson and Nightengale 1993). The Rendija Canyon study resulted in seven sites being identified as TCPs by San Ildefonso Pueblo.

The SWEIS ethnographic study involved a review of the extant historic documentary and ethnographic literature, along with letters of inquiry being sent to 24 tribes and Hispanic communities, and meetings being conducted with representatives of those tribes and Hispanic communities wishing to become involved with the study. The information gathered during this process, while of interest here, was insufficient to substantiate claims for specific TCPs at LANL. Therefore, a separate ongoing process has been implemented by DOE specific to the issue of TCPs (U.S. Department of Energy 2000).

The SWEIS study indicated that many tribes considered themselves to be at least loosely affiliated with LANL lands and the Jemez Mountains in general. However, with the exception of the Pueblos of San Ildefonso, Cochiti, Santa Clara, and Jemez, the claims of most other tribes were of such a nature (such as plant gathering resource areas) to suggest that the activities conducted by these other tribes would be unlikely to result in human remains and other items covered by NAGPRA to be present at LANL.

Archaeological and Physical Anthropological Evidence

Two bodies of archaeological evidence are important for our discussion of cultural affiliation at LANL. The first is that of the general archaeological evidence, apart from that at LANL itself, by which to evaluate oral traditions, linguistic reconstructions, and other aspects of culture history bearing on the movements of specific cultural groups. The second is that of the totality of archaeological evidence, as it currently exists from all past and current projects conducted at LANL.

General Archaeological Evidence [Non-LANL]

Ford et al. (1972) published a seminal paper that looked at the question of the archaeological origins of the historically documented Pueblos in the Southwest. Although the three authors exercised their prerogative for debate and disagreement among themselves, their general conclusions still largely stand today as the primary model for historic Pueblo origins (Ford et al. 1972:39):

> Agreement is evident concerning the prehistory of the Jemez extending back in time to the Gallina, Rosa, and Los Pinos phases [ca. AD 1 to 1300] and of the withdrawal of groups in northern Arizona and southern Utah to form the ancestral basis of the Hopi. We concur that the Tiwa developed in the Rio Grande but

> differ on the cause of the two divisions. The Zuni are also viewed as developing in the general area where they are found today, but Peckham feels they were augmented by additions from the Chuska-Chaco area. The Keres are seen occupying prehistoric Mesa Verde and Chaco Canyon; differences emerge when we attempt to trace their movements. The greatest disagreements emerge when the Tewa are examined; after AD 1300 we have no dissent, but before that Ford and Schroeder look to the upper San Juan area for their homeland, while Peckham defends a Rio Grande hearth.

Admittedly, these reconstructions were derived during an era when most archaeologists tended to view named pottery types and their associated cultural sequences as having some kind of a quasi-genetic relationship to specific cultural groups. However, given the broad experience with both archaeology and ethnohistory possessed by these three individuals (Ford, Schroeder, and Peckham), their general conclusions should not be readily dismissed. These conclusions are presented in more detail below. Other classic studies that usefully address Rio Grande and historic Tewa pottery-making include those by Guthe (1925), Chapman (1970), Harlow (1973), and Frank and Harlow (1990). The totality of Puebloan archaeology and related aspects of ethnohistory have been productively reviewed in several recent publications (e.g., Adams and Duff 2004; Adler 1996; Cordell 1994, 1997), including specific treatment of the northern Rio Grande (e.g., Riley 1995, Schlanger 2002), including Bandelier National Monument (Kohler 2004; Kohler et al. 2004; Powers 2005). These together with the earlier overview by Ford, Schroeder, and Peckham form the basis for the following cultural history outline:

By Basketmaker III times (ca. AD 400 to 750), the following distribution of Puebloan cultural groups seem to have been established (Ford et al. 1972:23):

> Hopi speakers occupied southeastern Nevada, southern Utah, and a band across Arizona north of the Colorado River. Zuni speakers inhabited a triangle generally delimited by extreme west-central New Mexico to the drainage of the upper Little Colorado and Puerco (west) rivers. We concur (Schroeder excepted) that the Keres were living in the middle San Juan area south toward the Rio Puerco and Acoma. This leaves the Tanoans as denizens of southern Colorado and New Mexico from the Animas River east to and down the Rio Grande.

Following the Basketmaker III period, there appears to have been a sequence in which the ancestors of the Tewa and Towa lived together in the upper San Juan until around AD 700 to 1000, about which time they began to split. After AD 1000 the Tewa began moving out of the upper San Juan down the Chama and Puerco valleys northwest of Albuquerque, and perhaps in the Galisteo Basin as well. They came into the Española portion of the Rio Grande Valley by no later than AD 1250. The Towa seemingly moved into the areas around Jemez Springs and at Pecos by around AD 1250 to 1300. Meanwhile, the Tiwa as a cultural entity seemingly developed in situ in the Rio Grande Valley. Around AD 950 to 1000 the Tiwa began to split into the southern and northern dialect groups. This split was caused by the advent of the Tewa migrations into the northern Rio Grande around Santa Fe, or alternatively by the in situ development of the Tewa from a local basis in the northern Rio Grande.

The archaeological relationship between Keresan speakers and the Tanoans after AD 1000 is intertwined, confused, and complex. Keresans moved out of Chaco Canyon during the period of AD 1100 to 1200, displacing some Tewa speakers towards the Jemez Mountains and perhaps the middle Rio Grande-Galisteo Basin. The eastern Keresans become recognizable archaeologically at around AD 1300. As noted by Ford et al. (1972:35):

> Schroeder and Ford have the Keres on the Puerco moving into the Salado River valley below Jemez to the Rio Grande, north to Frijoles Canyon, and east to San Marcos in the Galisteo.... This movement, following Schroeder, pushed more Tewa into the Pajarito Plateau and Chama, and displaced the Towa in the Santa Fe area toward Pecos Pueblo. Peckham strongly disagrees. By his model the initial withdrawal from Mesa Verde began in the twelfth century and brought the inhabitants in a southerly direction and expanded with other San Juan Basin migrants in the next century into the Puerco and Rio Grande areas.

The recent large-scale intensive survey conducted at Bandelier National Monument amplifies this picture for this portion of the Pajarito Plateau (Powers and Orcutt 1999b:551–589). Before around AD 1150, there was only limited use of the Bandelier National Monument area by post-Archaic period (after ca. AD 600) populations. At around AD 1150 (the beginning of the Coalition period) there is the start of the use of small, briefly occupied habitation sites that bear strong similarities to the basic habitation unit of the San Juan and Mesa Verde areas. These people were likely attracted to the largely pristine high woodlands by the development of dry farming techniques not previously extensively used along the northern Rio Grande.

Around AD 1200, population begins to aggregate into larger social groups (small hamlets and villages) in the Bandelier National Monument area. A sizable amount of this aggregation appears to be from the arrival of new immigrants. At around AD 1250 to 1300, most of the aggregated sites are abandoned and population drops, possibly a local response to climatic change. Between around AD 1300 to 1325, there is a renewal of aggregation associated with new immigrants, but it seems to be on a smaller scale than that between AD 1200–1250, but with longer life spans of use for individual habitation sites.

During the period of AD 1325–1440, population again declines in the Bandelier National Monument area, but there is a peak in aggregation. By around AD 1350 to 1375 virtually all population had aggregated into just a few large isolated villages such as Yapashi, Tyuonyi, San Miguel, and a few of the cavate complexes. Population in these villages is not stable, but shows periodic fluctuations. Between around AD 1400 to 1440, there is a decrease in the level of aggregation and an increase in the use of cavate rooms as opposed to rooms in the open pueblos, with about 60 percent of the rooms in use being cavates. Agricultural features (fieldhouses and gridded gardens) are also prevalent at this time.

Between AD 1440 and 1600, although population at Bandelier National Monument remains largely aggregated, overall population levels drop. Powers and Orcutt (1999b:586) note that the nearest aggregated settlements during this period to those in Frijoles Canyon were at Kuapa, 14 km to the south, and Tsirege, 6.5 km to the north. A drought during the AD 1570s to the early

1590s resulted in the final abandonment of the large aggregated settlements on the Pajarito Plateau, although the area may have been already largely abandoned by around AD 1550.

The potential of warfare (presumably including Navajo and Ute hostilities as well as internecine Pueblo warfare) at Bandelier National Monument for being a factor in the abandonment process was considered before the survey (Powers and Orcutt 1999b:27–28), but seemingly no evidence for such hostilities was documented. There was evidence, however, for the Puebloan reuse of at least one cavate complex in Frijoles Canyon around the time of the 1680 Pueblo Revolt.

However, it is clear that by at least the end of the 17th century Navajos were utilizing lithic resources in the Jemez Mountains (see Shackley 2005a for a general treatment of the value of obsidian sourcing). For example, Vierra (1995:126) found examples of Jemez Mountain source materials in his analysis of the lithic assemblages from Navajo Pueblito complexes in the Dinetah district of northwestern New Mexico that dated to around 1690–1750. A total of 29 obsidian artifacts were identified from sources in the Jemez volcanic field (Cerro del Medio, Polvadera Peak, Obsidian Ridge, Paliza Canyon), along with two specimens of Pedernal chert from the vicinity of Cerro Pedernal. It is certainly notable that the 21 specimens of Cerro del Medio obsidian would have been collected from Cerro del Medio, a volcanic glass source that is less than 5 km west of Pajarito Peak adjacent to Los Alamos.

Because the Jemez volcanic field lithic sources do not appear to have been controlled by any specific tribe, it is assumed that the Navajo were themselves procuring materials from Cerro del Medio as opposed to simply acquiring the material in trade (Bradley J. Vierra, personal communication 2001). This assumption is supported by the documented presence of Jemez volcanic field lithics (obsidian and chert) as a consistent exotic at many historic period Navajo sites throughout northern New Mexico (Kearns 1996:121–123, 143).

LANL Archaeology

The history of archaeological fieldwork at LANL has been detailed as part of the cultural resource assessment volume prepared in conjunction with the C&T Project (Vierra 2000:4-1 to 4-10).

Briefly summarized, this includes

- Excavations by Edgar Hewett at Otowi and Tsirege between 1900–1904.
- Excavations at Otowi by Lucy Wilson between 1915–1917.
- Surface collections from Tsirege and Otowi (and from Navawi and Tsankawi) by H. P. Mera in the 1920s–1930s. Stabilization work at Otowi and some of the nearby cavates by Robert Lister of the National Park Service in 1939.
- Salvage excavations of a one-room fieldhouse and a Coalition period 10-room pueblo roomblock by J. W. Hendron for the National Park Service in the early 1940s.
- Survey and surface collections in portions of Barrancas, Bayo, Pueblo, Otowi, Los Alamos, Sandia, and Mortandad canyons by John Turney for the National Park Service in 1955.

- General survey and the excavation of two Coalition period pueblo roomblocks (eight-room and a ten-room) at Technical Area 21 and in Los Alamos Canyon by Frederick Worman of the Los Alamos Scientific Laboratory (LASL) during 1950–1971.
- General survey throughout LANL by LASL archaeologist Charlie Steen during 1973–1981.
- Extensive survey and surface collection of artifacts throughout LANL by James Hill of the University of California, Los Angeles Pajarito Archaeological Research Project during 1977–1985.
- Small surveys and one homestead excavation project by LANL contract archaeologist David Snow during 1983–1985.
- Various surveys throughout LANL by LANL archaeologist Beverly Larson during 1986–1997. During this period of time, excavations were also carried out at two pueblo roomblocks, in Technical Area 54 Area L (1990–1991) and Area G (1993), that were threatened by LANL building construction activities (Schmidt 2006; Vierra et al. 2002).
- A cavate survey by LANL employee James Jorgenson during the 1980s.
- Two surveys and site testing by the Museum of New Mexico along State Route 4 and White Rock Y in 1987.
- Additional survey and the testing of 11 sites at White Rock Y by the Museum of New Mexico in 1987.
- Survey by TFA, Inc., of Rendija Canyon for the Bason Land Exchange in 1992.
- Survey by Archaeological Research, Inc., of Rendija Canyon for the Bason Land Exchange along with the testing of 26 sites in 1993 (Peterson and Nightengale 1993).
- Various surveys by the LANL Ecology Group CRT throughout LANL during 1998–2006. This included surveys for the C&T Project, and surveys as part of the Cerro Grande Fire Rehabilitation Project. Also during this period, University of New Mexico graduate student Marit Munson conducted a detailed study of rock art in various locations throughout LANL, including those associated with cavate complexes (Chapter 81, Volume 4).
- The recently finished excavation of more than 40 Archaic period, Ancestral Pueblo Coalition and Classic period, and historic Apachean tipi ring archaeological sites as part of the Congressionally mandated C&T Project.

As of the summer of 2006, approximately 84 percent of LANL had been subjected to intensive and systematic archaeological survey. Although some of the earlier studies (before 1986) remain poorly reported, general conclusions can be reached about the nature of the documented archaeological resources at LANL. The cultural historical sequence at LANL reflects our understanding of the findings at Bandelier National Monument as well as the data from the C&T Project. In addition to the baseline excavation itself, important baseline syntheses by a variety of subject matter experts have been prepared on a wide range of topics such as trails, rock art, faunal remains, agricultural intensification, projectile points, geology, biscuitware ceramics, maize, dendrochronology, pottery temper, geomorphology, and subjects that provide useful information about past peoples on the Pajarito Plateau. The following is a brief summary:

The Paleoindian period (9500 to 5500 BC) is only represented by a single isolated projectile point. It is undetermined if substantive Paleoindian sites are present at LANL.

There are a sizable number of Archaic period (5500 BC to AD 600) sites scattered throughout LANL. Virtually all of these appear to be temporary campsites associated with pine nut collecting, hunting, lithic procurement, and similar limited seasonal activities. Because of the temporary nature of these sites, it is unlikely (although still possible) that burial and associated grave goods dating to this period are present at LANL.

Evidence for Developmental period (AD 600 to 1150) sites is almost completely lacking for LANL. The Developmental sites that have been identified at LANL are distributed into two clusters: a northern cluster near Pajarito Canyon and a southern cluster near Ancho and Water canyons. These sites include artifact scatters, one- to three-room structures, and small roomblocks utilizing jacal construction. The ceramic assemblages are dominated by Kwahe'e Black-on-white, with lesser amounts of Red Mesa Black-on-white and Wingate Black-on-red. It seems likely that this limited occupation reflects an early attempt by agriculturalists to colonize the plateau, but was met with only limited success.

There are large numbers of Coalition period (AD 1150–1325) sites of many different types scattered throughout LANL. These include pueblo roomblocks, plaza pueblos, cavate complexes, rock art, agricultural features such as garden plots and fieldhouses, artifact scatters, and various rock features. Although there are a few trade items (such as ceramics) that obviously came from other Pueblo groups in northern New Mexico and eastern Arizona, there is nothing in the assemblages and sites known to date to the Coalition period that suggests anything other than a Tewa or possibly Keresan affiliation.

There a number of Classic period sites (AD 1325–1600) scattered throughout LANL, but these are far fewer in number than the earlier Coalition period sites. These Classic period sites include a few large aggregated pueblos such as Otowi and Tsirege, along with cavate complexes, agricultural features such as garden plots and fieldhouses, artifact scatters, rock art, and various rock features. And, as with the earlier Coalition period, although there are a few trade items (such as ceramics) that obviously came from other Pueblo groups in northern New Mexico and eastern Arizona, there is nothing in the assemblages and sites known to date to the Classic period that suggests anything other than a Tewa or possibly Keresan affiliation. There is an absence of material culture items that can be attributed to the Navajo, Apache, Utes, or Comanches during the Classic period. It is noted that excavation collections from Otowi and Tsirege, currently housed at the Smithsonian Institution and largely consisting of material culture items likely associated with burials, were briefly examined by members of the LANL CRT. These all appeared consistent with a Tewa affiliation.

The Puebloan reuse of Coalition and Classic period sites after AD 1600 has not yet been definitively documented at LANL, with the exceptions of the use of agricultural fields near Otowi (documented by pollen evidence and radiocarbon dated to the 1700s), and the known reuse of the Late Coalition-Early Classic period standing-wall pueblo of Nake'muu by women and children from San Ildefonso Pueblo during the 1680 Pueblo Revolt. It was this reuse of Nake'muu that likely resulted in the preservation of the site as the only standing-wall open Ancestral Pueblo archaeological site at LANL. Some of the cavate rooms at LANL exhibit what is almost assuredly Historic period use, but it is uncertain how much of this reuse represents the activities of Euroamerican homesteaders as opposed to Native American (presumably Pueblo) activities.

Throughout all of LANL, only two archaeological sites appear to represent the remains of non-Puebloan Native American activities. These two sites are both situated in Rendija Canyon and each contains a single nearly circular alignment of stones that bear reasonable similarities to the remains of known wickiup or tipi rings (e.g., Gunnerson 1979:Figure 6). The two sites are situated less than 150 m apart at the far northern boundary of the Rendija Canyon parcel. Both sites were recorded and tested as part of the Bason Land Exchange Project (Peterson and Nightengale 1993). The rock ring at one of the sites was estimated to have been about 4.5 m in diameter with individual rocks spaced from 40 to 75 cm apart (much of the feature has been destroyed by erosion), while the other ring was about 5.0 meters in diameter with rocks spaced from 40 to 60 cm apart.

Excavation in 2004 of these two stone ring sites as part of the C&T Project indicated there use as likely seasonal habitation by Apacheans for a brief period of time (one or two years) during the 1890s. It seems likely that the occupants were Jicarilla, based on the presence of Jicarilla ceramics, metal artifacts, and moccasin beads. However, due to the mobility of the period, other Apachean groups cannot be ruled out.

Physical Anthropology Evidence

A single recent study (Schillaci and Stojanowski 2005) looked at the physical evidence from actual human remains from the Pajarito Plateau and elsewhere in northern New Mexico in the attempt to identify and understand biosocial aspects of Ancestral Tewa populations. These remains were from Ancestral Pueblo villages of Puye, San Cristobal, Sapawe, Otowi, and Tsankawi.

This study suggested that Puye and Tsankawi were "somewhat isolated from extraregional migration and gene flow, or possibly did not participate in region-wide aggregation, despite comparatively long occupation spans" (Schillaci and Stojanowski 2005:410). This finding is seemingly consistent with the traditional view of Tsankawi as being related to just a single descendant pueblo (San Ildefonso), but may contrast with the previously mentioned view that Puye is ancestral to several different Pueblos and thus would have been expected to reflect a mixture of populations. The opposite case was found for Otowi in that it had a high degree of genetic heterogeneity in its population, but is associated with only a single descendant pueblo (San Ildefonso).

However, it is important to remember that the sample size for this study (128 crania) is relatively small given the length of occupation span and the numbers of people living at these five pueblos. Therefore, these findings should be viewed cautiously in terms of their explanatory value(s).

LANL NAGPRA Cultural Affiliation Determination Conclusions

The combined weight of the evidence outlined above leads to the following conclusions regarding the likely cultural affiliation of Native American human remains at LANL. This refers to all LANL lands with the exception of the small Fenton Hill parcel.

San Ildefonso Pueblo has maintained relative geographical stability since at least the beginning of the 13th century in its relationship to the Pajarito Plateau and LANL lands. During that period of time there may have been some boundary overlap with the Keresan-speaking Pueblo of Cochiti to the south and the neighboring Tewa Pueblo of Santa Clara to the north. Historically, the aboriginal lands of San Ildefonso Pueblo on the Pajarito Plateau were approximately bounded by Ancho Canyon to the south and Guaje or Chupaderos canyons to the north, and the flanks or crest of the Jemez Mountains to the west.

There is evidence for non-sedentary or limited seasonal non-Puebloan Native American use of a portion of LANL/DOE lands (Rendija Canyon), apparently during the 1890s by Jicarilla Apache or other Apachean groups. The remains of two tipi or wickiup rings suggest a brief occupation of the area, but are not indicative of sustained or repeated use of the area by Apacheans. It is unlikely, although possible, that additional similar remains are present in the unsurveyed portions of LANL.

There is little evidence for Developmental period (AD 600–1200) Puebloan archaeological material at LANL, and it seems plausible that such remains, if present, could with a degree of certainty be linked with the Pueblos of San Ildefonso, Cochiti, and perhaps Santa Clara. There is some possibility for Archaic period (5500 BC to AD 600) human remains to be present at LANL, but it would be difficult to directly link such remains to a specific tribe or Pueblo. The preponderance of evidence suggests that early Tanoan speakers (Tewa, Tiwa, Towa) and Keresan speakers occupied the northern Rio Grande region before AD 600, thus all Tanoan and Keresan pueblos should have some affinity to human remains dating to the Archaic period.

Based on these data and conclusions, the following determinations are made in terms of ownership and cultural affiliation as specifically applied to human remains and associated and unassociated objects covered by NAGPRA:

1. The Pueblo of San Ildefonso will be considered to have standing to claim cultural affiliation for all Developmental period through Classic period Ancestral Pueblo Native American human remains and associated material culture items covered by NAGPRA throughout LANL, with the specific exceptions noted below. Consideration of Paleoindian and Archaic period remains is treated separately below.

2. Given the development that has taken place at the LANL Fenton Hill parcel near Jemez Springs, it is unlikely that Puebloan Native American human remains and associations are present. However, in the event that such remains are discovered, Jemez Pueblo will be considered to have sole standing to claim cultural affiliation to these remains.

3. The Jicarilla Apache and the Mescalero Apache are considered to have standing solely for the two wickiup or tipi ring sites in Rendija Canyon. San Ildefonso Pueblo, Santa Clara Pueblo, and other Puebloan groups do not have standing for these specific sites for purpose of NAGPRA. In the unlikely event that additional similar non-Puebloan Native American sites are identified in the remaining unsurveyed portions of LANL, or in the equally unlikely event that intentional excavation or inadvertent discoveries elsewhere at

LANL result in Native American human remains and associated material culture items that may be non-Puebloan based on contextual evidence, then the appropriate non-Puebloan tribe(s) will be considered to have standing for such sites and remains.

4. Both the Pueblo of Cochiti and the Pueblo of San Ildefonso are considered to have standing to claim cultural affiliation for all Ancestral Pueblo Native American human remains and associated material culture items covered by NAGPRA that are located at LANL along the southern escarpment of Water Canyon, but not including Water Canyon itself. It is noted that discussions with each tribe suggest that this determination is satisfactory for both, although neither tribe was willing to commit to such a determination in writing.

5. After lengthy discussions with the Pueblos of Santa Clara and San Ildefonso, it was determined by LASO that both tribes have standing to Ancestral Pueblo NAGPRA remains and cultural objects in Rendija Canyon. A similar finding was made with respect to TCPs in Rendija Canyon in compliance with the NHPA. However, it is recognized that the Pueblo of San Ildefonso is not satisfied with this shared finding in that they view Rendija Canyon as being solely within their aboriginal territory. Although the specific determination for Rendija Canyon expressed here is considered disputatious, it is also understood by all parties that for the purposes of NAGPRA and cultural resources management at LANL, the determination seemingly does not have major consequences in that no NAGPRA remains and cultural objects were actually found during the C&T Project excavations, and the Rendija Canyon parcel is currently scheduled for transfer out of federal jurisdiction before 2012.

6. Because of a variety of historic marriage and kinship relationships along with customary land use, it is possible that individuals at pueblos other than San Ildefonso, Cochiti, Santa Clara, and Jemez feel they have legitimate claims for standing under NAGPRA to the Ancestral Pueblo Native American remains and associations found at LANL, and are likewise concerned with cultural resources management at LANL. While recognizing this likely may be the case, LASO will proceed with the determinations as described above. This approach does not preclude or foreclose on individuals and tribes making independent NAGPRA claim. Were claims to occur, LASO would evaluate on a case-by-case basis.

7. It is unlikely that Paleoindian period human remains and associations will be found at LANL, and it is also somewhat unlikely that Archaic period human remains and associations will be discovered. In the event Paleoindian and Archaic period remains and associations are discovered, standing to claim cultural affiliation should be provided for all New Mexico pueblos along with the Hopi-Tewa of Arizona and Ysleta del Sur in Texas. However, LASO will encourage that the Pueblos of San Ildefonso, Santa Clara, Cochiti, and Jemez take the lead for such a claim on the behalf of the other Pueblos.

8. The detailed scientific study of NAGPRA remains and cultural objects by appropriate professional members of the scientific community, apart from that necessary for initial NAGPRA evaluation and documentation, is permitted under NAGPRA. However, the

legitimacy of such a request for further scientific study and its appropriateness must be demonstrated to LASO and clearly discussed and documented in government-to-government consultation with the appropriate culturally affiliated tribes. The LASO Cultural Resources Program Manager with the assistance of the LANL CRT will determine if such study is warranted, but as a prerequisite it must be demonstrated that such detailed study has a positive value not only for the scientific community but also for the culturally affiliated tribes.

9. In the unlikely event intentional excavation or inadvertent discovery at LANL results in a finding that the discovered Native American human remains and/or their associations are of such character as to not fall under the recommendations listed above, these will be treated in accordance with NAGPRA on a case-by-case basis.

10. Each of the 25 tribes included in the LANL SWEIS (U.S. Department of Energy 1999), along with the Ute Mountain Utes, were provided a copy of the cultural affiliation document for review. It is understood that any of these groups may challenge the above determinations, with the understanding that they must provide enough appropriate documentation to substantiate their claims.

TRADITIONAL CULTURAL PROPERTIES (TCP)

TCPs are defined in National Register Bulletin 38, *Guidelines for Evaluating and Documenting Traditional Cultural Properties*, as places of special heritage value to contemporary communities (often, but not necessarily, Native American groups) because of their association with the cultural practices or beliefs that are rooted in the histories of those communities and are important in maintaining the cultural identity of the communities (DOI 1990). Native American TCPs typically represent what are commonly referred to as "sacred sites." Sacred sites are defined more narrowly in Executive Order (EO) 13007 as discrete locations on federal land identified as sacred by virtue of their religious significance or ceremonial use by Native American religious practitioners and made known to the administering federal agency by an appropriately authoritative representative of a Native American religion.

A difficulty in the process of identifying Native American TCPs on federal land results from the fact that the tribes associated with TCPs historically until recently have often been excluded from visiting such sites. This situation is sometimes due to explicit restrictions such as pertain to the high security areas at LANL, or more commonly result from miscommunication between the agency and the tribe in which the tribe is not aware that the agency would allow visitation if specifically asked by the tribe. There potentially are TCPs at LANL that have not been visited by pertinent tribes (e.g., the Pueblos of San Ildefonso and Cochiti) due to the establishment of the Manhattan Project on the Pajarito Plateau in 1943, and perhaps even to some degree since Anglo and Hispanic homesteads began to be constructed in the 1890s. Thus while a TCP may be present in the general fund of cultural knowledge of a tribe, the exact location may have been obscured or forgotten.

Opportunities for identifying TCPs specific to the C&T Project locations have consisted of several different initiatives conducted during the period of 1992 and 2003. Two of these initiatives were part of consultation associated with two major LANL Environmental Impact Statements (EIS), both released in 1999. The first of these was that of the DOE SWEIS (U.S. DOE 1999a). The second was the EIS for the C&T Project itself, the *Environmental Impact Statement for the Conveyance and Transfer of Certain Land Tracts Administered by the U.S. Department of Energy and Located at Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico* (DOE 1999b). The remaining opportunities for TCP identification consisted of studies accompanying the survey and testing of Rendija Canyon archaeological sites in 1992–1993 as part of the then considered Bason Land Exchange (Peterson and Nightengale 1993), during NHPA Section 106 compliance consultation associated with the release of the C&T Project survey report (Hoagland et al. 2000) and that of the C&T Project research design (Vierra et al. 2002), and a 2002 site assessment conducted by the Pueblos of San Ildefonso and Santa Clara in conjunction with the Cerro Grande Rehabilitation Project in response to cultural sites damaged by the May 2000 Cerro Grande fire (San Ildefonso Pueblo/Santa Clara Pueblo 2002).

TCP/sacred sites consultations were extensively attempted for the DOE SWEIS (U.S. DOE 1999a, Appendix D). Twenty-three Native American tribes and two Hispanic communities were contacted, informed of the undertaking, and asked to enter into consultation on issues of traditional and/or spiritual concerns. Of the 23 contacted groups, four did not wish to participate in formal consultations. Virtually all of the consulted groups indicated that they had TCPs present on, or in the vicinity of, LANL.

Although many Native American groups expressed interest in this process, they did not provide sufficient locational information essential for long-term management and protection decisions to LANL. To date only the Pueblos of San Ildefonso and Santa Clara have provided such detailed information, identifying eight locations specific to the C&T Project within the Rendija Tract (Figure 72.2). Seven of these sites—a series of shrines marking a trail leading from the Rio Grande to a specific peak in the Jemez Mountains—were first identified by the Pueblo of San Ildefonso and evaluated in 1992–1993 as part of the earlier considered Bason Land Exchange (Petersen and Nightengale 1993). The eighth site, a cultural boundary shrine, was identified and initially evaluated as part of the cultural site assessment project conducted in 2002 by the Pueblos of San Ildefonso and Santa Clara in conjunction with the Cerro Grande Rehabilitation Project.

Figure 72.2. Members of the Pueblos of Santa Clara and San Ildefonso examine an archaeological site in Rendija Canyon.

These eight locations have been subsequently fenced by LANL for protection from inadvertent damage by vehicular traffic and pedestrian recreational use of Rendija Canyon. Although these parcels (represented by two sets of fences) are within the lands being transferred to Los Alamos County, they will be restricted from future development and visitation access will be provided to the Pueblos of San Ildefonso and Santa Clara.

CONSULTATION AND EDUCATIONAL OUTREACH FIELD AND LABORATORY VISITS

It was determined through consultation with both the Pueblos of San Ildefonso and Santa Clara that neither Pueblo wanted LANL to conduct an active program of outreach and education with the non-Native American public in terms of the C&T Project archaeological excavations. Although LANL archaeologists may have regretted not being able to perform such public outreach, we understood the sensitivity involved.

However, we were pleased to conduct periodic field tours for the Pueblos of San Ildefonso and Santa Clara themselves (Figure 72.3), and for the Jicarilla Apache Nation at the two sites in Rendija Canyon that proved to be culturally affiliated with a late 19th century Apachean occupation (Figure 72.4), as well as to Ancestral Pueblo fieldhouses then being excavated in Rendija Canyon. In addition to these field visits, all three tribes took the opportunity to visit the C&T Project archaeology laboratory and our office building at Technical Area 21.

Figure 72.3. Members of the Pueblo of Santa Clara visiting site LA 135290 during excavation (October 30, 2003).

Figure 72.4. A Jicarilla Apache Nation elder discussing aspects of a tipi ring located at LA 85869 (October 7, 2003).

THE NAGPRA INTENTIONAL EXCAVATION PLAN

Background

The NAGPRA, enacted in 1990 as Public Law 101-601 (25 USC 3001), is designed to develop a systematic process for determining the right of lineal descendants and Indian tribes to certain Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony with which they are affiliated. This law is relevant to cases of intentional excavation and inadvertent discovery on federal lands, such as LANL. The federal agency is required to develop plans and associated comprehensive agreements, in consultation with appropriate affiliated Native American tribes, that detail the manner in which discovered human remains, funerary objects (both associated and unassociated), sacred objects, and objects of cultural patrimony are to be excavated, analyzed, stored, and repatriated, and that lay out a process of dialog and consultation during the recovery, analysis, and disposition of these remains and objects. The plan detailed here is specific to the act of intentional excavation at LANL.

Public Law 105-119, authorized by Congress in 1997, mandated LASO to identify excess lands at LANL for potential conveyance and transfer to the Incorporated County of Los Alamos (the County) and to the Department of Interior in trust for San Ildefonso Pueblo. An EIS was subsequently published that identified 10 tracts for conveyance and transfer (DOE 1999b). The timeline set for the actual conveyance and transfer of excess land was within 10 years of the passage of the law, which is the year 2007, with the transfer being conducted on a tract-by-tract basis. The first intentional excavations specific to Public Law 105-119 were initiated in June 2002, with subsequent field seasons beginning each succeeding May until the fieldwork is complete, which was in calendar year 2006. [NOTE: In 2006, the law was modified to extend the completion of the transfer process until 2012].

The 10 land conveyance and transfer tracts represent a total of approximately 4000 acres to be divided between the County and San Ildefonso Pueblo. An intensive archaeological survey documented a total of 213 cultural resource sites within the project parcels (Hoagland et al. 2000). The survey documented a number of historic homestead features and historic early Laboratory features, as well as Native American archaeological and cultural sites.

Among the resources on lands potentially being transferred to Los Alamos County are three Ancestral Pueblo habitation roomblocks (8 to 10 rooms) dating to the period of around AD 1200 to 1350, one of which has been previously impacted by highway construction as well as being partially excavated many years ago. Other resources include Ancestral Puebloan fieldhouses, agricultural features and artifact scatters dating to the period of around AD 1200 to 1600, and an Archaic period (ca. 5500 BC to AD 600) lithic scatter. These resources are typical of the types of Native American resources anticipated to be involved in any future intentional excavations.

The C&T Project also includes two probable historic non-Puebloan tipi or wickiup rings. It is emphasized that these two tipi or wickiup rings represent the only non-Puebloan Native American resources known to be present on LANL lands. In addition, San Ildefonso Pueblo has previously identified seven archaeological sites in one of the tracts proposed for transfer to the

County as being TCPs, and another site is presently being evaluated as a TCP. LASO and LANL are currently in the process of identifying and evaluating other possible TCPs on LANL lands.

Goals and Assumptions

The primary goal of this LANL NAGPRA Intentional Excavation Comprehensive Agreement is to create a framework for effective compliance with NAGPRA during and after archaeological data recovery fieldwork associated with the conveyance and transfer of lands from federal ownership under Public Law 105-119, and for any other intentional excavation projects that may arise on LANL lands in the future. The LANL NAGPRA Intentional Excavation Plan outlines the process for the identification and treatment of Native American human remains, associated funerary objects, unassociated funerary objects, sacred objects, and items of cultural patrimony encountered during the period from archaeological fieldwork through that of actual repatriation.

An archaeological Data Recovery Plan was prepared by the LANL CRT to help guide the intentional excavation efforts of the C&T Project. The Data Recovery Plan details research issues and the actual methods to be used during fieldwork and laboratory analysis, and addresses the structure of the subsequent report on project findings. Separate Data Recovery Plans will be prepared for all other future intentional excavation projects at LANL. These Data Recovery Plans, including the present one for the C&T Project, will incorporate the most recent updated LANL NAGPRA Intentional Excavation Comprehensive Agreement and any other pertinent agreements reached between LASO and LANL and culturally affiliated Native American tribes.

It is understood that the excavation of archaeological sites is something that the Pueblos of San Ildefonso and Santa Clara and most other Native American tribes do not condone in principle and actively seek to avoid unless absolutely necessary.

Cultural Affiliation

As noted above, based on the combination of geography, past ethnographic studies (including linguistics and collections of oral traditions), historical documents, and past cultural resource surveys and excavations in and around LANL, a set of recommendations was made regarding the likely cultural affiliation of the remains of Native Americans found at LANL (Masse 2002, LANL 2007a). In brief, it is anticipated that nearly all human remains and items covered by NAGPRA that may be found during project fieldwork will relate to Ancestral Puebloans (ca. AD 600 to 1600). San Ildefonso Pueblo has been determined to have primary standing under NAGPRA for the great majority of archaeological contexts throughout LANL. The Pueblos of Cochiti and Santa Clara have also been determined to have standing for portions of LANL, and ongoing consultations may help to further define these areas and relationships. The Pueblo of Jemez only has standing for the small, detached Fenton Hill facility near Jemez Springs.

The only archaeological evidence for a non-Puebloan Native American presence in the immediate vicinity of LANL are two apparent historic Apachean—probably Jicarilla Apache based on excavations conducted in the 2003 field season—temporary structures identified in

Rendija Canyon (Peterson and Nightengale 1993). Although these sites are not anticipated to contain human remains or the type of archaeological materials covered by NAGPRA, the present Intentional Excavation Comprehensive Agreement allows for such a possibility.

There is a slight possibility for Archaic period (5500 BC to AD 600) remains and associated NAGPRA-related objects in the C&T Project area, particularly in the White Rock parcel. If such Archaic period remains and objects are identified, it is assumed that all Tanoan and Keresan-speaking pueblos are potentially culturally affiliated. It is anticipated that despite the large numbers of Pueblos who may be affiliated, the Pueblos of San Ildefonso, Santa Clara, Cochiti, and Jemez would take the lead for any repatriation efforts.

Comprehensive agreements relating to NAGPRA have been sought with each of the culturally affiliated tribes outlined above, specific to the contexts defined above and in the LANL cultural affiliation study (Masse 2002). As of April 2002 the Pueblo of San Ildefonso verbally entered into such an agreement, and by April 2004 both San Ildefonso and Santa Clara have verbally entered into such an agreement. The signing of the present document will formalize these agreements. It is emphasized that in the unlikely event that an intentional excavation reveals the presence of remains or NAGPRA-related objects unquestionably associated with another tribe not involved with that specific intentional excavation project, that tribe will be brought into the overall NAGPRA consultation process for that project. For example, in the very unlikely event intentional excavations at the tipi/wickiup ring sites in Rendija Canyon were to yield burials obviously affiliated with the Tewa rather than Apachean groups, then the Pueblos of San Ildefonso and Santa Clara would be notified and brought into the overall consultation process for these two sites.

All intentional excavation work will be sensitive to the issue of cultural affiliation.

Definitions

- *Human Remains*. “Human remains” include any identifiable human skeletal element, including teeth, regardless of whether or not they are found in an intentional burial site or as an isolated element elsewhere in the archaeological sites.

- *Funerary Objects*. “Funerary objects” represent those items of material culture that are intentionally placed with human remains for inclusion in a burial site. Whole ceramic vessels, items of marine shell, whole projectile points, crystals, turquoise beads, stone pipes, whole manos, and other objects are often variously found in direct association with burials. However, it is noted that burials typically are placed in areas where “trash” has accumulated (such as broken pottery, chipped stone debris, and exhausted and discarded manos and metates), thus part of the job of professional archaeological excavation is to carefully separate the burial and its funerary objects from the surrounding unassociated trash. It is noted that post-burial offerings are sometimes deliberately placed on top of or in the immediate vicinity of the burial pit. The archaeologists will need to work closely with the tribal monitors to evaluate the materials and contexts surrounding burials and burial pits in order to identify, if possible, if such post-burial offerings are present.

- *Unassociated Funerary Objects*. "Unassociated funerary objects" represent special items of material culture whose primary function is to be placed with a burial, but which for some reason is not actually found in recognizable association with a burial. For example, for some Native American groups certain miniature ceramic vessels likely were specifically made to accompany burials. Thus, regardless of where such items are found during intentional excavation (including in a trash deposit), they would be considered to be a part of the objects and human remains covered under NAGPRA, and are thus subject to repatriation.

- *Sacred Objects and Items of Cultural Patrimony*. "Sacred objects" and "objects of cultural patrimony" represent material items that are closely bound with the cultural identity of a specific tribe, and which are also likely to have specific sacred value. Examples might include ceramic and stone images of tribal deities; ceramic vessels with painted images of deities (such as Kachinas); Shaman artifact bundles; and portions of wooden ceremonial masks. As with unassociated funerary objects, sacred objects and objects of cultural patrimony are covered under NAGPRA regardless of where such items are found during intentional excavation (including in a trash deposit). They would be considered to be a part of the objects and human remains subject to repatriation. It is emphasized that ordinary ceramic vessels and sherds, projectile points and other stone tools, animal bones, corncobs, and other items found in "trash" deposits and in habitation and storage contexts are usually not considered sacred objects or objects of cultural patrimony. They would be covered by NAGPRA only in the case of being determined to be a part of an intentional funerary assemblage. As with the case of post-burial offerings discussed above, the tribal monitors will need to work closely with the archaeologists to identify such potential funerary objects.

Stipulated Procedures

Listing of Unassociated Funerary Objects, Sacred Objects, and Items of Cultural Patrimony

1. For unassociated funerary objects, sacred objects, and items of cultural patrimony, a list of such objects will be developed in consultation with the appropriate affiliated tribes before the start of intentional excavation. This will ensure that the field archaeologist will know the proper manner in which to treat such objects if and when found during excavation.

2. Field archaeologists will be instructed to use their professional judgment in encountering unusual items during excavation that while not on the list of NAGPRA-covered objects, nevertheless given their attributes or context appear likely to be of a sacred nature. These will be handled and treated as if they are indeed an unassociated funerary object, sacred object, or object of cultural patrimony, and will be brought to the attention of the appropriate affiliated tribe.

NAGPRA Excavation Procedures

3. Archaeological field crews will be given mandatory training regarding the nature and content of this intentional excavation comprehensive agreement before the beginning of actual excavation.

4. Anytime human remains are encountered during the intentional excavation, they will be treated with the utmost sensitivity and respect. Excavation will be conducted in such a manner as to ensure the successful recovery and careful preservation of the remains, including the careful documentation of the burial context.

5. Typically, a burial is exposed in its entirety before the removal of the individual elements and associated funerary objects. This is done so as to ensure that issues of context and overlapping or multiple interments can be resolved before removal of the burial.

6. Photographs and sketches will be made to provide a documentary record of the burial, and to ensure that funerary objects can be re-associated with the burial at the time of repatriation. It is emphasized that photographs of the human remains will not be included in reports, rather only line drawings will be used.

7. A "Human Burial Feature Form" will be filled out for each set of human remains encountered during the intentional excavation.

8. Individual human elements will be collected separately and wrapped for protection, and will be securely placed into properly labeled bags and containers for transportation and temporary storage. Associated funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony will be provided similar treatment.

9. In the event that the documentation and removal of a burial takes longer than a single day, the burial will be carefully covered and protected at night before its final removal. In order to minimize the possibility that a burial will be left partly exposed over one or more non-working days (such as a weekend), no excavation of a known or suspected burial will be initiated the day before a non-working day.

10. Fences, surveillance cameras, and/or other protective measures will be utilized in excavation areas to minimize the possibility of vandalism of archaeological resources and human remains after work hours. In the unlikely event that vandalism does occur, The Pueblos of San Ildefonso and Santa Clara will be immediately notified and necessary corrective actions will be initiated.

Laboratory Analysis and Documentation of Human Remains

Documentation, or the physical examination of the remains, is an integral part of the repatriation process. It provides one line of evidence used to determine cultural affiliation as required by the law. Biological information on the shape and physical condition of the remains is evaluated, along with archaeological and anthropological information, and traditional knowledge, to help identify Native American groups with whom the remains may be affiliated. Documentation forms part of the permanent record of LASO's compliance with the repatriation mandate, the determination of cultural affiliation, and the arrangements made for transfer of remains to Native representatives. Information assembled and permanently archived as a record of repatriation is available to Native groups for their own records and use.

11. Analysis of human remains recovered from LANL intentional excavation projects will be performed by a professional physical anthropologist, but will be limited to standard non-destructive "metrical analyses" (collecting precise measurements using calipers) and non-metrical analyses for cultural ethnicity as required by NAGPRA.

12. The information will be recorded on appropriate analysis forms and will be summarized in the project report.

13. The documentation may require photography, but such photographs will not be included in reports. However, line drawings of the remains may be included in the report as a way of illustrating pertinent aspects of the analysis.

14. The analysis of all sets of human remains will be performed in a timely manner.

15. Upon completion of this analysis, the remains will be carefully wrapped for protection and placed into clearly labeled containers for short-term storage before repatriation.

16. The location of analyzed and stored human remains will be provided to the appropriate culturally affiliated tribe.

Analysis and Documentation of Funerary Objects, Unassociated Funerary Objects, Sacred Objects, and Items of Cultural Patrimony

17. Funerary objects, unassociated funerary objects, sacred objects, and items of cultural patrimony will be subject to analysis and documentation by photography and line drawings as warranted.

18. The analysis of these objects will be summarized in the project report, with the use of illustrative photographs and line drawings as warranted.

19. There will be no destructive analysis performed on these objects.

20. The analysis of any NAGPRA-related object will be performed in a timely manner.

21. Upon completion of analysis, the remains will be carefully wrapped for protection and placed into clearly labeled containers for short-term storage before repatriation.

22. The location of analyzed and stored NAGPRA-related objects will be provided to the appropriated culturally affiliated tribe.

Temporary Storage of Human Remains, Funerary Objects, Unassociated Funerary Objects, Sacred Objects, and Items of Cultural Patrimony

23. The temporary storage of human remains, funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony, both before and after analysis, will be conducted in a manner respectful of these remains and objects, and in a manner that satisfactorily provides for their security and safekeeping.

24. The location of analyzed and stored human remains and NAGPRA-related objects will be provided to the appropriate culturally affiliated tribe, and the tribe will be granted access to visit and view the remains and object upon request.

Disposition and Repatriation of Human Remains, Funerary Objects, Unassociated Funerary Objects, Sacred Objects, and Items of Cultural Patrimony

25. All Native American human remains, funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony that are recovered from an intentional excavation project must be repatriated to the appropriate affiliated tribe(s) in a timely manner. Unless otherwise agreed upon by LASO and LANL and the appropriate tribe(s), repatriation will take place no later than one year after the end of an excavation field season and its associated concluding formal NAGPRA meeting. At this meeting the tribe will examine the collections and will be presented with detailed lists of human remains, associated funerary objects, unassociated funerary objects, sacred objects, and items of cultural patrimony as defined by NAGPRA.

26. At the formal request of the appropriate tribe(s), LASO and LANL may store these remains and objects for a longer period in the event that the tribe(s) needs more time to adequately prepare to receive the remains. The maximum amount of time that LASO and LANL will store the remains and objects before repatriation will be five years.

Consultations, Notifications, and Monitoring

Depending on the outcome of ongoing consultations regarding NAGPRA cultural affiliation, it is anticipated that San Ildefonso Pueblo will be the primary Native American tribe for standing under NAGPRA for most archaeological contexts on LANL lands that pertain to Ancestral Pueblo occupation (AD 600–1600). Cochiti Pueblo will likely share this standing for resources around and south of Ancho Canyon, and possibly other locations at LANL as formally determined in consultation with LASO. Santa Clara Pueblo will equally share this standing with San Ildefonso Pueblo for resources in Rendija Canyon, and possibly other locations at LANL as formally determined in consultation with LASO. Jemez Pueblo will have sole standing for any NAGPRA-related resources that may be present at the Fenton Hill property, unless it can be demonstrated during the excavation or analysis that these resources are related instead to Apachean or Ute groups. The Navajo Nation, Jicarilla Apache Tribe (and possibly the Mescalero Apache), and the Southern Ute tribe will have standing only for intentional excavation performed on the two tipi/wickiup ring sites in Rendija Canyon, or for other similar non-Puebloan Native American resources that may be encountered on LANL lands. All Tanoan-speaking and Keresan-speaking Pueblos will have standing for Archaic period human remains and NAGPRA-related objects, but as noted above it is anticipated that consultations would be led by San Ildefonso, Santa Clara, Cochiti, and Jemez Pueblos.

Because the Pueblos of San Ildefonso and Santa Clara are presently considered to be the primary tribes to have standing for most archaeological contexts on LANL lands in Rendija Canyon, including those lands going to the County as part of the land conveyance and transfer process, the discussion here for consultation and monitoring is tailored specifically for these two Pueblos. However, similar procedures would be followed with the other NAGPRA culturally affiliated tribes for any intentional excavation that may pertain to them.

27. It is important that there be an open line of communication between LASO, LANL, and the Pueblos of San Ildefonso and Santa Clara during the conduct of intentional excavation fieldwork, during the laboratory analysis period, and through the period until any and all human remains and NAGPRA-related objects are repatriated. Arrangements will be made with the two Pueblos for a monitor from the Pueblos to be present during the intentional excavation fieldwork.

28. In the event that excavations are simultaneously being carried out at two or more widely separated areas within the Rendija Tract, multiple monitors are warranted. Due to a variety of logistical considerations discussed with the Pueblos of San Ildefonso and Santa Clara, the LASO has determined that two full-time monitors from San Ildefonso and one full-time monitor from Santa Clara will be supported during the 2004 excavation field season in Rendija Canyon. It will be up to the Project Director to determine in consultation with the monitors the most satisfactory and efficient manner by which sites will be monitored by the two Pueblos.

29. The purpose of the monitor would be to observe the conduct of the excavations, and to observe the treatment of any human remains, funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony that may be encountered during excavation.

30. The monitor could also be involved in physical aspects of the excavation (as a training tool) at the request of the tribe and with the permission of the LANL intentional excavation Project Director (Figure 72.5).

Figure 72.5. San Ildefonso Tribal Monitors Tim Martinez and Aaron Gonzales.

31. The monitor would not in any way direct the conduct of the excavations. However, the monitor (or other appropriate tribal member) may raise NAGPRA-related issues or pertinent concerns to the LANL Project Director (or his or her designee) at any time during the course of the intentional excavations. If the concerns or issues are not immediately resolved to the satisfaction of the monitor (or appropriate tribal representative), LASO and LANL must provide a formal response to the Pueblos of San Ildefonso and Santa Clara (and/or other culturally affiliated tribe) within three working days after the day that the issue is raised.

32. Regardless of whether or not a Pueblo of San Ildefonso and Santa Clara monitor is available during the intentional excavation fieldwork, the LANL Project Director (or his or her designee) must immediately notify the San Ildefonso's and Santa Clara's Governor's office and the Cultural Resources specialist whenever human remains are found. A status briefing regarding these remains and any funerary objects should be provided to the Cultural Resources specialist no more than five working days after the initial discovery is made.

33. In the event of the discovery of an Archaic Period burial, the LANL Project Director (or his or her designee) must immediately notify the Governors' offices of the four Accord pueblos. Written letters of notification, within 60 calendar days of the initial discovery, will be sent to the other culturally affiliated Pueblos as appropriate.

34. Regardless of the presence of a monitor, the Pueblos of San Ildefonso and Santa Clara may request at any time to allow representatives from the Pueblos to view the intentional excavation fieldwork. This request should be directed to the LANL Project Director (or his or her designee). This procedure would also be appropriate if either Pueblo (or even another Tanoan or Keresan Pueblo) wanted to bring classroom students to view the fieldwork for educational purposes.

35. Should members of the Pueblos of San Ildefonso and Santa Clara wish to take educational photographs, including video coverage, of the field excavations or of the laboratory analysis of excavated materials, this will be coordinated with the LANL Project Director (or his or her designee). Such educational media will be encouraged to the limit practicable without unduly impacting work schedules.

36. The Pueblos of San Ildefonso and Santa Clara may request at any time to allow representatives from the Pueblo to view ongoing laboratory analyses, or to view the storage and security measures in effect for the protection and preservation of human remains, funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony.

Reburial of Human Remains

The reburial of human remains is not a legally mandated federal agency responsibility under NAGPRA. The legal endpoint of the NAGPRA process is that of the repatriation or turning over of human remains and NAGPRA-related objects to the appropriate affiliated tribe(s). However, LASO and LANL recognize that the Pueblos of San Ildefonso and Santa Clara (and possibly other culturally affiliated tribes, as appropriate) may desire the reburial of remains and objects on LANL property so as to be as near as possible to the original interment location. LASO and LANL encourages a timely and frank discussion with the Pueblos of San Ildefonso and Santa Clara of the issues surrounding such a potential reburial scenario. Such a dialogue was begun after the completion of the initial field season, at the formal NAGPRA meeting with the Pueblo of San Ildefonso on April 1, 2003.

In addition to these stipulations, other duties for the tribal monitors became apparent during C&T Project excavations. For example, this included things such as assisting in the drawing and measurement of archaeological features and structures, the mapping of archaeological sites, screening dirt for artifacts, and assistance with the flotation of soil samples at the C&T Project archaeological laboratory. Also, it was decided through discussions between field supervisors and the tribal monitors that at the end of excavations at each individual site, it would be necessary to level the ground surface, including the razing of the masonry walls of roomblocks and fieldhouses, so as to discourage potential future pot-hunting at the sites once the transfers of land had taken place. This was an activity observed and often supervised by the tribal monitors themselves (Figure 72.6).

Figure 72.6. Tim Martinez observing the leveling of LA 135290 after the completion of archaeological site excavations.

NAGPRA REPATRIATION FOR THE C&T PROJECT

On December 14, 2005, the Cultural Resources Program Manager for DOE LASO, Vicki Loucks, met with the Pueblo of San Ildefonso Tribal Monitors, Aaron Gonzales and Timothy Martinez, and members of the LANL CRT, Brad Vierra, Steve Hoagland, Gerald Martinez, and Bruce Masse. The purpose of this meeting was to officially repatriate to the Pueblo of San Ildefonso the three sets of culturally affiliated human remains obtained during the C&T Project archaeological excavations at White Rock in 2003, along with an additional set of remains that had been inadvertently discovered in 2003 within the TA-72 White Rock Y land transfer tract, and subsequently excavated in 2005 due to its precarious situation in an erosional channel.

The repatriation also included 34 additional sets of remains that had been obtained from LANL lands between 1956 and 1993, along with sacred objects and items of cultural patrimony identified through the NAGPRA consultation process as being culturally affiliated with the Pueblo of San Ildefonso. These earlier sets of remains and objects had been curated in the Maxwell Museum at the University of New Mexico in Albuquerque and at the Laboratory of Anthropology in Santa Fe. All of these remains, objects, and items were physically transferred to the Pueblo of San Ildefonso tribal monitors.

As an expression of their gratitude for the successful completion of the NAGPRA repatriation process, the Pueblo of San Ildefonso subsequently hosted a traditional dinner for C&T Project personnel and representatives of LANL and LASO senior management, including LASO Manager Ed Wilmot. Part of the festivities included the bestowing of blankets upon those LANL and LASO representatives who worked most closely with the Pueblo during the C&T Project archaeological excavations and NAGPRA repatriation process (Figure 72.7).

Figure 72.7. Pueblo of San Ildefonso tribal monitors, Tim Martinez and Aaron Gonzalez, with LASO Manager, Ed Wilmot, and LANL C&T Project staff.

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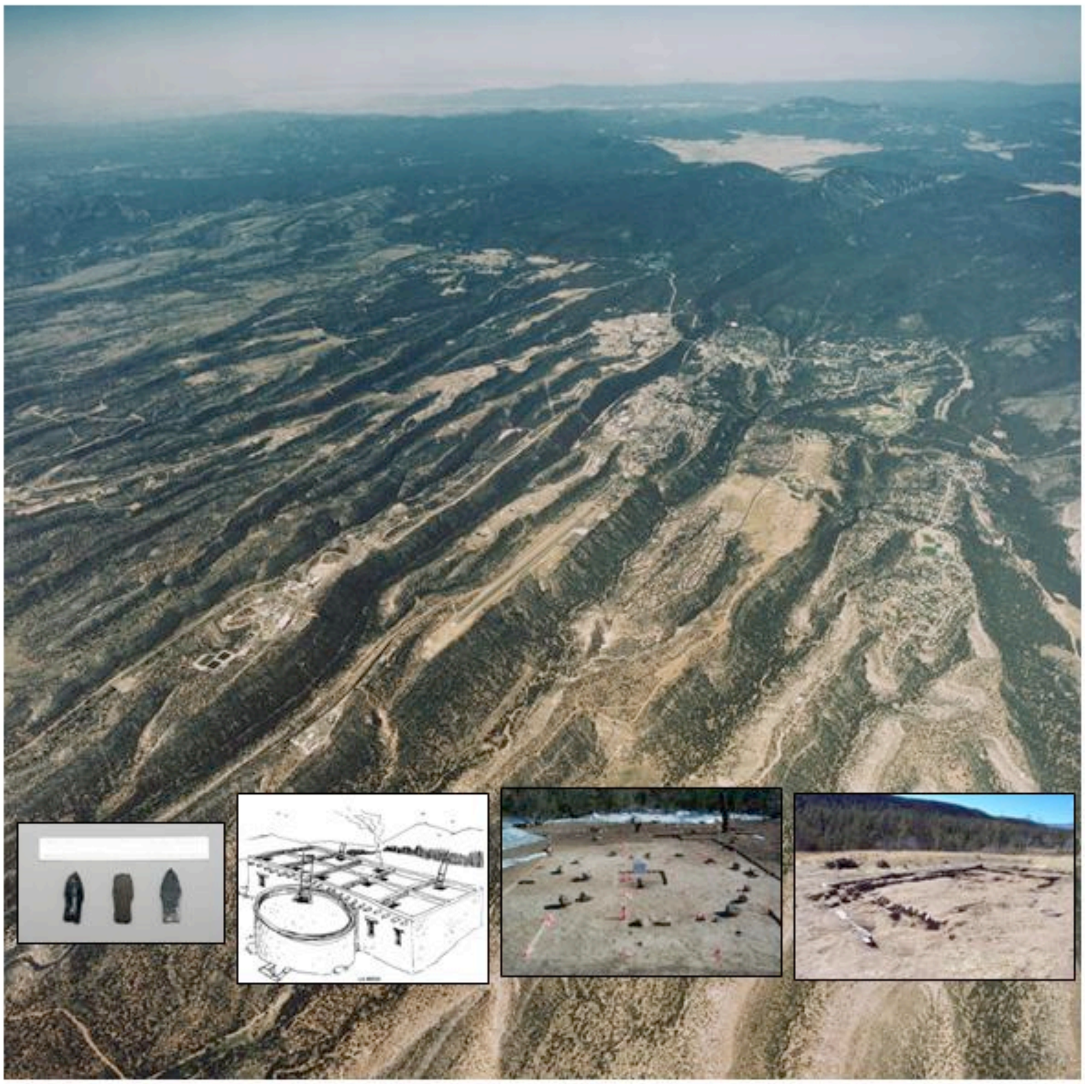
THE LAND CONVEYANCE AND TRANSFER DATA RECOVERY PROJECT: 7000 YEARS OF LAND USE ON THE PAJARITO PLATEAU



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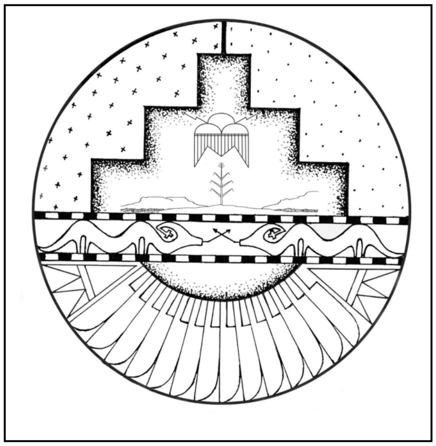

Artistic representation of the Pajarito Plateau; drawn by Aaron Gonzales.

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Title

THE LAND CONVEYANCE AND TRANSFER DATA RECOVERY PROJECT: 7000 YEARS OF LAND USE ON THE PAJARITO PLATEAU

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Contents

Chapter 73: Introduction to Volume 4, by Bradley J. Vierra 1

Chapter 74: Archaic Foragers of the Northern Rio Grande Valley, New Mexico, by Bradley J. Vierra 3

- Introduction 3
- Archaic Chronology and Environment 5
- Archaic Projectile Point Typology and Technology 7
- Regional Land-Use 11
- Conclusion 16

Chapter 75: Archaic Upland Resource Use: The View from the Pajarito Plateau, New Mexico, by Bradley J. Vierra and Teralene Foxx 19

- Introduction 19
- Archaic Land-Use at Los Alamos National Laboratory 19
- Seasonal Use of Upland Areas 23
- The Late Archaic Archaeological Record 30
- Summary and Conclusion 32

Chapter 76: Pajarito Culinary Ware: An Examination of Rim Sherd Attributes from Three Coalition and Three Classic Period Sites, by Diane C. Curewitz (Washington State University) 35

- The Question of Standardization and Specialization 37
- The Present Study 38
- Site Location and Description 39
- Ware and Type Distribution Changes 41
- Culinary Jar Size 57
- Sherd Thickness 67
- Rim Thickness 69
- Coefficients of Variation and Paste Composition 71
- Testing Equality of Variance 78
- Discussion 83
- Conclusion 85

Chapter 77: Ceramic Analysis and Interpretation of Classic Period Pueblos on Los Alamos National Laboratory Land Collected by the Pajarito Plateau Archaeological Project, by Samuel Duwe (University of Arizona) 87

- Introduction 87
- The Pajarito Plateau Natural Environment and Culture History 88
- History of Past Archaeological Research 89
- Study Area and Sample 90
- The Northern Rio Grande Ceramic Assemblage 95
- Ceramic Analysis Methodology 101
- The Otowi (LA 169) Ceramic Assemblage 103
- The Tsirege (LA 170) Ceramic Assemblage 113

Discussion ... 126
Conclusions ... 137

Chapter 78: An Analysis of Micaceous Pottery from Sites on the Pajarito Plateau, by B. Sunday Eiselt (Southern Methodist University) ... 139
Introduction ... 139
Ceramic Type Identifications ... 139
Source Provenance Determinations ... 145
Research Questions ... 148
Ceramic Descriptions ... 149
Discussion ... 157
Conclusion ... 159

Chapter 79: Settlement Change and Demography on the Pajarito Plateau, by Brandon M. Gabler (University of Arizona) ... 161
Pueblo Aggregations: A Perennial Problem in Prehistory ... 161
Methods and Theory ... 163
Discussion ... 182
Conclusion ... 183

Chapter 80: Elk Remains from Archaeological Sites in the Southwestern United States, by Kari M. Schmidt (University of New Mexico) ... 185

Chapter 81: Ancestral Pueblo Trails of the Pajarito Plateau: A Summary of Recent Research, by James E. Snead (George Mason University) ... 201
Introduction ... 201
Method ... 202
Background ... 206
Ancestral Pueblo Trails ... 221
Discussion ... 232
Conclusions ... 239

Chapter 82: Rock Art of Los Alamos National Laboratory, by Marit Munson (Trent University) ... 241
Introduction ... 241
Past Research ... 241
Temporal Variation in Rock Art Styles ... 247
Contextual Differences Through Time ... 261
Geographic Variation in Pajarito Rock Art ... 266
Recording and Management Issues ... 271

Chapter 83: Fuel Loads and Wildfire Effects on Archaeological Sites at Los Alamos National Laboratory, by Bradley J. Vierra and Randy G. Balice ... 275
Introduction ... 275
Distribution of Archaeological Sites ... 275
Fuel Loading at Los Alamos National Laboratory ... 278

The Effects of the Cerro Grande Fire on Archaeological Sites at Los Alamos National Laboratory 279
Conclusions........ 281

Chapter 84: The Land Conveyance and Transfer Project Archaeological Site Restoration Program, by Samuel Loftin 283
Introduction........ 283
White Rock Tract........ 283
Airport Tract........ 286
Rendija Tract........ 288
Conclusions........ 298

Chapter 85: Personal Perspectives on the Native American Graves Protection and Repatriation Act Tribal Monitor Program of the Pueblos of San Ildefonso and Santa Clara, by Timothy Martinez, Jeremy Yepa, and Aaron Gonzales 301
Statement of Timothy Martinez—Pueblo of San Ildefonso 302
Statement of Jeremy Yepa—Pueblo of Santa Clara 306
Statement of Aaron Gonzales—Pueblo of San Ildefonso 309

Chapter 86: Research Questions and Conclusions, by Bradley J. Vierra........ 313
Introduction........ 313
Chronometric Dating Research Questions 314
Geoarchaeology Research Questions........ 322
Paleoenvironmental Research Questions 324
Land-Use, Community, and Site Organization Questions 326
Subsistence and Seasonality Research Questions........ 334
Technology, Production, and Exchange Research Questions 341

References Cited 355

Appendices 495

Appendix A: Programmatic Agreement........ 497

Appendix B: Modern pollen analog study: Plant species lists and site description notes 513

Appendix C: Los Alamos modern pollen analog study 525

Appendix D: Dendrochronological samples from the Pajarito Plateau 537

Appendix E: Standardized decadal departures in mean ring-width for the Jemez Mountains 593

Appendix F: Reconstructed annual precipitation in inches for Arroyo Hondo........ 597

Appendix G: Reconstructed spring precipitation for Arroyo Hondo 601

Appendix H: Reconstructed values for the Jemez chronology 605

Appendix I: Chama reconstructed precipitation values 639

Appendix J: Splined Z-Score values for both reconstructions 669

Appendix K: Soil horizon nomenclature, keys to symbols used in descriptions of soil morphology, and soil properties used in field descriptions 699

Appendix L: Description of soil morphology from C&T sites 711

Appendix M: Radiocarbon dates and age calibrations 785

Appendix N: A metal detection survey of LA 85864 and LA 85869 793

Appendix O: Report for ceramics from LA 85864 and LA 85869 807

Appendix P: Reconstructible vessel analysis 811

Appendix Q: Petrographic tables 837

Appendix R: Debitage coding sheets 887

Appendix S: C&T flotation sample summary information 901

Appendix T: C&T flotation results 913

Appendix U: C&T vegetal sample results 1059

Appendix V: Maize morphometrics 1099

Appendix W: Intensive scanning microscopy (ISM) results 1111

Appendix X: Pollen sample provenience 1117

Appendix Y: Pollen data raw counts 1155

Appendix Z: Technical report on dating of ceramic materials from Los Alamos, New Mexico 1329

Appendix AA: Summary of Coalition period culinary ware data 1343

Appendix BB: Summary of Classic period culinary ware data 1351

Appendix CC: Description of Ceramic Methodology (Duwe) 1359

List of Figures

Figure 74.1. Location of study area Zones 1 to 3 4

Figure 74.2. Distribution of Archaic point types 4

Figure 74.3. Radiocarbon dates from the Anasazi Origins Project......................................5

Figure 74.4. Collier Dune pollen profile..6

Figure 74.5. Maize cob from Jemez Cave 7

Figure 74.6. Jay (upper) and Bajada (lower) Early Archaic points 8

Figure 74.7. San Jose (upper), side-notched (middle), and Armijo (lower) Middle to Late Archaic period points..9

Figure 74.8. Late Archaic point types..10

Figure 74.9. Distribution of Archaic point types by zone...11

Figure 74.10. Distribution of material types for Archaic point types..................................12

Figure 74.11. Distribution of material types for Archaic points in Zone 1 12

Figure 74.12. Distribution of material types for Archaic points in Zone 2 13

Figure 74.13. Distribution of obsidian types in Zone 1 14

Figure74. 14. Distribution of obsidian types in Zone 2 15

Figure 74.15. Distribution of dacite types in Zone 1 15

Figure 74.16. Distribution of dacite types in Zone 2 16

Figure 75.1. Vegetation types at Los Alamos National Laboratory 20

Figure 75.2. Diagnostic Early, Middle, and Late Archaic point types 21

Figure 75.3. Relative frequency of Early, Middle, and Late Archaic sites...........................21

Figure 75.4. Distribution of Archaic sites at LANL 22

Figure 75.5. Distribution of Archaic and lithic scatter sites.......... 23

Figure 75.6. Relative percentage of food plants by vegetation community.......... 25

Figure 75.7. Plant groups by vegetation community.......... 26

Figure 75.8. Plant seasonality by vegetation zone.......... 26

Figure 75.9. Relative plant species abundance by vegetation community.......... 27

Figure 75.10. Late Archaic seasonal mobility pattern.......... 29

Figure 75.11. Debitage types.......... 31

Figure 75.12. Debitage material types.......... 32

Figure 76.1. Major cities, modern pueblos, and selected archaeological sites of the northern Rio Grande.......... 36

Figure 76.2. Selected archaeological sites on the Pajarito Plateau.......... 39

Figure 76.3a. Culinary ware temper at LA 12587 (top), LA 86534 (middle), and LA 60372 (bottom), Coalition period Pajarito sites.......... 52

Figure 76.3b. Culinary ware temper at LA 3840 (top), LA 60550, (middle), and LA 82B (bottom), Coalition period Pajarito sites.......... 53

Figure 76.4. Ratio of jar aperture to jar diameter for culinary jars at Tonque Pueblo (LA 240) (from Barnett 1969).......... 59

Figure 76.5. Culinary jars from Tonque Pueblo.......... 60

Figure 76.6a. Summary of culinary ware data from LA 12587.......... 61

Figure 76.6b. Summary of culinary ware data from LA 86534.......... 62

Figure 76.6c. Summary of culinary ware data from LA 60372.......... 63

Figure 76.7a. Aperture radii for jars from LA 3840 and LA 82A.......... 75

Figure 76.7b. Aperture radii for jars from LA 82A and LA 82B.......... 76

Figure 76.7c. Aperture radii for jars from LA 82B and LA 60550.......... 77

Figure 77.1. Classic period sites at LANL selected for analysis.......... 90

Figure 77.2. Map of Otowi (LA 169) with both PARP and LANL collection units 92

Figure 77.3. Map of Tsirege (LA 170) and PARP collection units 94

Figure 77.4. Kidder's (1936) Glaze Series rim seriation chart 99

Figure 77.5. Proposed occupational sequence at Otowi 114

Figure 77.6. Abiquiu Black-on-gray bowl rim sherds from Tsirege 116

Figure 77.7. Bandelier Black-on-gray bowl rim sherds from Tsirege 118

Figure 77.8. Sankawi Black-on-cream bowl rim sherds from Tsirege 120

Figure 77.9. Proposed occupational sequence at Tsirege 125

Figure 77.10. Distribution of rim diameter of Bandelier Black-on-gray bowls between Otowi and Tsirege 135

Figure 77.11. Distribution of interior framing line width of Bandelier Black-on-gray bowls between Otowi and Tsirege 136

Figure 78.1. Map showing locations of predefined source districts and source areas (Redrawn from Bauer and Williams 1989) 146

Figure 79.1. Adaptive cycle for village farming societies in the U.S. Southwest (adapted from Holling and Gunderson 2002:34, Figure 2-1) 164

Figure 79.2. A panarchy representing the multiple levels of adaptive cycles for the pre-aggregated Pajarito Plateau (adapted from Holling et al. 2002:75, Figure 3-10) 165

Figure 79.3. Coalition period pueblos with more than three rooms 169

Figure 79.4. Coalition period small (one- to three-room) structures 170

Figure 79.5. Late Coalition/Early Classic period pueblos with more than three rooms 170

Figure 79.6. Late Coalition/Early Classic period small (one- to three-room) structures 171

Figure 79.7. Classic period pueblos with more than three rooms 171

Figure 79.8. Classic period small (one- to three-room) structures 172

Figure 79.9. Distribution of Coalition period one- to three-room structures with respect to elevation 174

Figure 79.10. Distribution of Classic period one- to three-room structures with respect to elevation 174

Figure 79.11. Roomblock area for PARP survey (after Orcutt 1999:Figure 5.1) 177

Figure 79.12. Room count on LANL region based on Orcutt (1999) room distribution methodology 177

Figure 79.13. Momentary population estimates for LANL region using Orcutt (1999) methodology 178

Figure 79.14. Momentary population estimates for LANL region using various strategies 179

Figure 79.15. Momentary population estimate for LANL region, projected for the entire LANL-owned property, both surveyed and unsurveyed, based on the combined Plog (1974) and Preucel (1990) population estimate method 180

Figure 79.16. Momentary population from Figure 78.15, smoothed through time 181

Figure 79.17. Room count for LANL region matched against precipitation reconstructed from tree ring indices shows the greatest population increase for the region during the middle of the Great Drought (AD 1276–1299) 182

Figure 81.1. LA 134901 as it descends from the Portero del Rito into White Rock Canyon, illustrating cleared talus trail construction 209

Figure 81.2. LA 66885, the Sandia Canyon Trail Network (Segment 03), illustrating wearing and braiding (10 cm scale) 210

Figure 81.3. LA 70989, the Tsankawi Mesa Trail network (Segment 01), illustrating wearing and probable construction 211

Figure 81.4. “One-foot” steps on Tsankawi Mesa. 1 m scale 212

Figure 81.5. LA 77779, illustrating “basin steps.” 10 cm scale, view from above 212

Figure 81.6. LA 70989, the Tsankawi Mesa trail network, illustrating worn segment and associated steps 213

Figure 81.7. LA 65581, illustrating braiding associated with the Capulin Staircase 214

Figure 81.8. LA 66885, the Sandia Canyon trail network, illustrating braiding on Segment 6 215

Figure 81.9. LA 125383, illustrating Segment 1 with flanking walls 216

Figure 81.10. LA 84137, illustrating associated cairns of possible Ancestral Pueblo date . 217

Figure 81.11. LA 21602, the Kwage Mesa trail network, illustrating Segment 4 with petroglyph trail marker 218

Figure 81.12. LA 66885, the Sandia Mesa trail network, illustrating Segment 6, with a game trap overlying descending stairs. View downhill, 1 m scale 218

Figure 81.13. LA 84137, illustrating cobble berms associated with trail 219

Figure 81.14. LA 70989, the Tsankawi Mesa trail network, illustrating Segment 69, part of the Tsankawi North Staircase 219

Figure 81.15. LA 21585, the Otowi Mesa trail network, illustrating Segment 07, part of the Bayo Staircase 220

Figure 81.16. LA 134111, illustrating Segment 3, part of the Frijoles Staircase (detail).... 220

Figure 81.17. LA 65581, illustrating Segment 2, part of the Capulin Staircase 221

Figure 81.18. Ancestral Pueblo trails of the Pajarito recorded by PTP or other recent projects, along with other sites mentioned in the text 233

Figure 82.1. Historic incised or scratched rock art, as illustrated by K. Chapman (1938) .. 244

Figure 82.2. Abstract style petroglyphs (from P. Schaafsma 1992:85) 248

Figure 82.3. Abstract style petroglyphs, showing typical layout of elements (from P. Schaafsma 1992:84) 249

Figure 82.4. Typical Pueblo III rock art. Upper: Rio Grande Valley, north of Santa Fe (from P. Schaafsma 1992:87). Lower: Petrified Forest National Monument, Arizona (from P. Schaafsma 1980:157) 251

Figure 82.5. Rio Grande style petroglyphs, post-AD 1325 (from P. Schaafsma 1992) 252

Figure 82.6. Coalition style human figures from the Pajarito Plateau 254

Figure 82.7. Coalition style flute players from the Pajarito Plateau 255

Figure 82.8. Classic style humans from the Pajarito Plateau 256

Figure 82.9. Classic style flute players from the Pajarito Plateau 258

Figure 82.10. Historic style human figures from the Pajarito Plateau 259

Figure 82.11. Detailed animals from the Pajarito Plateau.. 260

Figure 82.12. A composite animal from LA 127636, combining characteristics of a mountain lion and deer... 261

Figure 82.13. High-contrast imagery inside a cavate at LA 12609 262

Figure 82.14. Interior petroglyphs from the Mortandad Cave Kiva 263

Figure 82.15. Location of isolated rock art panels relative to cavate pueblos in Bayo Canyon. The photograph was taken from Otowi Pueblo 264

Figure 82.16. A plan map of the Mortandad site, showing the relationship of exterior rock art panels to other features... 265

Figure 82.17. The horned serpent at Tsirege (vertical panel at center of photo) is located along the main stairs leading to the mesa top pueblo 266

Figure 83.1. Vegetation types at Los Alamos National Laboratory 276

Figure 84.1. Overview of the White Rock Tract showing important landmarks 284

Figure 84.2. LA 12587 with extensive bare soils (top) with much of the straw mulch blown off the site. Bottom photo shows establishment of early successional weedy plant species two years later... 285

Figure 84.3. Overview of the Airport Tract showing important landmarks 286

Figure 84.4. LA 86534 in the first growing season following seeding treatment; most of the understory plants are early successional weedy plant species...................................... 287

Figure 84.5. LA 86534 in August of 2007 shows fewer weedy plants and more grasses ... 288

Figure 84.6. Overview of the Rendija Tract showing important landmarks....................... 289

Figure 84.7. Top photo shows one locale at LA 85408 shortly after seed and mulch were applied in the summer of 2005. The bottom photo shows the response after two years when the site is dominated by blue grama and soils are well stabilized 290

Figure 84.8. Adjacent to the locale shown in Figure 84.7, this locale has less establishment by seeded grass and better establishment from resident plants. Top is shown in summer of 2005 and bottom is summer of 2007 291

Figure 84.9. Top photo shows LA 85411 shortly after seed and mulch were applied in summer 2005. Bottom photo shows vegetation response aftertwo years 293

Figure 84.10. Top photo shows LA 85413 shortly after seed and mulch were applied in summer 2005. Bottom photo shows vegetation response after two years 294

Figure 84.11. Top photo shows LA 85867 shortly after seed and mulch were applied in summer 2005. Bottom photo shows vegetation response after two years 295

Figure 84.12. Top photo shows LA 85414 shortly after seed and mulch were applied in summer 2005. Bottom photo shows vegetation response after two years 296

Figure 84.13. Top photo shows LA 85414 shortly after seed was applied in summer 2005. Bottom photo shows vegetation response after two years.. 297

Figure 84.14. Photo of juniper slash with blue grama established under and around the protective cover of the dead limbs... 298

Figure 84.15. Photo of site with no rehab treatments. Although this site is relatively small, after two years the soils remain mostly bare with little vegetation reestablishment.. 299

Figure 85.1. Tribal Monitors Aaron Gonzales, Jeremy Yepa, and Timothy Martinez........ 301

Figure 85.2. Tim Martinez observing artifact collecting at LA 86534.............................. 302

Figure 85.3. Timothy Martinez screening at one of the sites in the White Rock tract 303

Figure 85.4. Bettina Kuru'es and Tim Martinez processing flotation samples.................. 304

Figure 85.5. Completion of excavations at LA 127635.. 305

Figure 85.6. Tim Martinez and Jeremy Yepa discussing issues in Rendija Canyon........... 306

Figure 85.7. Jeremy Yepa excavating a fieldhouse in Rendija Canyon 307

Figure 85.8. Jeremy Yepa screening excavation fill at a site in Rendija Canyon 308

Figure 85.9. Aaron Gonzales and Tim Martinez, San Ildefonso Tribal Monitors 310

Figure 85.10. Aaron Gonzales, processing flotation samples 311

Figure 86.1. Early Archaic points (Jay: upper; Bajada: lower).. 316

Figure 86.2. Middle and Late Archaic points (San Jose: upper; Large side-notched: middle; Armijo: lower) 316

Figure 86.3. Late Archaic points (top to bottom: corner-notched, side-notched, stemmed, leaf-shaped, and contracting stem).. 317

Figure 86.4. Arrow (top) and lance/dart (bottom) points from LA 4618 ... 319

Figure 86.5. Reconstructed precipitation for the Jemez Mountains tree-ring chronology ... 325

Figure 86.6. Roomblock ground plans ... 327

Figure 86.7. Room size at Coalition period roomblocks ... 329

Figure 86.8. Grid gardens at LA 12587, LA 128803, and LA 139418 ... 333

Figure 86.9. The relative distribution of debitage types for Archaic, Ancestral Pueblo, and Jicarilla Apache sites ... 342

Figure 86.10. Early Archaic bifacial cores (upper) and biface blanks (lower) from the La Bajada site ... 342

Figure 86.11. The relative distribution of debitage material types for Archaic, Ancestral Pueblo, and Jicarilla Apache sites ... 343

Figure 86.12. One and two-hand manos ... 346

Figure 86.13. Hoe from LA 128803 ... 348

Figure N.1. Jicarilla Apache maiden, 1873 ... 803

Figure P.1. Santa Fe Black-on-white vessel from Otowi ... 812

Figure P.2. Mudware seed jar from Tsirege ... 813

Figure P.3. Biscuit B vessel from Tsirege ... 813

Figure P.4. Biscuit B vessel from Tsirege ... 814

Figure P.5. Biscuitware jar from the Pajarito Plateau ... 815

Figure P.6. Kotyiti Glaze F vessel from Tsirege ... 816

Figure P.7. Espinosa Glaze C Polychrome vessel from Tsirege ... 817

Figure P.8. Fire clouds present on the exterior portion of the Espinosa Glaze C vessel ... 817

Figure P.9. Wiyo Black-on-white vessel from an unknown site on the plateau ... 818

Figure P.10. Sankawi Black-on-cream bowl from Tsirege ... 819

Figure P.11. Interior of Sankawi Black-on-cream vessel from Tsirege............................. 819

Figure P.12. San Lazaro Glaze D glaze-on-red bowl from Tsirege 820

Figure P.13. Masked figure on the exterior of a Glaze D bowl... 821

Figure P.14. San Lazaro Glaze D bowl from Tsirege 822

Figure P.15. Interior decoration on a San Lazaro Glaze D bowl....................................... 822

Figure P.16. Sankawi Black-on-cream jar from Tsirege... 823

Figure P.17. Sankawi Black-on-cream jar from Tsirege... 824

Figure P.18. Potsui'i Incised wide mouth jar from Tsirege 825

Figure P.19. Ocate Micaceous wide mouth pitcher from the plateau................................ 826

Figure P.20. Sapawi Gray wide mouth utilityware jar from the plateau 827

Figure P.21. Sapawe Micaceous utilityware jar from the plateau 827

Figure P.22. Indented corrugated utililtyware jar from the plateau................................... 828

Figure P.23. Smeared-indented corrugated vessel from LA 4631.................................... 829

Figure P.24. Smeared-indented corrugated vessel from LA 4712.................................... 830

Figure P.25. Smeared-indented corrugated jar from the plateau....................................... 831

Figure P.26. Square Santa Fe Black-on-white bowl from LA 4634................................. 832

Figure P.27. Biscuit B bowl from an unknown site on the plateau 833

List of Tables

Table 75.1. Plant uses by vegetation community 23

Table 75.2. Target plant species in vegetation communities 28

Table 76.1a. Ware and type distribution for selected units at three Coalition period Pajarito sites.. 41

Table 76.1b. Type distribution as a percentage of ware 42

Table 76.1c. Ware and type distribution for selected units at Classic period Pajarito sites ... 43

Table 76.1d. Type distribution as a percentage of ware ... 44

Table 76.1e. Summary table for whitewares ... 46

Table 76.2a. Sample distribution for three Coalition Pajarito sites ... 47

Table 76.2b. Sample distribution for three Classic Pajarito sites ... 47

Table 76.3a. Rim and body sherd temper by ceramic type at Pajarito sites ... 50

Table 76.3b. Temper type as a percentage of ware ... 51

Table 76.4a. Mica-washed sherds as a proportion of all mica-tempered sherds ... 56

Table 76.4b. Micaceous washboard at all sites ... 56

Table 76.4c. Mica-washed culinary sherds at Pajarito sites ... 57

Table 76.5a. Rio Grande-style culinary jars from Tonque Pueblo (LA 240): Globular with flared rims and rounded bottoms ... 57

Table 76.5b. Sankawi-style culinary jars from Tonque (LA 240) with thicker walls and an elongated neck ... 58

Table 76.6a. Culinary vessel aperture for selected types at Pajarito sites. Vessel aperture is measured at the throat, below the vessel rim interior ... 64

Table 76.6b. Proportion of small jars at Pajarito sites ... 65

Table 76.6c. T-test results for mean jar aperture between Coalition and Classic period (Pooled Method, Equal Variances except for clapboard neck) ... 66

Table 76.7a. Univariate statistics: Culinary sherd thickness at Pajarito sites by vessel aperture ... 67

Table 76.7b. Mean culinary sherd thickness of major types at Pajarito sites ... 68

Table 76.7c. T-test results for mean sherd thickness from Coalition to Classic period (Pooled Method, Equal Variances) ... 68

Table 76.8a. Univariate statistics: Culinary rim thickness at Pajarito sites by vessel aperture ... 69

Table 76.8b. Mean culinary rim thickness for major types at Pajarito sites 70

Table 76.8c. T-test results for mean rim thickness from Coalition to Classic periods (Pooled Method, Equal Variance except for clapboard neck)... 71

Table 76.9a. Coefficients of variation for Pajarito sites – all paste types........................... 71

Table 76.9b. Coefficients of variation for non-micaceous culinary vessels at Classic period Pajarito sites.. 73

Table 76.9c. Coefficients of variation for micaceous culinary vessels at Classic period sites 74

Table 76.10a. Coefficients of variation for vessel aperture of Pajarito Plateau archaeological samples compared with selected ethnoarchaeological samples using D'AD.. 80

Table 76.10b. Coefficients of variation for vessel aperture of Pajarito Plateau archaeological samples compared with selected archaeological samples using D'AD........ 81

Table 76.10c. Coefficients of variation for sherd thickness of Pajarito Plateau archaeological samples compared with both archaeological and ethnoarchaeological samples using D'AD 82

Table 77.1. PARP collection units at Otowi and their associated sizes and reasons for collection (from PARP 1978)... 91

Table 77.2. PARP collection units at Tsirege and their associated sizes and reasons for collection (from PARP 1979)... 93

Table 77.3. Types of Tewa Series pottery and associated date ranges 95

Table 77.4. Types of Rio Grande Glaze Series pottery and associated date ranges............ 98

Table 77.5. Types of Utility grayware and associated date ranges 100

Table 77.6. Percentages of decorated ceramic types by PARP collection in the Otowi surface assemblage.. 103

Table 77.7. Percentages of temper types by unit for Abiquiu Black-on-gray bowl sherds from Otowi 106

Table 77.8. Percentages of temper types by unit for Bandelier Black-on-gray bowl sherds from Otowi 107

Table 77.9. Percentages of utility ceramic types by PARP collection in the Otowi

surface assemblage 108

Table 77.10. Percentages of refiring colors in the clay oxidation experiments for both Abiquiu and Bandelier Black-on-gray bowl sherds from Otowi 109

Table 77.11. Percentages of samples of temper type by refiring color from biscuitwares at Otowi 110

Table 77.12. Correlation of PARP and LANL testing units at Otowi 112

Table 77.13. Comparison of percentages of decorated ceramics from both PARP and LANL analyses at Otowi 112

Table 77.14. Selected units used to build site chronology from Otowi 113

Table 77.15. Percentages of decorated ceramic types by PARP collection in the Tsirege surface assemblage 115

Table 77.16. Percentages of temper types by unit for Abiquiu Black-on-gray bowl sherds from Tsirege 117

Table 77.17. Percentages of temper types by unit for Bandelier Black-on-gray bowl sherds from Tsirege 119

Table 77.18. Percentages of glazeware rim sherd type by unit from Tsirege 121

Table 77.19. Percentages of utility ceramic types by PARP collection in the Tsirege surface assemblage 122

Table 77.20. Percentages of refiring colors in the clay oxidation experiments for both Abiquiu and Bandelier Black-on-gray bowl sherds from Tsirege 123

Table 77.21. Percentages of samples of temper type by refiring color from biscuitwares at Otowi 123

Table 77.22. Selected units used to build site chronology from Tsirege 124

Table 77.23. The application of Gauthier's (1987a) clay oxidation color chronology based on Bandelier Black-on-gray ceramics at Tsirege 133

Table 77.24. Statistics of the distribution of rim diameter of Bandelier Black-on-gray bowls between Otowi and Tsirege 136

Table 77.25. Statistics of the distribution of interior framing line width of Bandelier Black-on-gray bowls between Otowi and Tsirege 136

Table 78.1. Distinguishing characteristics of Pueblo and Hispanic plainwares (from Carrillo 1997; Dick 1968; Levine 1990, 2004; Olinger 2004) 140

Table 78.2. Distinguishing characteristics of micaceous slipped pottery (from Dick 1968; Eiselt 2005; Olinger 1992) 141

Table 78.3. Distinguishing characteristics of micaceous pottery (from Eiselt 2005) 142

Table 78.4. Summary of diagnostic traits for source districts (from Eiselt 2006) 147

Table 78.5. Ethnographically recorded micaceous clay sources and communities 147

Table 78.6. LA 131237 ceramic counts 150

Table 78.7. LA 85407 ceramic counts 153

Table 78.8. Ceramic summary counts 157

Table 79.1. Ancestral Puebloan chronology for the Pajarito Plateau 162

Table 79.2. Archaeological site type categories present at LANL and used in this research (Vierra et al. 2006:183–185) 167

Table 79.3. Temporal affiliation categories assigned to LANL archaeological sites (Vierra et al. 2006:180) 167

Table 79.4. Relevant categories and summary statistics of identified archaeological sites 172

Table 79.5. Frequency of sites by elevation and period, using elevation categories from Hill and Trierweiler 1986:Table 7 and Vierra et al. 2006:Table 9.4) 173

Table 79.6. Statistical results of hypothesis testing for mean elevation change of agricultural sites between the Coalition and Classic periods 173

Table 80.1. Elk remains at archaeological sites in the southwestern United States 186

Table 81.1. Characteristics of trail structure developed for the recording of Pajarito trails (modified after Table 1 in Snead 2000) 209

Table 81.2. Ancestral Pueblo trails on the central Pajarito Plateau, listing alternative numbers and suggested names 223

Table 81.3. Ancestral Pueblo trails on the southern Pajarito Plateau, listing alternative numbers and suggested names 228

Table 81.4. An incomplete list of recently recorded Historic period trails on the Pajarito Plateau 229

Table 81.5. Reputed Ancestral Pueblo trails on the Pajarito Plateau that could not be re-identified by PTP 229

Table 83.1. Density of archaeological sites by vegetation type 277

Table 83.2. Archaeological site by vegetation type. Top number is frequency and bottom number is adjusted residual. Adjusted residuals in bold are significant at the 0.05 level.... 277

Table 83.3. Fuels inventory summaries and results of multivariate analyses. Significant values are in bold 278

Table 83.4. Burn severity by vegetation type for field-assessed archaeological sites within the Cerro Grande burn area at LANL........ 279

Table 83.5. Burn severity by vegetation type for field-assessed archaeological sites within the Cerro Grande burn area at LANL. Top number is the frequency and bottom number is the adjusted residual. Adjusted residuals in bold are significant at the 0.05 level........ 280

Table 83.6. Archaeological site by field-assessed burn severity........ 280

Table 83.7. Burn severity by topographic setting for field-assessed archaeological sites within the Cerro Grande burn area at LANL. Top number is the frequency and bottom number is the adjusted residual. Adjusted residuals in bold are significant at the 0.05 level........ 281

Table 86.1. Ancestral Pueblo site temporal sequence from the C&T Project........ 315

Table 86.2. Obsidian hydration data for the projectile points from LA 4618........ 318

Table 86.3. Results of the Pajarito whiteware ceramic tensile strength analysis........ 349

Table C.1. Raw pollen counts from 20 stations (x notes scan identified taxa) 526

Table D.1. All dendrochronological samples from Pajarito Plateau, including duplicates . 538

Table E.1. Standardized decadal departures in mean ring-width for the Jemez Mountains (Dean and Robinson 1977) 594

Table F.1 Reconstructed annual (prior August-current July) precipitation in inches for Arroyo Hondo (from Rose et al. 1981)........ 598

Table G.1. Reconstructed spring (March-June) precipitation in inches for Arroyo Hondo (from Rose et al. 1981)........ 602

Table H.1. Reconstructed values for the Jemez chronology 606

Table I.1. Chama reconstructed precipitation values 640

Table J.1. Splined Z-Score values for both reconstructions 670

Table L.1. Summary of soil morphology for White Rock land transfer parcel soil profiles for geomorphic mapping units 712

Table L.2. Summary of soil morphology for White Rock land transfer parcel for geomorphic mapping units (described by Paul Drakos and Steven Reneau, May 2002): preliminary descriptions 720

Table L.3. Summary of soil morphology at White Rock tract cultural sites (described by Paul Drakos and Steven Reneau) 724

Table L.4. Summary of soil morphology at Airport tract cultural sites (described by Paul Drakos and Steven Reneau) 733

Table L.5. Summary of soil morphology at Western Rendija tract cultural sites (described by Paul Drakos and Steven Reneau) 749

Table L.6. Summary of soil morphology at Western Rendija tract fieldhouse and tipi ring sites (described by Paul Drakos and Steven Reneau) 758

Table L.7. Summary of soil morphology at Western Rendija tract Archaic/ multicomponent sites (described by Paul Drakos and Steven Reneau) 766

Table L.8. Summary of soil morphology at TA-74 South tract cultural sites (described by Paul Drakos and Steven Reneau) 777

Table L.9. Summary of soil morphology at the White Rock Y tract cultural sites (described by Paul Drakos and Steven Reneau). 783

Table M.1. Calibrated radiocarbon dates from samples used for reference soil stratigraphic descriptions in geoarchaeology investigation 785

Table M.2. Radiocarbon dates from Land Transfer parcels 787

Table N.1. Artifacts derived from test excavations from LA 85869 801

Table P.1. Measured dimensions for Vessel 1 812

Table P.2. Measured dimensions for Vessel 2 812

Table P.3. Measured dimensions for Vessel 3 814

Table P.4. Measured dimensions for Vessel 4 814

Table P.5. Measured dimensions for Vessel 5 815

Table P.6. Measured dimensions for Vessel 6 816

Table P.7. Measured dimensions for Vessel 7 816

Table P.8. Measured dimensions for Vessel 8 818

Table P.9. Measured dimensions for Vessel 9 818

Table P.10. Measured dimensions for Vessel 10.. 821

Table P.11. Measured dimensions for Vessel 11.. 822

Table P.12. Measured dimensions for Vessel 12.. 823

Table P.13. Measured dimensions for Vessel 13.. 824

Table P.14. Measured dimensions for Vessel 14.. 825

Table P.15. Measured dimensions for Vessel 15.. 826

Table P.16. Measured dimensions for Vessel 16.. 826

Table P.17. Measured dimensions for Vessel 17.. 828

Table P.18. Measured dimensions for Vessel 18.. 828

Table P.19. Measured dimensions for Vessel 19.. 829

Table P. 20. Measured dimensions for Vessel 20.. 830

Table P.21. Measured dimensions for Vessel 21.. 831

Table P.22. Measured dimensions for Vessel 22.. 831

Table P.23. Measured dimensions for Vessel 23.. 832

Table P.24. Vessel type and form for each ware 834

Table P.25. Distributions by form for whole vessels... 834

Table P.26. Distribution of whole vessels by site.. 835

Table P.27. Distribution of vessels by size 836

Table Q.1. Inventory of all sherds selected for petrographic analysis showing object identifier numbers, ceramic type, and site 838

Table Q.2. Inventory of all sherds selected for petrographic analysis showing temper characterization 846

Table Q.3. Rock and sand samples collected for comparison to Los Alamos Land Transfer Project sherds 851

Table Q.4a. Sherd point count data, Part 1: total, quartz and feldspars (felsic, light-colored minerals) 853

Table Q.4b. Sherd point count data, part 2: dark-colored minerals, micas, and accessory minerals 858

Table Q.4c. Sherd point count data, part 3: lithic fragments 863

Table Q.4d. Sherd point count data, part 4: paste parameters and calculated values 868

Table Q.5. Sand point count data 874

Table Q.6. Qualitative attributes, texture, morphology, and grain types of sand-sized grains in the Los Alamos sherds 875

Table Q.7. Temper characterizations for the Los Alamos sherds 881

Table S.1. C&T summary flotation information 901

Table T.1. C&T flotation results 914

Table U.1. C&T vegetal sample plant remains 1060

Table V.1. C&T maize morphometrics 1099

Table W.1. Intensive scanning microscopy (ISM) results 1112

Table X.1. Pollen samples provenience 1118

Table Y.1. Pollen counts from LA 86534 1156

Table Y.2. Pollen counts from LA 86534 and LA 135290 1171

Table Y.3. Pollen counts from LA 135290 and LA 139418 1199

Table Y.4. Pollen counts from LA 139418 and LA 141505 1204

Table Y.5. Pollen counts from LA 21592 and LA 15116 1209

Table Y.6. Pollen counts from LA 15116, LA 70025, LA 85403, LA 85404, and LA 85407 1214

Table Y.7. Pollen counts from LA 85407, LA 85408, and LA 85411 1219

Table Y.8. Pollen counts from LA 85411, LA 85413, LA 85414, LA 85417, and LA 85859 1224

Table Y.9. Pollen counts from LA 85859 1229

Table Y.10. Pollen counts from LA 85859, LA 85861, LA 85864, LA 85867, and LA 85869 1234

Table Y.11. Pollen counts from LA 85869 and LA 86605 1239

Table Y.12. Pollen counts from LA 86605, LA 86606, LA 86607, and LA 87430 1244

Table Y.13. Pollen counts from LA 87430, LA 99396, and LA 99397 1249

Table Y.14. Pollen counts from LA 99397 and LA 127627 1254

Table Y.15. Pollen counts from LA 127627, LA 127633, LA 127634, and LA 127635 1259

Table Y.16. Pollen counts from LA 127635, LA 135291, and LA 135292 1264

Table Y.17. Pollen counts from LA 12587 1269

Table Y.18. Pollen counts from LA 12587, LA 86637, and LA 127631 1309

Table Y.19. Pollen counts from LA 127631 and LA 128803 1314

Table Y.20. Pollen counts from LA 128803, LA 128804, and LA 128805 1319

Table Y.21. Pollen counts from LA 128803, LA 128804, and LA 128805 1324

Table Z.1. TL samples from the 2002 excavations 1329

Table Z.2. TL samples from the 2003 excavations 1329

Table Z.3. TL samples from the 2004 excavations 1329

Table Z.4. TL samples from the 2005 excavations 1330

Table Z.5. Dose rates from radioactivity measurements for 2002 samples 1330

Table Z.6. Dose rates from radioactivity measurements for 2003 samples 1331

Table Z.7. Dose rates from radioactivity measurements for 2004 samples 1332

Table Z.8. Dose rates from radioactivity measurements for 2005 samples 1332

Table Z.9. Dose rates (Gy/ka) for 2002 TL samples 1332

Table Z.10. Dose rates (Gy/ka) for 2003 TL samples 1333

Table Z.11. Dose rates (Gy/ka) for 2004 TL samples 1333

Table Z.12. Dose rates (Gy/ka) for 2005 TL samples 1333

Table Z.13. Equivalent dose values and b-values for the 2002 TL samples 1334

Table Z.14. Equivalent dose values and b-values for the 2003 TL samples 1334

Table Z.15. Equivalent dose values and b-values for the 2004 TL samples 1335

Table Z.16. Equivalent dose values and b-values for the 2005 TL samples 1335

Table Z.17. Equivalent dose values and b-values for the 2005 TL samples 1335

Table Z.18. Significant fading test results for the TL data 1336

Table Z.19. Derived ages and bases for the 2002 TL data 1336

Table Z.20. Derived ages and bases for the 2003 TL samples 1337

Table Z.21. Derived ages and bases for the 2004 TL samples 1337

Table Z.22. Derived ages and bases for the 2004 TL samples 1338

Table AA.1. Inventory of thin-sectioned culinary ceramics from Pajarito Plateau Coalition period sites 1344

Table AA.2. Qualitative attributes of temper in Pajarito Coalition period culinary ceramics 1345

Table AA.3. Point-count data from Pajarito Coalition culinary ceramics – general categories and generic temper groups 1347

Table AA.4. Point-count data for Pajarito Coalition culinary ceramics - lithic parameters and matrix parameters....1348

Table AA.5. Point-count data from Pajarito Coalition culinary ceramics – mineral Parameters....1349

Table BB.1. Inventory of thin-sectioned micaceous culinary ceramics from Pajarito Plateau Classic period sites....1352

Table BB.2. Qualitative attributes of temper in Pajarito Classic period micaceous culinary ceramics....1354

Table BB.3. Point-count data for Pajarito Classic period micaceous culinary ceramics – generic temper groups....1356

Table BB.4. Point-count data from Pajarito Classic period micaceous culinary ceramics – mineral parameters....1357

Table BB.5. Point-count data for Pajarito Classic period micaceous culinary ceramics – lithic and matrix parameters....1358

CHAPTER 73
INTRODUCTION TO VOLUME 4

Bradley J. Vierra

The Land Conveyance and Transfer (C&T) Project data recovery program was implemented for seven archaeological sites in the White Rock Tract (A-19), five archaeological sites in the Airport Tracts (A-3, A-7, A-5-1), and 27 archaeological sites in the Rendija Tract (A-14). The results of the four-year excavation project were presented in Volumes 1, 2, and 3. Excavations were conducted from 2002 to 2005; thirty-nine archaeological sites were excavated and approximately 150,000 artifacts were collected. Volume 1 (Baseline Studies) included background information on the geology, geomorphology, and environment of the Pajarito Plateau, as well as on general dating techniques. Volume 2 (Site Excavations) presented the site excavation reports for the White Rock, Airport, and Rendija tracts and the results of site testing for the Technical Area 74 and White Rock Y tracts. Volume 3 (Analyses) provided the detailed results of artifact and sample analyses. This volume (Research and Conclusions) provides various specialized studies and answers to the final project research questions.

The C&T Project data recovery program involved the collection of data necessary to answer a series of detailed research questions as provided in the data recovery plan (Vierra et al. 2002). The data recovery plan presented a set of research contexts that consists of chronometrics, geoarchaeology, paleoenvironment, land-use, community and site organization, subsistence and seasonality, and technology, production, and exchange. These questions laid the ground work that guided the excavation of 39 archaeological sites ranging in age from Early Archaic campsites to Coalition period roomblocks to a Homestead era cabin. Chapter 85 presents the conclusion to this project by addressing the research questions.

As noted in the introduction to Volume 2 (Chapter 13), this project involved the hard work of many individuals. The majority of the field staff was comprised of graduate students, with several members of the project conducting their dissertation research on these data. The results of their research are presented here, in conjunction with several chapters involving project data. Vierra and Balice's chapter (Chapter 82), however, was written as part of the post-Cerro Grande fire archaeological site assessment. It is included here due to the potential effects of wildfires on obsidian hydration dating and includes data from the Rendija Tract. Overall, a wide range of topics are discussed in Volume 4, including Archaic foraging technology, prehistoric and historic ceramic production and exchange, prehistoric agriculture, trail systems, rock art, and the results of the project's site rehabilitation program. The information presented in Volumes 1 through 4 provides the data necessary to summarize and address the project research questions.

Finally, the C&T Project data recovery program involved a close working relationship with the affiliated tribal governments. The Pueblos of San Ildefonso and Santa Clara provided monitors to observe the excavations, identify sacred objects, and supervise the treatment of human remains. These monitors provide their own individual perspectives on the process of excavation, tribal consultation, and repatriation in this volume (Chapter 84). An open and fair dialogue was critical to the success of the project and has led to a strong working relationship between Los

Alamos National Laboratory and the Pueblos. As the Lieutenant Governor of Santa Clara once stated, “our ancestors have always watched over us, now it is our turn to take care of them.”

CHAPTER 74
ARCHAIC FORAGERS OF THE NORTHERN RIO GRANDE VALLEY, NEW MEXICO

Bradley J. Vierra

INTRODUCTION

The Pajarito Plateau is a unique geologic feature situated within the larger northern Rio Grande Valley. Archaic foragers roamed over this ancient landscape while hunting and gathering a variety of plant and animal species. These annual rounds involved a seasonal pattern of movement up and down the valley and between lowland and upland areas. This chapter presents the results of a preliminary study of the possible relationship between changes in climate, resource structure, foraging strategies, and Archaic projectile point technology in the northern Rio Grande Valley.

The northern Rio Grande Valley includes an area from the San Luis Valley and adjacent foothills of the San Juan Mountains to the north to the Santa Fe area and the Jemez Mountains in the south. From tundra and high mountain meadows in the San Juan and Jemez Mountains, to the marshes and grasslands of the San Luis Valley, to the piñon-juniper covered mesa tops, the region contains a diverse array of resources across elevations ranging from about 1600 to 4260 m (5200 to 14,000 ft). Lithic raw materials also abound in the area, including obsidian, fine-grained dacite, chalcedony, chert, and quartzite.

In order to spatially delineate the sample, I divided my study area into three separate zones (Figure 74.1). Zone 1 is located at the southern end of the region and includes the Santa Fe-Abiquiu area; Zone 2 includes the Taos-Tres Piedras area; and Zone 3 consists of the San Luis Valley and the Rio Grande headwaters. Zone 3 was included in a previous study conducted by Vierra et al. (2005) for the Late Paleoindian and Early Archaic time periods. In contrast, this study will focus on the Early, Middle, and Late Archaic periods in Zones 1 and 2. One hundred and thirty-nine Early Archaic, 87 Middle Archaic, and 172 Late Archaic projectile points provide the database used for this study. Figure 74.2 illustrates the frequency distribution across the 10 separate point types identified.

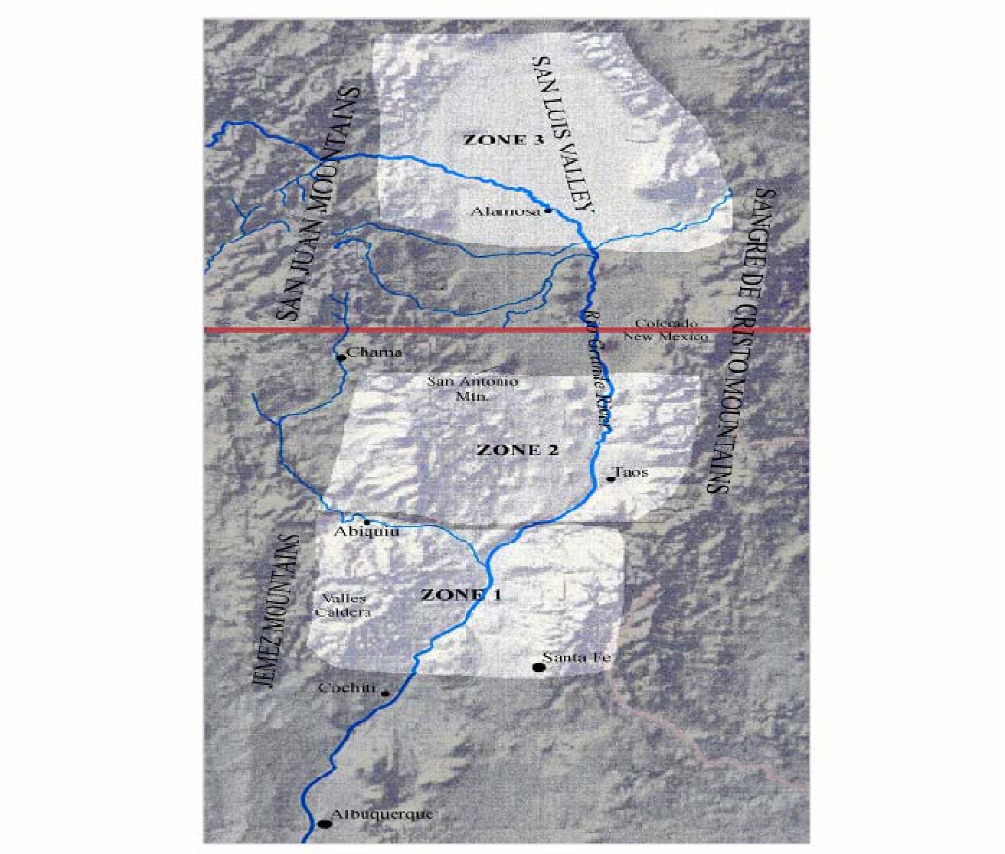


Figure 74.1. Location of study area Zones 1 to 3.

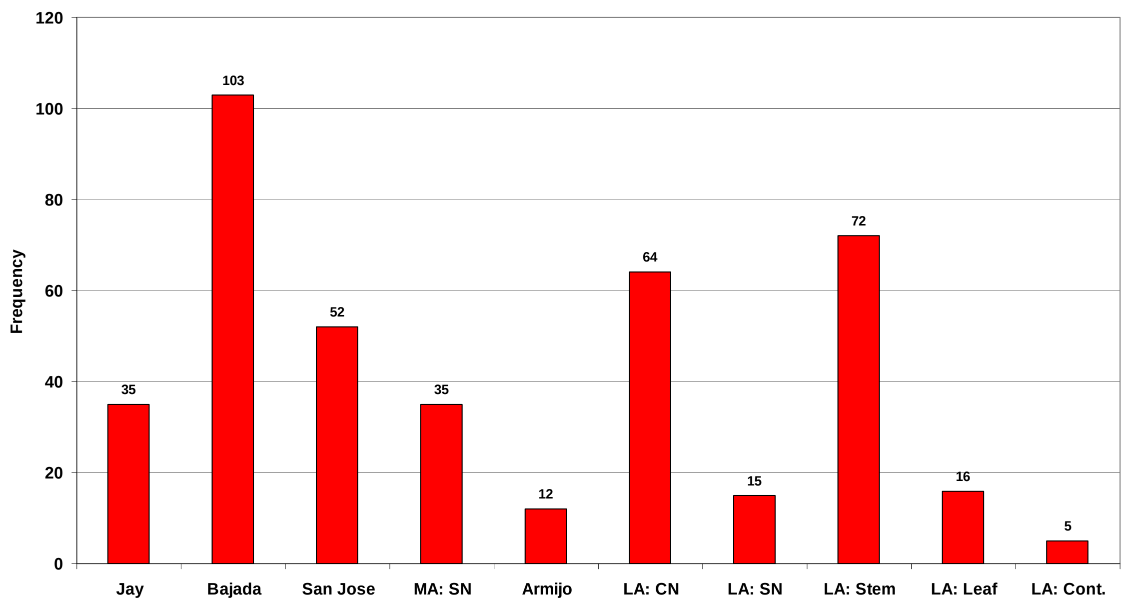


Figure 74.2. Distribution of Archaic point types.

ARCHAIC CHRONOLOGY AND ENVIRONMENT

The projectile point chronology used in this study follows the defined Oshara Tradition sequence (Irwin-Williams 1973). However, I would suggest a date range of circa 8000 to 6000 BP for the Early Archaic, 6000 to 4000 BP for the Middle Archaic, and 4000 to possibly as late as circa 900 BP for the Late Archaic (Vierra and Ford 2007). The Early Archaic includes Jay and Bajada points, the Middle Archaic consists of San Jose and possibly large side-notched points, and the Late Archaic includes Armijo and five other distinctive point types. These latter types consist of corner-notched, side-notched, stemmed, leaf-shaped, and contracting stemmed varieties. The exact temporal placement of these large side-notched points is unclear in this region; however, my review of the literature indicates that the radiocarbon dates, obsidian hydration data, and relative stratigraphic sequence data primarily indicate a Middle Archaic temporal designation (Vierra 1993a) and as such the points will tentatively be assigned to this period.

A review of documents at Eastern New Mexico University indicates that a range of radiocarbon dates were obtained during Irwin-Williams' Anasazi Origins Project near Albuquerque, New Mexico (Vierra 1996). These dates are illustrated in Figure 74.3, with a Late Paleoindian and Early Archaic date cluster between about 9000 to 6000 BP (uncalibrated), followed by a second cluster of Middle Archaic dates between 6000 and 4000 BP, followed by a continuous occupation from Late Archaic through the Ceramic period.

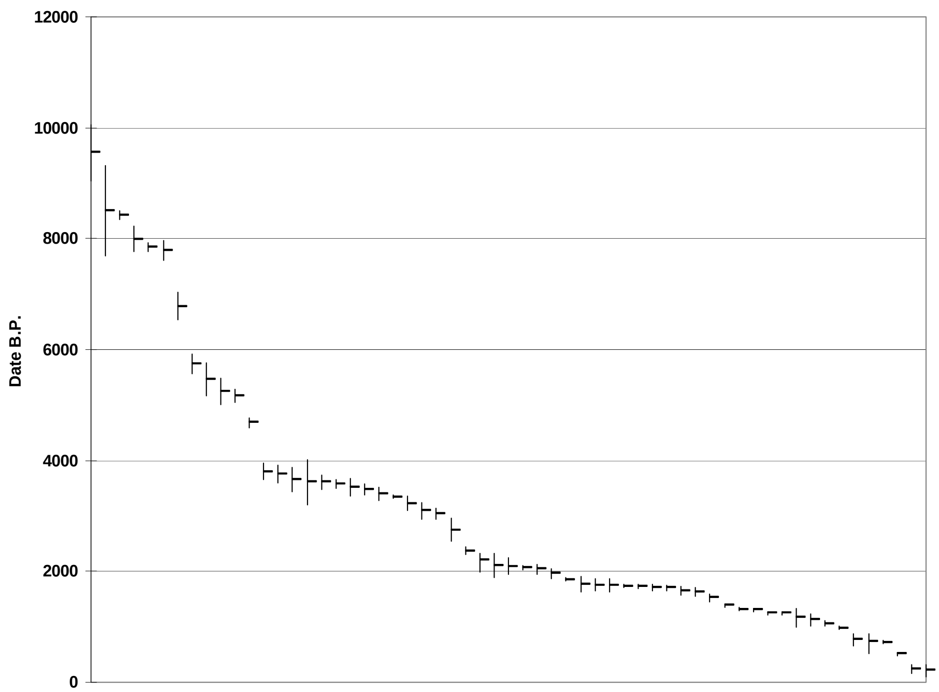


Figure 74.3. Radiocarbon dates from the Anasazi Origins Project.

Recent studies by Scott Anderson (Chapter 5, Volume 1; Anderson et al. 2007; Brunner-Jass 1999) and his students of pollen cores in the Jemez Mountains indicate that these Late Paleoindian and Early Archaic dates are separated by a period of decreased effective moisture when the Chihuahueños Bog had dried up from circa 8000 to 6500 BP. Pollen cores from basin lakes in the San Luis Valley show a similar trend with a decline in lake and creek levels after about 8000 BP and a period of least effective moisture at roughly 6500 BP (Jodry 1999; Jodry and Stanford 1996; Shafer 1989). This obviously had a significant effect on the Early Archaic foragers in the area, with their settlement system shifting to a north-south pattern within the northern Rio Grande Valley (Vierra et al. 2005). A variety of large, medium, and small size game was hunted, including evidence for bison hunting and fishing in the San Luis Valley (Jodry 2006; Vierra and Ford 2007).

There is evidence for moister conditions and the expansion of piñon-juniper woodlands in the northern Rio Grande Valley during the subsequent Middle Archaic (6000 to 4000 BP). This evidence is represented by increased percentages of piñon pollen at circa 4500 BP at Chihuahueños Bog, 4300 BP at Alamo Bog, and 4000 to 3500 at Alta Alamo Bogs (Chapter 5, Volume 1; Anderson et al. 2007; Brunner-Jass 1999; Stearns 1981). However, this pattern is clearly illustrated in a pollen diagram from the Anasazi Origins excavations at Collier Dune near Albuquerque (Figure 74.4). This diagram shows a marked shift from grassland to piñon-dominated pollen at about 4500 BP (Vierra 1997). It may be during the Middle Archaic that fall hunts in the Rio Grande Valley were becoming less successful, so these hunter-gatherers would have shifted their residence to the uplands where they could collect piñon nuts and hunt deer. Rather than dried bison meat, stored piñon nuts might have provided an important source of protein during the winter months (Vierra 2005a).

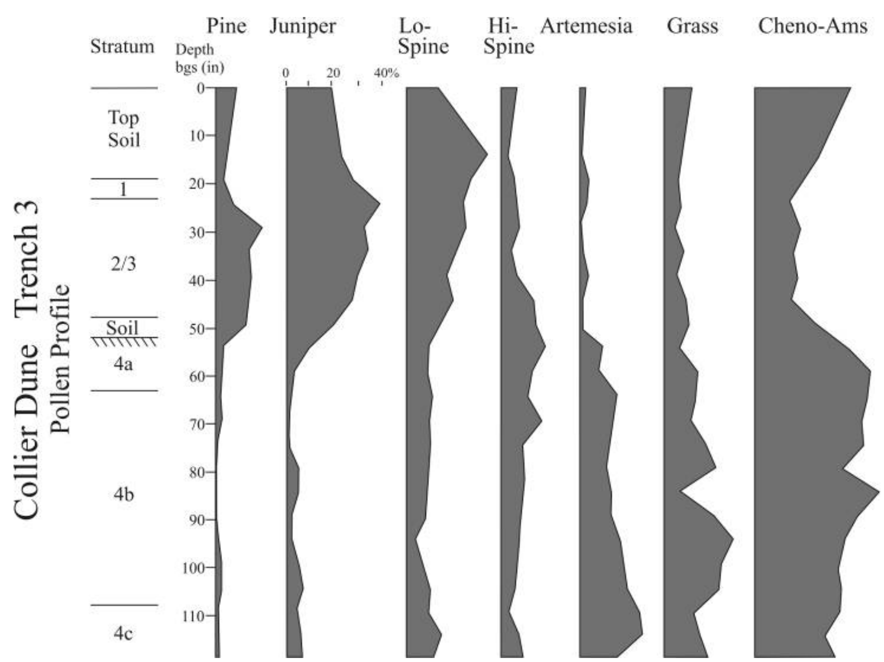


Figure 74.4. Collier Dune pollen profile.

The initial use of maize agriculture is dated to about 3000 BP during a period of increased effective moisture (Smith and McFaul 1997; Vierra and Ford 2006, 2007) (Figure 74.5). These moister conditions continue until about 2200 BP with the onset of drier conditions. The cyclical nature of the rainfall conditions during the subsequent time period has been described in the El Malpais data (Grissino-Mayer 1996). Late Archaic land-use appears to be characterized by a lowland/upland pattern within restricted areas of the Rio Grande Valley. This involved movements from the juniper-savanna in the early summer (Indian ricegrass), to the ponderosa pine/mixed conifer in the mid to late summer (cheno-ams, wild onions, berries, and wild potatoes), and then down to the piñon-juniper woodlands in the fall (pine nuts, acorns, broad leaf yucca, and cacti). Riverine settings also appear to have been used for winter campsites (Vierra 2003, this volume; Vierra and Foxx 2002, this volume).

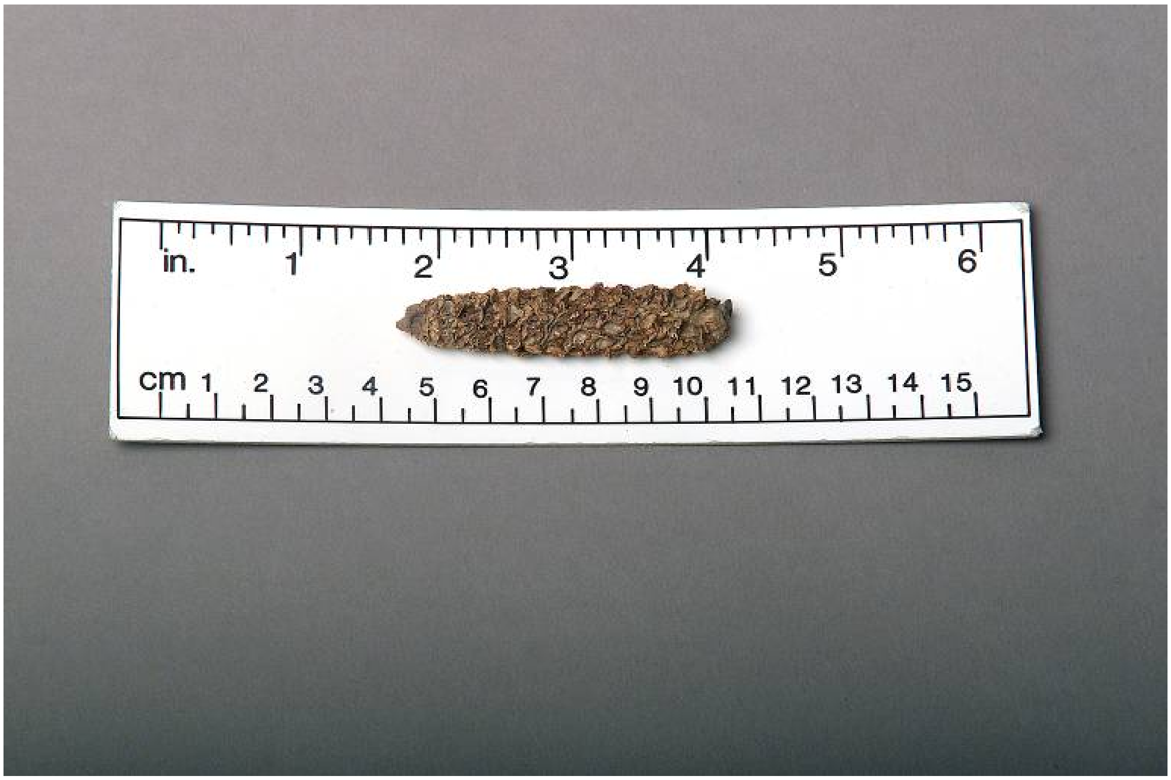


Figure 74.5. Maize cob from Jemez Cave.

ARCHAIC PROJECTILE POINT TYPOLOGY AND TECHNOLOGY

A total of 409 Archaic projectile points provide the database for research conducted for this chapter. Previous systematic studies of Archaic projectile points have identified important changes in point technology through time (e.g., Moore 1994; Moore and Brown 2002). Most notable of these are decreasing stem length, changes in basal morphology, and stem/base modifications (e.g., grinding and thinning).

The Early Archaic points are large stemmed points with long blades, slight shoulders, and a contracting stem (Figure 74.6). Jay points (upper) are generally larger than Bajada points (lower), with the latter exhibiting basal thinning and concave bases, and most of the former having straight or convex bases. These points are made from large biface blanks with a mean thickness of 8.3 mm. The base and/or lateral edges usually exhibit grinding (96%), with blade resharpening and rebasing also being common (86%). Previous studies indicate that Late Paleoindian groups often increased tool use-life by refurbishing the proximal end of broken points, while discarding the smaller base fragments. Early Archaic groups, on the other hand, resharpened the blade in conjunction with refurbishing the base. This may in part reflect a shift from the intercept hunting of large game in open settings to the increasing use of an encounter hunting tactic for medium to small game in wooded settings. This might also explain the shift to smaller-sized Bajada points.

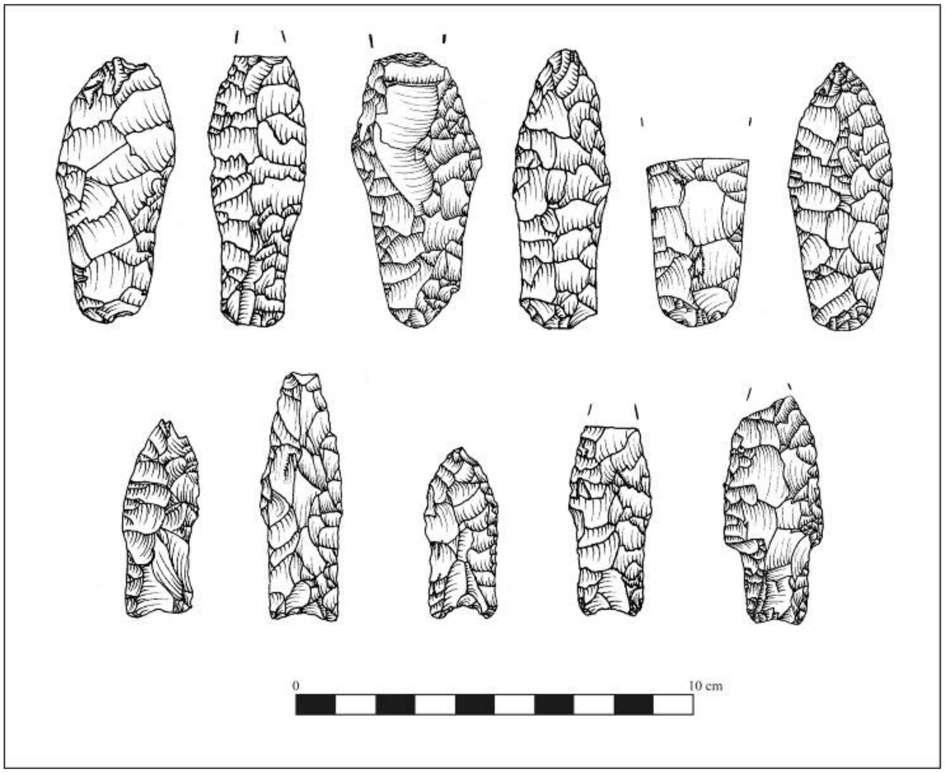


Figure 74.6. Jay (upper) and Bajada (lower) Early Archaic points.

Middle Archaic San Jose style points are characterized by large to medium size stemmed points with shorter blades and stems (Figure 74.7, upper). The blade is serrated with a concave base. The base and/or lateral edges often exhibit grinding (96%); however, the points are rarely rebased, but the blades are often resharpened (66%). They are often discarded when exhausted, with about 50 percent of the points being whole. Again, this point type is made from a large biface blank, with a mean thickness of 6.9 mm. This change in point morphology could have allowed for greater efficiency while encounter hunting in upland wooded environments. This might also explain the presence of serration, which would have increased bleeding and therefore provided a blood trail to follow. In addition, serration might also offset the decreased resharpening potential of the shorter blade by allowing for fewer resharpening events.

In summary, Early and Middle Archaic point technology is designed for a lower tool replacement rate that involves the production of points from biface blanks and heavy blade resharpening (also rebasing during Early Archaic). On the other hand, there is low point diversity, with generalized points being used to hunt various large, medium, and small size game.

Changes in point size and design presumably reflect the increasing importance of hunting medium to small size game in wooded settings.

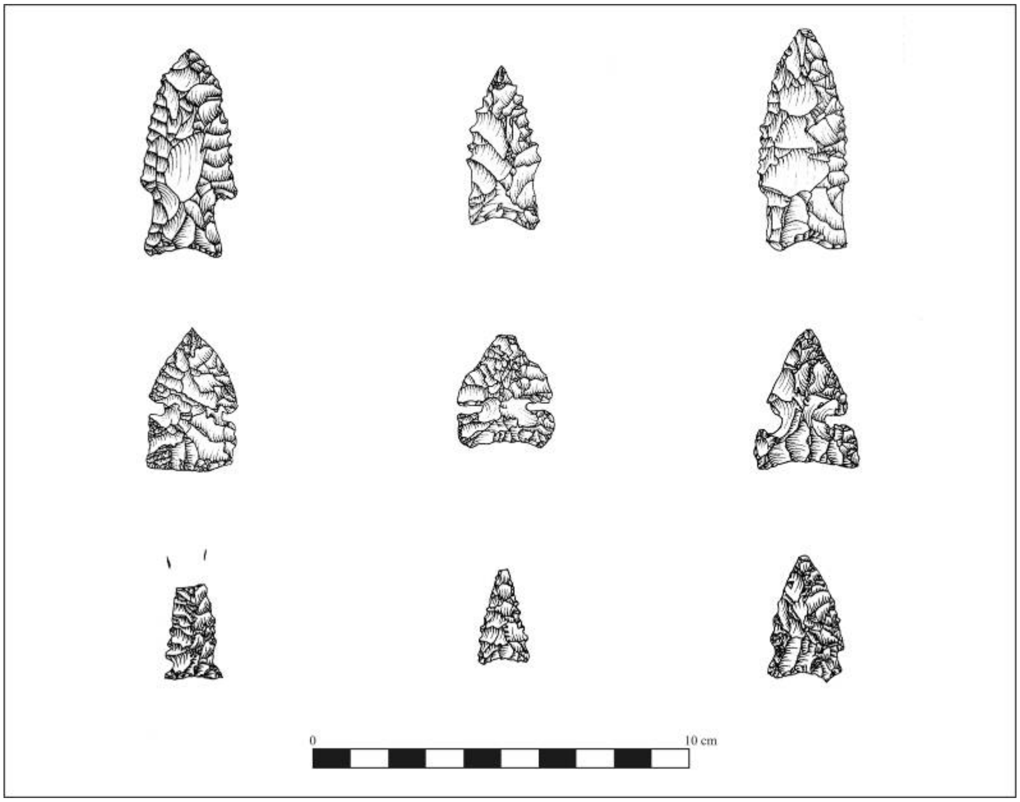


Figure 74.7. San Jose (upper), side-notched (middle), and Armijo (lower) Middle to Late Archaic period points.

On the other hand, if the large side-notched points are roughly contemporaneous with San Jose style points, then two very different technologies were being used at the same time (Figure 74.7, middle). All are made on thinner flake blanks with a mean thickness of 5.0 mm. These points exhibit less blade resharpening (52%) and almost no basal grinding (3%). They are more often being discarded when broken, with only 34 percent being whole.

Late Archaic Armijo points appear to represent a continuation of the San Jose style, with shorter blade and stem and the presence of serration and a concave base (Figure 74.7, bottom). However, there are important differences. These Late Archaic points are also made on thin flake blanks with a mean thickness of 5.1 mm. They also exhibit little resharpening (33%), but usually exhibit basal grinding (75%). Like the large side-notched points, they too are mostly being discarded when broken, with only 33 percent being whole.

The Late Archaic En Medio period is characterized by a shift away from the use of a few generalized point types to a variety of specialized point types. This includes at least five different types: corner-notched (n = 64), side-notched (n = 15), wide and narrow stemmed points with straight and concave bases (n = 72), leaf-shaped points (n = 16), and contracting stemmed points (n = 5) (Figure 74.8). All of these are made on flake blanks with mean thicknesses ranging from 5.4 to 5.9 mm, with evidence of the original ventral surface of the flake and plano-convex cross-section being common. These points are rarely resharpened (0 to 30%), with roughly half of the points being discarded either when broken or whole. They generally do not exhibit basal grinding (0 to 30%), which is especially true for the leaf-shaped points that may have been hafted with mastic. The leaf-shaped and contracting stem points also differ from most other Late Archaic points by being mostly serrated (75% versus 60%, respectively).

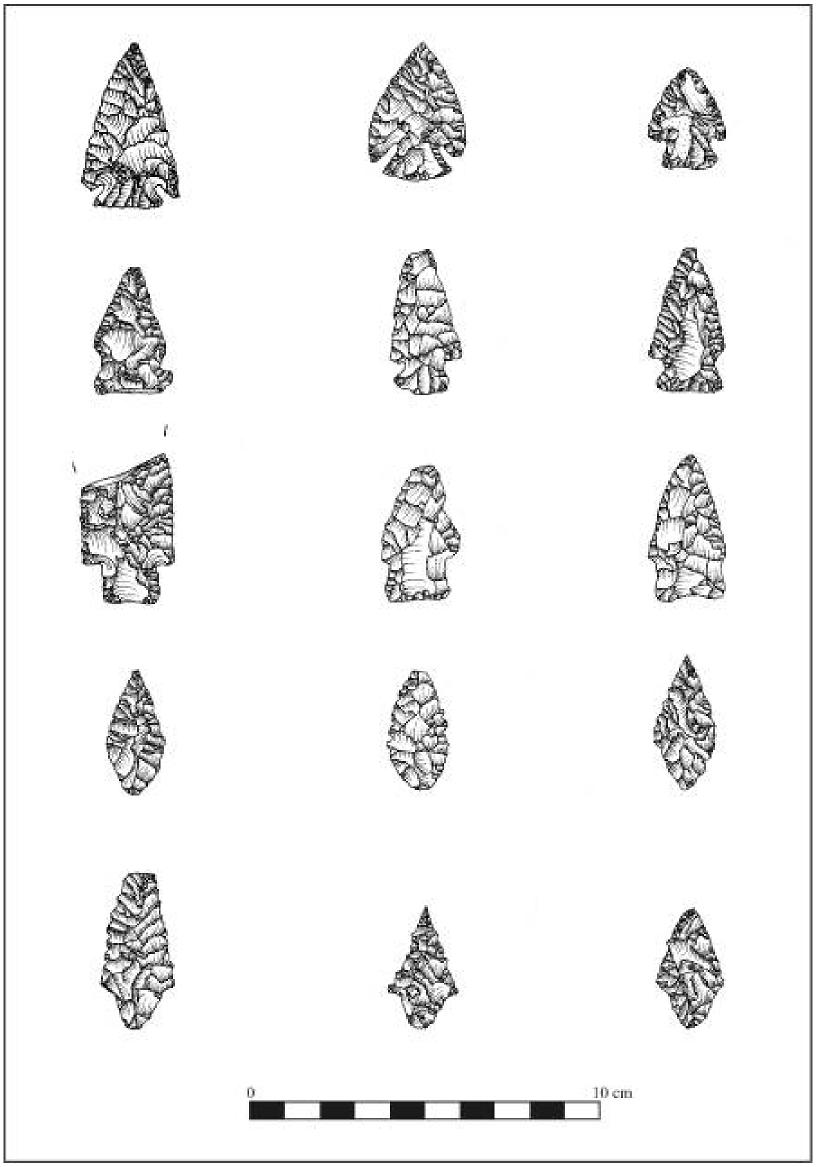


Figure 74.8. Late Archaic point types.

This diversity of Late Archaic point types presumably reflects the implementation of a variety of hunting tactics designed to efficiently procure specific types of game. The use of a few generalized point types, and low tool replacement rates due to resharpening during the Early and Middle Archaic, is now replaced with a diversity of point types and high tool replacement rates, with little blade resharpening to extend tool use-life. Flake blanks could reduce tool production costs and allow for a greater variety of smaller raw materials to be used, something important with restricted mobility. Otherwise, the use of a variety of specialized points sets the stage for the later adoption of the bow and arrow, circa AD 400.

REGIONAL LAND-USE

Distribution of point types across Zones 1 to 3 for Jay and Bajada points, and Zones 1 to 2 for the remaining point types, is provided in Figure 74.9 (left to right). There is an increase in the number of Jay points from south to north, with more Bajada points in the southern zones. The prevalence of Jay points in the San Luis Valley reflects the increased importance of large game hunting in this area, while the later Bajada foragers primarily exploited the wooded terrain in Zones 1 and 2. San Jose points are primarily represented in Zone 1, in contrast to the large side-notched points that are present in Zone 2. If this pattern continued into Zone 3, it might indicate that these side-notched points actually represent foragers entering the Rio Grande Valley from the north with San Jose foragers moving up from the south. There are also more Armijo points in Zone 2, but the sample size is only 12. On the other hand, all the other Late Archaic point types reflect a bias towards Zone 1, especially for the leaf-shaped points.

A variety of lithic raw materials were available to these ancient foragers, and the data indicate that they were very selective in choosing which material fit their tool requirements. The distribution of the three primary lithic raw materials is presented in Figure 74.10. There is a general decrease in the use of basalt from Jay, to Bajada, to San Jose, to large-side notched and Armijo points, with a corresponding increase in the use of obsidian through time. The increasing use of obsidian may in part reflect the increasing use of these upland resources areas, while dacite is primarily situated in lowland settings. Otherwise, very little chert/chalcedony is used for the production of most point types.

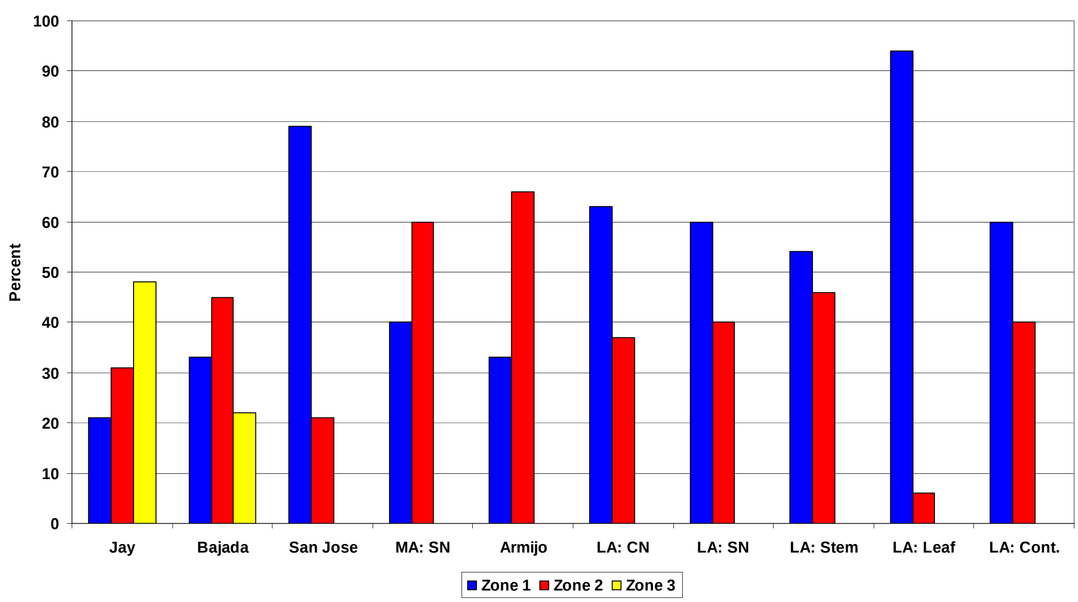


Figure 74.9. Distribution of Archaic point types by zone.

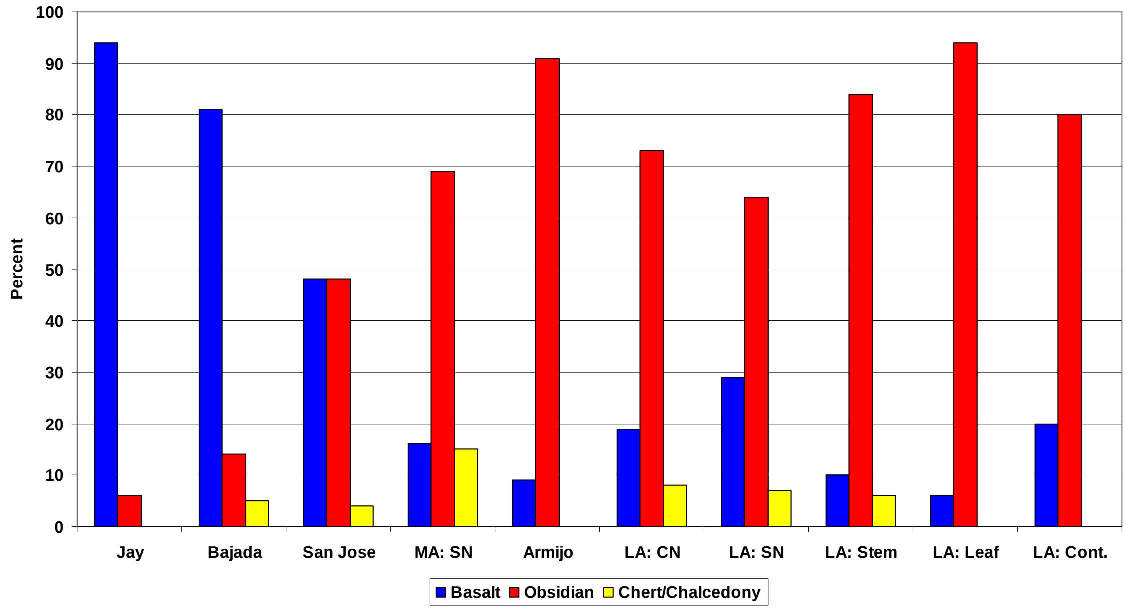


Figure 74.10. Distribution of material types for Archaic point types.

These data were then separated between Zones 1 and 2, with obsidian being visually segregated between the translucent central Jemez Mountains sources and the dusty El Rechuelos source situated at the northern end of the mountains. Figure 74.11 illustrates a similar pattern as observed in Figure 74.10, with the exception that most of the obsidian was derived from the central Jemez Mountains sources (i.e., Valle Grande and Cerro Toledo). In contrast, Figure 74.12 also shows a similar pattern as seen in Figure 74.10, but in this case most of the obsidian was derived from the El Rechuelos source**.** The two exceptions are the San Jose and Armijo style points, which have a mix of Jemez Mountains and El Rechuelos obsidian.

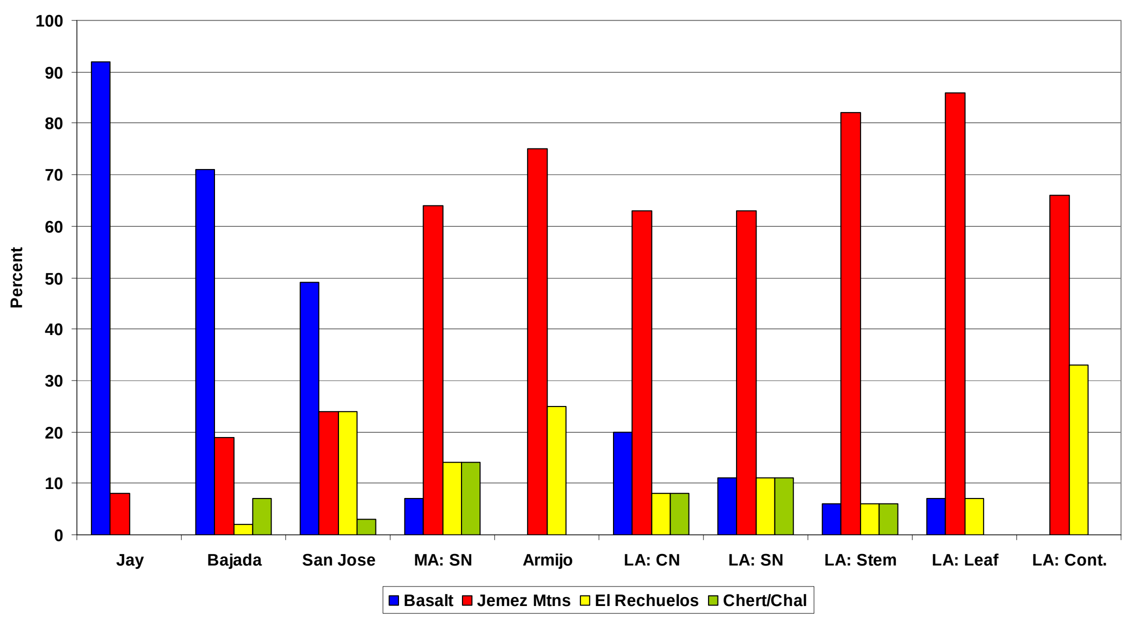


Figure 74.11. Distribution of material types for Archaic points in Zone 1.

An X-ray fluorescence analysis was conducted of a sample of 101 projectile points to further clarify this pattern. This sample consists of 72 obsidian and 29 dacite points. A previous study by Vierra et al. (2005) indicates that these "basalt" artifacts are actually a fine-grained black dacite, with three identified sources: the Cerros del Rio source in Zone 1 at Bandelier National Monument and the San Antonio Mountain and Newman's Dome sources near Tres Piedras in Zone 2.

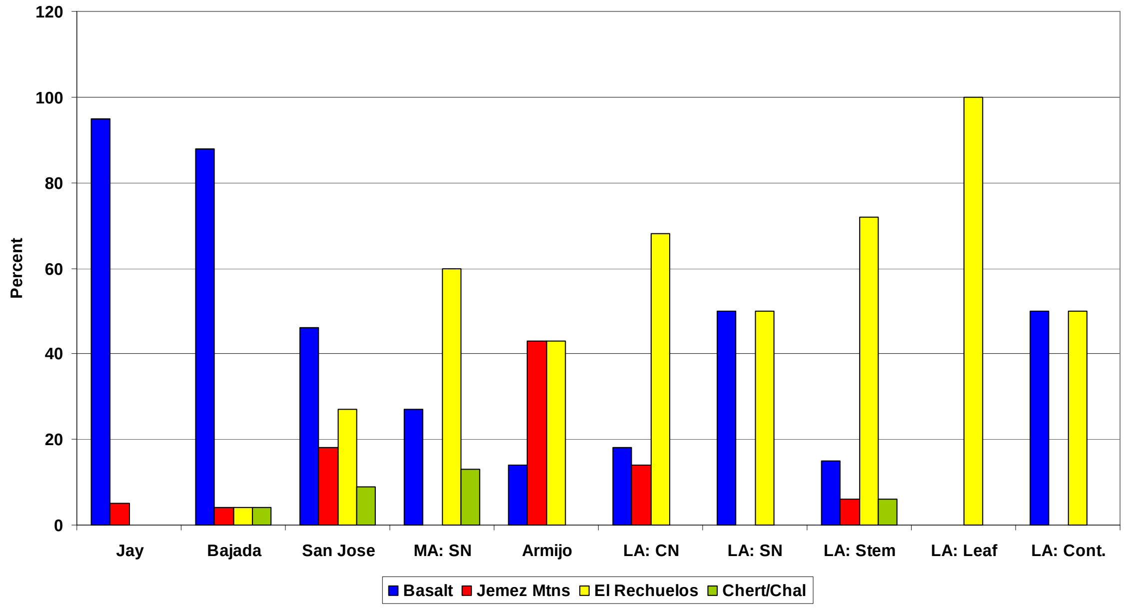


Figure 74.12. Distribution of material types for Archaic points in Zone 2.

Figure 74.13 illustrates the distribution of obsidian types in Zone 1. Due to the small sample sizes and similarities in distribution, the Early and Late Archaic samples have been merged into two single categories. On the other hand, the San Jose and large side-notched points have been kept separate because of important differences in these two distributions. Nonetheless, the central Jemez Mountains sources dominate Zone 1 with mostly Cerro Toledo and Valle Grande obsidian. However, the Early Archaic and San Jose-style points are also represented by obsidian derived from the southern Bear Springs source and a few items from the northern El Rechuelos source. Both San Jose and the large-notched points dominate the Valle Grande source. Since the Valle Grande obsidian source is restricted to the caldera, this pattern provides support for the contention that these Middle Archaic foragers were integrating these upland areas into their summer and fall seasonal rounds and thereby collecting more of this obsidian. This contrasts with the Cerro Toledo source, which is present along the eastern periphery of the caldera and in secondary deposits along the nearby canyons and Rio Grande Valley.

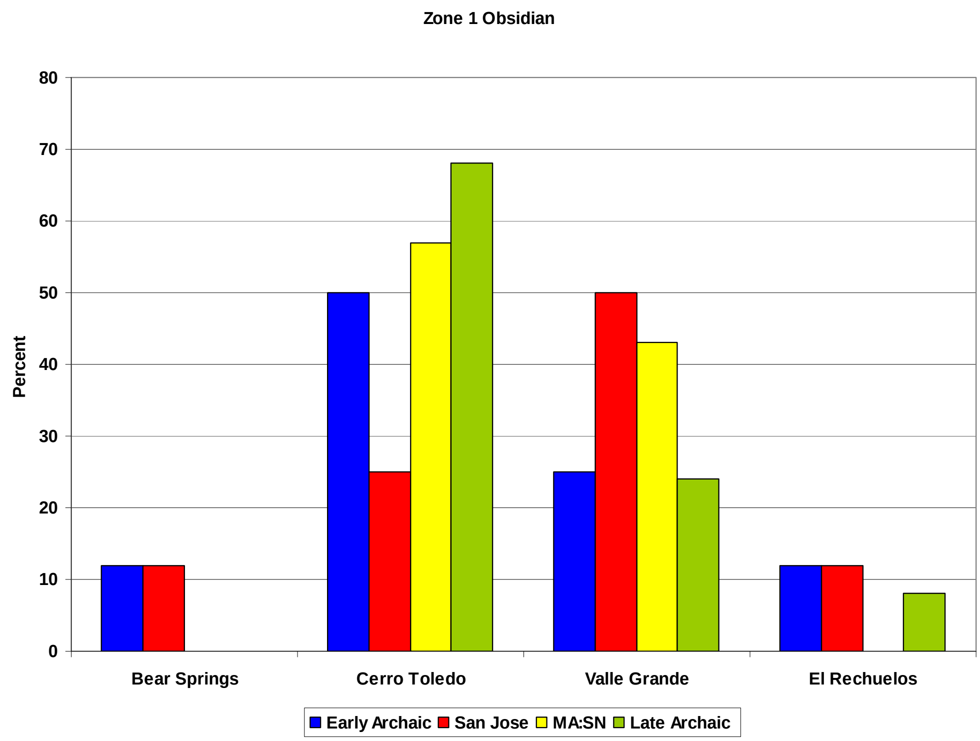


Figure 74.13. Distribution of obsidian types in Zone 1.

Figure 74.14 illustrates the distribution of obsidian types in Zone 2. In this case, most of the points are made of the northern El Rechuelos source. However, the Early Archaic again reflects a north-south pattern with all three central and northern obsidian sources represented. San Jose points continue to reflect the importance of Valle Grande obsidian, but now with El Rechuelos. Lastly, the large side-notched and Late Archaic points are primarily made of El Rechuelos obsidian. Together the obsidian data seem to support a north-south seasonal movement during the Early Archaic, with a more restricted north-south pattern during the Middle Archaic. The large side-notched and Late Archaic points were made on flake blanks with shorter use-lives. In this case, both sets of points are dominated by the most proximate obsidian source. Yet the question is, do these large side-notched points represent foragers moving down the Rio Grande Valley towards the Jemez Mountains and then turning north towards the San Juan Mountains? This contrasts to the Late Archaic, which probably represents an even more restricted pattern of movement that involves a mostly east-west, lowland to upland pattern.

Figure 74.15 illustrates the distribution of dacite in Zone 1. As can be seen, the Early Archaic sample contains examples of all three dacite types that are available in both Zones 1 and 2. In contrast, the later periods are characterized by smaller samples, but lack the San Antonio Mountain source, with some Newman's Dome. This also reflects a clear north-south pattern of movement between Zones 1 and 2 during the Early Archaic period.

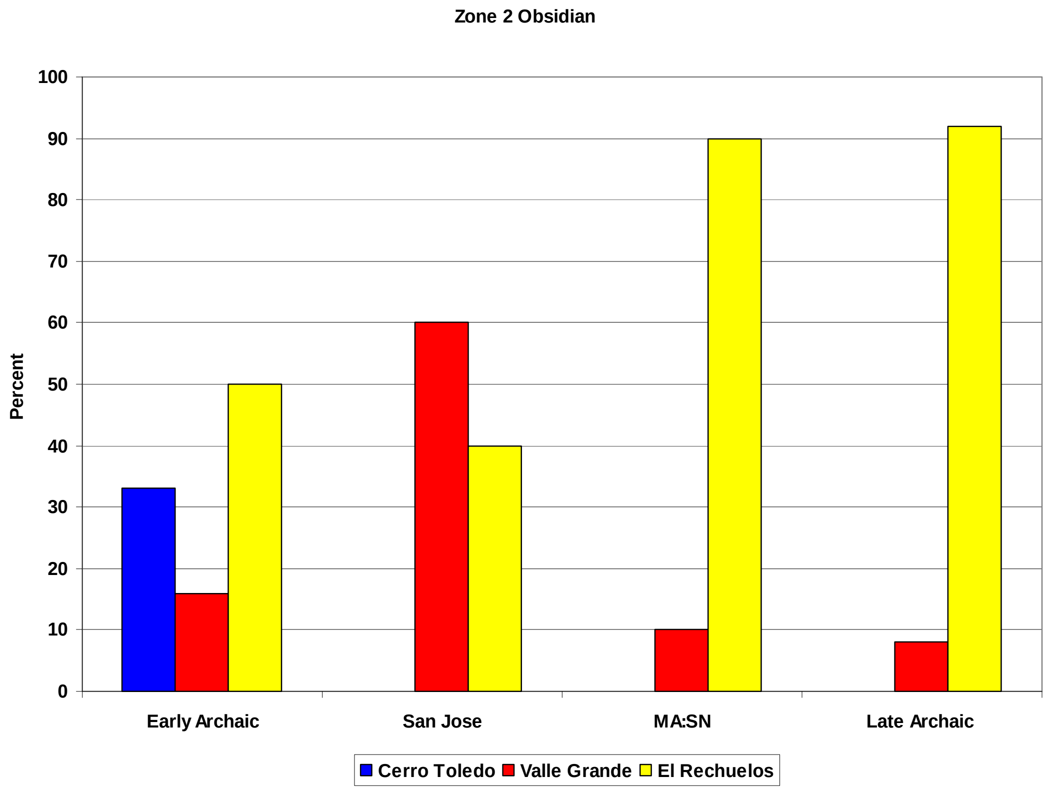


Figure74. 14. Distribution of obsidian types in Zone 2.

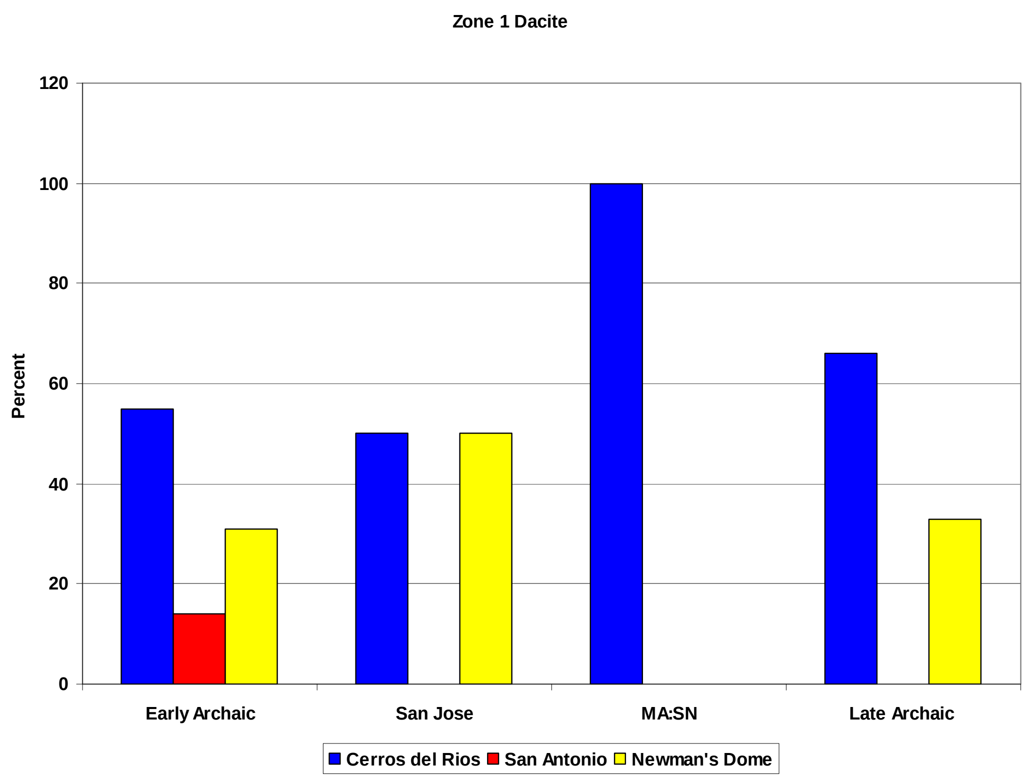


Figure 74.15. Distribution of dacite types in Zone 1.

Figure 74.16 illustrates the distribution of dacite in Zone 2. Again, all three dacite sources are represented in the Early Archaic sample. In contrast, the San Jose points are represented by both local dacite sources, but the large side-notched and Late Archaic points are solely made from the local Newman's Dome source. Presumably this continues to represent a long pattern of decreasing north-south movement from Early to Middle Archaic, with a much more restricted range during the Late Archaic. More data are needed from the San Luis Valley (i.e., Zone 3) to fully clarify the possible relationship with the southern Rocky Mountains for these large side-notched points.

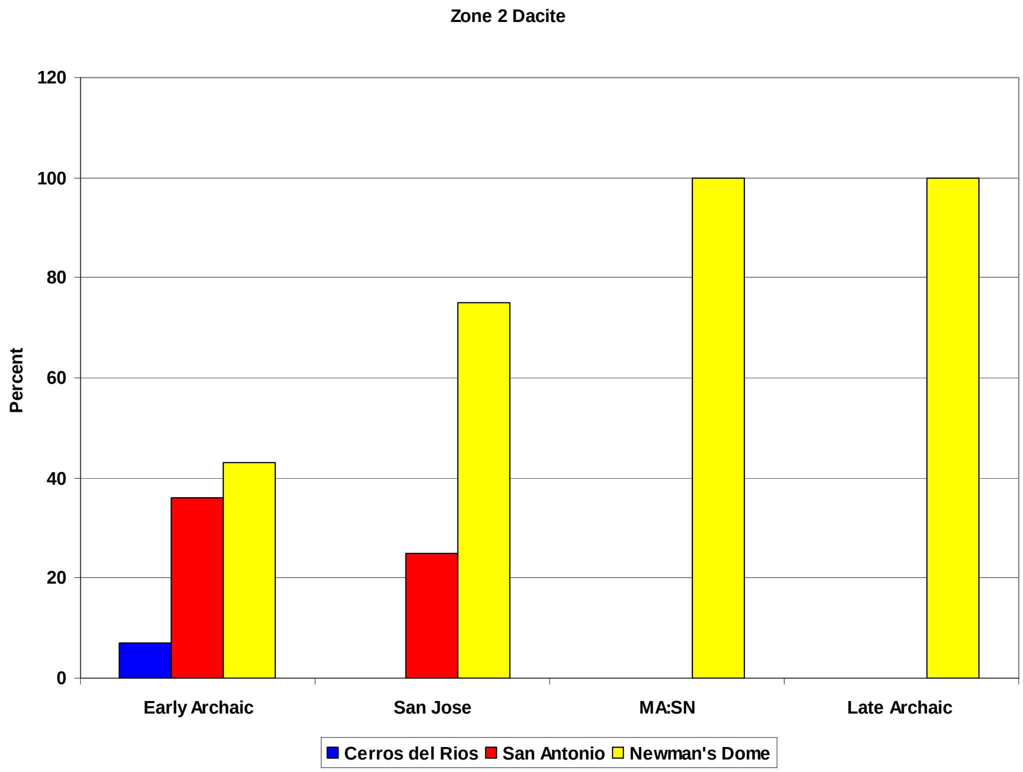


Figure 74.16. Distribution of dacite types in Zone 2.

CONCLUSION

In conclusion, this chapter has taken a preliminary look at the possible relationship between changes in climate, resource structure, foraging strategies, and projectile point technology in the northern Rio Grande Valley. Changes in Early and Middle Archaic period point typology and technology may be associated with the expansion of piñon-juniper woodlands in the region and a shift from hunting large game in open settings to more medium to small sized game in wooded settings. The projectile point technology was characterized by low point diversity and low tool replacement rates. In contrast, the Late Archaic point technology was characterized by high tool replacement rates and high point diversity. Annual movements became more restricted and oriented to a lowland-upland seasonal pattern. The long-term replacement of mostly dacite with obsidian lithic material is presumably associated with the increasing use of these upland resource areas. Overall, these changes in projectile point technology could reflect a "replacement when exhausted" versus a "replacement based on a probability of failure" strategy (Kuhn 1989). That is, Early to Middle Archaic groups were more residentially mobile, with a technology that was continuously being used and maintained. In contrast, Late Archaic groups were becoming more logistically organized while focusing on a greater variety of target species. Therefore, higher tool replacement rates could have been used as a means of increasing tool reliability and hunting success rates (also see Vierra 1992b:104).

CHAPTER 75
ARCHAIC UPLAND RESOURCE USE: THE VIEW FROM THE PAJARITO PLATEAU, NEW MEXICO

Bradley J. Vierra and Teralene Foxx

INTRODUCTION

In 1973, Cynthia Irwin-Williams (1973:5) stated that “two kinds of special activity sites are known outside the [Arroyo Cuervo] region: isolated hunting camps in the Jemez Mountains and repeated quarry workshop camps…” Five years later, one of the first systematic surveys in the Jemez Mountains was conducted along the valley of the Redondo Creek at elevations over 8000 feet (Moore et al. 1978). Although they found numerous lithic scatters, they were neither hunting camps nor quarries, but rather campsites where a range of hunting and gathering activities appeared to have taken place (also see Baker and Winter 1981). However, there has been very little systematic research conducted in these upland settings during the intervening 20 years.

This chapter reviews the archaeological evidence for the Archaic occupation on the central Pajarito Plateau. Recent survey and excavations conducted at Los Alamos National Laboratory (LANL) has identified over 50 Archaic sites and 175 lithic scatters. The survey evidence reveals the systematic and repeated long-term use of these upland resource areas by Archaic foragers. Indeed, several broad occupation zones can be identified. We summarize the ethnobotanical data on possible plant use for each vegetation community and suggest a possible seasonal strategy for exploiting these resource zones during the Late Archaic. Debitage artifact data from recently excavated Late Archaic sites are subsequently used to link lowland habitation to upland campsites to illustrate this complementary land-use strategy.

ARCHAIC LAND-USE AT LOS ALAMOS NATIONAL LABORATORY

LANL occupies the central section of the Pajarito Plateau**.** The plateau covers an area roughly extending from Santa Clara Canyon on the north to the mesas above Cochiti Pueblo on the south to the caldera on the west and the mesas overlooking the Rio Grande Valley to the east. LANL covers approximately 29,000 acres of land on this high mesa, ranging from about 6000 to 8000 feet in elevation. The mesa has been incised with several deep canyons that drain from the mountain country down to the river valley. Balice et al. (1997) have defined four basic vegetation types at LANL: juniper-savanna, piñon-juniper, ponderosa pine, and mixed conifer. Figure 75.1 illustrates the distribution of these vegetation types. As can be seen, most of the area is covered with piñon-juniper woodlands at the lower elevations and ponderosa pine at the higher elevations.

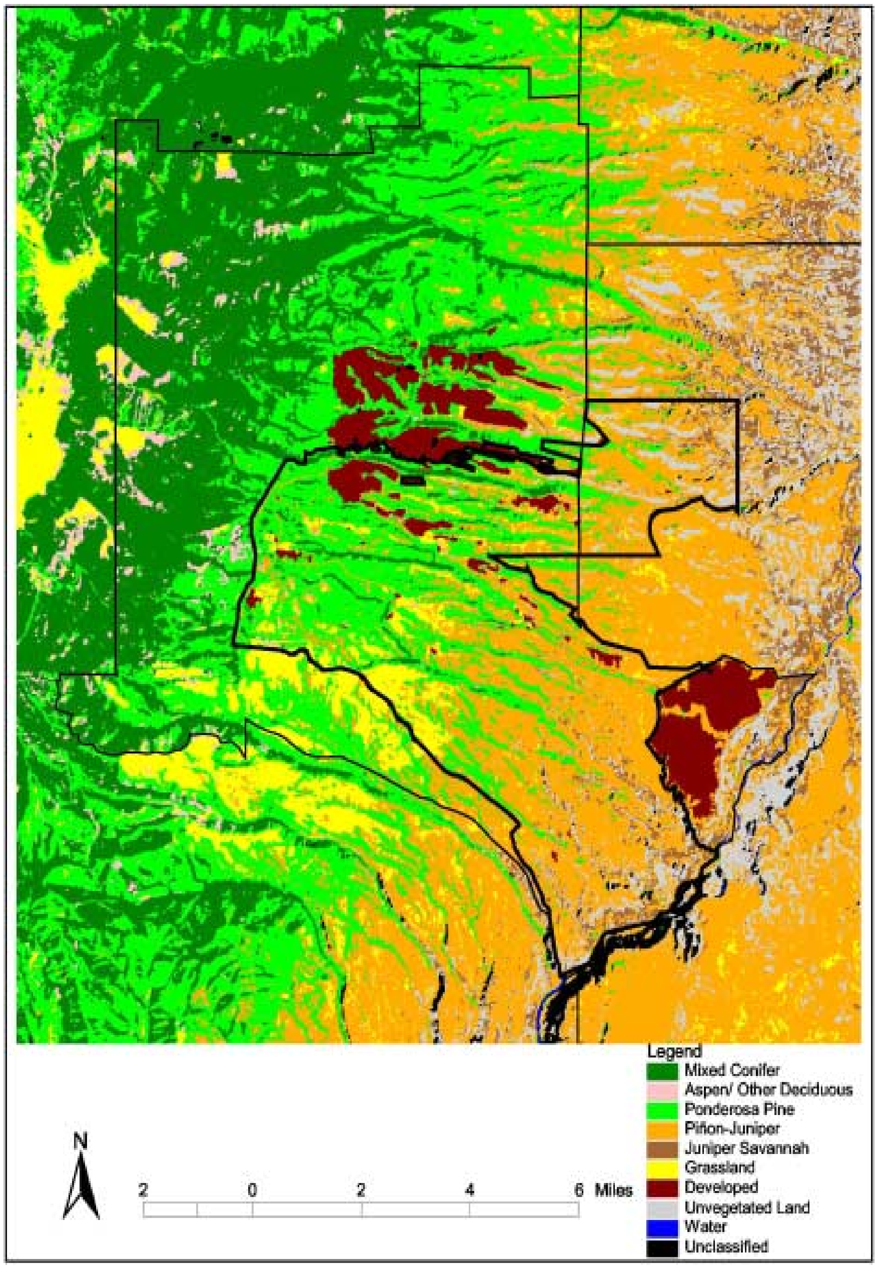


Figure 75.1. Vegetation types at Los Alamos National Laboratory.

A total of 51 Archaic sites have been identified at LANL. These sites are characterized by obsidian lithic scatters ranging from 40 to 140,000 sq m in size. The assemblages emphasize the production/maintenance of bifacial tools, with occasional one-hand manos and millingstones also present. The diagnostic Early, Middle, and Late Archaic projectile point types on the plateau are similar to those defined by Irwin-Williams for the Oshara Tradition (Figure 75.2). Figure 75.3 illustrates the relative percentage of sites by Archaic time period. As can be seen, there are very few Early Archaic sites, somewhat more Middle Archaic sites, and mostly Late Archaic sites represented.

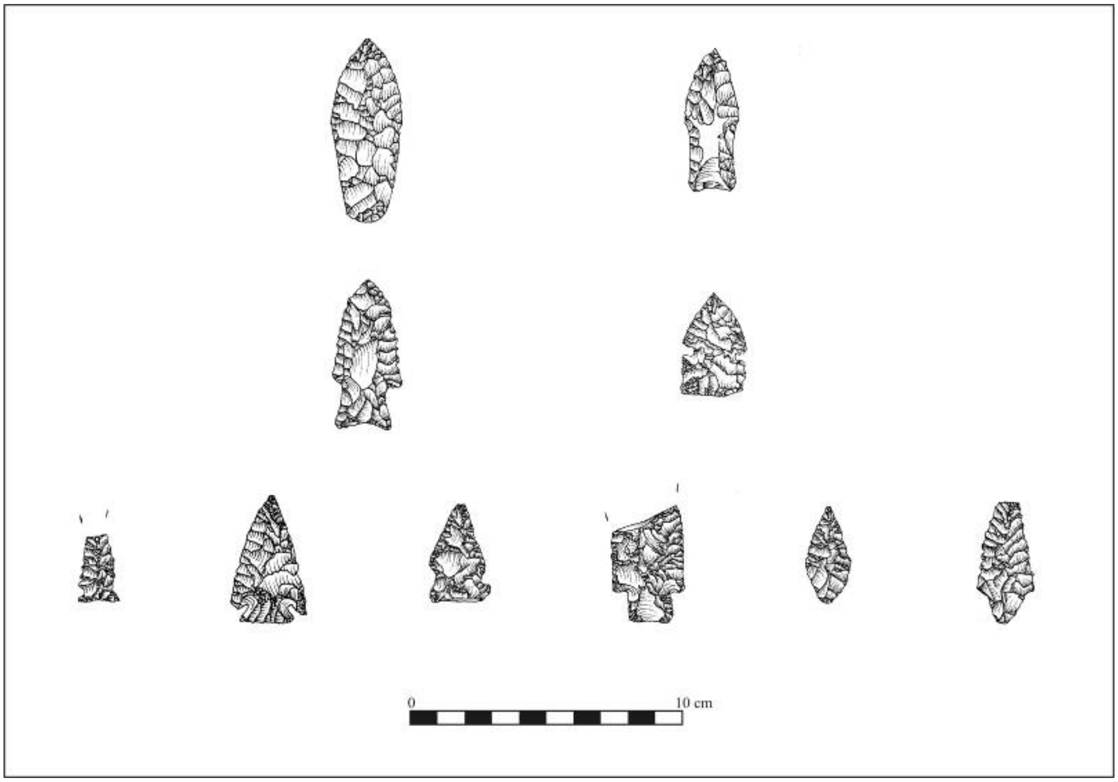


Figure 75.2. Diagnostic Early, Middle, and Late Archaic point types.

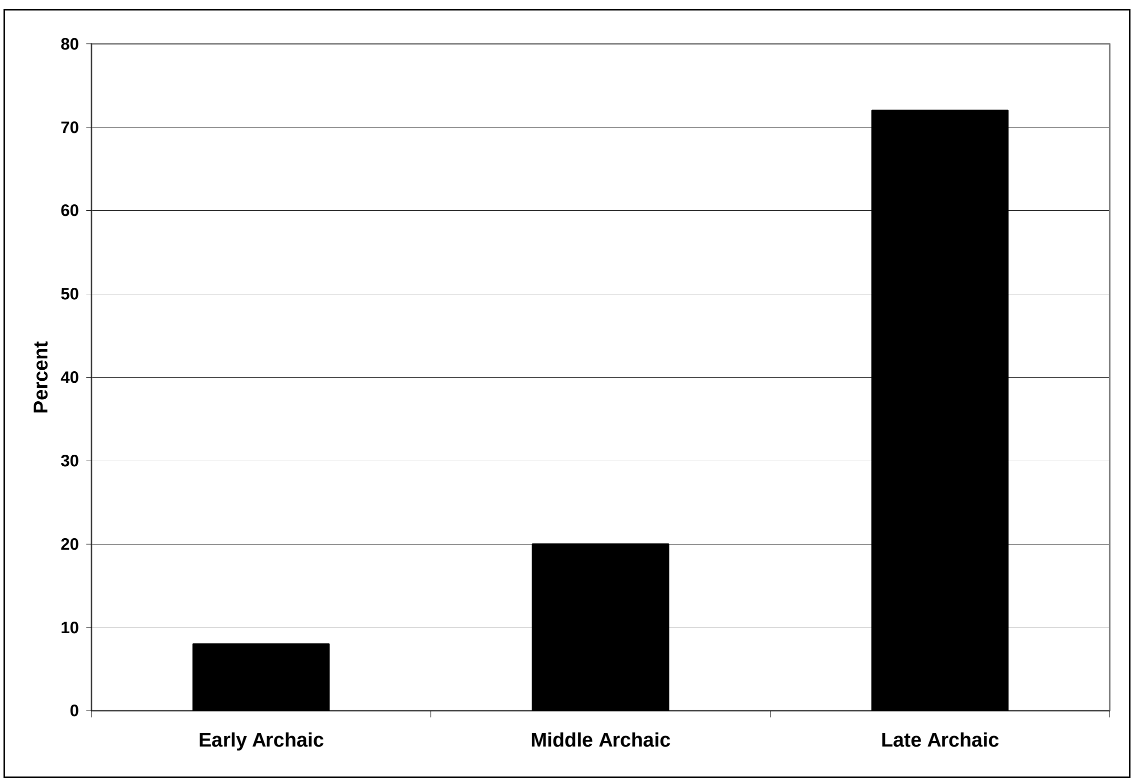


Figure 75.3. Relative frequency of Early, Middle, and Late Archaic sites.

This pattern does not necessarily reflect the increasing use of these upland areas through time, but rather the long-term effects of various geomorphic processes on the archaeological record. For example, although there is a Late Archaic site present on the surface of Mortandad Canyon, a charcoal sample was collected from an 11-m-deep core hole that yielded a date of 7260 BP, indicating that Early and Middle Archaic deposits may be buried within these alluvial settings (Reneau et al. 1996a). This chapter will therefore focus on the Late Archaic, given the number of archaeological sites represented, and the relative similarity in environment over the last 3000 years.

Figure 75.4 illustrates the distribution of Archaic sites at LANL. Since the distribution of sites is sparse, we have combined them with the distribution of all obsidian lithic scatter sites (Figure 75.5). In the latter case, we have used the actual site boundaries and not single points. These assemblages are also dominated by the production/maintenance of obsidian bifacial tools, but lack diagnostic projectile points. Given the previous data, it is likely that most of these sites represent Late Archaic occupations. Nonetheless, both figures illustrate several broad occupation zones: 1) juniper-savanna zone in the Rio Grande Valley, 2) piñon-juniper zone at lower elevations on the plateau, 3) piñon-juniper/ponderosa ecotone at mid-elevations on the plateau, and 4) ponderosa pine/mixed conifer ecotone at the higher elevations. It appears that the ponderosa pine and mixed conifer communities are also important to Late Archaic foragers and not only the piñon-juniper zone as has traditionally been argued.

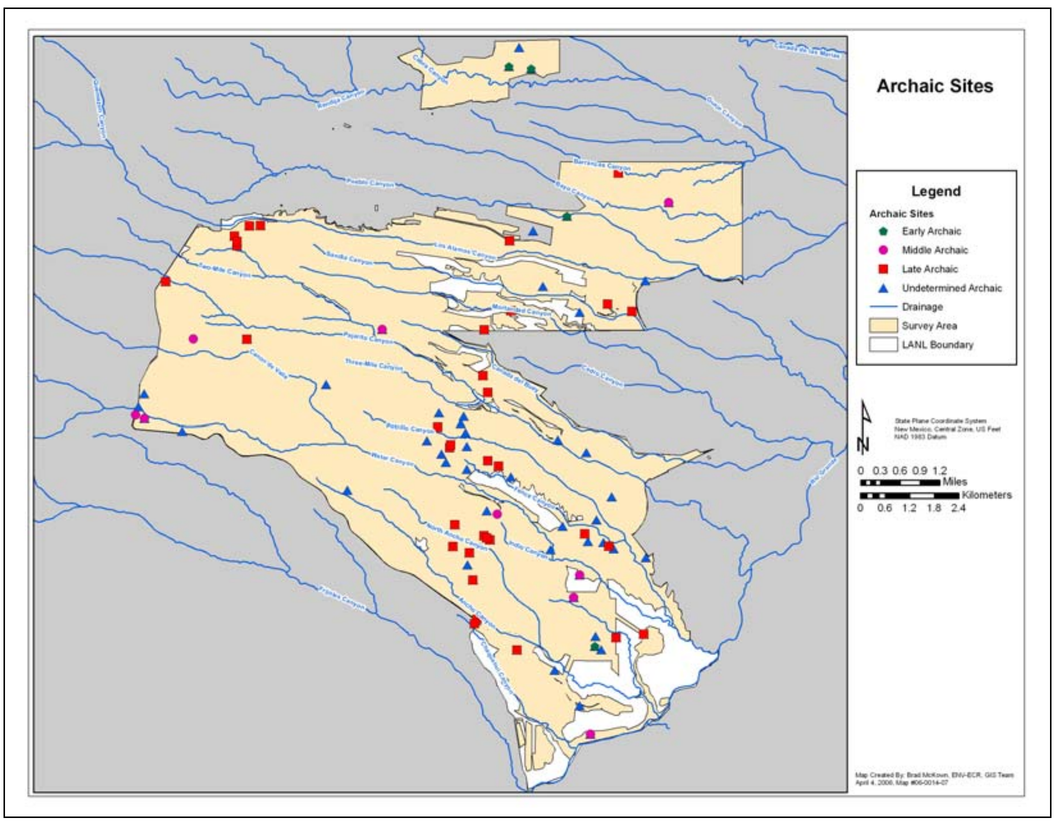


Figure 75.4. Distribution of Archaic sites at LANL.

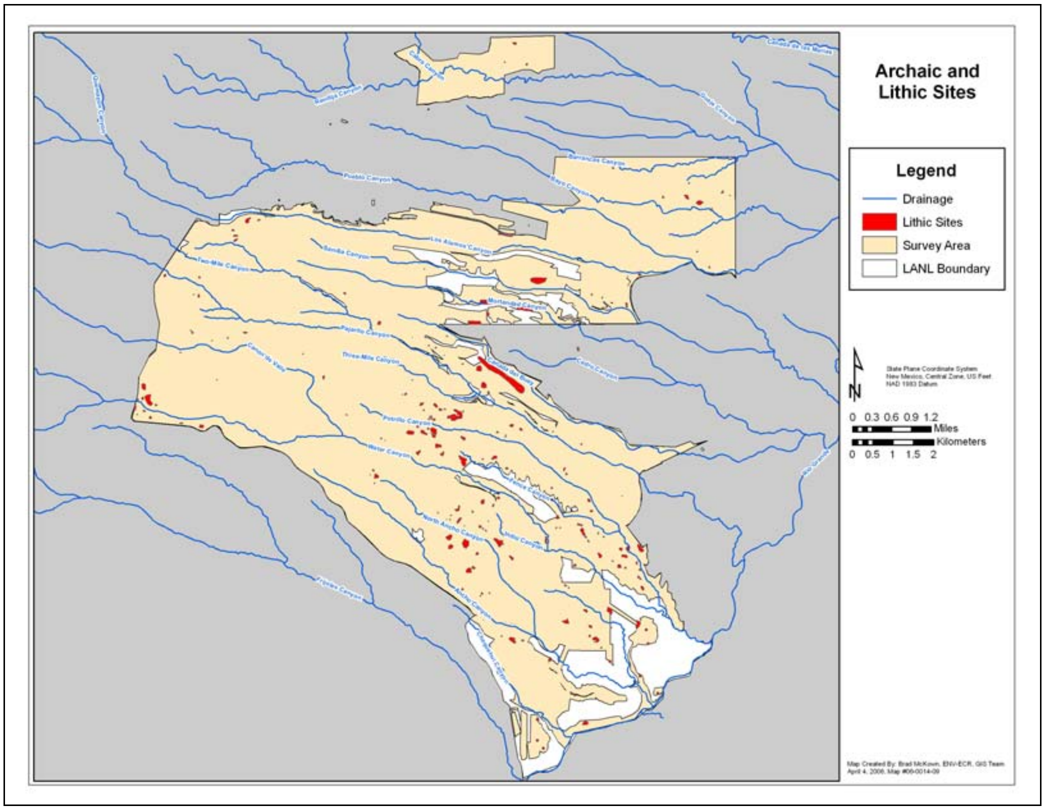


Figure 75.5. Distribution of Archaic and lithic scatter sites.

SEASONAL USE OF UPLAND AREAS

So, how were these Late Archaic foragers using these upland resource areas? A total of 985 plant species were described in Foxx et al.'s (1998) recent *Annotated Checklist of Vascular Plants in the Jemez Mountains*. This checklist provides information on plant locations, occurrence, phenology, and uses. Over 200 of the plants identified for the Jemez Mountains by Foxx et al. (1998) are also identified in Dunmire and Tierney (1995) as having specific ethnobotanical uses such as food, medicine, implements, and many with multiple uses. Using these two references, we constructed tables to analyze the possible plant use by elevation and activity for the Pajarito Plateau and east Jemez Mountains. Table 75.1 summarizes all the uses for the over 200 plants identified. Although many of the plants have multiple uses, we are confining our analysis in this paper to only the108 plants identified as subsistence plants.

Table 75.1. Plant uses by vegetation community.

Activity	**Riparian**	**Jun-Sav***	**PJ***	**Pipo***	**MC***	**Burned**
Medicinal (*n* = 148)	18	82	111	73	35	14
Food (*n* = 108)	23	41	77	56	30	13
Implements (*n* = 28)	4	14	20	15	6	4

Activity	Riparian	Jun-Sav*	PJ*	Pipo*	MC*	Burned
Coloring/Tanning (*n* = 37)	6	19	24	16	6	6
Construction (*n* = 16)	6	7	9	8	4	2
Smoking (*n* = 13)	0	8	11	3	9	1
Cordage (*n* = 6)	2	3	2	2	1	1
Total	**59**	**174**	**254**	**173**	**91**	**41**

*Jun-Sav is juniper-savanna; PJ is piñon-juniper; Pipo is *Pinus ponderosa* or ponderosa pine; MC is mixed conifer.

The plants identified as potential subsistence species are available from a variety of vegetation communities, including from lower to higher elevations: juniper-savanna, piñon-juniper, ponderosa, and mixed conifer. Many species can be found in multiple vegetation communities, but some species are limited to certain habitats within a plant community, or may be more abundant in certain habitats. For example, riparian and water resources are associated with multiple zones and are found within the canyon bottoms, along the Rio Grande, and in areas with springs and flowing water. Some species found near watered sites include wild grape, bee balm, willows, and cottonwoods.

Burned and disturbed areas also provide unique potential collecting sites within the piñon-juniper, ponderosa pine, and mixed-conifer zones. Tree-ring data indicate that there were frequent fires before 1900, particularly in the ponderosa pine zone (Foxx and Potter 1984). Burning enhances the habitat for species such as wild onion and cheno-ams, but also increases the vigor and vitality of these species for a short time, thus making these species more abundant and larger in burned sites (Foxx and Potter 1984). These areas would provide foraging patches within the ponderosa pine or burned areas within other zones. Disturbed areas can be found through all zones and are often associated with Ceramic period habitation sites. Species such as common purslane, wolfberry, and Rocky Mountain beeweed are commonly found in such sites.

To determine the relative potential use of the plant communities and the individual habitats, we took each species and determined which plant community it might occur in, when the plant would most likely be available, and how common it might be. We also looked at other factors that might influence the availability such as the phenology of the plant or habit.

Figure 75.6 illustrates the relative percentage of plant foods by vegetation community. As can be seen, the piñon-juniper community contains the greatest variety of plant foods followed by ponderosa pine zone. Fewer species are found in the juniper-savanna, mixed conifer, and riparian communities. If the five percent burned area species are target collecting sites primarily in the ponderosa pine plant community, then that community becomes an enhanced site for collecting species such as wild onion and cheno-ams. Therefore, the piñon-juniper and ponderosa pine communities are potentially the most productive areas for plant foods.

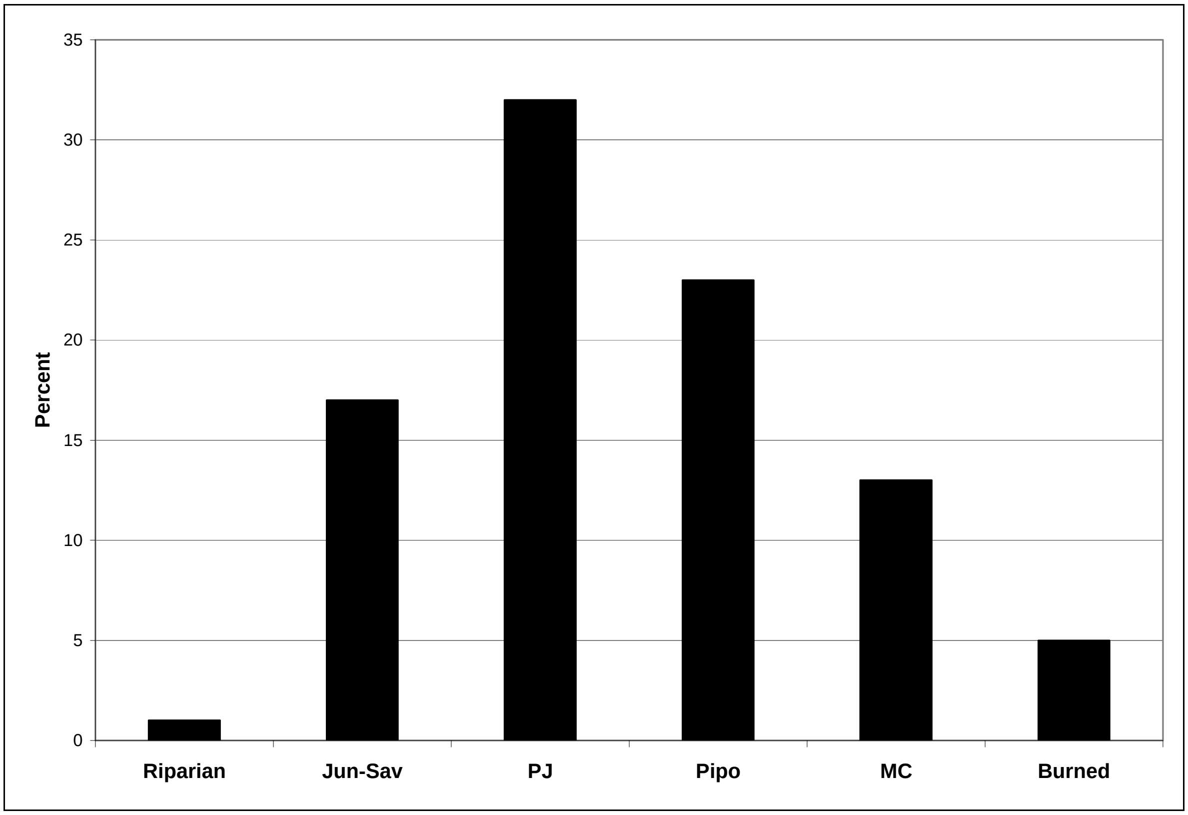


Figure 75.6. Relative percentage of food plants by vegetation community.

Figure 75.7 separates the species by plant group (structure or habit) and vegetation community. There are several important patterns. There is an increase in shrubs with elevation versus a corresponding decrease in annuals with elevation. One factor is the availability of plants as related to the plant structure. Trees, shrubs, and perennial plants will be found in the same locations from year to year because of their long-term longevity. On the other hand, annual plants live only one year and therefore are more dependent on seasonal rainfall patterns and other conditions such as disturbance. Many of the shrubs within the mid-elevation ranges (i.e., piñon-juniper and ponderosa pine) have collectable berries and would be a predictable resource. The increase in diversity of plants within these two zones make the ponderosa pine and piñon-juniper communities more desirable collecting areas.

Figure 75.8 illustrates the seasonal availability of food plant species by vegetation zone. The availability is very dependent on the elevational seasonality. High elevations such as mixed conifer will have a shorter growing season than the lower elevations such as the piñon-juniper woodlands. Warming will begin with the juniper-savannah in early spring providing early-season species such as Indian ricegrass. By May, greening of the mixed conifer and ponderosa pine will begin and species will start to sprout or leaf out. In the fall, the reverse is true. The seasonal cooling begins at high elevations and moves downslope. Therefore, in the fall more species would be available for collecting at lower elevations (i.e., the piñon-juniper woodlands). Overall, there are a variety of plant species available to procure at all elevations and at various seasons.

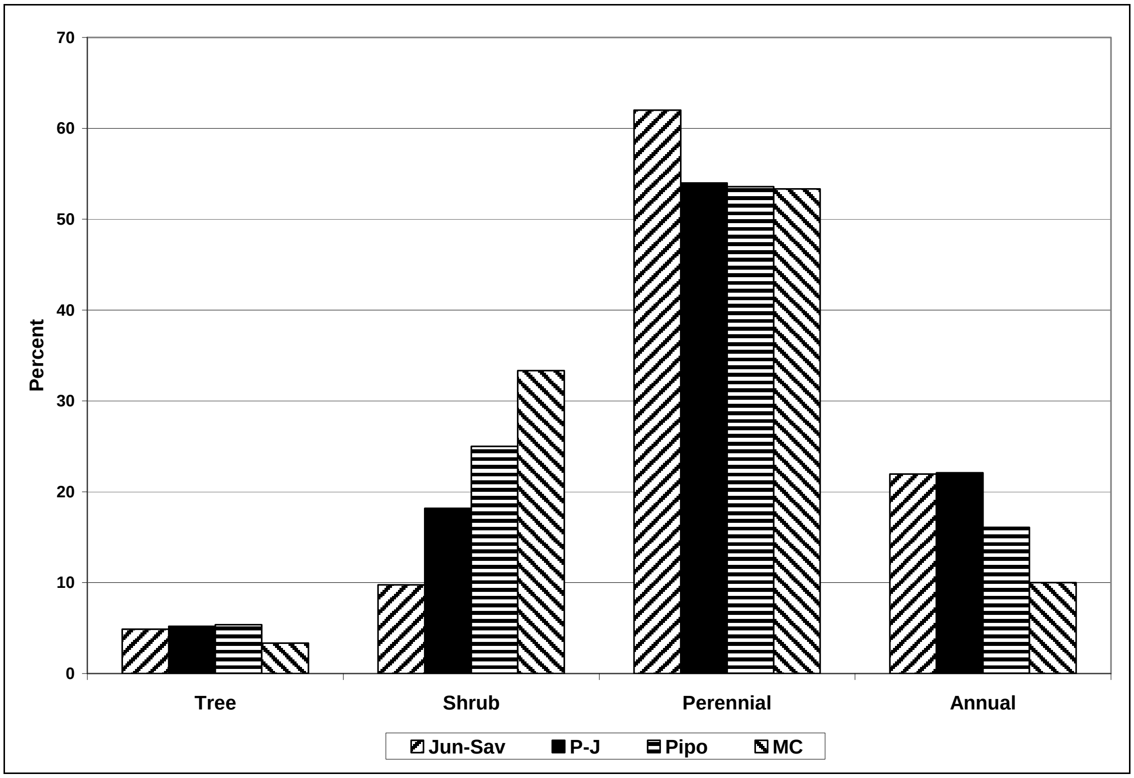


Figure 75.7. Plant groups by vegetation community.

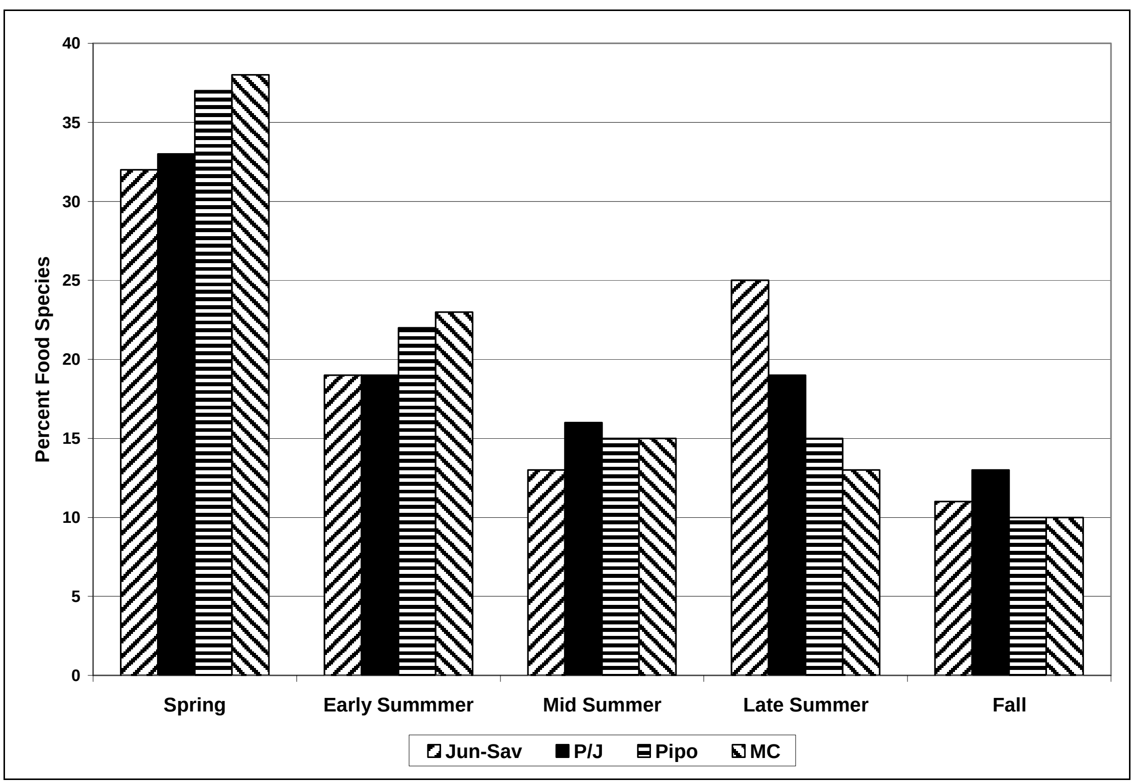


Figure 75.8. Plant seasonality by vegetation zone.

Various portions of a plant can be used at differing times of the year. Many perennial food plants are available for consumption in the springtime and later during the summer. For example, cheno-ams can be used as greens early in the season and seeds harvested later in the summer. Other plants used for the bulb or root crops such as wild onion will be available throughout the growing season. Some plants such as those with nuts and berries will not be used for greens and are therefore most available in mid to late summer or fall.

In this analysis, a number of plants are available in the spring and early summer at higher elevations. The highest number of food species is available during the mid-summer at the higher elevations (mixed conifer and ponderosa pine). In late summer the pattern changes when there is a step-like pattern with decreasing species richness with increasing elevation. In the fall, there are more food plants available in the piñon-juniper community. The drying of soils and south-facing aspect of White Rock Canyon and lack of berry producing shrubs and nut producing trees make the lower juniper-savannah less desirable for collecting except within the riparian zone along the river where berry producing species such as wild grape is found.

However, species richness does not necessarily reflect relative species abundance or evenness. Particular target species within each vegetation zone can be more common and productive than other species. Figure 75.9 provides information related to how common a particular plant is and its availability.

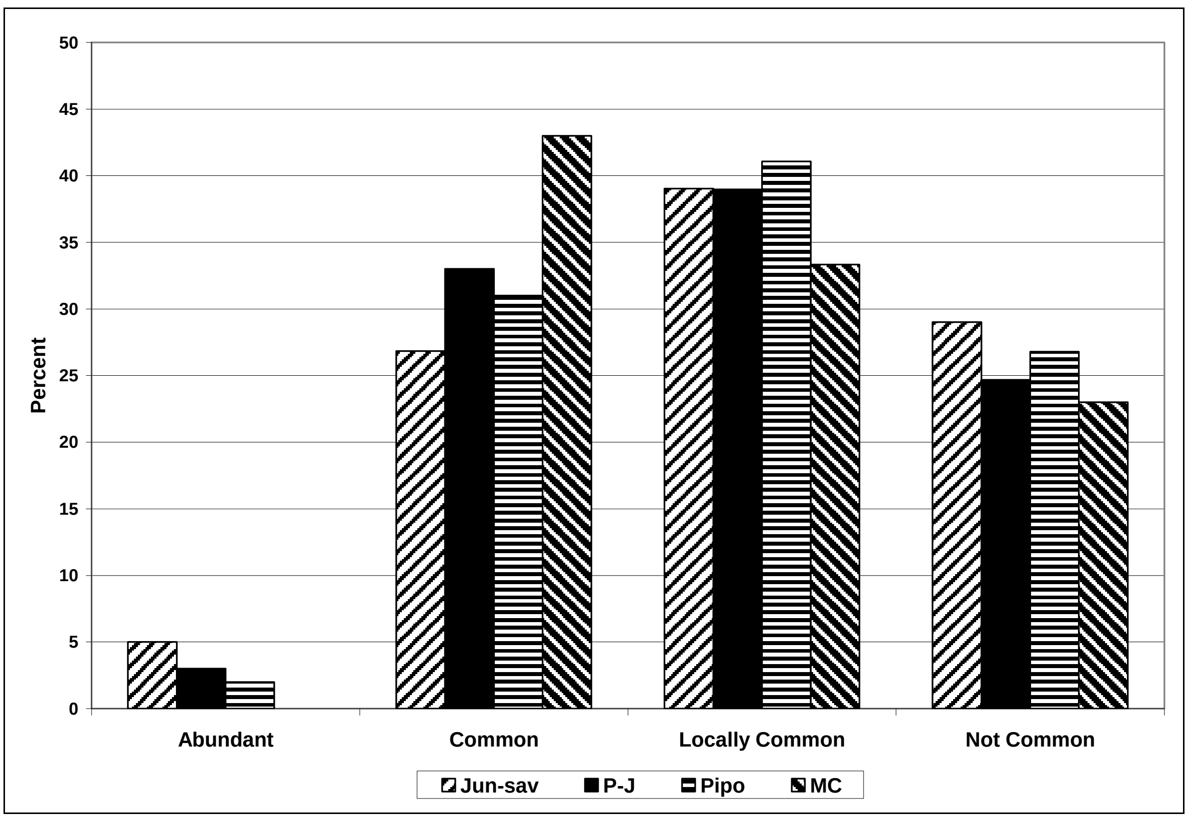


Figure 75.9. Relative plant species abundance by vegetation community.

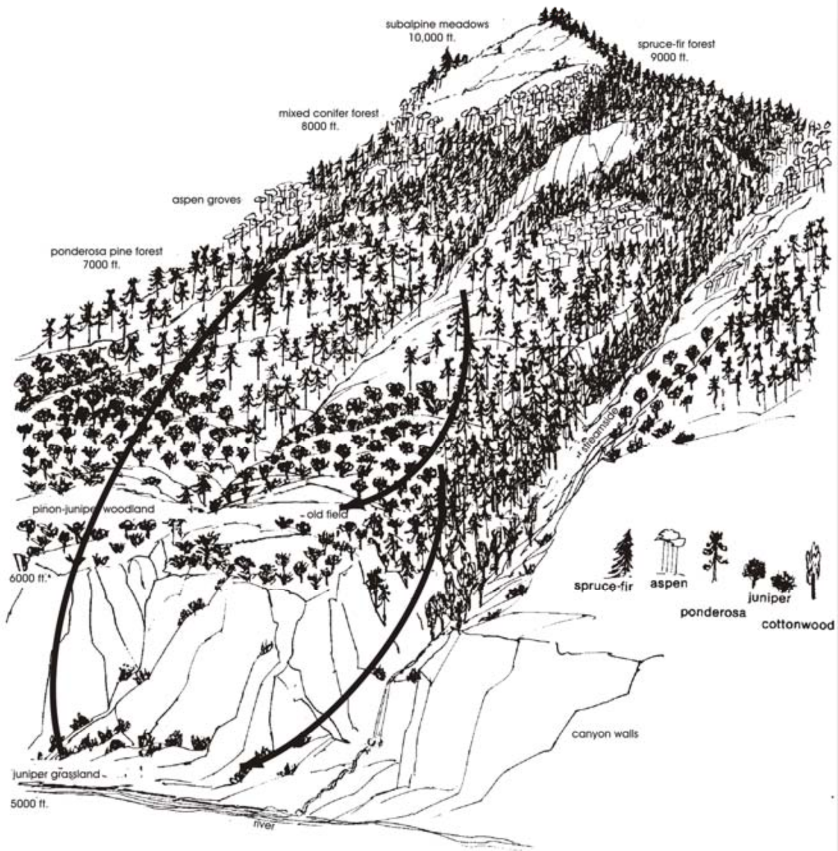
Based on personal experience, plant collections, and botanical texts, we have divided the plants into four categories: common, locally common, not common, and abundant. Species identified as common are those that are seen throughout an area. Locally common means that plants are found in patches or groups. Not common indicates they are seen as single plants, not in patches and not throughout an area. Abundant usually refers to a dominant species of an area such as the piñon pine in the piñon-juniper plant community. As can be seen from this figure, many of the species are locally common. This means perennial plants that are locally common would be found in patches. Therefore, we would expect particular target species to be collected in these areas.

If we identify a few possible target species that are both common and abundant in these various communities, then we can suggest a possible annual cycle for exploiting these resource areas (see Table 75.2). In the juniper-savanna community, cool-season grasses like Indian ricegrass are abundant, having seeds that are available in the early summer. Species used for greens such as cheno-ams can be found in all disturbed and burned contexts, but their resource patches could be found represented in the ponderosa pine zone and lower mixed conifer early in the summer. In addition, wild onions, berries, and wild potatoes are also available in these areas during the mid to late summer time period. In contrast, acorns, pine nuts, broad leaf yucca, and cacti would be available for consumption during the fall in the piñon-juniper zone. Dropseed grasses and cheno-am and saltbush seeds could have also been exploited during the late summer in this zone. If obsidian raw materials were procured while at high-elevation quarries while foraging, then these materials could have been reduced while camping at the lower-elevation campsites. This model of Late Archaic seasonal mobility is graphically illustrated in Figure 75.10.

Table 75.2. Target plant species in vegetation communities.

Vegetation Community	Season			
	Spring	Early Summer	Mid to Late Summer	Fall
Jun-Sav	Greens	Indian ricegrass, wolfberry		Cacti
P-J	Greens		Dropseed, saltbush, cheno-ams, wild potato, purslane	Pine nuts, acorns, broad leaf yucca, cacti
Pipo	Greens		Cheno-ams, wild onions, berries, wild potato	
MC	Greens		Cheno-ams, wild onions, berries	

If we consider that the deep canyons could act as natural travel routes to these upland plateau resource areas, then camping in the piñon-juniper/ponderosa pine ecotone would provide easy access to a wide variety of species within a small catchment area. For example, riparian and some mixed conifer species would be present in the canyon bottoms, ponderosa pine communities along the south-facing canyon slopes, and mixed conifer on the north-facing canyon slopes, and piñon-juniper woodlands on the mesa tops. Indeed, if the typical daily foraging radius around a hunter-gatherer campsite is about 10 km, then almost all of the plateau at LANL would be located within walking distance of a site located in this central zone (Binford 1982; Yellen and Lee 1976).



PLANT COMMUNITIES AND HABITATS

Figure 75.10. Late Archaic seasonal mobility pattern.

Lastly, if these Late Archaic populations were practicing some form of incipient horticulture, then how would this activity have been integrated into the foraging schedule? The evidence from Jemez Cave may help us understand this. Ford (personal communication, 2002) suggests that maize may have been planted in May, and the site abandoned and then reoccupied during September or October to harvest the crop. On occasion, this occurred when the maize was still green, and other times when it was mature. Maize plants were probably grown in the mud flats adjacent to a small lake located behind the Soda Dam. Broad leaf yucca was also procured and used for textiles, and a variety of game species were hunted (e.g., bighorn sheep). The lithic assemblage was dominated by obsidian, with some Pedernal chalcedony/chert. Therefore, some of these early horticulture sites could have been placed in well-watered settings adjacent to piñon-juniper woodlands and fall plant resource areas. This would have reduced any seasonal scheduling conflicts and provided a backup strategy for natural resource shortfalls (e.g., see Minnis 1985).

THE LATE ARCHAIC ARCHAEOLOGICAL RECORD

Seven Late Archaic open-air sites were selected for this study of debitage assemblages. Together, they cover an elevation range from 1700 to 2880 m (5580 to 9450 ft). From lower to higher elevations, this includes a possible winter habitation site near San Ildefonso Pueblo that contains a single structure, with storage pits and an outside activity area (LA 51912; Lent 1991; *n* = 1747). Excavations along Highway 502 at the Los Alamos/Española interchange also identified an extensive Late Archaic site containing multiple hearths and activity areas (LA 65006; Moore et al. 1998; *n* = 5997 for Component 1). Both of these sites were excavated by the Museum of New Mexico and are located in the valley just east and west of the Rio Grande, respectively.

Two sites are situated in the piñon-juniper zone at LANL. LA 12587 (Area 8) is a small lithic scatter situated in the White Rock Tract that was recently excavated by Schmidt (Chapter 15, Volume 2; *n* = 485). Another site is located on Mesita del Buey that was mostly excavated. Although the site consists of an extensive lithic scatter, the sample used for this study included the area around a possible occupation surface (LA 70029; Biella 1992; *n* = 1420). LA 115373 is another lithic scatter site that was recently tested, but is located in the ponderosa pine zone at the upper elevations of LANL (Larson et al. 1997; *n* = 402). Site 03-1172 is an extensive lithic scatter site that was tested by Forest Service archaeologists on Sawyer Mesa near Obsidian Ridge in the higher ponderosa pine zone (Moore 1986; *n* = 1003). Lastly BG-21, is a small lithic scatter located in Redondo Creek Valley along the west side of the Valles Caldera (*n* = 296). It is one of 23 sites excavated by the University of New Mexico (Baker and Winter 1981). All but two of the sites have sample sizes of over 1000 artifacts. However, the remaining two sites have smaller samples of 135 and 402 artifacts. Four of the seven sites were analyzed for this study; whereas, published data were used for the two Museum of New Mexico and the Forest Service sites.

Analysis of the debitage assemblages from these sites indicates that there are some significant differences in the reduction tactics being implemented between riverine versus upland sites. The sites are oriented from left to right, that is, from lower to higher elevations in Figure 75.11. As can be seen, the two riverine sites emphasize core reduction activities with less biface production/maintenance. In contrast, the upland sites emphasize biface production with less core reduction. The exception to this pattern is site 03-1172, which is located within the Cerro Toledo obsidian source area. Here the emphasis is on core reduction activities, which presumably reflects the production of prepared cores and flake blanks for transport to sites at lower-elevation settings. Otherwise, the distinction between core reduction versus biface production appears to reflect differences between lowland habitation versus upland campsites.

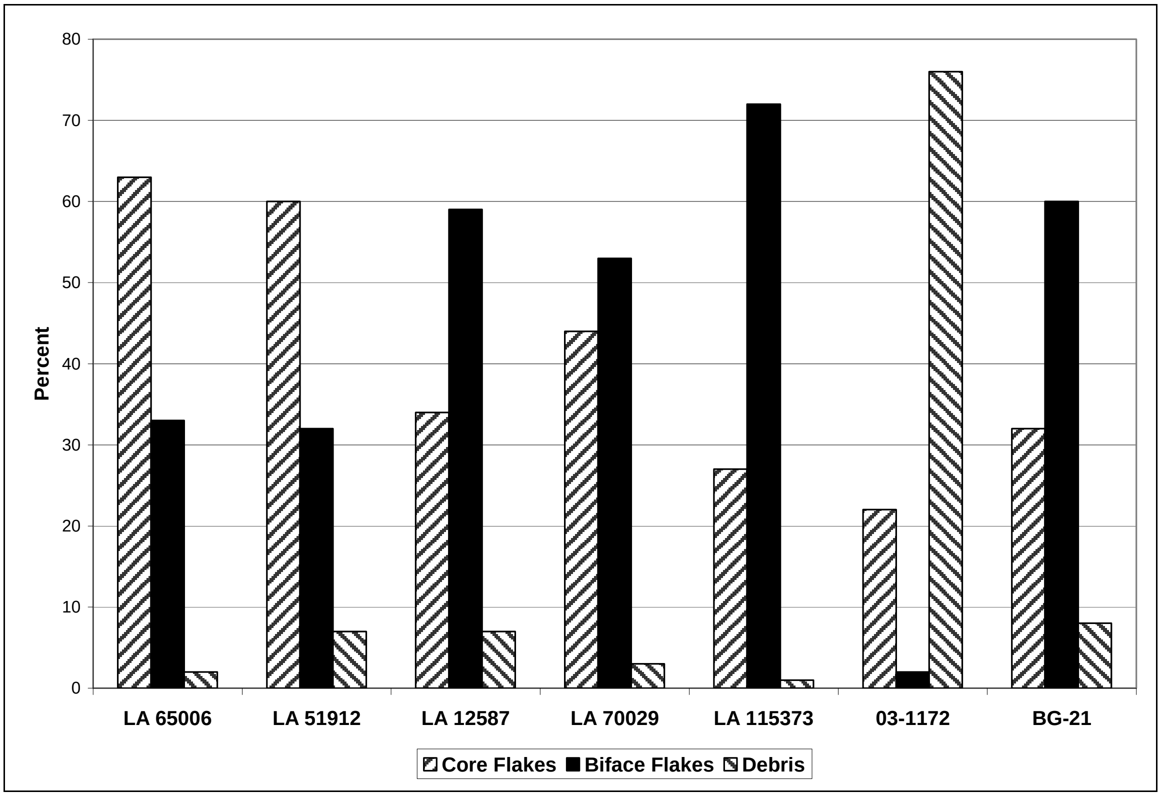


Figure 75.11. Debitage types.

This complementary link between lowland and upland sites is also reflected in the lithic material assemblage. Figure 75.12 illustrates that all the assemblages are dominated by obsidian. However, the four sites situated in the riverine and piñon-juniper settings also contain some chalcedony/chert and other materials. This includes basalt and quartzite in the lowland sites and orthoquartzite at LA 70029. With the exception of the orthoquartzite, these materials are available in gravels along the flanks of the Rio Grande Valley. The presence of waterworn cortex on these materials supports this contention. It is, however, undetermined as to whether the orthoquartzite is also available from this secondary source or was obtained from primary sources to the north near Abiquiu Reservoir. Otherwise, the higher-elevation sites are almost exclusively composed of obsidian that primarily exhibits a natural weathered (i.e., nodular) cortex, indicating that this material was derived from the primary source.

X-ray fluorescence analysis had been conducted on four of the sites identifying the specific obsidian sources utilized by these groups. Samples were analyzed from a lowland habitation site (Lent 1991:40), the LA 12587 and LA 70029 campsites located in the piñon-juniper zone (Chapter 61, Volume 3; Stevenson 1992), and the two higher-elevation sites situated in the ponderosa pine/mixed conifer communities (03-1172: Hughes 1986; BG-21: Sappington and Baker 1981). Three points and four bifaces were analyzed at the lowland habitation site. Four of these artifacts are made of Cerro Toledo, two from Cerro del Medio, and one from El Rechuelos (Polvadera) obsidian. Twenty-six flakes and two retouched tools were analyzed at the piñon-juniper campsites, with 23 made of Cerro Toledo, four from Cerro del Medio, and one from El Rechuelos obsidian. Twenty-one artifacts were analyzed from the campsite located within the

Cerro Toledo obsidian source area, so it is not surprising that 18 of these were derived from this source, with two made of El Rechuelos and one of an undetermined source. Lastly, 100 flakes were analyzed from three sites located in the area of BG-21. All but one of these were derived from the nearby Cerro del Medio source, with a single flake made of El Rechuelos obsidian. Our own analysis indicates that El Rechuelos obsidian was visually identified at both the piñon-juniper campsites and BG-21, in both cases representing 2 percent to 3 percent of the debitage assemblage.

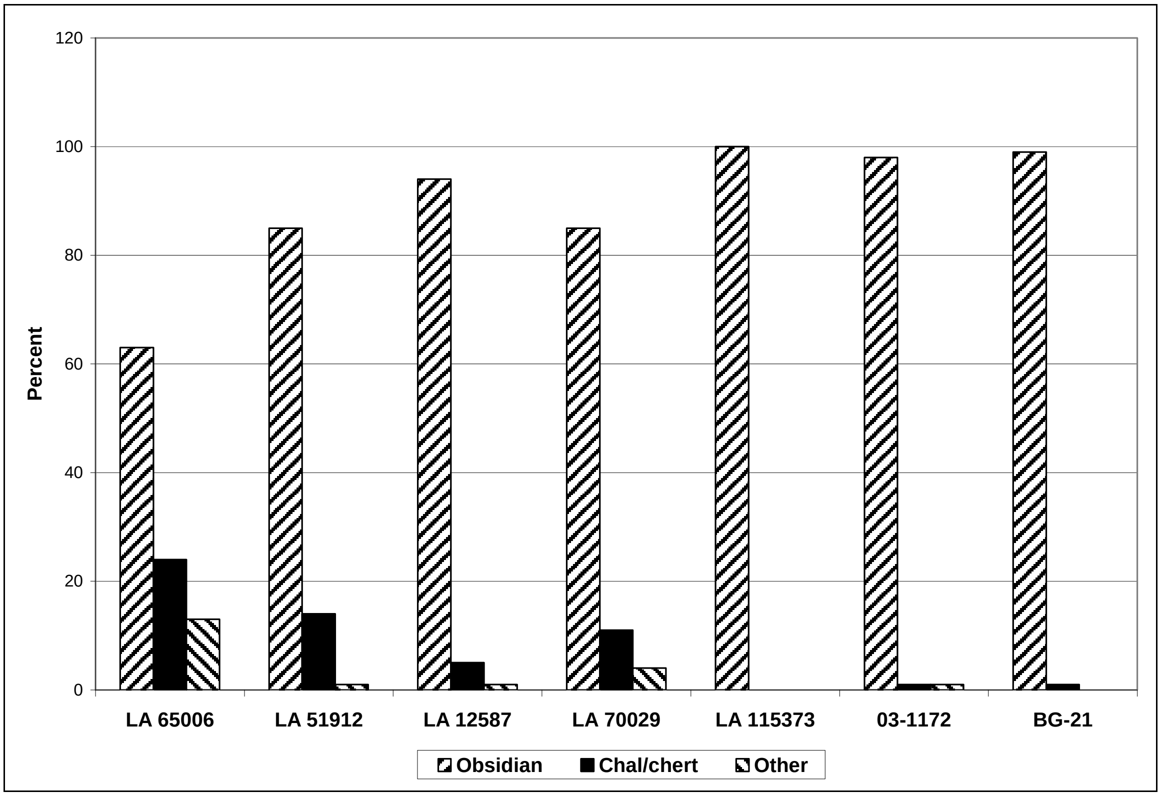


Figure 75.12. Debitage material types.

Overall, we see that the sites in my study are primarily linked to the Cerro Toledo and Cerro del Medio obsidian source areas, with each of the two high-elevation sites being tied to the nearby obsidian source. This supports our contention that obsidian could have been procured at these high-elevation settings during the mid to late summer and later reduced at the lower-elevation sites. The presence of small amounts of El Rechuelos obsidian may also reflect some distant ties to this area further to the north.

SUMMARY AND CONCLUSION

In conclusion, a variety of resources are present as plant foods in all the vegetation communities. Therefore, multiple foraging tactics could have been used by Late Archaic populations depending on seasonal rainfall, plant productivity, and changes in annual resource structure. Nonetheless, we have proposed one possible transhumance pattern, involving seasonal movements from the juniper-savanna to ponderosa pine/mixed conifer and then down to the piñon-juniper zone. It was in the latter community that maize could have also been harvested to reduce seasonal resource shortfalls. Nonetheless, these higher elevation resource settings were critical to Late Archaic foragers, including plant, animal, and obsidian raw material procurement.

The analysis of debitage assemblages from a sample of sites distributed throughout these vegetation zones, indicates that they are all linked by reduction tactic and obsidian procurement patterns. That is, lowland habitation sites are characterized by an emphasis on core reduction while upland campsites are characterized by biface production. Otherwise, obsidian dominated all the lithic assemblages, with sites situated in the juniper-savanna and piñon-juniper communities also containing a small amount of material derived from local river gravels. These data appear to lend some preliminary support to our model of a complementary settlement system that is distributed from river valley to mountaintop.

CHAPTER 76
PAJARITO CULINARY WARE: AN EXAMINATION OF RIM SHERD ATTRIBUTES FROM THREE COALITION AND THREE CLASSIC PERIOD SITES

Diane C. Curewitz

This study of culinary ceramics at six sites on the Pajarito Plateau of north-central New Mexico (Figure 76.1) is part of a larger research program that addresses the role of ritual in effecting changes in ceramic economy, particularly in stimulating increased specialization and value-based exchange during a period of population aggregation and agricultural intensification (Anschuetz 1995; Hill 1998; Hill et al. 1996; Powers and Orcutt 1999a). The overall research program examines five major ceramic types in three sub-regions of the northern Rio Grande: two glazeware types, two biscuitware types, and micaceous culinary ware. Ceramics from the Santa Fe sub-region and the Rio Ojo Caliente area of the Chama sub-region will be analyzed in future studies.

The Pajarito Plateau sites are central to the hypotheses to be tested. This area shows overlapping distribution of contemporaneous but very distinct ceramic wares, thought to denote the pre-contact presence of contemporary ethnic boundaries (Creamer et al. 2002; Futrell 1998; Vint 1999). Creamer (2000) convincingly argues, however, that language groups, commodity exchange networks, and settlement clustering show a variety of possible social boundary configurations. My hypothesis is that these overlapping ceramic distributions show that exchange between sub-regions was essential to the performance of common rituals, including communal feasts, and that the requirements associated with these rituals stimulated specialized production and exchange at the local level.

Analysis of culinary ware is an integral part of the overall research program. While much northern Rio Grande culinary ware shows standardized attributes that may be related to specialist production, micaceous ware is the only culinary ware whose production may be specialized for exchange (Curewitz 2004a). Significant quantities appear in Classic period assemblages at Tyuonyi (Curewitz 2004a; Vint 1999) and Arroyo Hondo (Habicht-Mauche 1993), but was produced only in the Chama-Española area north of Santa Fe (Habicht-Mauche 1993:Table 2; Warren 1981; Vint 1999).

Asymmetry of exchange is apparent between the Chama-Española and Pajarito areas. Little or no sand-tempered or mafic volcanic rock-tempered Pajarito grayware occurs in Chama-Española area assemblages, such as Howiri (Gauthier 1987a:44, Table 7), other sites in the Rio Ojo Caliente valley (Curewitz 2004b), and Te'ewi in the Rio del Oso valley (Gauthier 1987a:45, Table 8; Wendorf 1953). However, micaceous ware most likely produced in these areas occurs at Pajarito sites.

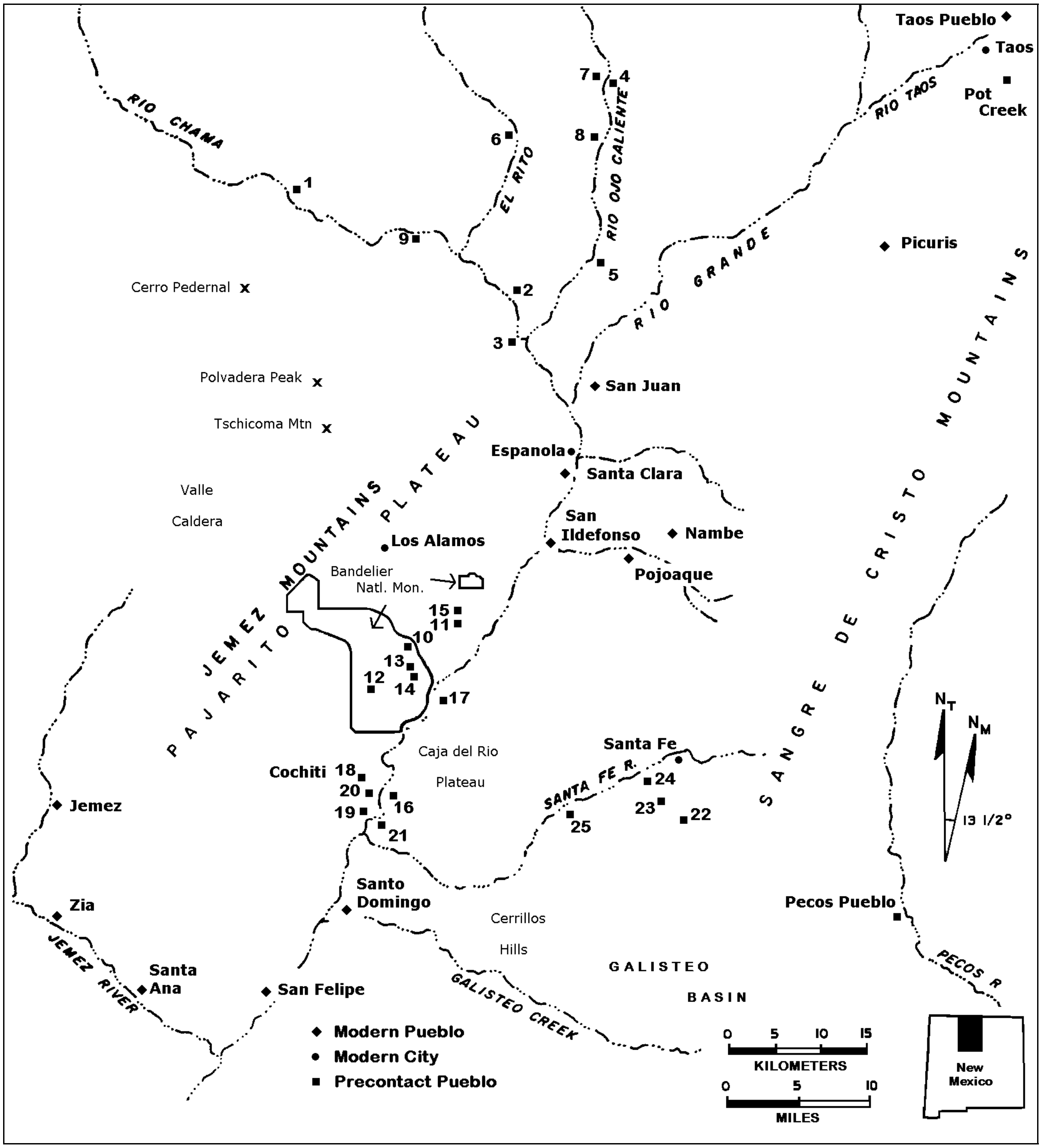


Figure 76.1. Major cities, modern pueblos, and selected archaeological sites of the northern Rio Grande. Precontact sites: 1. Riana (LA 920); 2. Leaf Water (LA 300); 3. Te'ewi (LA 252); 4. Howiri (LA 71); 5. Ponsipa-Akeri (LA 297); 6. Sapawe (LA 306); 7. Hupobi (LA 380); 8. Posi (Pose'uinge) (LA 632); 9. Poshuinge (LA 274); 10. Burnt Mesa (LA 60372.1); 11. White Rock (LA 12587); 12. Shohakka Pueblo (LA 3840); 13. Tyuonyi (LA 82); 14. Tyuonyi Annex (LA 60550); 15. Tsirege (LA 170); 16. Caja del Rio South (LA 5137); 17. Caja del Rio North (LA 174); 18. Cochiti (LA 295); 19. Alfred Herrera (LA 6455); 20. Kuapa (LA 3444); 21. Pueblo del Encierro (LA 70); 22. Arroyo Hondo (LA 12); 23. Pindi (LA 1); 24. Agua Fria Schoolhouse (LA 2); 25. Tzeguma (Cieneguilla) (LA 16). (Adapted from Powers and Van Zandt 1999:Figure 1.6).

Symmetrical, reciprocal exchange of pots is believed to represent reinforcement of existing relationships through gifts, establishment of new relationships through marriage, transportation of resources, circulation during intercommunity gatherings, or all of the above at various times (Zedeño 1998). If pots are associated with different ideological systems, exchange may represent reciprocal gifting between communities practicing similar classes of rituals (i.e., communal feasting), as in the case of biscuitware found at southern Pajarito sites (Mera 1940; Vint 1999). Asymmetrical exchange of relatively standardized undecorated culinary ware, however, may indicate that a barter system is developing.

THE QUESTION OF STANDARDIZATION AND SPECIALIZATION

Research on aspects of northern Rio Grande Classic period production organization using Costin's (1991) parameters (Habicht-Mauche 1993; Vint 1999) suggests that *context* of production was independent. Households continued to produce according to their own perceptions of advantage without control by an elite group. C*oncentration* of production facilities ranged from dispersed to nucleated. Production *scale* was most likely small, kin-based work units, operating in households. *Intensity* of production was probably part-time rather than full-time, since households still needed to produce most of their food. Clark and Parry (1990:320) note that all societies examined in their study of the correlation between craft specialization and cultural complexity, no matter what level of complexity, exhibit some type of craft specialization, usually part-time and independent.

There is little or no direct ceramic production evidence, such as kilns, raw material caches, production debris, and tools, on the Pajarito Plateau and in the northern Rio Grande in general. In this case, comparing attribute variation to arrive at relative standardization is one method of measuring degree of specialization (Arnold and Nieves 1992; Costin 1991, 2001; Crown 1994; Longacre 1999; Roux 2003). Other methods include identifying production sources and defining ceramic distributions (Bishop et al. 1982; Costin and Hagstrum 1995; Shepard 1942; Warren 1979).

Crown (1994:116) and B. Stark (1995:238) use Coefficient of Variation (CV) or Q-test to measure standardization. Based on ethnographic and ethnohistoric research, CVs of 10 percent or less are believed to indicate standardization at a level highly suggestive of specialized production. Stark's (1995:256–257) ethnoarchaeological research suggests that standardization may result when many potters follow customary production methods or a few specialize in production for exchange ("the ratio effect").

Crown's examination of Salado Polychrome production organization (1994:115−122) showed complex, non-repetitive, labor-intensive designs and relatively nonstandard forms for vessels produced for local use. CVs calculated to assess relative vessel height and diameter homogeneity were generally above 10 percent, indicating a low degree of specialization (Crown 1994:Table 7.2). The exception is CVs below 10 percent for height and diameter of very large bowls at one site, suggesting specialized production of vessels for communal feasts.

Schleher (2005) has recently compared the production characteristics of ethnographic ceramic assemblages with those from archaeological sites. In her assessment of whether CVs of 10 percent or less have value as measures of specialization in archaeological assemblages, she notes that time scales, number of producers and production episodes, and sample size variation are not always known for archaeological assemblages, and even when known may not be comparable with ethnographic production parameters.

Hagstrum's (1985) calculation of CV for painted decoration (but not size) of a small sample of Coalition period Santa Fe/Wiyo Black-on-white bowls relative to Classic period Bandelier Black-on-gray (Biscuit B) bowls is the only study to focus on production specialization in the northern Rio Grande. She found more standardized design elements and greater decoration efficiency in the later type, implying an increase in ceramic specialization in decorated service wares.

Motsinger (1997) analyzed the width and placement of framing lines on northern Rio Grande glazeware rim sherds tempered with hornblende latite. He found a decrease in CV for framing line width from early Glaze A through Glaze D and a decrease in CV for distance of the framing line from the vessel lip from late Glaze A through Glaze F. He concluded that earlier glazewares are more specialized than later varieties.

The research reported here represents the first examination of standardization and possible specialization in northern Rio Grande culinary ware production. Vessel thickness and size are used to measure standardization. These are considered production efficiency measures, but may also relate to consumer demand for performance-related functional characteristics (Costin and Hagstrum 1995; Hegmon et al. 1995:35; Rice 1987; Rye 1981; Shepard 1956).

THE PRESENT STUDY

In this study of ceramic attributes, I measured and categorized over 600 culinary jar rim sherds from excavation units at three Coalition period sites and three Classic period sites on the Pajarito Plateau (Figure 76.2). I found changes in surface treatment, temper, size range of jars, ratio of large to small jars, vessel wall thickness, and rim thickness. I found some indications of standardization at Coalition sites and increased standardization between the Coalition (AD 1150 to 1325) and Classic (AD 1325 to 1600) periods.

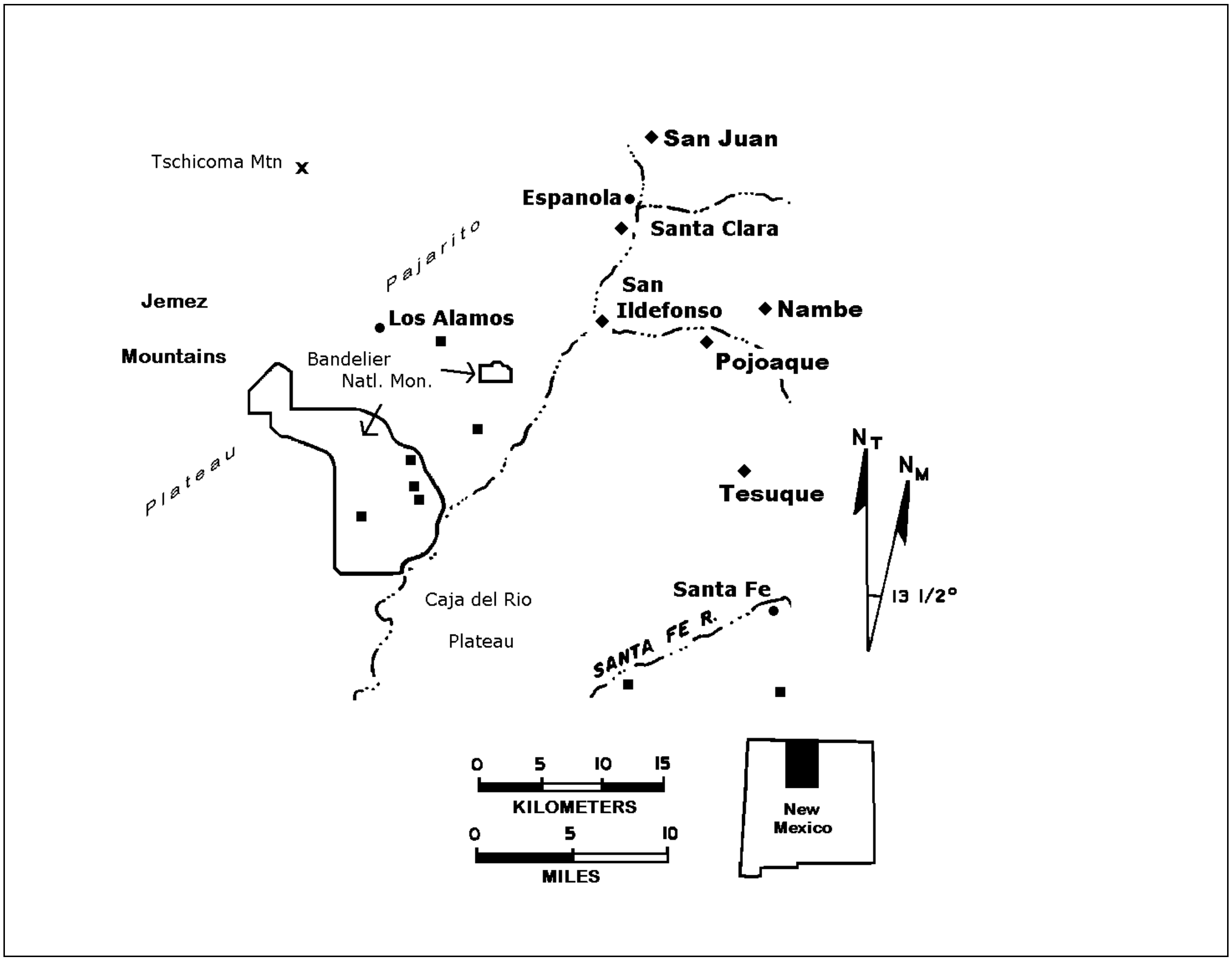


Figure 76.2. Selected archaeological sites on the Pajarito Plateau. A) Shohakka Pueblo (LA 3840); B) Tyuonyi (LA 82); C) Tyuonyi Annex (LA 60555); D) Burnt Mesa Pueblo (LA 60372); E) White Rock (LA 12587); F) Airport (LA 86534).

SITE LOCATION AND DESCRIPTION

Coalition Sites

These sites are presented according to their geographic location from south to north on the Pajarito Plateau (Figure 76.2).

- LA 60372 (Burnt Mesa Pueblo) is a Late Coalition/Early Classic period site located on Burnt Mesa north of Frijoles Canyon at Bandelier National Monument. Area 1 is a plaza pueblo with 65 rooms and a kiva in the plaza. The 93 culinary rims I examined came from a stratified plaza test unit to the west of the kiva (Kohler 1989; Kohler and Root 1992b, 2004). Unit 90S/88E was excavated in 1990 as part of the Bandelier Archaeological Excavation Project and described in Kohler and Root (2004:191–192). A tree-ring date from Stratum 6 of this unit yielded an age of 1271vv, and Kohler and Root

(2004:211) propose that the main construction of Area 1 began in the 1270s or 1280s. Based on tree-ring dates and ceramic assemblage, they estimate the occupation of Area 1 "to have occurred between 1275 and 1325 or slightly later" (Kohler and Root 2004:212).

- LA 12587 (White Rock Site) is a linear roomblock (Vierra et al. 2002:5-2) located just west of the town of White Rock on Mesita del Buey, about 10 km north of LA 60372. One of the 22 rooms is a large room with two hearths that might be a kiva. The 71 culinary rims analyzed came from 60-cm-wide trenches excavated into the midden east of the roomblock. No stratigraphic distinctions were made between levels in these trenches. Wilson and Castro-Reino (2005:1) use ceramics from room and midden units at LA 12587 to date the site "to the early and middle 13th century with some continuation into the 14th century." Radiocarbon dates from hearths in the roomblock suggest that the site was occupied from ca. AD 1180 (870±70 B.P.; two-sigma calibrated result AD 1020–1280; intercept AD 1180; Beta 183747) to ca. AD 1300 (650±40 B.P.; two-sigma calibrated result AD 1280–1400; intercept AD 1300; Beta 183748) (Harmon et al. Volume 2).

- LA 86534 (Airport Site) is located near the Los Alamos Airport and "dates to the early to middle 13th century" (Wilson and Castro-Reino 2005:1; see Vierra et al. 2002:5-1). This site was cut through when NM 502 was built and only eight rooms remain, but one is a kiva cut into the tuff east of the roomblock. The 41 culinary rims analyzed came from the west half of this kiva. Excavators identified rooffall, wallfall, and a post-occupation layer within the kiva. The materials from LA 12587 and LA 86534 studied here constitute samples from different portions of the site than those studied by Wilson and Castro-Reino (2005). Radiocarbon dates from hearths in the roomblock suggest the site was occupied from ca. AD 1190 (860±40 B.P.; 2σ calibrated result AD 1040–1260; intercept AD 1190; Beta 183760) to ca. AD 1280 (730±40 B.P.; 2σ calibrated result AD 1240–1300; intercept AD 1280; Beta 183761) (Schmidt Volume 2).

The three Classic period sites are all located at Bandelier National Monument and are presented here according to geographic location from south to north. No ceramics were examined from Classic sites on the Pajarito Plateau north of Bandelier.

- LA 3840 (Shohakka Pueblo), in Capulin Canyon, about 12 km southwest of Frijoles Canyon, is a horseshoe-shaped roomblock, open to the south, containing about 90 rooms. The plaza contains three kivas. The 63 culinary rims analyzed came from a midden trench excavated south of the roomblock (Kohler 1989; Kohler and Linse 1993; Kohler et al. 2004; Ruscavage-Barz 1999). Tree-ring samples from the site could not be dated. Radiocarbon dates were obtained from beams in Room 1 and Kiva 3 rooffall. An archaeomagnetic date was obtained from the hearth in Room 2. Calibrated ages for these samples, combined with ceramic evidence, yield an occupation range "that begins in the last decade of the 1300s and extends through the first three decades of the 1400s (Linse and Kohler 1993:34). The distribution of ceramics in the midden, which probably contains material deposited over the entire occupation, shows some slight differences with the room and kiva fills, notably a higher proportion of smeared-indented corrugated ware (Kohler and Gray 1993:40–41).

- LA 82 (Tyuonyi) is an enclosed plaza pueblo in Frijoles Canyon with 240 ground floor rooms, three kivas in the northern part of the plaza, and a big kiva to the east. Tree-ring samples from the site date from the 1360s to 1520s. The 293 culinary rims analyzed are from two units excavated in the southern part of the plaza in the early 1970s (Curewitz 2004a; Kohler et al. 2004; Williams and Griggs 1973). These units did not produce any tree-ring or radiocarbon samples, but Mean Ceramic Dates have been calculated (see Curewitz 2004a).

- LA 60550 (called "the unexcavated site" on Park Service maps of Frijoles Canyon) is referred to here as Tyuonyi Annex (Kohler 1989). This 50-room rectangular block is located 60 m southeast of Tyuonyi, between Tyuonyi and the big kiva. The 52 culinary rims analyzed are from a 2- by 2-m unit located about 10 m southeast of the roomblock. The ceramic assemblage suggests occupation relatively late in the Classic sequence, overlapping with the last 75 years of occupation at Tyuonyi (Kohler 1989; Kohler and Linse 1993; Kohler et al. 2004).

WARE AND TYPE DISTRIBUTION CHANGES

Culinary ware makes up 84 percent to 88 percent of the sherds at the Coalition sites (Table 76.1a), but only 61 percent to 72 percent at the Classic period sites (Table 76.1c). Smeared-indented corrugated ware is the dominant culinary type at Coalition period sites, with percentages ranging from 92 to 95 (Table 76.1b). Plain gray is the dominant culinary type at Classic period sites, with percentages ranging from 82 to 90 (Table 76.1d). Micaceous ware makes up a significant proportion of the culinary ware at LA 82 (Tyuonyi), averaging 22 percent in the two excavated units (Table 76.1d). Larger percentages occur in the upper levels of the units (Curewitz 2004a:Table 2). In contrast, only 0.1 percent of the culinary sherds at one Coalition period site (LA 12587) and between 0.6 percent and 1.1 percent at the other two Classic period sites contain any mica (Table 76.1a and 76.1b).

Table 76.1a. Ware and type distribution for selected units at three Coalition period Pajarito sites.

Type/Field Specimen (FS)	LA 12587		LA 86534		LA 60372	
	n	%	*n*	%	*n*	%
Plain body	82	2.0	17	1.0	231	3.7
Plain rim	14	0.4	5	0.4	7	0.1
Clapboard neck	2	0.0	0	0.0	0	0.0
Indented corrugated	122	3.0	37	2.2	34	0.5
Plain corrugated	10	0.2	4	.02	86	1.4
Smeared-indented corrugated (SIC)	2965	73.7	1306	76.4	4887	78.0
SIC rim	146	3.6	61	3.5	218	3.5
Micaceous	5	0.1	0	0.0	0	0.0
Other	25	0.6	15	0.9	44	0.6
Total Culinary Ware	*3371*	*83.8*	*1445*	*84.5*	*5507*	*87.9*

Type/Field Specimen (FS)	LA 12587		LA 86534		LA 60372	
	n	%	*n*	%	*n*	%
Black-on-white body	374	9.3	131	7.7	414	6.6
Santa Fe rims	56	1.4	29	1.7	101	1.6
Kwahe'e body	1	0.0	0	0.0	0	0.0
Kwahe'e rims	3	0.1	0	0.0	1	0.0
Wiyo body	8	0.2	11	0.6	38	0.6
Wiyo rims	5	0.1	0	0.0	8	0.1
Biscuit A body	8	0.2	3	0.2	3	0.0
Biscuit A rim	0	0.0	0	0.0	2	0.0
Biscuit B body	2	0.0	0	0.0	2	0.0
Biscuit B rim	1	0.0	0	0.0	0	0.0
Jar sherds	7	0.2	8	0.5	0	0.0
Santa Fe jar rim	1	0.0	0	0.0	0	0.0
Whiteware nfs	180	4.5	74	4.3	145	2.3
Basket-impressed B/w	1	0.0	1	0.1	4	0.0
Unusual design B/w	1	0.0	0	0.0	0	0.0
B/w int/ext slip	1	0.0	0	0.0	0	0.0
White Mountain redware	1	0.0	0	0.0	0	0.0
Other	0	0.0	8	0.5	6	0.1
Glazeware	0	0.0	0	0.0	33	0.4
Total Service Ware	*650*	*16.2*	*265*	*15.5*	*757*	*12.1*
	4021	100.0	1710	100.0	6264	100.0
Utility sherds <1 cm	621		82		-	-
Total	**4642**		**1792**		**-**	**-**

Table 76.1b. Type distribution as a percentage of ware.

Type/FS	LA 12587		LA 86534		LA 60372	
	n	%	*n*	%	*n*	%
Plain body	82	2.4	17	1.2	231	4.2
Plain rim	14	0.4	5	0.3	7	0.1
Clapboard neck	5	0.1	2	0.1	5	0.1
Indented corrugated	122	3.6	37	2.6	34	0.6
Plain corrugated	10	0.3	4	0.3	86	1.6
Smeared-indented corrugated	2965	88.0	1306	90.4	4887	88.7
SIC rim	146	4.3	61	4.2	218	4.0
Micaceous	5	0.1	0	0.0	0	0.0
Other	25	0.8	15	1.0	44	0.8
Total Culinary Ware	*3371*	*100.0*	*1445*	*100.1*	*5507*	*100.1*
Black-on-white body	374	57.5	131	49.4	414	54.7
Santa Fe rims	56	8.6	29	10.9	101	13.3
Kwahe'e body	1	0.2	0	0.0	0	0.0
Kwahe'e rims	3	0.5	0	0.0	1	0.1
Wiyo body	8	1.2	11	4.2	38	5.0

Type/FS	LA 12587		LA 86534		LA 60372	
	n	%	*n*	%	*n*	%
Wiyo rims	5	0.8	0	0.0	8	1.1
Biscuit A body	8	1.2	3	1.1	3	0.4
Biscuit A rim	0	0.0	0	0.0	2	0.3
Biscuit B body	2	0.3	0	0.0	2	0.3
Biscuit B rim	1	0.2	0	0.0	0	0.0
Jar sherds	7	1.1	8	3.0	0	0.0
Santa Fe jar rim	1	0.2	0	0.0	0	0.0
Whiteware nfs	180	27.7	74	27.9	145	19.2
Basket-impressed B/w	1	0.2	1	0.4	4	0.5
Unusual design B/w	1	0.2	0	0.0	0	0.0
B/w int/ext slip	1	0.2	0	0.0	0	0.0
White Mountain redware	1	0.2	0	0.0	0	0.0
Other	0	0.0	8	3.0	6	0.8
Glazeware	0	0.0	0	0.0	33	4.4
Total Service Ware	*650*	*100.0*	*265*	*100.0*	*757*	*100.0*
	4021		1710		6264	
Utility sherds <1 cm	621		82		-	-
Total	**4642**		**1792**		**-**	**-**

Table 76.1c. Ware and type distribution for selected units at Classic period Pajarito sites.

Ware/Type	3840		82A		82B		60550	
	n	%	*n*	%	*n*	%	*n*	%
Plain gray	1168	51.7	1240	36.3	2575	42.1	1213	57.2
Plain gray rims	67	3.0	89	2.6	172	2.8	57	2.7
Micaceous	8	0.4	389	11.4	1098	18.0	15	0.7
SIC	101	4.5	361	10.6	478	7.8	76	3.6
SIC rims	7	0.3	15	0.4	25	0.4	1	0.0
Coalition nfs	31	1.4	4	0.1	21	0.3	54	2.5
Classic nfs	5	0.2	0	0.0	0	0.0	7	0.3
Total Culinary	*1387*	*61.3*	*2098*	*61.4*	*4369*	*71.5*	*1423*	*67.2*
Kwahe'e Black-on-white	0	0.0	1	0.0	0	0.0	1	0.0
Santa Fe Black-on-white	4	0.2	97	2.8	75	1.2	1	0.0
Santa Fe Black-on-white rim	1	0.0	19	0.6	17	0.3	1	0.0
Galisteo Black-on-white	0	0.0	2	0.1	0	0.0	0	0.0
Wiyo Black-on-white	1	0.0	3	0.1	0	0.0	1	0.0
Wiyo Black-on-white rim	1	0.0	3	0.1	1	0.0	1	0.0
Whiteware nfs	37	1.6	0	0.0	0	0.0	12	0.6
Glaze A	66	2.9	50	1.5	51	0.8	0	0.0
Glaze A-B	8	0.4	1	0.0	1	0.0	0	0.0
Glaze B	2	0.1	1	0.0	0	0.0	1	0.0
Glaze B-C	0	0.0	1	0.0	5	0.1	0	0.0
Glaze C	2	0.1	16	0.5	12	0.2	4	0.2

Ware/Type	3840		82A		82B		60550	
	n	%	*n*	%	*n*	%	*n*	%
Glaze C-D	0	0.0	0	0.0	10	0.2	0	0.0
Glaze D	0	0.0	1	0.0	1	0.0	8	0.4
Glaze D-E	0	0.0	3	0.1	0	0.0	0	0.0
Glaze E	0	0.0	4	0.1	4	0.1	4	0.2
Glaze nfs	711	31.4	772	22.6	1194	19.5	509	24.0
Biscuit A	28	1.2	104	3.0	58	0.9	10	0.5
Biscuit A rims	2	0.1	17	0.5	5	0.1	1	0.0
Biscuit B	3	0.1	157	4.6	215	3.5	61	2.9
Biscuit B rims	0	0.0	20	0.6	29	0.5	13	0.6
Biscuit nfs	1	0.0	43	1.3	54	0.9	19	0.9
Other Service*	7	0.3	4	0.1	9	0.1	49	2.3
Total Service	874	38.7	1319	38.6	1741	28.5	696	32.8
Total	**2261**	**100.0**	**3417**	**100.0**	**6110**	**100.0**	**2119**	**99.6**

*White Mountain Redware, Sankawi Black-on-cream, Potsuii, buffware, Tewa Red

Table 76.1d. Type distribution as a percentage of ware.

Ware/Type	3840		82A		82B		60550	
	n	%	*n*	%	*n*	%	*n*	%
Plain gray	1168	84.2	1240	59.1	2575	58.9	1213	85.2
Plain gray rims	67	4.8	89	4.2	172	3.9	57	4.0
Micaceous	8	0.6	389	18.5	1098	25.1	15	1.1
SIC	101	7.3	361	17.2	478	10.9	76	5.3
SIC rims	7	0.5	15	0.7	25	0.6	1	0.1
Coalition nfs	31	2.2	4	0.2	21	0.5	54	3.8
Classic nfs	5	0.4	0	0.0	0	0.0	7	0.5
Total Culinary	*1387*	*100.0*	*2098*	*100.0*	*4369*	*100.0*	*1423*	*100.0*
Kwahe'e Black-on-white	0	0.0	1	0.1	0	0.0	1	0.1
Santa Fe Black-on-white	4	0.5	97	7.4	75	4.3	1	0.1
Santa Fe Black-on-white rim	1	0.1	19	1.4	17	1.0	1	0.1
Galisteo Black-on-white	0	0.0	2	0.2	0	0.0	0	0.0
Wiyo Black-on-white	1	0.1	3	0.2	0	0.0	1	0.1
Wiyo Black-on-white rim	1	0.1	3	0.2	1	0.1	1	0.1
Whiteware nfs	37	4.2	0	0.0	0	0.0	12	1.7
Glaze A	66	7.6	50	3.8	51	2.9	0	0.0
Glaze A-B	8	0.9	1	0.1	1	0.1	0	0.0
Glaze B	2	0.2	1	0.1	0	0.0	1	0.1
Glaze B-C	0	0.0	1	0.1	5	0.3	0	0.0
Glaze C	2	0.2	16	1.2	12	0.7	4	0.6
Glaze C-D	0	0.0	0	0.0	10	0.6	0	0.0
Glaze D	0	0.0	1	0.1	1	0.1	8	1.1
Glaze D-E	0	0.0	3	0.2	0	0.0	0	0.0
Glaze E	0	0.0	4	0.3	4	0.2	4	0.6

Ware/Type	3840		82A		82B		60550	
	n	%	*n*	%	*n*	%	*n*	%
Glaze nfs	711	81.4	772	58.5	1194	68.6	509	73.1
Biscuit A	28	3.2	104	7.9	58	3.3	10	1.4
Biscuit A rims	2	0.2	17	1.3	5	0.3	1	0.1
Biscuit B	3	0.3	157	11.9	215	12.3	61	8.8
Biscuit B rims	0	0.0	20	1.5	29	1.7	13	1.9
Biscuit nfs	1	0.1	43	3.3	54	3.1	19	2.7
Other Service*	7	0.8	4	0.3	9	0.5	49	7.0
Total Service	874	100.0	1319	100.0	1741	100.0	696	100.0
Total	**2261**		**3417**		**6110**		**2119**	

*White Mountain Redware, Sankawi Black-on-cream, Potsuii, Buff ware, Tewa Red

Service ware types also change from the Coalition to Classic periods. Santa Fe Black-on-white and other thin, hard, ash-tempered varieties of the Pajarito Series (Habicht-Mauche 1993:Table 2; 19–26) are the dominant decorated Coalition period service ware types, making up between 93 percent and 97 percent of all decorated wares (Table 76.1b). Glazewares are the dominant Classic period service wares, ranging from 69 percent at LA 82 (Tyuonyi) to 90 percent at LA 3840 (Shohakka) (Table 76.1d). Only one Coalition site (LA 60372) contains any glazeware (Table 76.1a). Kohler and Root (2004:197) consider the two later glaze rim sherds from Unit 90S/88E to represent late reuse of the site rather than late occupation. Biscuitware makes up less than 0.2 percent or less of any Coalition service ware assemblage, but ranges from 4 percent at LA 3840 (Shohakka) to 23 percent at LA 82 (Tyuonyi) (Table 76.1d).

The Sample

Attributes were recorded for a total of 1108 culinary and service ware rim and body sherds from the six Pajarito sites (Tables 76.2a and 76.2b). The culinary ware sample consists of 618 rim sherds (58.6 percent of all Pajarito rim sherds) and 20 body sherds (37.0 percent of all Pajarito body sherds). The discrepancy between the total percentage and the sample percentage of each type is due in part to the smaller number of culinary ware types and tempers to be sampled. It may also relate to better preservation of service ware rims. Rims make up 7 percent to 12 percent of all service ware sherds but only 5 percent to 7 percent of culinary ware. Within culinary ware categories, the ratio of smeared-indented corrugated rims to body sherds is much smaller than for plain gray. Smeared-indented corrugated rims are generally much thinner and more tapered than plain gray, which may affect their preservation rate.

Table 76.1e. Summary table for whitewares.

	LA 12587		LA 86534		LA 60372		LA 3840		LA 82 (A)		LA 82 (B)		LA 60550	
Kwahe'e	4	0.7	0	0.0	1	0.1	0	0.0	1	0.0	0	0.0	1	0.1
Santa Fe	614	94.4	236	88.7	664	87.7	42	4.8	116	8.8	92	5.3	14	1.9
Wiyo	13	2.0	11	4.2	46	6.1	2	0.2	6	0.4	1	0.1	2	0.2
Biscuit A	8	1.2	3	1.1	5	0.7	30	3.4	121	9.2	63	3.6	11	1.5
Biscuit B	10	1.6	8	3.0	2	0.3	3	0.3	177	13.4	244	14.0	74	10.7
Biscuit nfs	0	0.0	0	0.0	0	0.0	1	0.1	43	3.3	54	3.1	19	2.7
	649	99.9	258	97.0	718	94.9	78	8.8	464	35.1	454	26.1	121	17.1
Galisteo	0	0.0	0	0.0	0	0.0	0	0.0	2	0.0	0	0.0	0	0.0
WMRW	1	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Glaze	0	0.0	0	0.0	33	4.4	842	90.3	849	64.4	1278	73.5	538	75.5
Other nfs	0	0.0	8	3.0	6	0.8	7	0.8	4	0.3	9	0.5	49	7.0
	650	100.1	266	100	757	100.1	927	99.9	1319	99.8	1741	100.1	708	99.6

Table 76.2a. Sample distribution for three Coalition Pajarito sites.

Type	LA 12587		LA 86534		LA 60372	
	n	%	*n*	%	*n*	%
Culinary Rims						
Clapboard	5	7.0	2	4.9	5	5.4
SIC	52	73.2	34	82.9	81	87.1
Plain	14	19.7	5	12.2	7	7.5
Total Culinary	71	99.9	41	100.0	93	100.0
Service Rims						
Kwahe'e	3	9.7	0	0.0	0	0.0
Santa Fe	19	61.3	16	69.6	57	63.3
Santa Fe/Wiyo	5	16.1	7	30.4	27	30.0
Wiyo	3	9.7	0	0.0	4	4.4
Biscuit A	0	0.0	0	0.0	0	0.0
Biscuit B	1	3.2	0	0.0	0	0.0
Glaze C	0	0.0	0	0.0	2	2.2
Total Service	31	100.0	23	100.0	90	99.9
Total Rims	102		64		183	
Body Sherds						
Biscuit A	1	20.0	3	100.0	1	10.0
Biscuit B	4	80.0	0	0.0	2	20.0
Glaze nfs	0	0.0	0	0.0	7	70.0
Total Body	5	100.0	3	100.0	10	100.0
Total Sherds	**107**		**67**		**193**	

Table 76.2b. Sample distribution for three Classic Pajarito sites.

Type/Site	3840		82A		82B		60550	
	n	%	*n*	%	*n*	%	*n*	%
Culinary Rims								
Clapboard	0	0.0	1	1.0	6	3.1	0	0.0
SIC	4	6.3	15	14.9	19	9.7	1	1.9
Plain	59	92.2	85	84.2	166	84.7	51	98.1
Washboard	0	0.0	0	0.0	5	2.6	0	0.0
TIA	1	1.6	0	0.0	0	0.0	0	0.0
Total Culinary	64	100.1	101	100.1	196	100.1	52	100.0
Service Rims								
Santa Fe	0	0.0	16	15.4	9	8.3	0	0.0
Santa Fe/Wiyo	0	0.0	3	2.9	8	7.3	0	0.0
Wiyo	1	1.5	3	2.9	1	0.9	1	7.7
Biscuit A	2	3.0	17	16.3	5	4.6	0	0.0
Biscuit B	1	1.5	20	19.2	29	26.6	9	69.2
Biscuit nfs	0	0.0	0	0.0	0	0.0	1	7.7

Sankawi	0	0.0	0	0.0	1	0.9	0	0.0
Glaze A	59	89.4	36	34.6	43	39.4	1	7.7
Glaze B	1	1.5	0	0.0	0	0.0	0	0.0
Glaze C	2	3.0	9	8.7	13	11.9	1	7.7
Total Service	66	99.9	104	100.0	109	99.9	13	100.0
Total Rims	130		205		305		65	
Body Sherds								
Plain Gray	5	41.7	0	0.0	0	0.0	10	45.5
SIC	1	8.3	0	0.0	1	50.0	3	13.6
Biscuit A	4	33.3	0	0.0	0	0.0	2	9.1
Biscuit B	2	16.7	0	0.0	0	0.0	7	31.8
Glaze A	0	0.0	0	0.0	1	50.0	0	0.0
Total Body	12	100.0	0	0.0	2	100.0	22	100.0
Total Sherds	**142**		**205**		**307**		**87**	

Culinary Ware Type/Temper Associations

Several recent studies have used petrographic analysis to identify the sources of Pajarito Plateau ceramics from the Coalition period. These include a study of ceramics at LA 4624, located west of LA 12587 on Mesita del Buey (Castro-Reino and Lavayen 2002; Curewitz and Harmon 2002), and at LA 135290 (Chapter 25, Volume 2) and LA 4618 (Schmidt 2006) as well as rooms and midden units at LA 12587 and LA 86534 (Chapters 14 and 24, Volume 2; Castro-Reino 2005; Wilson and Castro-Reino 2005).

These studies "support previous observations on the distinct nature and uniformity of Coalition period pottery" (Wilson and Castro-Reino 2005:10). Observation of ceramics from the three Coalition period Pajarito sites with a binocular microscope shows similar results (Table 76.3). The dominant temper type for smeared-indented corrugated and plain gray culinary ware at the three sites is "anthill sand," which consists mainly of coarse feldspar and quartz crystals.

The Coalition to Classic period transition from smeared-indented corrugated to plain gray culinary ware occurs at the same time that the thin, hard, ash-tempered Black-on-white Santa Fe varieties in the Pajarito series are replaced by glazeware and by thicker, softer biscuitware (Tables 76.1a through 76.1d). A change in culinary ware tempering material can be observed while smeared-indented corrugated is still the dominant culinary type (Tables 76.3a and 76.3b).

At the earlier Coalition period sites, LA 12587 and LA 86534, smeared-indented corrugated makes up over 90 percent of the culinary ware, and almost all of it is tempered with coarse anthill sand (Figures 76.3a and 76.3b). The temper change to finer material appears first in smeared-indented corrugated ware at Burnt Mesa (LA 60372), which bridges the Coalition to Classic period transition. Petrographic characterization of a sub-sample of smeared-indented corrugated and plain gray sherds (n = 35) shows similar mineral and lithic content, but differences in grain size and sorting (Appendix AA).

Both varieties of anthill sand temper are dominated by sanidine feldspar and monocrystalline quartz, with minor biotite, oxides, and plagioclase occurring in most sherds. Rare pyroxenes, amphiboles, or olivine may also be present. In the coarser anthill sand temper, 67 percent to 100 percent of the dominant grains are very coarse sand-size quartz (1.0-2.0 mm). Only 33 percent to 67 percent of the secondary grains are very coarse. Sorting is bimodal.

In the finer anthill sand temper, 0 to 40 percent of the dominant grains are very coarse; more are fine (0.125 to 0.25 mm), medium (0.25 to 0.50 mm), or coarse (0.50 to 1.0 mm). It is the secondary temper grains that are larger, more often coarse to very coarse. Sorting is poor, but not strongly bimodal as in the earlier type.

Felsic volcanic rock (rhyolite) is the lithic most often found with both anthill sand tempers. Small quantities of intermediate (andesitic) and mafic (basaltic) volcanic rock are present, sometimes as the dominant lithic type, but more often secondary to the felsic rock. Pumice dominates only one sherd but is found as a secondary lithic in about one-third of all sherds. Two sherds contain glassy pumice.

The above suggests that differences in the tempers may be due to a change in the preparation method for anthill sand temper, possibly sieving and selection of a finer fraction. Almost a fifth of the sherds in the sample are tempered with this finer material.

Most plain gray sherds from Coalition sites (*n* = 5) show three different temper varieties: earlier, coarser anthill sand, later, finer anthill sand; two plain gray sherds from LA 60372 contain fragments of disaggregated intermediate and mafic volcanic rock and very little additional sand. My study of culinary ware at Tyuonyi (Curewitz 2004a) found similar rock temper in plain gray sherds in upper levels of the two excavated units. Non-micaceous culinary sherds from Classic period sites were not sampled for petrographic analysis in this study.

At Classic period Shohakka (LA 3840), 89 percent of the culinary ware is plain gray (see Table 76.1d). Eighty-nine percent of it contains fine, angular to sub-angular felsic material and nine percent contains some mica. The small amount of smeared-indented corrugated present also contains finer, angular to sub-angular felsic material rather than coarse anthill sand crystals.

At Tyuonyi, smeared-indented corrugated makes up between 10 percent and 20 percent of the lower levels, dropping to less than 10 percent in the upper levels (Curewitz 2004a:76, Table 2). Roughly equal percentages are tempered with anthill sand crystals and finer, more angular felsic material, with sparse mica flakes in some (Table 76.3b). Most plain grayware is tempered with the finer, more angular, felsic material.

Micaceous sherds make up about 22 percent of the plain-surfaced ware from the two excavation units (Table 76.3b; Figure 76.3). The five micaceous washboard rim sherds found in Unit B appear to have a micaceous paste or added mica temper.

Table 76.3a. Rim and body sherd temper by ceramic type at Pajarito sites.

Temper	LA 12587		LA 86534		LA 60372		LA 3840		LA 82A		LA 82B		LA 60550	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
SIC–Anthill	41	38.3	28	41.7	62	32.1	0	0.0	5	2.4	7	2.3	0	0.0
SIC–Crushed Igneous	8	7.5	6	9.0	18	9.3	3	2.1	8	3.9	11	3.6	1	1.1
SIC–Mica	3	2.8	0	0.0	0	0.0	2	1.4	2	1.0	1	0.3	3	3.4
Plain–Anthill	6	5.6	4	6.0	1	0.5	1	0.7	2	1.0	6	2.0	1	1.1
Plain–Crushed Igneous	3	2.8	1	1.5	6	3.1	57	40.1	61	29.8	102	33.3	47	54.0
Plain–Sparse Mica	3	2.8	0	0.0	0	0.0	0	0.0	7	3.4	31	10.1	6	6.9
Plain–Dense Mica	0	0.0	0	0.0	0	0.0	6	4.2	15	7.3	27	8.8	6	6.9
Volcanic Ash–Santa Fe Paste (11)	21	22.3	22	33.8	61	31.6	1	0.7	15	7.3	11	3.6	0	0.0
Volcanic Ash–Wiyo, Biscuit Paste (11-, 20)	9	9.6	4	6.2	25	13.0	7	4.9	30	14.6	38	12.4	20	23.0
Volcanic Ash–Modified (20+, 22)	0	0.0	0	0.0	0	0.0	1	0.7	8	3.9	3	1.0	0	0.0
Glaze A–I					5	2.6	33	23.2	18	8.8	28	9.2	1	1.1
Glaze A–II					0	0.0	16	11.3	14	6.8	11	3.6	0	0.0
Glaze A–III					2	1.0	10	7.0	1	0.5	4	1.3	0	0.0
Glaze A–IV					0	0.0	0	0.0	3	1.5	0	0.0	0	0.0
Glaze C–I					0	0.0	1	0.7	2	1.0	6	2.0	0	0.0
Glaze C–II					2	1.0	1	0.7	3	1.5	4	1.3	0	0.0
Glaze C–III					0	0.0	0	0.0	1	0.5	1	0.3	1	1.1
Glaze C–IV					0	0.0	0	0.0	0	0.0	2	0.7	0	0.0
	94		65		181		139		195		293		86	
Other	13	12.1	2	3.0	12	6.2	3	2.1	10	4.9	13	4.2	1	1.1
Total	**107**	**100.0**	**67**	**100.0**	**193**	**100.0**	**142**	**100.0**	**205**	**100.0**	**306**	**100.0**	**87**	**100.0**

Table 76.3b. Temper type as a percentage of ware.

Temper	LA 12587		LA 86534		LA 60372		LA 3840		LA 82A		LA 82B		LA 60550	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
SIC˜ Anthill	41	78.8	28	82.4	62	77.5	0	0.0	5	33.3	7	36.8	0	0.0
SIC˜ Crushed Igneous	8	15.4	6	17.6	18	22.5	3	60.0	8	53.3	11	57.9	1	25.0
SIC˜ Mica	3	5.8	0	0.0	0	0.0	2	40.0	2	13.3	1	5.3	3	75.0
	52	100.0	34	100.0	80	100.0	5	100.0	15	99.9	19	100.0	4	100.0
Plain˜ Anthill	6	50.0	4	80.0	1	14.3	1	1.6	2	2.4	6	3.6	1	1.7
Plain˜ Crushed Igneous	3	25.0	1	20.0	6	85.7	57	89.1	61	71.8	102	61.4	47	78.3
Plain–Sparse Mica	3	25.0	0	0.0	0	0.0	0	0.0	7	8.2	31	18.7	6	10.0
Plain–Dense Mica	0	0.0	0	0.0	0	0.0	6	9.4	15	17.6	27	16.3	6	10.0
	12	100.0	5	100.0	7	100.0	64	100.1	85	100.0	166	100.0	60	100.0
Volcanic Ash–Santa Fe Paste (11)	21	70.0	22	84.6	61	70.9	1	11.1	15	28.3	11	21.2	0	0.0
Volcanic Ash–Wiyo, Biscuit Paste (11-, 20)	9	30.0	4	15.4	25	29.1	7	77.8	30	56.6	38	73.1	20	100.0
Volcanic Ash–Modified (20+, 22)	0	0.0	0	0.0	0	0.0	1	11.1	8	15.1	3	5.8	0	0.0
	30	100.0	26	100.0	86	100.0	9	100.0	53	100.0	52	100.0	20	100.0
Glaze A–I	0	0.0	0	0.0	5	55.6	33	54.1	18	42.9	28	50.0	1	50.0
Glaze A–II	0	0.0	0	0.0	0	0.0	16	26.2	14	33.3	11	19.6	0	0.0
Glaze A–III	0	0.0	0	0.0	2	22.2	10	16.4	1	2.4	4	7.1	0	0.0
Glaze A–IV	0	0.0	0	0.0	0	0.0	0	0.0	3	7.1	0	0.0	0	0.0
Glaze C–I	0	0.0	0	0.0	0	0.0	1	1.6	2	4.8	6	10.7	0	0.0
Glaze C–II	0	0.0	0	0.0	2	22.2	1	1.6	3	7.1	4	7.1	0	0.0
Glaze C–III	0	0.0	0	0.0	0	0.0	0	0.0	1	2.4	1	1.8	1	50.0
Glaze C–IV	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	3.6	0	0.0
Total	**0**	**0.0**	**0**	**0.0**	**9**	**100.0**	**61**	**100.0**	**42**	**100.0**	**56**	**100.0**	**2**	**100.0**

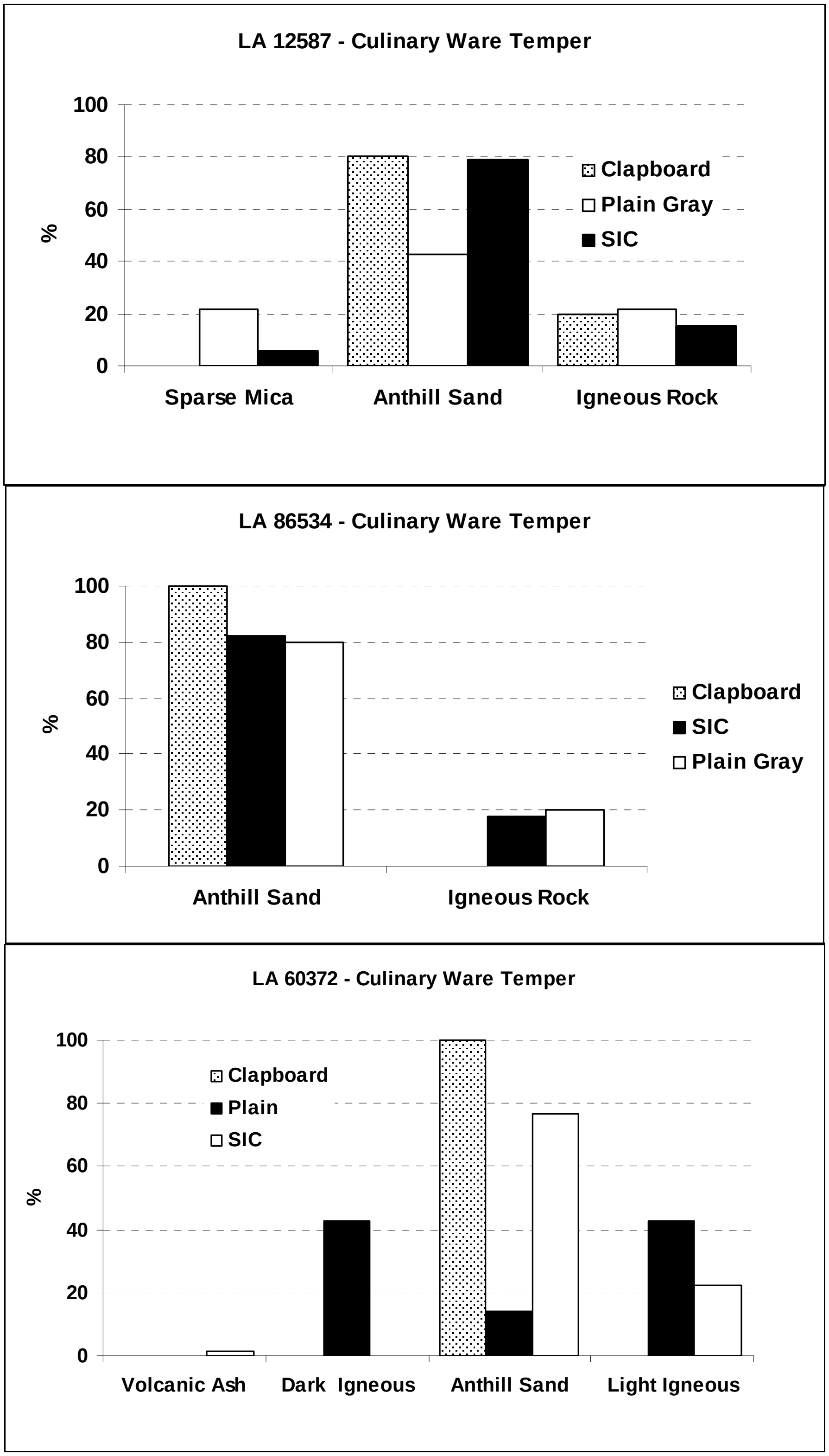


Figure 76.3a. Culinary ware temper at LA 12587 (top), LA 86534 (middle), and LA 60372 (bottom), Coalition period Pajarito sites.

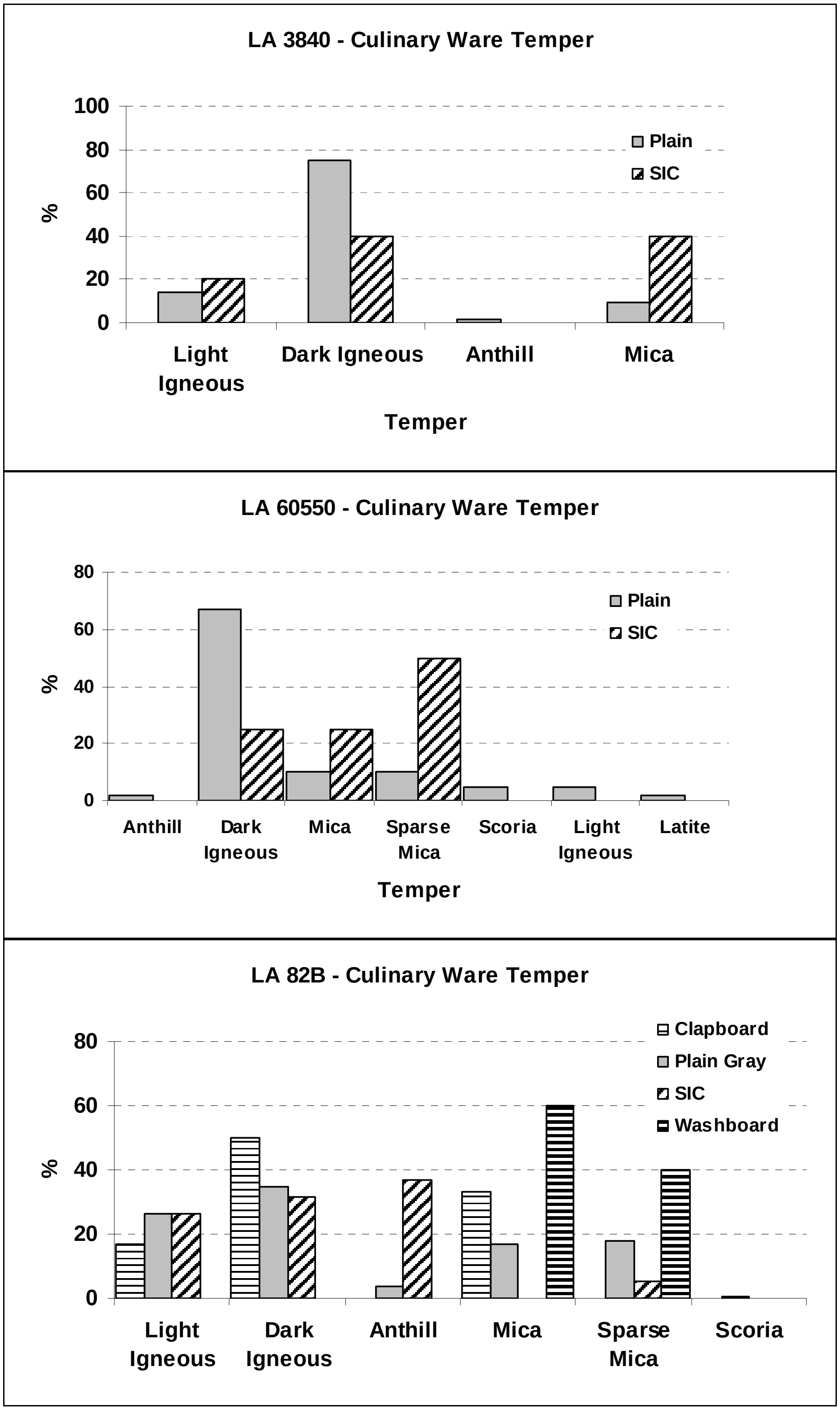


Figure 76.3b. Culinary ware temper at LA 3840 (top), LA 60550, (middle), and LA 82B (bottom), Coalition period Pajarito sites.

The excavation unit at LA 60550, which is contemporaneous with Tyuonyi does not contain any micaceous washboard (Table 76.2b). Ninety percent of the culinary sherds from the excavated midden unit are plain gray (Table 76.1d). Eighty percent contain fine, angular felsic inclusions, and eight percent also contain mica (Table 76.3b). Three of the four smeared-indented corrugated sherds found contain mica. In addition to mica inclusions, one-third of the micaceous sherds are washed with a micaceous solution.

Smeared-indented corrugated sherds containing coarse anthill sand crystals are not found at LA 3840 and LA 60550, nor do these sites contain Santa Fe Black-on-white rims (Table 76.1c). This may relate to the later initial settlement of these sites.

Micaceous Ware on the Pajarito

A small quantity of plain-surfaced micaceous ware, with sparse mica inclusions, is found at LA 12587. Dean Wilson of the Office of Archaeological Studies at the Museum of New Mexico (Blinman and Wilson, OAS workshop notes, December 2001) believes these early micaceous culinary wares first appeared in the Rio Grande along with Red Mesa Black-on-white pottery in the 10th century AD. Mica fragments in the paste may be from granite-derived clays or crushed granitic rock temper.

According to Eric Blinman (Blinman and Wilson, OAS workshop notes, December 2001) true micaceous clays in the northern Rio Grande are weathered from the granites of the Sangre de Cristo Mountains north and east of Santa Fe. Sources of added mica include Rio Grande alluvium, crushed granitic rock, and crushed metamorphic schist. According to Shepard (1956:162), "it may be difficult in some instances to distinguish a residual clay paste [derived from mica granite] from one tempered with sand high in mica, or a mica-bearing rock such as gneiss and schist." She recommends petrographic analysis and precise knowledge of the geology as essential to distinguishing these micaceous pastes. Blinman suggests refiring to distinguish between micaceous clay and added mica temper. Until the distinction can be made with certainty, Shepard (1956:162) recommends that "paste…be described as micaceous rather than as mica-tempered."

Petrographic characterization of micaceous sherds from Coalition period sites is instructive but not conclusive. The three smeared-indented corrugated sherds and one plain gray sherd come from LA 12587 and have similar paste, mineral, and lithic characteristics. The medium to coarse paste has low to moderate birefringence and low grain alignment and void quantity. Paste grains are predominantly monocrystalline quartz with secondary muscovite. Temper is monocrystalline quartz (75%) or microcline. Platy muscovite and biotite are minor minerals. Temper size maximum is very coarse, but most grains are coarse. The lithic type is mica granite containing microcline. There are no volcanic or mica schist (metamorphic) lithic grains present (Appendix BB).

One micaceous smeared-indented corrugated sherd from each Classic period site was examined. The medium-texture paste shows low to moderate birefringence, moderate grain alignment and void quantity. The dominant paste grain is monocrystalline quartz. Two sherds have secondary mica in the paste, and one does not. Each sherd has a different dominant temper mineral:

muscovite, monocrystalline quartz, or microcline feldspar. The two sherds with dominant quartz or feldspar contain minor muscovite and biotite. Grain size maximum is coarse, but most grains are medium size. All lithics are mica granite, with no volcanics or mica schist.

A sub-sample of 42 Classic period micaceous sherds was characterized using a petrographic microscope. The sub-sample consists of plain gray (n = 32), washboard (n = 5), smeared-indented corrugated (n = 3), and clapboard neck (n = 2) sherds. Under the binocular microscope, the sherds initially appeared to have different densities and/or sizes of mica flakes. Two tempers were identified, Type 5, with flakes appearing larger and more numerous, and Type 5-, which appeared to contain sparser concentrations and/or smaller grains. Higher proportions of Type 5- sherds are washed with a mica solution (Table 76.4c).

Type 5 (Dense Mica) sherds at all three sites show high-moderate to high birefringence, moderate to high-moderate alignment and void quantity. Dominant paste grains are 79 percent quartz, 21 percent muscovite. Half the sherds have fine-textured paste. Dominant temper mineral at LA 82 is muscovite 65 percent of the time, whereas none of the sherds at LA 3840 or LA 60550 have muscovite as dominant mineral. Maximum grain size for the dominant mineral ranges up to granule size (>2.0 mm) but most grains are coarse. Mica granite is the dominant lithic type; two have added mica schist and one includes volcanics and mica schist. One sherd contains only mica schist. Paste characteristics of Type 5- sherds (Sparse Mica) are much more variable. There is a wide range of birefringence, but most trend to high-moderate to high. Alignment is moderate to high-moderate, and voids are low-moderate to moderate in quantity. Eighty-seven percent of the sherds have monocrystalline quartz as the dominant grain in the paste. Only 20 percent of sherds have fine paste. Sixty percent of the sherds have monocrystalline quartz as the dominant grain; 26 percent have feldspar (microcline or plagioclase) as the dominant grain; only 13 percent have muscovite as the dominant temper mineral. Maximum grain size for the dominant temper mineral is 40 percent medium and 40 percent coarse sand-size. Secondary and minor muscovite and biotite also tend to fall into the medium to coarse sand size category. Lithic grains in the sherds at LA 3840 (n = 3) are all mica granite. At LA 60550, lithic grains are mica granite plus mica schist. Lithics at LA 82 are both variable and mixed: some are entirely volcanic, while others consist of mica granite or mica schist plus andesite or basalt. Only one sherd consists of mica granite and no other lithic type.

At the Chama-area sites, which are possible sources for these micaceous vessels, 20 percent to 50 percent of dense mica sherds and 46 to 68 percent of sparse mica sherds in excavated units are finished with a mica wash (Table 76.4a). Much of the culinary ware at Chama sites has a washboard exterior surface (Table 76.4b).

Micaceous culinary sherds at Classic period Pajarito sites are mainly plain-surfaced, rather than washboard. The five micaceous washboard sherds found in LA 82 Unit B represent less than three percent of the culinary ware rim sample from both excavation units. The lack of sources for micaceous clay or mica temper on the Pajarito suggests that these vessels were brought to Tyuonyi from the Chama area. Comparison of the paste composition of the sherds at Tyuonyi with those from Chama-area sites should further refine the possible production location of these jars.

Table 76.4a. Mica-washed sherds as a proportion of all mica-tempered sherds.

Site and Unit	Mica Sherds	Mica Wash	%	Sparse Mica	Mica Wash	%
LA 16 B	1	0	0.0	7	0	0.0
LA 16 SFAS	1	0	0.0	2	1	50.0
LA 82 A	14	0	0.0	9	1	11.1
LA 82 B	32	1	3.1	30	7	23.3
LA 174	1	0	0.0	4	0	0.0
LA 252*	0	0	0.0	2	2	100.0
LA 297 A	16	3	18.8	11	5	45.5
LA 297 C	52	26	50.0	53	33	62.3
LA 380 D	8	3	37.5	93	63	67.7
LA 380 WSI	13	0	0.0	27	4	14.8
LA 632 B	10	2	20.0	42	24	57.1
LA 632 WSI	25	3	12.0	31	4	12.9
LA 3840	8	0	0.0	0	0	0.0
LA 5137	5	0	0.0	13	0	0.0
LA 12587	0	0	0.0	6	0	0.0
LA 60372	0	0	0.0	0	0	0.0
LA 60550	7	3	42.9	8	2	25.0
LA 86534	0	0	0.0	0	0	0.0

*biased sample

Table 76.4b. Micaceous washboard at all sites.

	Total Culinary	Plain	SIC	Washboard	% Washboard
LA 16	19	15	4	0	0.0
LA 82	298	252	34	5	2.0
LA 174	38	9	26	0	0.0
LA 252*	3	1	0	2	66.7
LA 297	141	66	15	51	36.2
LA 380	142	70	2	70	49.3
LA 632	112	58	7	46	41.1
LA 3840	962	58	4	0	0.0
LA 5137	54	44	10	0	0.0
LA 12587	68	13	50	0	0.0
LA 60372	93	7	81	0	0.0
LA 60550	51	50	1	0	0.0
LA 86534	41	5	34	0	0.0

*biased sample

Table 76.4c. Mica-washed culinary sherds at Pajarito sites.

Site and Unit	Mica Sherds	Mica Wash	%	Sparse Mica	Mica Wash	%
LA 12587	0	0	0.0	6	0	0.0
LA 60372	0	0	0.0	0	0	0.0
LA 86534	0	0	0.0	0	0	0.0
LA 3840	8	0	0.0	0	0	0.0
LA 82 A	14	0	0.0	9	1	11.1
LA 82 B	32	1	3.1	30	7	23.3
LA 60550	7	3	42.9	8	2	25.0

CULINARY JAR SIZE

Each jar rim sherd in the sample was measured between the rim and shoulder using a template fitted into the curve of the jar throat. These aperture measurements are recorded as radii in centimeters. Based on the jar aperture size distribution histograms, small jars are defined as less than or equal to 12 cm.

Measurements taken on a small sample (*n* = 11; *n* = 9) of whole Classic period culinary jars excavated from rooms at Tonque Pueblo (LA 240) strongly suggest that vessel aperture may serve as proxy for vessel diameter (Barnett 1969:Table XXV and XXVI) (Tables 76.5a and 76.5b). The scatter plots and associated R^2 values (Figure 76.4) demonstrate that the ratio of aperture diameter to vessel diameter for each defined type of culinary jar but remains constant for both large and small vessels (Barnett 1969:181–185).

Table 76.5a. Rio Grande-style culinary jars from Tonque Pueblo (LA 240): globular with flared rims and rounded bottoms.

Orifice Diameter (inches)	Vessel Diameter (inches)	Vessel Height (inches)	Orifice Diameter (cm)	Radius (cm)
4.75	9.13	6.25	12.1	6
5.50	9.50	7.00	14.0	7
6.75	10.50	8.25	17.1	9
7.00	10.88	7.75	17.8	9
7.25	10.50	8.25	18.4	9
8.25	11.50	8.63	21.0	10
8.50	11.88	9.13	21.6	11
9.00	14.25	9.50	22.9	11
9.50	14.00	11.75	24.1	12
9.75	15.00	12.50	24.8	12
16.25	21.63	20.00	41.3	21

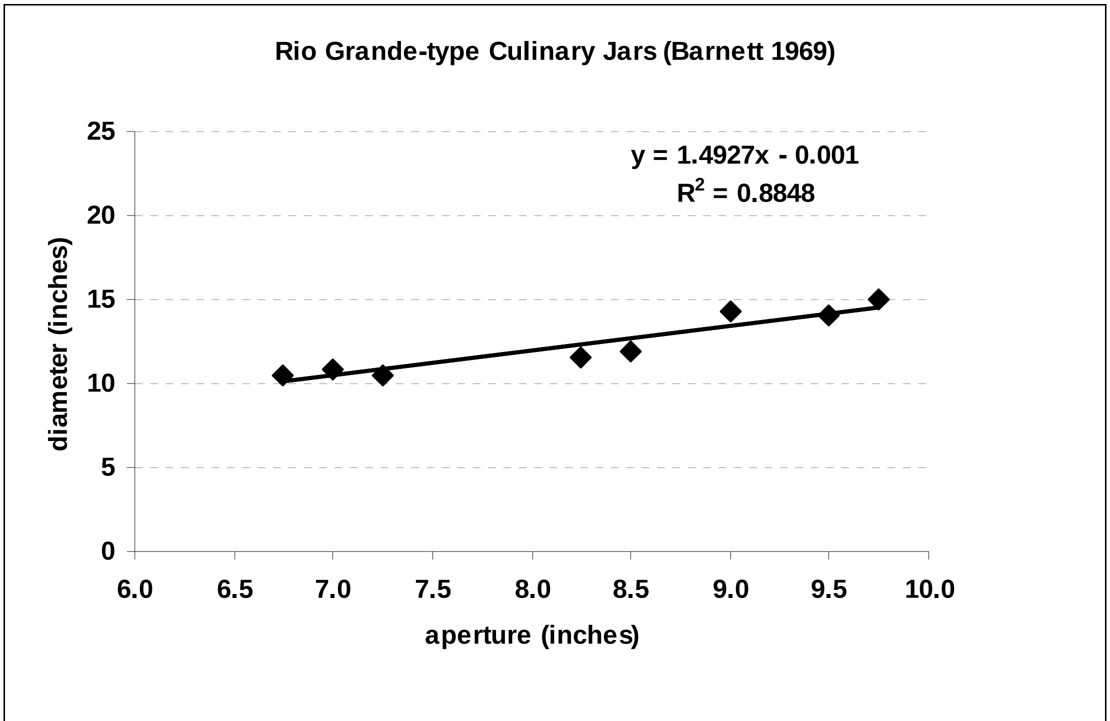
The two smallest vessels have an ovoid shape and lugs at the rim; the largest vessel is an oversized storage vessel.

Table 76.5b. Sankawi-style culinary jars from Tonque (LA 240) with thicker walls and an elongated neck.

Orifice Diameter (inches)	Vessel Diameter (inches)	Vessel Height (inches)		Orifice Diameter (cm)	Radius (cm)
4.25	6.00	5.25	w. handles	10.8	5
6.00	8.25	6.25		15.2	8
7.50	12.13	9.63		19.1	10
8.25	9.75	7.38		21.0	10
9.00	12.50	10.63		22.9	11
9.25	13.75	9.00		23.5	12
9.75	14.75	12.50		24.8	12
11.75	16.75	13.00		29.8	15
12.75	16.75	14.00		32.4	16

The smallest vessel is ovoid with handles

It should be noted that there are few very large jars at Tonque (Figure 76.5) compared with the six Pajarito sites (Figure 76.6a, b, and c). The difference may be that Barnett's sample represents *de facto* or primary refuse, whole vessels abandoned on room floors, rather than the secondary refuse, generally found in middens (Schiffer 1972:161–162). Very large jars may not have been stored in these rooms, or may have been removed before abandonment, especially if they were more difficult to replace.



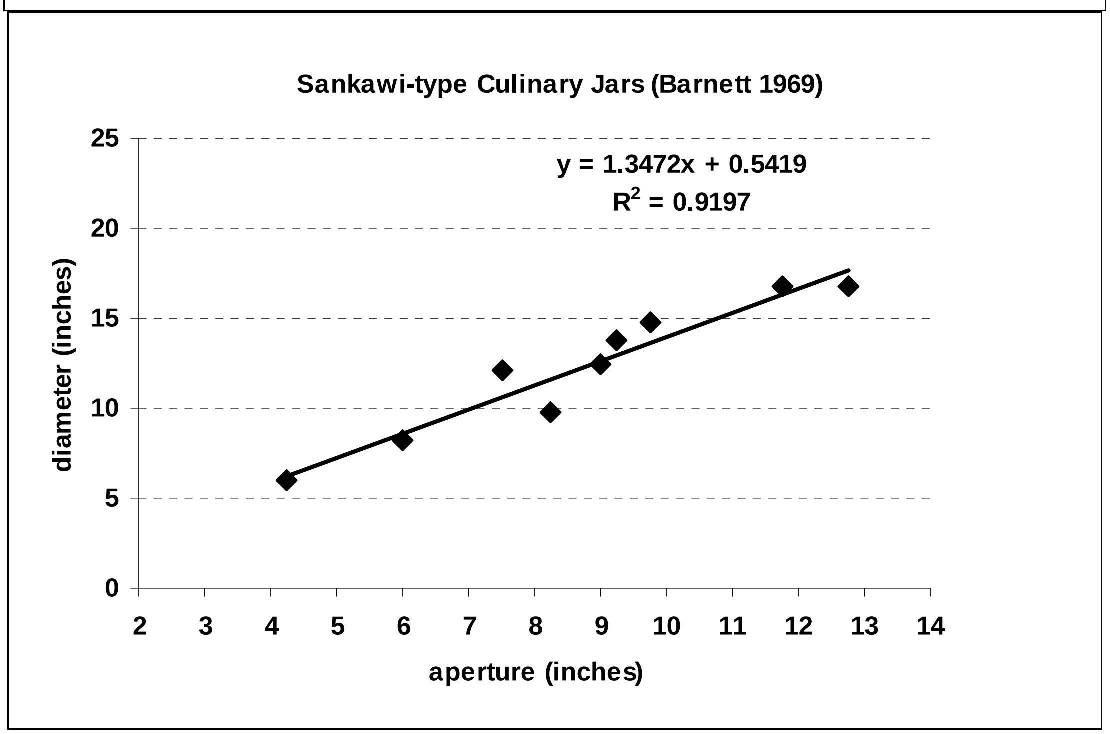


Figure 76.4. Ratio of jar aperture to jar diameter for culinary jars at Tonque Pueblo (LA 240) (from Barnett 1969).

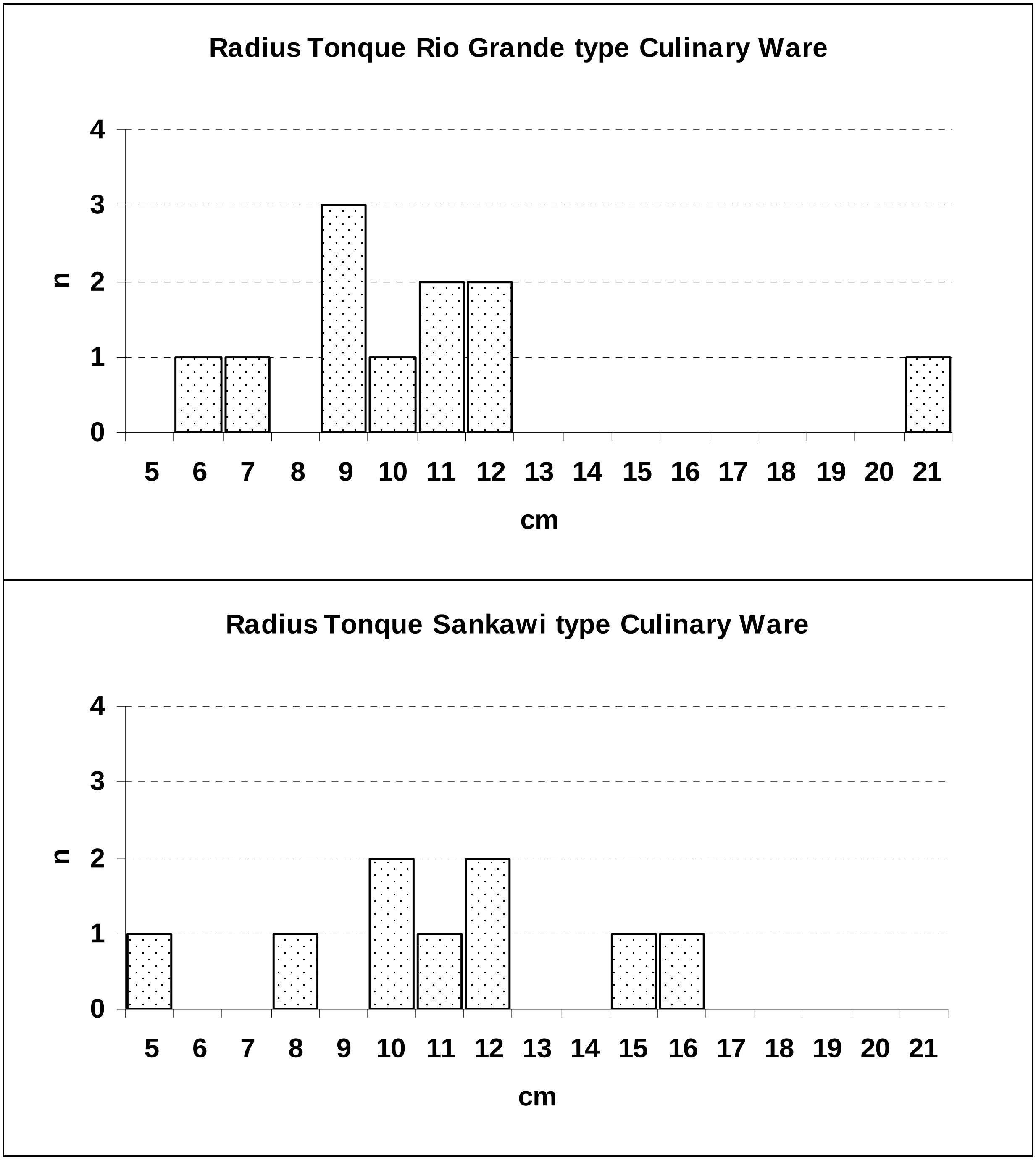


Figure 76.5. Culinary jars from Tonque Pueblo.

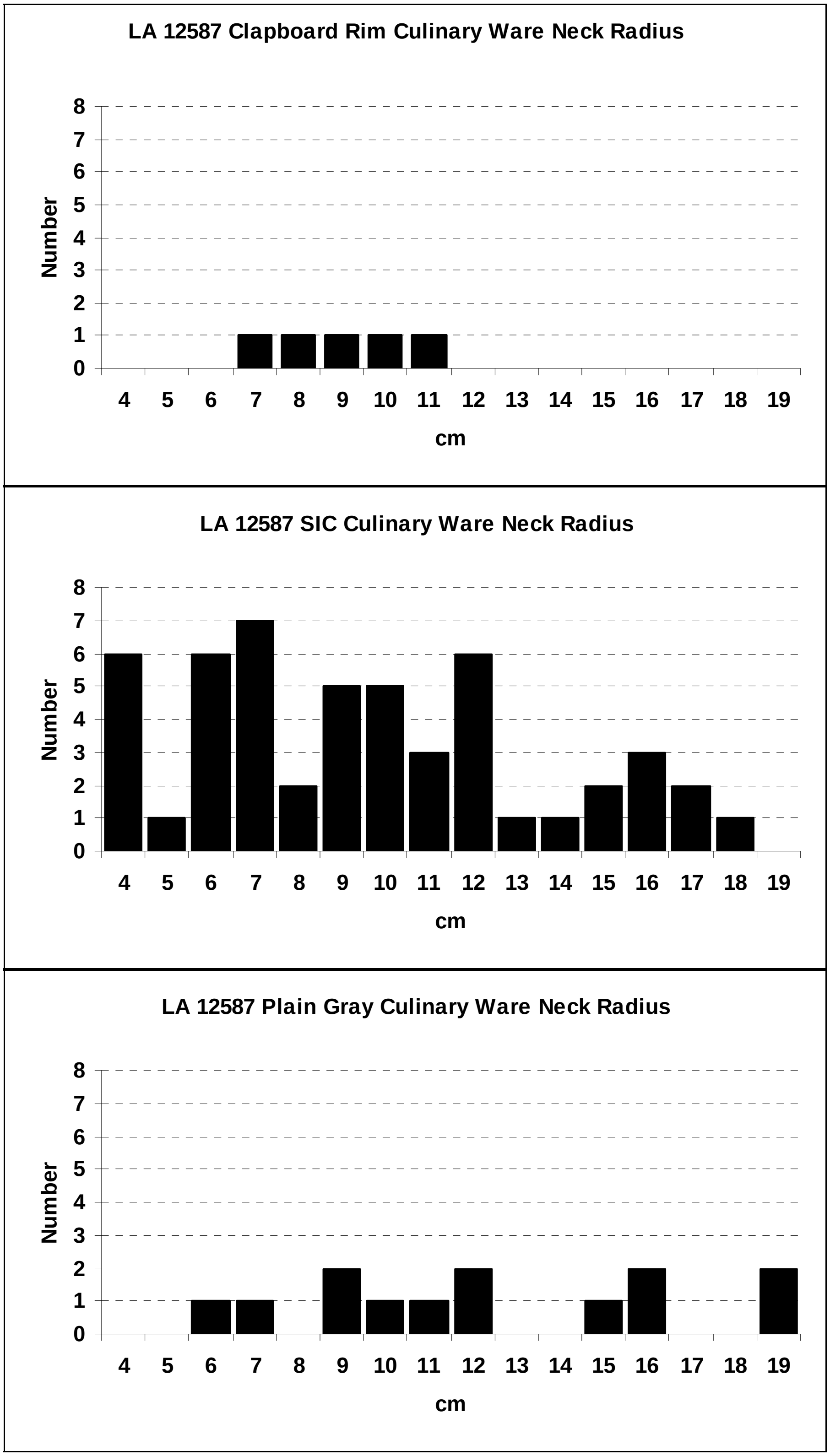


Figure 76.6a. Summary of culinary ware data from LA 12587.

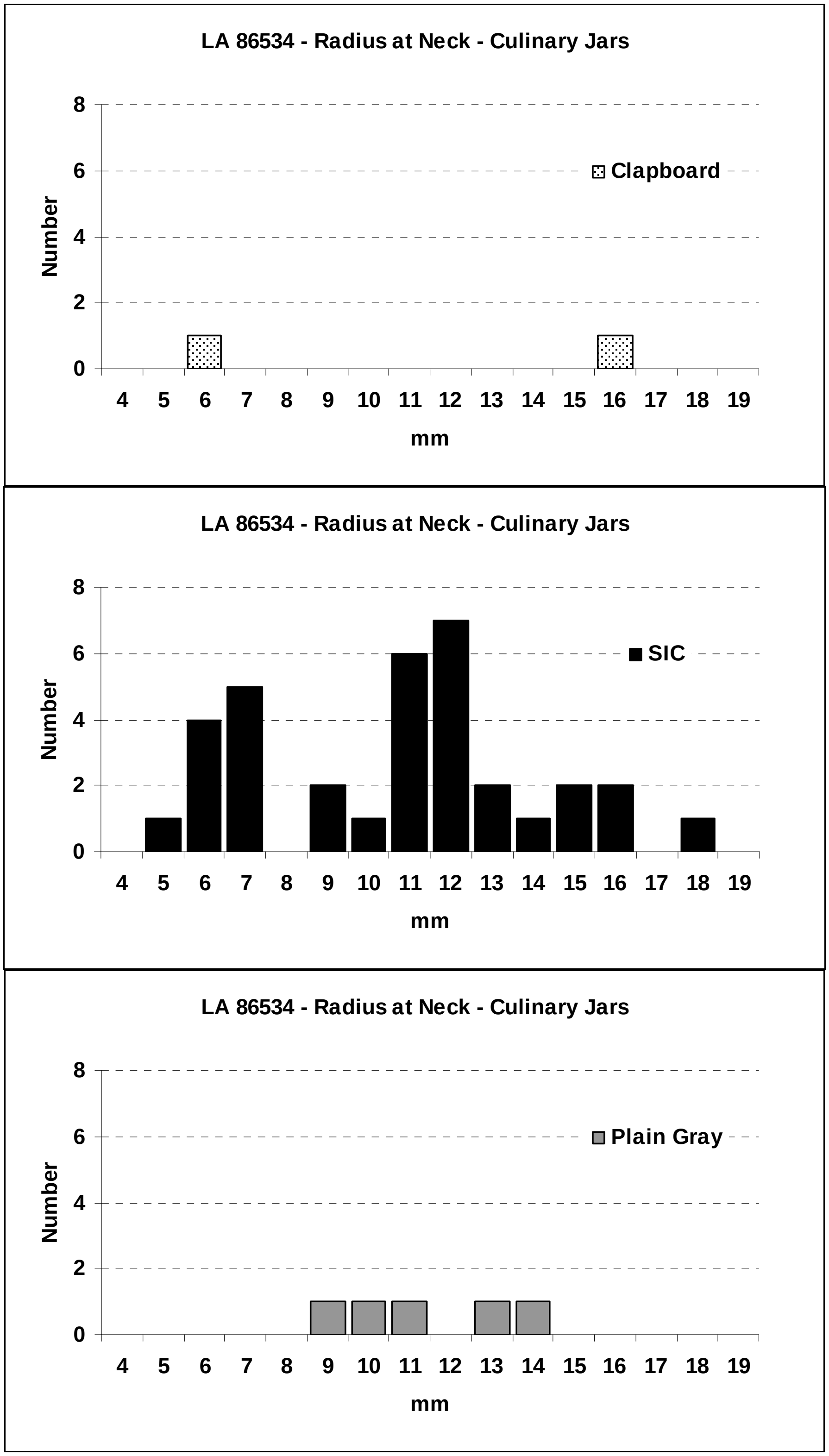


Figure 76.6b. Summary of culinary ware data from LA 86534.

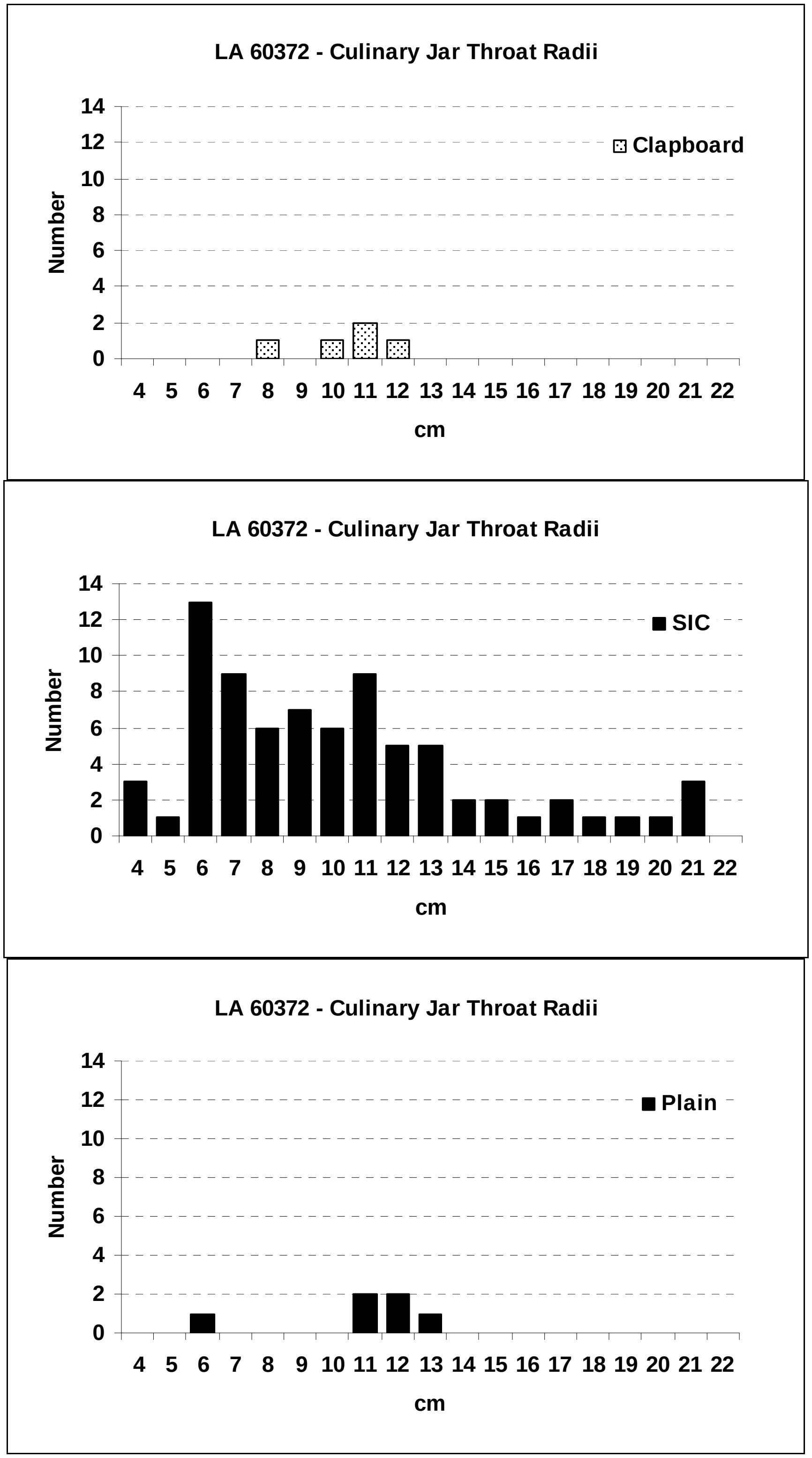


Figure 76.6c. Summary of culinary ware data from LA 60372.

Coalition Sites

The range of jar sizes and the ratio of small to large jars both change over time (Tables 76.6a and 76.6b) (Figures 76.6a, b, and c). At each of the three Coalition sites, 77 to 80 percent of smeared-indented corrugated jars have aperture radii less than or equal to 12 cm (Table 76.6b).

Table 76.6a. Culinary vessel aperture for selected types at Pajarito sites. Vessel aperture is measured at the throat, below the vessel rim interior.

	LA 12587	LA 86534	LA 60372	LA 3840	LA 82A	LA 82B	LA 60550
SIC ≤12 cm							
n =	41	26	59	2	7	10	1
Mean	8	9.3	8.3	9	8.7	8.5	8
Median	8	10.5	8.0	9	10.0	9.0	8
Std. Dev.	2.7	2.5	2.3	-	3.9	2.8	-
CV	33.1	27.0	27.8	-	44.3	32.9	-
Range	4–12	5–12	4–12	7–11	3–12	5–12	8
SIC ≥13 cm							
n =	10	8	18	2	5	2	-
Mean	15.7	15	16.2	15.5	15.8	15	-
Median	16.0	15	15.5	15.5	16.0	15	-
Std. Dev.	1.5	1.7	3.0	3.5	2.8	-	-
CV	9.5	11.3	18.8	22.8	17.6	-	-
Range	13–18	13–18	13–21	13–18	13–19	15	-
Plain Gray							
n =	-	-	6	-	-	-	-
Mean	-	-	10.8	-	-	-	-
Median	-	-	11.5	-	-	-	-
Std. Dev.	-	-	2.5	-	-	-	-
CV	-	-	22.9	-	-	-	-
Range	-	-	6–13	-	-	-	-
Plain Gray ≤12 cm							
n =	8	3	5	28	31	66	24
Mean	9.5	10.0	10.4	9.4	9.7	9.9	8.7
Median	9.5	10.0	11.0	9.0	11.0	10.0	8.5
Std. Dev.	2.2	1.0	2.5	1.8	2.6	2.1	1.8
CV	23.2	10.0	24.1	18.9	26.5	21.5	20.2
Range	6–12	9–11	6–12	6–12	4–12	4–12	6–12
Plain Gray ≥13 cm							
n =	5	2	1	9	31	42	13

	LA 12587	LA 86534	LA 60372	LA 3840	LA 82A	LA 82B	LA 60550
Mean	17.0	13.5	13.0	16.8	16.6	15.3	14.5
Median	16.0	13.5	13.0	17.0	15.0	15.0	14.0
Std. Dev.	1.9	0.7	-	1.9	3.4	1.9	1.4
CV	11.0	5.2	-	11.1	20.2	12.4	9.6
Range	15–19	13–14	13	14–20	13–25	13–20	13–18
Clapboard							
n =	5	2	5	-	1	4	-
Mean	9.0	11.0	10.4	-	7.0	13.25	-
Median	9.0	11.0	11.0	-	7.0	13.0	-
Std. Dev.	1.58	7.1	1.5	-	-	3.0	-
CV	17.6	64.3	14.6	-	-	22.5	-
Range	7–11	6–16	8–12	-	7	10–17	-
Washboard							
n =	-	-	-	-	-	5	-
Mean	-	-	-	-	-	13.0	-
Median	-	-	-	-	-	13.0	-
Std. Dev.	-	-	-	-	-	1.2	-
CV	-	-	-	-	-	9.4	-
Range	-	-	-	-	-	12–15	-

Table 76.6b. Proportion of small jars at Pajarito sites.

Type/Site	**All jars ≤12 cm**	**Non-micaceous jars ≤13 cm**	**Micaceous jars ≤14 cm**	**Large jars**
Smeared-indented corrugated				
LA 12587	80.3			19.7
LA 86534	76.5			23.5
LA 60372	76.6			23.4
Plain Gray				
LA 3840	75.7			24.3
LA 82A	50.0	61.0	59.6	50-39-44
LA 82B	61.1	73.9	68.4	38.9-26-32
LA 60550	64.9			35.1

Table 76.6c. T-test results for mean jar aperture between Coalition and Classic period (Pooled Method, Equal Variances except for clapboard neck).

Type/Size	*n* =	*df* =	*t*	Pr>|t|
SIC–small	7	5	0.04	0.9724
SIC–large	6	4	-0.48	0.6580
Plain Gray–small	7	5	-1.43	0.2128
Plain Gray–large	7	5	1.05	0.3408
Clapboard Neck	4	2	-2.64	0.1182

The size distribution of large jars differs at the three Coalition sites. The maximum radius for any smeared-indented corrugated jar aperture for LA 60372 is 21 cm, 3 cm greater than the 18 cm maximum for LA 12587 (White Rock) and LA 86534 (the Airport) (Table 76.6a). Five of the 18 large smeared-indented corrugated jars at LA 60372 (28 percent) exceed the maximum radius found at the other two sites (see Figures 76.6a through 76.c). T-tests comparing the vessel aperture radius sample means for large and small smeared-indented corrugated and plain gray jars at Coalition and Classic period sites showed no significant differences between large and small vessels, types, or time periods (Table 76.6c).

Coefficients of Variation (CV) are uniformly high for small smeared-indented corrugated jars and noticeably lower for large ones, indicating that while there are fewer large jars, their sizes are more uniform. The CV for large smeared-indented corrugated jars at LA 12587 is 9.5 percent (*n* = 10), suggesting standardized production. The larger size range at LA 60372 affects the CV, which is between 10 percent and 20 percent.

Small plain gray jars at Coalition sites show larger mean radii than small smeared-indented corrugated jars. For large jars, both maximum vessel size (19 cm) and mean radius (17 cm) at LA 12587 are larger than at LA 86534 and LA 60372, with a CV of 11 percent. CVs at or below 10 percent at LA 86534 are for samples of three or fewer rim sherds.

Classic Sites

The Classic period sample of smeared-indented corrugated rims is considerably smaller. Mean aperture radii for small and large jars are similar to those from Coalition sites. CVs are high, particularly for the small jars (Table 76.6a).

The proportion of large jars increases at Classic period sites (Table 76.6b). Ratios of large to small plain gray jars at the two smaller sites, however, are closer to those for smeared-indented corrugated at Coalition sites, with 76 percent and 65 percent small jars, respectively (Table 76.6b). Small jars make up 50 percent of plain gray rims in LA 82 Unit A and 61 percent in Unit B.

Jars are larger overall in the Classic than in the Coalition. The largest jar in the sample has a radius of 20 cm, with a 25 cm outlier at Tyuonyi. CVs are generally higher for small jars. CV for large plain gray jars at LA 60550 (Tyuonyi Annex) (*n* = 13) is 9.6 percent, and for washboard micaceous jars from LA 82 Unit B (*n* = 5) CV = 9.4 percent (Table 76.6a), with the rest between 10 percent and 20 percent.

SHERD THICKNESS

Sherd thickness (Table 76.7a) is the median wall thickness of the four sides of a body sherd or the three non-rim sides of a rim sherd (Rocek 2002). Sherds with no measurable body wall below the rim were not included in the calculation.

Table 76.7a. Univariate statistics: Culinary sherd thickness at Pajarito sites by vessel aperture.

	LA 12587	LA 86534	LA 60372	LA 3840	LA 82A	LA 82B	LA 60550
SIC ≤12 cm							
n =	41	26	59	2	7	10	1
Mean	4.8	4.3	4.5	4.9	4.5	4.4	4.3
Median	4.9	4.2	4.4	4.9	4.2	4.5	4.3
Std. Dev.	0.7	0.5	0.7	0.6	0.9	0.5	-
CV	13.7	11.6	16.4	13.1	20.1	10.8	-
Range	3.1–6.4	3.4–5.5	3.1–7.1	4.4–5.3	3.6–6.0	3.5–5.1	4.3
SIC ≥13 cm							
n =	10	8	18	2	5	2	0
Mean	5.0	4.9	4.7	4.9	5.6	4.4	-
Median	4.9	5.2	4.7	4.9	5.5	4.4	-
Std. Dev.	0.6	0.6	0.5	1.8	0.7	0.4	-
CV	11.9	12.7	10.2	37.5	12.6	8.1	-
Range	4.1–5.9	4.0–5.6	4.0–6.0	3.6–6.2	4.7–6.6	4.1–4.6	-
Plain Gray ≤12 cm							
n =	8	3	5	28	31	66	24
Mean	4.8	5.1	4.9	5.0	5.1	5.0	5.3
Median	4.8	5.2	4.8	5.1	5.2	5.0	5.3
Std. Dev.	0.6	0.3	0.4	0.6	0.7	0.9	1.1
CV	12.1	6.0	8.4	11.6	14.2	17.6	20.2
Range	3.8–5.7	4.8–5.4	4.6–5.6	3.4–5.9	3.3–6.5	3.3–7.2	3.6–7.6
Plain Gray ≥13 cm							
n =	5	2	1	9	31	42	13
Mean	5.2	5.5	5.1	5.1	5.2	5.1	5.9
Median	5.2	5.5	5.1	5.2	5.2	5.1	5.6
Std. Dev.	0.4	1.6	-	0.6	0.8	0.7	0.9

	LA 12587	LA 86534	LA 60372	LA 3840	LA 82A	LA 82B	LA 60550
CV	8.1	28.3	-	12.3	15.2	14.1	15.8
Range	4.7–5.8	4.4–6.6	5.1	4.0–5.8	3.7–7.3	3.5–7.0	4.2–7.1
Clapboard Neck							
n =	5	2	5	-	1	6	-
Mean	4.3	4.2	4.4	-	4.8	5.0	-
Median	4.5	4.2	4.4	-	-	4.7	-
Std. Dev.	0.6	0.2	0.3	-	-	0.8	-
CV	14.8	5.1	6.0	-	-	16.5	-
Range	3.3–4.9	4.0–4.3	4.1–4.7	-	-	4.2–6.3	-
Washboard							
n =	-	-	-	-	-	5	-
Mean	-	-	-	-	-	4.8	-
Median	-	-	-	-	-	4.9	-
Std. Dev.	-	-	-	-	-	0.5	-
CV	-	-	-	-	-	10.9	-
Range	-	-	-	-	-	4.1–5.4	-

Plain gray jars have a greater mean thickness than smeared-indented corrugated jars, whether at Coalition or Classic period sites (Table 76.7b). Smeared-indented corrugated sherds are thicker at Classic sites, and the mean thickness range overlaps for large plain gray and smeared-indented corrugated. T-tests comparing the sherd thickness sample means for large and small smeared-indented corrugated and plain gray jars at Coalition and Classic period sites showed no significant differences between large and small vessels, types, or time periods. It is very likely, however, that there is a significant difference in mean rim thickness for the small sample of clapboard neck jars ($n = 5$; $df = 3$; $t = 5.69$; $Pr > t = 0.0107$) (Table 76.7c).

Table 76.7b. Mean culinary sherd thickness of major types at Pajarito sites.

	Smeared-indented Corrugated	Plain Gray
Coalition Sites–Small Jars	4.3–4.8	4.8–5.1
Coalition Sites–Large Jars	4.7–5.0	5.1–5.5
Classic Sites–Small Jars	4.3–4.9	5.0–5.3
Classic Sites–Large Jars	4.4–5.6	5.1–5.9

Table 76.7c. T-test results for mean sherd thickness from Coalition to Classic period (Pooled Method, Equal Variances).

Type/Size	*n* =	*df* =	*t*	Pr>|t|
SIC–small	7	5	-0.04	0.9680
SIC–large	6	4	0.28	0.7944

Type/Size	*n* =	*df* =	*t*	Pr>|t|
Plain Gray–small	7	5	1.49	0.1954
Plain Gray–large	7	5	0.23	0.8245
Clapboard Neck	5	3	5.69	0.0107
All Coalition SIC	6	4	1.96	0.1214
All Classic SIC	7	5	1.34	0.2386
All Coalition Plain	6	4	2.24	0.0890
All Classic Plain	8	6	1.09	0.3159

With the exception of large plain gray jars at LA 86534 (*n* = 2; CV = 28.3 percent), CVs for Coalition period sherd thickness fall below 20 percent (Table 76.7a). Large smeared-indented corrugated jars at LA 60372 (*n* = 18) have a CV of 10.2 percent, otherwise only small samples of plain gray and clapboard neck fall at or below 10 percent.

Likewise, CVs for sherd thickness at Classic period sites fall at or below 20 percent, with the exception of large smeared-indented corrugated jars at LA 3840 (*n* = 2; CV = 37.5 percent). Only two small samples at LA 82 Unit B fall below 10 percent (Table 76.7a).

RIM THICKNESS

Rim thickness (Table 76.8a) is measured ~2 mm below the vessel lip. Plain gray jars have a greater mean rim thickness than smeared-indented corrugated jars, whether at Coalition or Classic period sites. The upper end of the range for smeared-indented corrugated rims overlaps with the lower end of the plain gray range at Coalition sites, but not at Classic sites (Table 76.8b). The differences in mean rim thickness, however, are not significant. T-tests comparing the rim thickness sample means for large and small smeared-indented corrugated and plain gray jars at Coalition and Classic period sites showed no significant differences between large and small vessels, types, or time periods. There is a small likelihood of a significant difference in mean rim thickness for the small sample of clapboard neck jars (*n* = 5; *df* = 2; *t* = 4.36; *Pr > t* = .0488) (Table 76.8c).

Table 76.8a. Univariate statistics: Culinary rim thickness at Pajarito sites by vessel aperture.

	LA 12587	LA 86534	LA 60372	LA 3840	LA 82A	LA 82B	LA 60550
SIC ≤12 cm							
n =	41	26	59	2	7	10	1
Mean	3.8	3.5	3.5	3.5	3.9	3.3	3.1
Median	3.8	3.4	3.4	3.5	3.6	3.4	3.1
Std. Dev.	0.7	0.6	0.6	0.4	1.1	0.6	-
CV	18.5	16.6	17.9	12.1	27.4	17.3	-
Range	2.5–5.3	2.7–5.1	2.5–5.5	3.2–3.8	3.1–6.1	2.6–4.3	3.1
SIC ≥13 cm							
n =	10	8	18	2	5	2	0

	LA 12587	LA 86534	LA 60372	LA 3840	LA 82A	LA 82B	LA 60550
Mean	4.0	3.6	3.6	4.1	4.7	3.1	-
Median	4.0	3.5	3.6	4.1	4.8	3.1	-
Std. Dev.	0.9	0.4	0.7	0.7	0.7	0	-
CV	23.0	11.6	18.9	17.2	15.6	0	-
Range	2.9–5.6	3.2–4.4	2.2–5.3	3.6–4.6	3.8–5.4	3.1	-
Plain Gray ≤12 cm							
n =	8	3	5	28	31	66	24
Mean	4.3	3.7	4.1	4.2	4.5	4.2	4.2
Median	4.3	3.8	4.2	4.2	4.6	4.1	4.0
Std. Dev.	0.5	0.3	0.8	0.7	0.6	0.8	1.1
CV	10.8	8.2	19.4	15.6	13.9	19.6	27.1
Range	3.4–4.7	3.4–4.0	2.7–4.7	2.9–5.7	3.2–5.8	2.9–6.7	2.7–7.7
Plain Gray ≥13 cm							
n =	5	2	1	9	31	42	13
Mean	3.9	3.9	5.1	4.2	4.5	4.3	4.9
Median	3.8	3.9	5.1	4.2	4.4	4.3	4.8
Std. Dev.	0.5	1.3	-	0.6	0.7	0.7	0.9
CV	12.5	34.9	-	14.6	15.7	16.2	18.8
Range	3.2–4.4	2.9–4.8	5.1	3.4–5.4	3.4–6.4	3.0–5.7	3.3–6.5
Clapboard Neck							
n =	5	2	5	-	1	6	-
Mean	3.4	3.1	3.6	-	4.0	4.0	-
Median	3.5	3.1	3.9	-	4.0	3.9	-
Std. Dev.	0.6	0.2	0.7	-	-	0.5	-
CV	16.6	7.0	19.3	-	-	11.6	-
Range	3.0–4.4	2.9–3.2	2.4–4.1	-	4.0	3.5–4.8	-
Washboard							
n =	-	-	-	-	-	5	-
Mean	-	-	-	-	-	4.2	-
Median	-	-	-	-	-	4.2	-
Std. Dev.	-	-	-	-	-	0.7	-
CV	-	-	-	-	-	16.7	-
Range	-	-	-	-	-	3.5–5.4	-

Table 76.8b. Mean culinary rim thickness for major types at Pajarito sites.

	Smeared-indented Corrugated	Plain Gray
Coalition Sites–Small Jars	3.5–3.8	3.7–4.3
Coalition Sites–Large Jars	3.6–4.0	3.9–5.1
Classic Sites–Small Jars	3.1–3.9	4.2–4.5
Classic Sites–Large Jars	3.1–4.1	4.2–4.9

Table 76.8c. T-test results for mean rim thickness from Coalition to Classic periods (Pooled Method, Equal Variance except for clapboard neck).

Type/Size	*n* =	*df* =	*t*	Pr>|t|
SIC–small	7	5	-0.69	0.5233
SIC–large	6	4	0.48	0.6558
Plain Gray–small	7	5	1.40	0.2194
Plain Gray–large	7	5	0.46	0.6657
Clapboard Neck	5	2	4.36	0.0488
All Coalition SIC	6	4	0.80	0.4685
All Classic SIC	7	5	1.18	0.2928
All Coalition Plain	6	4	0.61	0.5748
All Classic Plain	8	6	1.16	0.2891

With two exceptions (large smeared-indented corrugated jars at LA 12587 [*n* = 10; CV = 23.0 percent] and large plain gray jars at LA 86534 [*n* = 2; CV = 34.9 percent]), CVs for rim thickness at Coalition sites are below 20 percent. One very small sample of clapboard neck jars at LA 86534 (*n* = 2) has a CV of 7.0 percent. This same sample also has a CV below 10 percent for sherd thickness (Table 76.8a).

With one exception (small smeared-indented corrugated jars at LA 82 Unit A [*n* = 7; CV = 27.4 percent]) all CVs for rim thickness at Classic sites are between 10 percent and 20 percent.

COEFFICIENTS OF VARIATION AND PASTE COMPOSITION

Table 76.9a compares CVs for jar aperture, sherd thickness, and rim thickness at each site for large and small jars by exterior surface treatment (smeared-indented corrugated, plain, clapboard neck, and washboard).

Table 76.9a. Coefficients of variation for Pajarito sites – all paste types.

	LA 12587	LA 86534	LA 60372	LA 3840	LA 82 (A)	LA 82 (B)	LA 60550
SIC							
n =	41	26	59	2	7	10	1
radius ≤12 cm	33.1	27.0	27.8	-	44.3	32.9	-
body thickness	13.8	11.6	16.4	13.1	20.1	10.8	-
rim thickness	18.5	16.6	17.9	12.1	27.4	17.3	-
SIC							
n =	10	8	18	2	5	2	0
radius ≥13 cm	9.5	11.3	18.8	22.8	17.6	-	-
body thickness	11.9	12.7	10.2	37.5	12.6	8.1	-
rim thickness	23.0	11.6	18.9	17.2	15.6	0	-
Plain Gray							
n =	8	3	5	28	31	66	24

	LA 12587	LA 86534	LA 60372	LA 3840	LA 82 (A)	LA 82 (B)	LA 60550
radius ≤12 cm	23.2	10.0	24.1	18.9	26.5	21.5	20.5
body thickness	12.1	6.0	8.4	11.6	14.2	17.6	20.2
rim thickness	10.8	8.2	19.4	15.6	13.9	19.6	27.1
Plain Gray							
n =	5	2	1	9	31	42	13
radius ≥13 cm	11.0	5.2	-	11.1	20.2	12.4	9.6
body thickness	8.1	28.3	-	12.3	15.2	14.1	15.8
rim thickness	12.5	34.9	-	14.6	15.8	16.2	18.8
Clapboard							
n =	5	2	5	1	0	4	0
radius	17.6	64.3	14.6	-	-	22.5	-
body thickness	14.8	5.1	6.0	-	-	16.5	-
rim thickness	16.6	7.0	19.3	-	-	11.6	-
Washboard							
n =	0	0	0	0	0	5	0
radius	-	-	-	-	-	9.4	-
body thickness	-	-	-	-	-	10.9	-
rim thickness	-	-	-	-	-	16.7	-

Coalition Sites

Few CVs at Coalition sites are lower than 10 percent for vessel aperture and rim thickness, and these may be the effect of sample size.

Large smeared-indented corrugated jars at LA 12587 (*n* = 10) have a CV of 9.5 percent for aperture. This suggests that these jars may have been produced to certain size specifications. Large smeared-indented corrugated jars at LA 86534 (*n* = 8) and LA 60372 (*n* = 10) are between 10 percent and 20 percent.

Plain gray jars at Coalition sites show a higher degree of standardization, but these samples are quite small. Large plain jars at LA 12587 (*n* = 5) have a CV of 8.1 percent for sherd thickness. Large plain gray jars at LA 86534 (*n* = 3) have a low CV for aperture (CV = 10.0) as do small plain gray jars (*n* = 2; CV = 5.2). The small jars also have low CVs for both sherd thickness (CV = 6.0) and rim thickness (CV = 8.2). Small plain jars at LA 60372 (*n* = 5) have a low CV for sherd thickness (CV = 8.4).

Low CVs for most plain gray and clapboard neck rims at all three Coalition sites may reflect small sample size (Costin 2001; Schleher 2005). Thirteen out of 14 samples (93%) have CVs lower than 20 percent for sherd thickness even in the six cases (43%) when CV for vessel aperture is high.

Classic Sites

Classic period samples initially show very few low CVs. These are for small samples at LA 82 Unit B (large smeared-indented corrugated jars [*n* = 2; CV = 8.1% for sherd thickness]; micaceous washboard jars [*n* = 5; CV = 9.4% for jar aperture]). CVs for all attributes of plain gray jars are higher than 10 percent, but 16 of the 18 values (89%) fall below 20 percent

Micaceous and non-micaceous culinary jars at LA 82 Units A and B were analyzed separately to ascertain whether CV differed based on presumed production locale. The micaceous rim samples at LA 3840 and LA 60550 were too small for a separate analysis. Histograms of plain gray micaceous and non-micaceous samples at Tyuonyi (Figures 76.7a through 76.7c) show a higher breakpoint between large and small vessels for non-micaceous plain gray jars (≤13 ≥14), and an even higher breakpoint for micaceous jars (≤14 ≥15).

There are four times as many non-micaceous smeared-indented corrugated jars at Tyuonyi as micaceous (Tables 76.9b and 76.9c), but the samples are still quite small and CV calculations may be affected by sample size. However, 10 of the 12 jars (83 percent) have aperture radii less than or equal to 13 cm. Five of the six CVs are below 20 percent; two are below 10 percent.

Table 76.9b. Coefficients of variation for non-micaceous culinary vessels at Classic period Pajarito sites.

	LA 3840*	LA 82 (A)	LA 82 (B)	LA 60550*
SIC				
n =		4	6	
radius ≤13 cm		4.6	26.8	
body thickness		7.1	13.2	
rim thickness		20.2	12.1	
n =		1	1	
radius ≥14 cm		-	-	
body thickness		-	-	
rim thickness		-	-	
Plain Gray				
n =		25	51	
radius ≤13 cm		24.0	22.8	
body thickness		11.8	15.4	
rim thickness		13.2	17.6	
n =		16	18	
radius ≥14 cm		16.8	10.4	
body thickness		12.9	11.8	
rim thickness		13.1	10.6	
Clapboard				
n =		-	2	
radius		-	12.9	
body thickness		-	0	
rim thickness		-	9.4	

	LA 3840*	LA 82 (A)	LA 82 (B)	LA 60550*
Washboard				
n =		-	-	
radius ≤14		-	-	
body thickness		-	-	
rim thickness		-	-	
n =		-	-	
radius ≥15		-	-	
body thickness		-	-	
rim thickness		-	-	

*see Table 76.10a

Table 76.9c. Coefficients of variation for micaceous culinary vessels at Classic period sites.

	LA 3840*	LA 82 (A)	LA 82 (B)	LA 60550**
SIC				
n =		2	1	
radius ≤14 cm		64.3	-	
body thickness		23.0	-	
rim thickness		16.2	-	
n =		0	0	
radius ≥15 cm		-	-	
body thickness		-	-	
rim thickness		-	-	
Plain Gray				
n =		9	26	
radius ≤14 cm		22.9	20.1	
body thickness		10.2	14.8	
rim thickness		10.4	14.6	
n =		7	12	
radius ≥15 cm		8.9	9.1	
body thickness		16.8	14.3	
rim thickness		18.5	13.0	
Clapboard				
n =		1	1	
radius		-	-	
body thickness		-	-	
rim thickness		-	-	
Washboard				
n =			4	
radius ≤14			4.6	
body thickness			7.8	
rim thickness			19.3	
n =			1	
radius ≥15			-	

	LA 3840*	LA 82 (A)	LA 82 (B)	LA 60550**
body thickness			-	
rim thickness			-	

* only one micaceous rim found at LA 3840; **only two micaceous rims found at LA 60550

The non-micaceous plain gray sample for both units (*n* = 110) includes 76 jars with aperture radii ≤13 cm (69 percent). CVs are just above 20 percent for aperture and between 10 percent and 20 percent for sherd and rim thickness. For large jars, CVs are between 10 percent and 20 percent. A very small sample of non-micaceous clapboard neck jars has one CV just above 10 percent and one just below (one attribute did not return a CV).

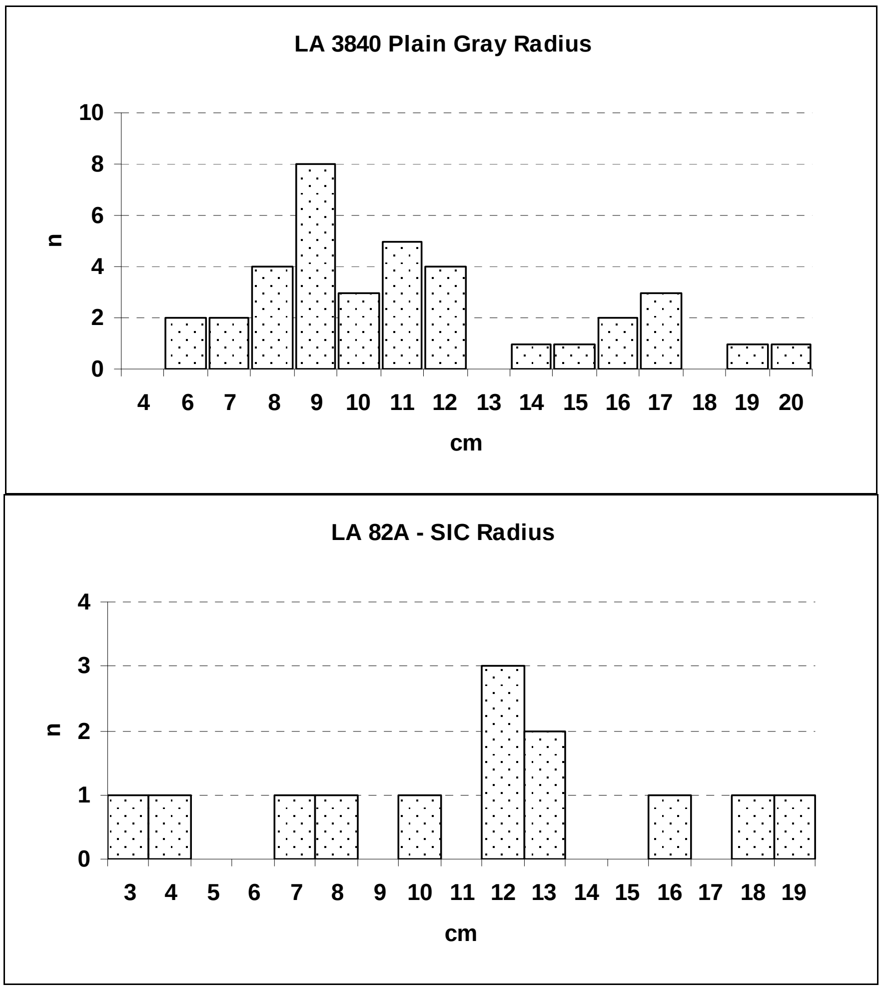


Figure 76.7a. Aperture radii for jars from LA 3840 and LA 82A.

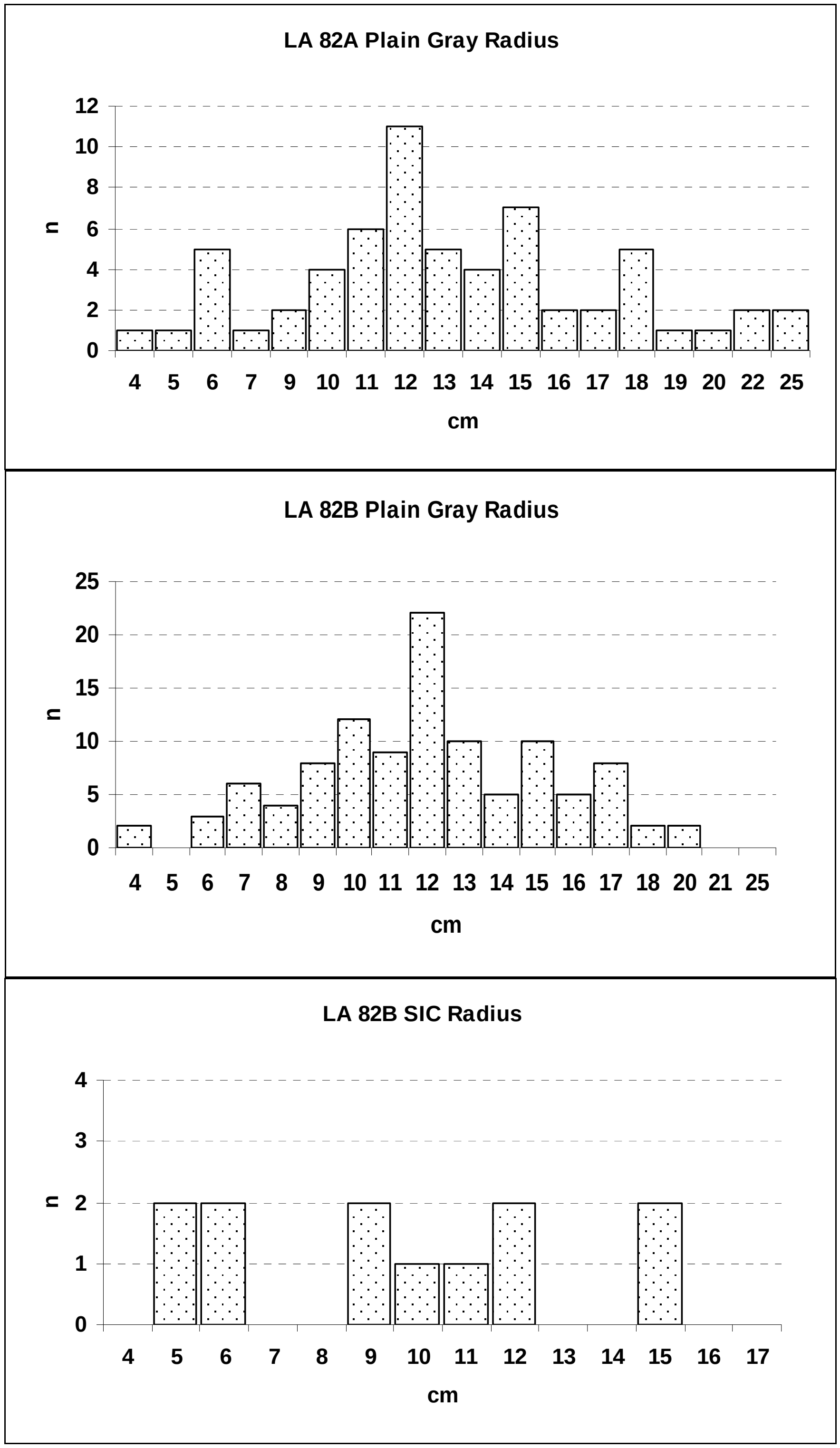


Figure 76.7b. Aperture radii for jars from LA 82A and LA 82B.

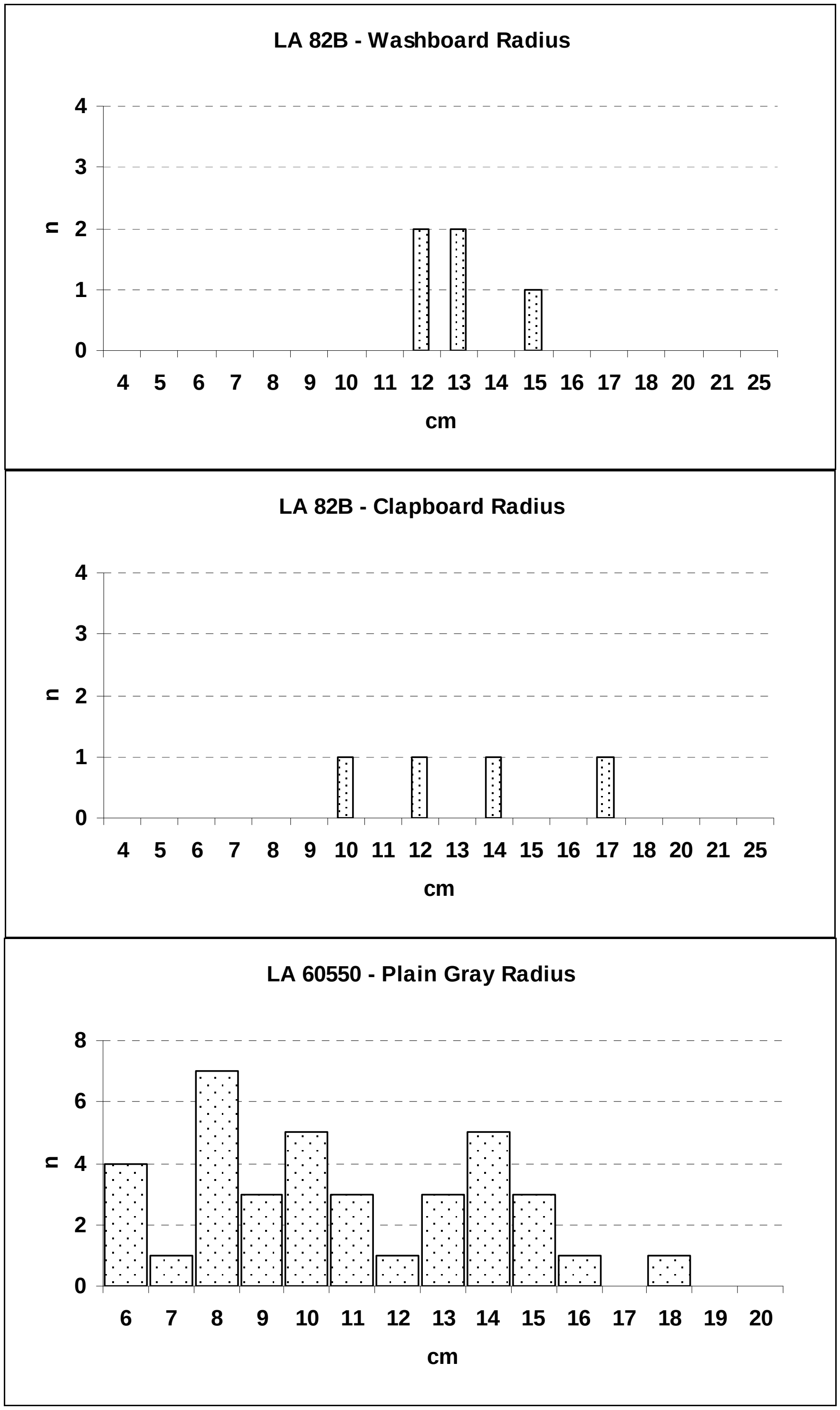


Figure 76.7c. Aperture radii for jars from LA 82B and LA 60550.

The sample of micaceous plain gray jars for both units (n = 54) includes 35 jars with aperture radii ≤14 cm (65 percent). Small micaceous jars, like the non-micaceous jars, have CVs just above 20 percent for aperture radii. In this case, however, CVs for sherd and rim thickness are between 10 percent and 15 percent, slightly lower than for the small non-micaceous plain gray vessels. CVs for large micaceous plain gray jar apertures are below 10 percent, with CVs for sherd and rim thickness between 10 percent and 20 percent, slightly higher than for large non-micaceous plain gray. Micaceous washboard jars return values for small jars only. CVs for aperture and sherd thickness go down slightly for the smaller sample, while CV for rim thickness goes up slightly.

TESTING EQUALITY OF VARIANCE

How reliable are the CVs calculated from these archaeological samples? Sample sizes are relatively small and the samples are not normally distributed. Occupation dates are imprecise and range from ca. 40 years for LA 3840 to ca. 160 years for LA 82. The number of producers, production episodes, and number of vessels produced are unknown. Dividing samples into vessel size classes magnifies the effect of these conditions.

CVs calculated in this study were compared with CVs calculated for controlled ethnoarchaeological and archaeological samples, using an Excel® algorithm provided by Jelmer Eerkens (personal communication, December 2005). The method is discussed fully in Eerkens and Bettinger (2001). It tests the equality of CVs and describes "how far sample CVs lie from the estimate of the overall population CV" (Eerkens and Bettinger 2001:499). A *p*-value less than 0.05 indicates that CVs for two samples are statistically distinct.

The controlled ethnoarchaeological samples are from studies done in the Philippines (Kvamme et al. 1996) and India (Roux 2003). Potters in the village of Dangtalan, Luzon, Philippines, produce meat and vegetable cooking pots (two-*chupa oppaya*) "primarily for household use and restricted exchange" (Kvamme et al. 1996:118). Although these are the least specialized of the potters studied in three Philippine communities, CVs for aperture, circumference, and height are below 10 percent (Kvamme et al. 1996:123; Table 4). Seasonal potters in Andhra Pradesh, India, produce *ralla catti* for cooking lentils and spinach. Each potter produces roughly 6000 vessels per year for barter or trade. Roux (2003:777; Table 4) pooled measurements taken for six individual potters for height, maximum diameter, and vessel aperture.

The archaeological samples are from a study of fine-ware bowl wasters at Tell Leilan, Syria (Blackman et al. 1993) and medium size, globular, Early Matsaki buffware jars from protohistoric Zuni Pueblo villages in New Mexico (Mills 1995). The fine-ware bowl wasters are from a single production episode dating to approximately 2300 BC (Blackman et al. 1993:63). Data are from Table 5 in Blackman et al. (1993:73). The Zuni buffware jars are dated from the 1400s–1500s through "formal and stylistic attributes" (Mills 1993:205–208). Data are from Table 8.5 in Mills (1995:222).

Eerkens' algorithm compares two samples using sample mean, standard deviation, and sample number. In this case, I held sample 1 constant, using one of the four control data sets as sample 1, and used the measurements from each of the 16 Pajarito grayware data sets as sample 2.

Pajarito Gray Ware versus Ethnoarchaeological Samples: Aperture

In the first comparison (Table 76.10a), sample 1 is aperture measurements for Dangtalan *two-chupa oppaya* and sample 2 is aperture measurements for Pajarito gray ware jars. Five samples of Pajarito grayware jars return *p*-values above 0.05. The CVs for these archaeological samples range from 8.9 to 11.3. A second comparison, made with sample 1 equal to aperture measurements for Andhra Pradesh *ralla catti*, returns only three samples with *p*-values above .05. CVs for these samples range from 8.9 to 9.5. The difference between the two ethnoarchaeological samples are 1) a slightly smaller CV for the Andhra Pradesh vessels (7.35 versus 7.47) and 2) a sample size for the Andrha Pradesh vessels, which is three times as large as that from Dangtalan.

Pajarito Grayware versus Archaeological Samples: Aperture

In the second comparison (Table 76.10b), sample 1 consists of aperture measurements for Tell Leilan fine-ware bowl wasters and sample 2 consists of aperture measurements for Pajarito grayware jars. The same five samples, with a CV range of 8.9 percent to 11.3 percent, return *p*-values greater than 0.05. A second comparison, using aperture measurements for Zuni Early buffware jars as sample 1, returns *p*-values greater than 0.05 for the same five samples of Pajarito grayware jars. Comparison of the range of *p*-values for the two sets of calculations shows that *p*-values are much higher in the two cases where sample 1 archaeological samples are used as the basis for comparison.

Pajarito versus Ethnoarchaeological and Archaeological Samples: Thickness

Only the Tell Leilan data include measurements and CVs for vessel thickness. These data and the aperture measurements for the Dangtalan vessels were used to compare CVs for vessel thickness (Table 76.10c). None of the CVs for thickness for the Pajarito Plateau vessels are below 10 percent, however, the first case returned nine *p*-values greater than 0.05. CV values for these samples range from 10.2 to 12.9. The second case returned only three *p*-values greater than 0.05. CV values for these samples range from 10.2 to 10.8. The differences between the two data sets used for sample 1 are 1) the CV for the Dangtalan apertures is lower (7.47 versus 8.14) and 2) there are twice as many vessels in the Dangtalan sample.

Examination of these comparisons indicates that the algorithm is effective in comparing CVs from less precisely controlled Pajarito Plateau archaeological samples and more precisely controlled archaeological and ethnoarchaeological samples. I can reliably report CVs for samples as small as seven vessel rims and expect that the overall population would return a similar result. However, results are affected by control sample size, mean, and standard deviation, and any interpretations should factor these in.

Table 76.10a. Coefficients of variation for vessel aperture of Pajarito Plateau archaeological samples compared with selected ethnoarchaeological samples using D'AD.

Site/Type/Size	*n* =	CV	D'AD Dangtalan Aperture (*n* = 55; CV = 7.47)	*p* =	D'AD Andhra Pradesh Aperture (*n* = 166; CV = 7.35)	*p* =
Coalition vessels						
LA 12587 SIC small	41	33.1	83.17445514	7.51222E-20	293.3623485	9.20334E-66
LA 86534 SIC small	26	27.0	64.599789	9.17652E-16	177.1148406	2.06726E-40
LA 60372 SIC small	59	27.8	64.9743775	7.58783E-16	227.7237487	1.86967E-51
LA 82B SIC small	10	32.9	75.92290679	2.94958E-18	157.8622795	3.31691E-36
LA 12587 SIC large	**10**	**9.5**	**0.883598443**	**0.347217991**	**1.94673415**	**0.162939285**
LA 86534 SIC large	**8**	**11.3**	**2.552654416**	**0.110109153**	4.501394103	0.033867237
LA 60372 SIC large	18	18.8	28.49075516	9.4147E-08	59.45313669	1.25241E-14
LA 82B SIC large	2	-	-	-		
Classic vessels						
LA 82A Plain small	25	24.0	54.49601182	1.55764E-13	140.6434166	1.92538E-32
LA 82B Plain small	51	22.8	50.35034703	1.28607E-12	156.5938166	6.27924E-36
LA 82A Mica small	9	22.9	35.78095284	2.20796E-09	64.02665064	1.22747E-15
LA 82B Mica small	26	20.1	36.53209985	1.50173E-09	87.66204056	7.76504E-21
LA 82A Plain large	16	16.8	20.68653242	5.40951E-06	40.62530606	1.84403E-10
LA 82B Plain large	**18**	**10.4**	**3.105968432**	**0.078005843**	**6.616864498**	**0.010101753**
LA 82A Mica large	**7**	**8.9**	**0.320027286**	**0.571591251**	**0.80050273**	**0.370943107**
LA 82B Mica large	**12**	**9.1**	**0.393570275**	**0.530428659**	**1.141682766**	**0.285297272**

Table 76.10b. Coefficients of variation for vessel aperture of Pajarito Plateau archaeological samples compared with selected archaeological samples using D'AD.

Site/Type/Size	*n* =	CV	D'AD Tell Leilan Aperture (*n* = 23; CV = 9.19)	p =	D'AD Zuni Aperture (*n* = 58; CV = 9.3)	*p* =
Coalition vessels						
LA 12587 SIC small	41	33.1	24.27886338	8.33487E-07	66.28767067	3.89689E-16
LA 86534 SIC small	26	27.0	19.80558652	8.57317E-06	44.68048053	2.31958E-11
LA 60372 SIC small	59	27.8	19.40715426	1.05611E-05	49.96130509	1.56808E-12
LA 82B SIC small	10	32.9	26.48407062	2.6572E-07	49.85739683	1.65336E-12
LA 12587 SIC large	**10**	**9.5**	**0.019357526**	**0.889346373**	**0.000939989**	**0.975541301**
LA 86534 SIC large	**8**	**11.3**	**0.508634728**	**0.475730472**	**0.36851476**	**0.543814967**
LA 60372 SIC large	18	18.8	9.177494868	0.002450092	14.78688178	0.00012037
LA 82B SIC large	2	-	-	-	-	-
Classic vessels						
LA 82A Plain small	25	24.0	16.92572181	3.88713E-05	35.62569391	2.39113E-09
LA 82B Plain small	51	22.8	14.97103764	0.000109174	34.53075347	4.1957E-09
LA 82A Mica small	9	22.9	13.4422984	0.000246014	19.91941361	8.07759E-06
LA 82B Mica small	26	20.1	11.24420822	0.000798719	20.93789955	4.74415E-06
LA 82A Plain large	16	16.8	6.61856232	0.010092127	9.561559364	0.001986943
LA 82B Plain large	**18**	**10.4**	**0.368711009**	**0.543707719**	**0.229035914**	**0.632239607**
LA 82A Mica large	**7**	**8.9**	**0.004191625**	**0.948378814**	**0.046938056**	**0.828479618**
LA 82B Mica large	**12**	**9.1**	**0.025936519**	**0.872055447**	**0.13658629**	**0.711698567**

Table 76.10c. Coefficients of variation for sherd thickness of Pajarito Plateau Archaeological samples compared with both archaeological and ethnoarchaeological samples using D'AD.

Site/Type/Size	*n* =	CV Thickness	D'AD Tell Leilan Thickness (*n* = 28; CV = 8.14)	*p* =	D'AD Dangtalan Aperture (*n* = 55; CV = 7.47)	*p* =
Coalition vessels						
LA 12587 SIC small	41	13.7	5.621391	0.017743	19.25117	1.15E-05
LA 86534 SIC small	**26**	**11.6**	**1.265595**	**0.260595**	6.720567	0.009531
LA 60372 SIC small	59	16.4	7.547367	0.00601	24.68787	6.74E-07
LA 82B SIC small	**10**	**10.8**	**0.583866**	**0.444801**	**3.14447**	**0.076185**
LA 12587 SIC large	**10**	**11.9**	**0.967775**	**0.325236**	4.2179	0.04
LA 86534 SIC large	**8**	**12.7**	**0.961696**	**0.32676**	**3.868941**	**0.049188**
LA 60372 SIC large	**18**	**10.2**	**0.378967**	**0.538157**	**3.262354**	**0.070887**
LA 82B SIC large	2	-	-	-	-	-
Classic vessels						
LA 82A Plain small	**25**	**11.8**	**0.964706**	**0.326004**	5.732862	0.01665
LA 82B Plain small	51	15.4	7.136111	0.007555	23.45271	1.28E-06
LA 82A Mica small	**9**	**10.2**	**0.23433**	**0.628332**	**1.907642**	**0.167225**
LA 82B Mica small	26	14.8	6.50357	0.010766	20.33092	6.51E-06
LA 82A Plain large	**16**	**12.9**	**1.769164**	**0.183486**	7.192918	0.007319
LA 82B Plain large	**18**	**11.8**	**2.119792**	**0.145406**	8.363774	0.003828
LA 82A Mica large	7	16.8	5.409731	0.020025	13.59401	0.000227
LA 82B Mica large	12	14.3	4.401229	0.035913	12.93412	0.000323

DISCUSSION

Surface Treatment Change

The dominant culinary ware type changes from smeared-indented corrugated at Coalition sites to plain gray at Classic sites, as service ware types are also changing. The proportion of culinary sherds decreases at Classic sites.

Temper Change

Most smeared-indented corrugated sherds contain coarse, subangular feldspar and quartz sand-sized crystals from anthills. About one-fifth of the smeared-indented corrugated at the later Coalition site, LA 60372, appears to have inclusions of finer, more angular feldspar and quartz. The small quantities of smeared-indented corrugated at Classic sites, as well as the plain gray jars that dominate the Classic assemblages, are mainly tempered with this finer material (see also Wilson and Castro-Reino 2005:6).

Micaceous ware, which is rare in any Coalition assemblage, becomes an important part of the ceramic assemblage at LA 82, the largest Classic site, especially in the upper levels of the two excavation units. There is much less micaceous culinary ware at the two smaller Classic sites. Five micaceous washboard jar rims, likely to have come from the Chama-Española area, appear washed with a mica solution. These occur only in one unit at LA 82. This suggests that although micaceous washboard jars may have been brought to Tyuonyi, none were brought to the Annex.

Size Change

More than three-quarters of all jars at Coalition sites are small, with aperture radii less than or equal to 12 cm.

Large smeared-indented jars at LA 12587 show a peak size distribution at 16 cm and have a CV of 9.5 percent, strongly suggesting production by a small number of skilled potters. The large plain gray jars at this site have a CV just above 10 percent. There is some suggestion of short-distance whiteware exchange, based on the composition of the volcanic lithic fragments (Wilson and Castro-Reino 2005:8), but culinary ware temper composition does not differ from other sites on the Pajarito. This would suggest specialized local production of this ware.

The presence of very large smeared-indented corrugated jars at LA 60372, the plaza pueblo, suggests cooking for larger groups, either extended families or communal feasts. The CV for these jars, however, is higher.

The mean size of plain gray jars at Coalition sites is greater than for smeared-indented corrugated. This could indicate a temporal trend toward larger jars. While samples of plain gray are small, several have low CVs, which might represent the work of one potter.

Classic period assemblages have a larger proportion of jars with openings ≥13 cm, and the upper end of the size range is greater. The breakpoint between large and small jars appears to shift upward in the Classic period. Four samples of large jars have low CVs: LA 82 Unit B micaceous washboard (n = 5; CV = 9.4%) and plain micaceous in Unit A (n = 7; CV = 8.9%) and Unit B (n = 12; CV = 9.1%). LA 60550 has 13 large plain gray jar sherds with CV = 9.6 percent.

Thickness

Plain gray jars are always thicker than smeared-indented corrugated. Increased wall thickness would increase resistance to mechanical stress and would transfer heat more slowly, possibly indicating a change in food preparation methods to longer, slower cooking (Skibo 1994). Reduction in breakage might account for the lower proportion of culinary sherds in Classic period assemblages.

Most CVs for Coalition types of both sizes are less than 20 percent. When the Classic period sample is subdivided by type and temper, CVs for both micaceous and non-micaceous plain gray jar sherds and rim thickness are less than 20 percent.

Rim Thickness

Plain gray jar rims are thicker in the Classic than the Coalition, and always have a greater mean rim thickness than smeared-indented corrugated. Rim thickness may be more of a stylistic attribute than a functional attribute, but a thicker rim may add to the strength of the vessel and increase its use-life. Most CVs for rim thickness fall between 10 percent and 20 percent in both the Coalition and Classic periods.

Coefficients of Variation

A large number of CVs for size, body thickness, and rim thickness fall between 10 percent and 20 percent in both the Coalition and the Classic. The number of CVs below 10 percent is greater in the Classic period, especially when the sample is subdivided according to the presence or absence of mica in the paste.

Many Coalition CVs below 10 percent may be an effect of the small sample size. While a small sample with a low CV might indicate the output of a single potter, a larger sample with a low CV could indicate size standardization. The former may be the case at LA 86534, where the sample is small, while the larger sample of large smeared-indented corrugated jars at LA 12587 may indicate the latter. Because corrugations and smearing create additional variability in thickness, smeared-indented corrugated jars show little standardization of this attribute except possibly at LA 60372.

CVs for Classic period jars are mainly between 10 percent and 20 percent, with exceptions for very small samples. However, when the Classic period jars at LA 82 are analyzed based on presence or absence of mica in the paste, the CVs for all attributes are lower. Here many samples are large enough to suggest attribute standardization rather than a lower number of producers.

CONCLUSION

This preliminary examination of Pajarito culinary ware shows changes from the Coalition to the Classic period in surface treatment, inclusions, size range, ratio of large to small vessels, and vessel wall and rim thickness. These changes are not in lock-step; they differ in timing according to settlement size and type and may be part of an overall increase in large-group feasting activities.

The presence of much larger jars at LA 60372 in the Late Coalition may indicate food preparation in larger quantities, suggesting larger family groups or communal feasting. There is evidence of a trend toward standardization at LA 12587 and at LA 60372, which could indicate either specialized production for local exchange at those sites, or trade with specialists from another community. Standardization in the smaller samples may indicate output by a few skilled domestic specialists.

Vessel size range, the proportion of large jars, and the degree of size standardization increases from the Coalition to the Classic period at these Pajarito sites. Production of large jars requires a higher degree of skill, and these may have been made by fewer potters, resulting in a more standardized size range. If large jars were being produced for special functions or events, then size range may have also been prescribed (B. Stark 1995).

Vessel thickness and rim thickness also increase from Coalition period smeared-indented corrugated to Classic period plain gray. This may relate to changes in cuisine, cooking practices, or in fuel available for cooking and/or firing (see Curewitz 2004b for discussion). Thickness of plain versus smeared-indented corrugated may be related to the change in temper material, but may also relate to vessel size.

Micaceous sherds make up 23 percent of the culinary ware at LA 82, but only 0.4 percent and 0.7 percent, respectively of the culinary ware at LA 3840 and LA 60550. These vessels were not produced on the plateau. They clearly show attribute standardization and may have been produced for exchange by specialist potters. The quantities present suggest that they were an important item of exchange for the inhabitants of the large plaza pueblo but not for those of the two smaller Classic period sites.

CHAPTER 77
CERAMIC ANALYSIS AND INTERPRETATION OF CLASSIC PERIOD PUEBLOS ON LOS ALAMOS NATIONAL LABORATORY LAND COLLECTED BY THE PAJARITO ARCHAEOLOGICAL RESEARCH PROJECT

Samuel Duwe

INTRODUCTION

Archaeological questions of identity, technology, and craft specialization have preoccupied researchers over the past 25 years. By understanding the methods and use-life of craft (such as pottery) it becomes possible to delineate interesting patterns in the material record. These can be used to infer group identity and modes of social cohesion, social boundaries, and interactions and relationships at an inter- and intra-site level. This research also is important to descendent communities of prehistoric people whose material culture is being analyzed. These lines of inquiry make it possible to not only understand the presence and location of a prehistoric society in culture historic terms, but also create ways in explaining this behavior.

The above questions are especially pertinent in the American Southwest where a detailed culture history has been devised, making it possible to ask detailed and somewhat abstract questions. The reason for the precision of knowledge of the archaeological record owes much from the over 100 year history of investigation and inquiry. The northern Rio Grande is no exception. In fact, much of the early work in the Southwest was performed near or amongst the modern Rio Grande pueblos. This area was also subject to many ethnographic analyses, which has given researchers the ability to use analogies of Pueblo behavior as an effective middle-range theory in interpreting prehistoric ruins and artifacts.

Even with this excellent knowledge of the archaeological record, as well as a firm base in the ethnographic and ethnohistoric literature, certain large portions of prehistory have yet to be addressed, or if already addressed, more completely understood. This includes Classic period (AD 1325–1600) prehistoric Tewa populations on the Pajarito Plateau. Although a general understanding of their location and material culture are understood, questions of chronology, identity, and the degree of craft specialization and pottery technology have not been successfully answered. Another problem that plagues the entire field of archaeology is the collection of artifacts that remain unanalyzed. This too is true of many collections of northern Rio Grande sites currently housed in museums but never examined to their full potential (or in many cases, not at all).

This report examines ceramics collected from two Classic Period sites on the Pajarito Plateau by the Pajarito Archaeological Research Project (PARP): Otowi (LA 169) and Tsirege (LA 170). These collections have never been fully analyzed and their analysis promises answers to a broad range of questions, including those mentioned above. I will first briefly describe the study area and the history of archaeological research. After laying out a research design for analyzing these collections, I analyze multiple attributes of pottery sherds (both painted and utilitarian wares) including not only basic visual properties but also microscopic temper/paste characteristics and the results of refiring oxidation experiments. These results are interpreted using a theoretical and methodological approach that addresses questions of chronology, identity, technology, and craft specialization.

Of course, ceramics from the surface of two sites can only reveal so much information about regional patterns of exchange, specialization, and identity. Near the end of this report, the results of this analysis are compared with existing data from other pueblos in the northern Rio Grande region to make preliminary hypothesis of regional interaction during the Classic period. Further directions for future research are suggested to fully incorporate these results into the larger culture history of northern New Mexico.

THE PAJARITO PLATEAU NATURAL ENVIRONMENT AND CULTURE HISTORY

The Pajarito Plateau is defined as the high mesas that slope eastward from the Jemez Mountains to the Rio Grande Valley in north-central New Mexico, ranging from Puye ruins on the Santa Clara Pueblo Reservation to the north to Canada de Cochiti near present day Santa Fe in the south (Steen 1977). The magnitude of this area both in size and environmental diversity is represented in the change of elevation: 1590 m (5217 ft) above sea level at the Rio Grande to 3526 m (11,568 ft) at Tschicoma Peak in the Jemez (Allen 2004). Geologically, the landscape is formed by the explosion and collapse of a great volcano (1.4 and 1.1 million years ago), which created the Valles Caldera to the west and whose remnants formed the Jemez Mountains and canyon-dissected tuff plateaus on their eastern flank. The area experiences a semi-arid climate with a mean annual precipitation of 40.7 cm (Allen 2004)—a climate that can reasonably be extended into prehistory (Dean and Robinson 1977). Vegetation ranges from juniper (*Juniperus monosperma*) grasslands in the lowlands, juniper and piñon pine (*Pinus edulis)* woodlands on the raised mesas, and ponderosa pine (*Pinus ponderosa*) in the mountains (Allen 2004).

Although the natural landscape can be separated into three unique and easily identifiable categories, the cultural landscape is more difficult to discern. The earliest human occupants in the region were Paleoindian foragers (9500–5500 BC) who most likely ventured across the plateau during hunting expeditions or raw material procurement endeavors. The evidence lies in projectile points: a Folsom point was found during the Los Alamos National Laboratory (LANL) survey (Steen 1977:7) and Clovis, Folsom, and Plainview points were identified in the general study area (Acklen 1993, 1997; Lent et al. 1986; Traylor et al. 1990; Wiseman 1992).

Archaic period (5500 BC–AD 600) foragers appear to have occupied the plateau at least seasonally, hunting small and large game (rabbits and deer) and procuring nearby lithic materials. Evidence takes the form of projectile points, obsidian lithic tools, and stone chipping debris (Vierra et al. 2002). Summer sites used for pine nut harvesting, hunting, and rock collection were recorded and interpreted (Baker and Winter 1981; Biella 1992; Moore et al. 1998), as were winter sites nearer the Rio Grande in the piñon grasslands (Lent 1991).

The first Pueblo occupation was during the Developmental period (AD 600–1150). Although there are few sites with corresponding diagnostic Kwahe'e Black-on-white ceramics, those that are found are small pithouses and lithic and ceramic scatters (Vierra et al. 2002). Because of this low frequency of sites, it can be interpreted that there was a minor Pueblo presence during the Developmental period and that these people were practicing a mixed subsistence: that of mostly foraging with some maize horticulture.

During the Coalition period (AD 1150–1325), the plateau saw a large increase in the number of sites. Year-round settlement appeared in the uplands and there was an increased reliance on agriculture as evidenced by agricultural features such as check dams and gravel mulch gardens (Vierra et al. 2002). This rapid population growth has been attributed to migration (Wendorf and Reed 1955) or population explosion (Steen 1982).

The Classic period (AD 1325–1600) saw an even greater increase in the reliance on agriculture and populations aggregated into multiple large centers. At these centers were large pueblos with various other corresponding sites such as fieldhouses, shrines, and smaller pueblos. These main pueblos were Tsirege, Tsankawi, and Otowi and are typed by the presence of biscuitware (Vierra et al. 2002). At this time there was also the apparent solidification of a Tewa group, defined by pottery and settlement patterns. To the south, this aggregation had created tightly definable regions as well, especially along traditional cultural lines. This is seen most spectacularly with the change in ceramic assemblage between the northern Pajarito Plateau and pueblos to the south. These pueblos were specializing in the manufacture of Rio Grande glazewares and the Tewa groups were producing their own distinct biscuitware vessels.

HISTORY OF PAST ARCHAEOLOGICAL RESEARCH

Although the area was visited and sites were mentioned by early explorers, the first true archaeological investigation of the Pajarito Plateau was by Adolph Bandelier who collected artifacts from the major sites of Otowi and Tsirege (Bandelier 1892). The first large publications of the major sites were by Edgar Lee Hewett and Lucy Wilson. Hewett (1904, 1905, 1906, 1908a) recorded and sketched some of the largest Classic Pueblo ruins located on LANL property, including Otowi and Tsirege (Figure 77.1). Wilson led excavations at Otowi from 1915 to 1917 and produced information in the northern roomblocks of the site (Wilson 1916a, 1916b, 1917, 1918a, 1918b). Harry Mera surveyed the Plateau in the 1920s and 30s, recording some of the same large Classic period pueblos and collecting ceramics in which he constructed an initial chronology that dated the sites of Tsirege and Otowi to the 14th and 15th centuries (Mere 1932, 1934). Through the mid-part of the century, further work on the plateau was performed by archaeologists working under the auspices of LANL (Steen 1977, 1983; Worman and Steen 1978) and Bandelier National Monument (Turney 1955). These included test excavations and extensive survey projects.

The PARP was the first systematic survey of the region. Conducted from 1977 to 1985, the project was lead by James Hill of the University of California, Los Angeles (UCLA). The survey recorded 935 sites, 445 which were multi-room masonry dwellings ranging from one- to three-room fieldhouses to large multi-storied plaza pueblos (Hill et al. 1996). Small test excavations were performed on the smaller sites, whereas large-scale collection of artifacts was performed on the large Classic period sites (Otowi and Tsirege). Much of this material, including ceramics, remains unanalyzed at the UCLA. The main theoretical framework of the project was the understanding of settlement patterns and demographics of sites to interpret prehistoric people of the plateau's adaptation to environmental and social stress. This included preliminary dating, mapping, and collection at all accessible sites.

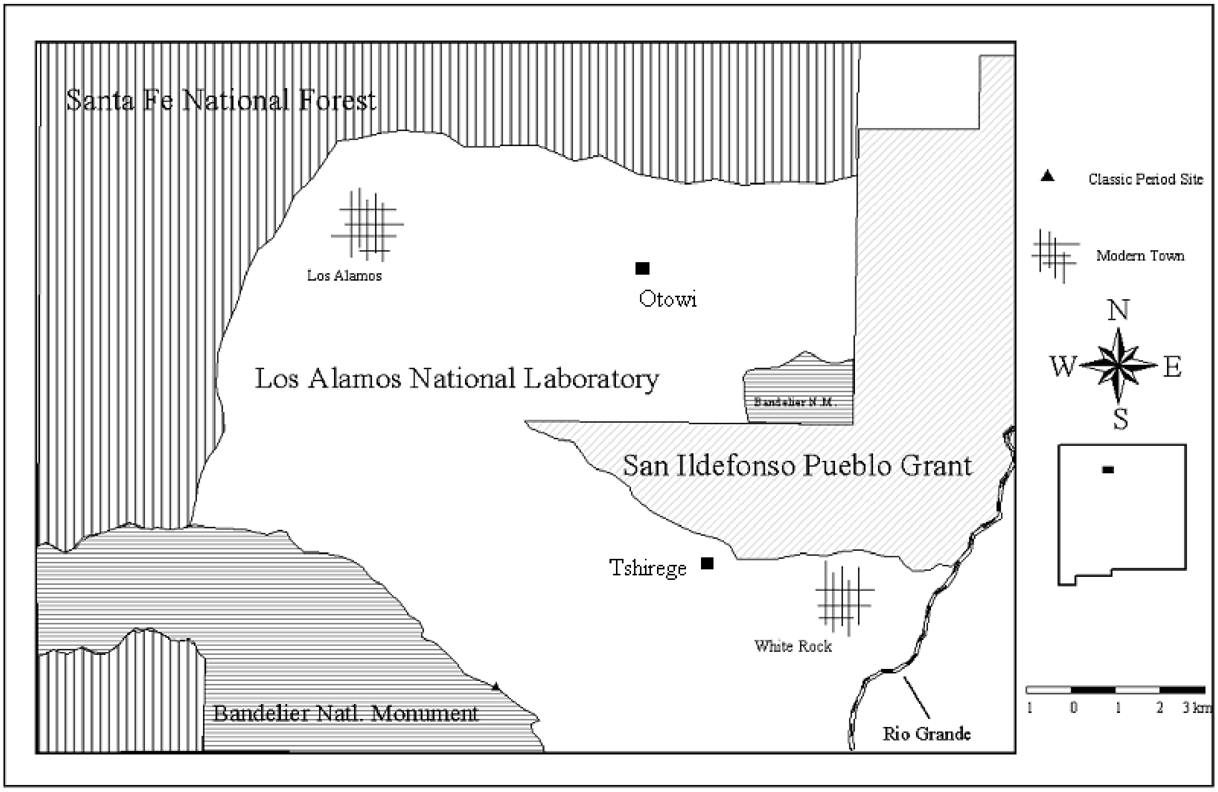


Figure 77.1. Classic period sites at LANL selected for analysis.

Up until the present, various LANL archaeologists have performed culture resource management work across the northern Pajarito Plateau in which LANL (United Stated Department of Energy) owns much of the land. The most important of these projects was the survey and synthesis of LANL data. As of this report, 16,000 acres of LANL lands have been 100 percent surveyed, with another 5,500 acres unsystematically examined. A total of 1595 sites have been recorded (Vierra et al. 2002). Currently, LANL archaeologists are completing the Land Conveyance and Transfer Project in which a multitude of smaller one- to three-room Coalition and Classic period fieldhouses have been excavated. This data will help in understanding chronology, settlement, and subsistence patterns during these periods on the Pajarito Plateau.

STUDY AREA AND SAMPLE

Otowi (LA 169)

Otowi (LA 169) is a very large Classic period pueblo with 700 or more ground floor rooms, including five rubble mounds and several kiva and midden areas. Both tree-ring and ceramic samples have dated the site tentatively to the AD 1400s (see Chapter 7, Volume 1). The pueblo is divided into five roomblocks and seven kivas. The roomblocks are estimated to be two to three stories tall (Hewett 1953). The site was first excavated by Hewett (1906, 1953) and reported by Lucy Wilson (1916a, b), where the first detailed maps and analyses were presented. PARP crews in the 1970s parceled the site into 12 units (A–H and J–M) and surface collected 100 percent of the ceramic assemblage within these units (PARP 1978) (Table 77.1). The site was again revisited in 1999 by LANL archaeologists who performed infield analyses of surface ceramics (LANL 1999) (see Figure 77.2 for a map of the sites as well as the location of collection units from both PARP and LANL analyses).

Table 77.1. PARP collection units at Otowi and their associated sizes and reasons for collection (from PARP 1978).

Unit	Location	Size	Reason Collected
A	Central mound (backdirt?)	3- by 3-m grid square	For midden and backdirt samples (from previous excavations)
B	Primary midden	2- by 2-m grid square	For midden and backdirt samples (from previous excavations)
C	Central mound (backdirt?)	2- by 3-m grid square	For midden and backdirt samples (from previous excavations)
D	Primary midden	2- by 2-m grid square	For midden and backdirt samples (from previous excavations)
E	South of Roomblock A	3- by 3-m grid square	To obtain ceramics from earlier occupations
F	South of Roomblock A	1- by 2-m grid square	Revealed glazeware
G	South of Roomblock A	1- by 1-m grid square	Revealed glazeware
H	Roomblock A	2- by 2-m grid square	As a check to make sure no important components were missed
J	West of Roomblock B	2- by 2-m grid square	As a check to make sure no important components were missed
K	West of Roomblock B	2- by 2-m grid square	To obtain ceramics from earlier occupations
L	Adjacent to Roomblock B	2- by 2-m grid square	As a check to make sure no important components were missed
M	South of Roomblock A	0.5- by 0.5-m grid square	Revealed glazeware

The excavations by Wilson (1916a, b) revealed that Roomblock A was most likely the oldest occupation of the site, which she called the "old pueblo." However, very little information is known on the extent of these excavations as well as by those of Hewett (1906). In fact, there is debate whether the central earthen mound is backdirt from these early excavations (as proposed by PARP crews) or a "burial mound" (Hewett 1906). Most likely it is a mixture of both, although this has been difficult to prove using surface collections alone. This problem points to the complexity of both natural and cultural transformation processes (Schiffer 1976) that affect the composition of ceramic assemblages in surface contexts.

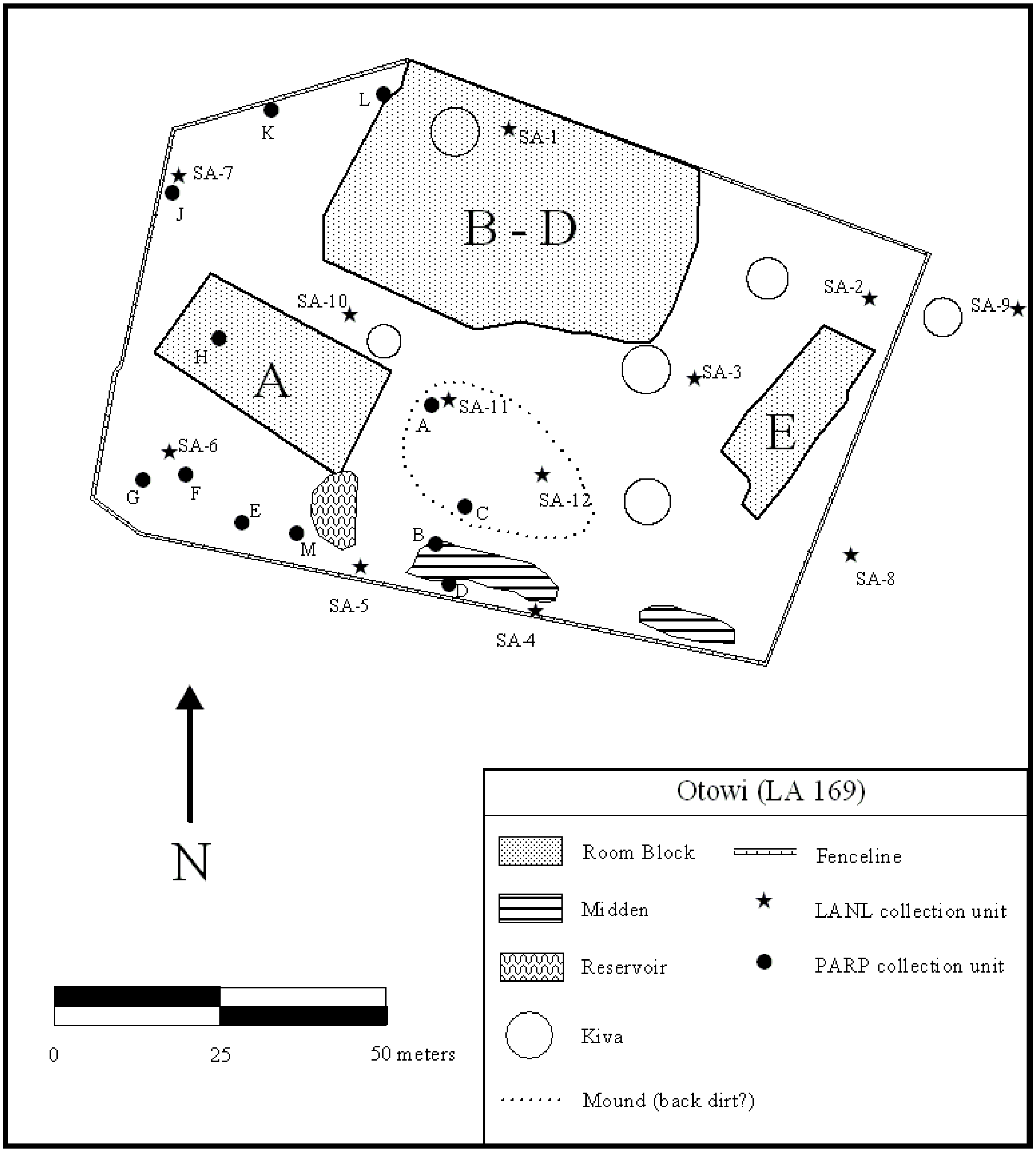


Figure 77.2. Map of Otowi (LA 169) with both PARP and LANL collection units.

Otowi is an important site to many groups for it is claimed as an ancestral home for the modern Pueblo residents of San Ildefonso Pueblo. It also holds a great deal of interest to archaeologists because of its location on the southern edge of the historic Tewa language (and ethnic) area. The analysis of ceramic at the site may aid researchers in understanding the occupational sequence of the site and its relationship with Keres speaking groups to the south, a perennial and still debated question to the nature of this historic ethnic boundary that possibly extended back into prehistory.

Tsirege (LA 170)

Tsirege is a large Classic period site located on the north side of Pajarito Canyon near the modern town of White Rock. Limited tree-ring samples have dated it to the AD 1500s (see Chapter 7, Volume 1), although no ceramic cross-dating has been performed. The site has many large features that include the masonry pueblo, kivas, middens, a reservoir, and numerous small cavates in the surrounding canyon (Hewett 1938). The original excavations were performed by Edgar Hewett in the early 20th century and the site has been studied by LANL archaeologists since mid-century. PARP crews sectioned the pueblo into six horizontal spatial units (A-F) and collected each (Figure 77.3). Tsirege has the largest ceramic assemblage of the sites collected by PARP (Table 77.2).

Table 77.2. PARP collection units at Tsirege and their associated sizes and reasons for collection (from PARP 1979).

Unit	Location	Size	Reason for Collection
A	Southeast of east roomblock, near (or part of) midden	7- by 5-m grid square	Representative of east roomblock
B	South of Plaza 1 in primary midden	5- by 5-m grid square	Representative of west roomblock
C	Center of Plaza 1	5- by 5-m grid square	Representative of main plaza
D	North of north roomblock in midden	5- by 5-m grid square	Representative of north roomblock
E	Near primary midden	1- by 1-m grid square	Pothunter's cache
F	Southeast of east roomblock	1- by 1-m grid square	Pothunter's cache
G	Southeast of east roomblock	1- by 1-m grid square	Pothunter's cache
H	Southern portion of east roomblock	1- by 1-m grid square	Pothunter's cache
J	Plaza 2	5- by 5-m grid square	Representative of Plaza 2
K	East roomblock	1- by 1-m grid square	Pothunter's cache
L	Plaza 1	1- by 1-m grid square	Pothunter's cache
M	East roomblock midden	1- by 1-m grid square	not specified
N	Near east roomblock midden	1- by 1-m grid square	not specified
O	Southwestern corner of west roomblock	1- by 1-m grid square	not specified
P	Northwest of north roomblock (near reservoir)	1- by 1-m grid square	not specified
Q	Northwest of north roomblock (near reservoir)	1- by 1-m grid square	not specified

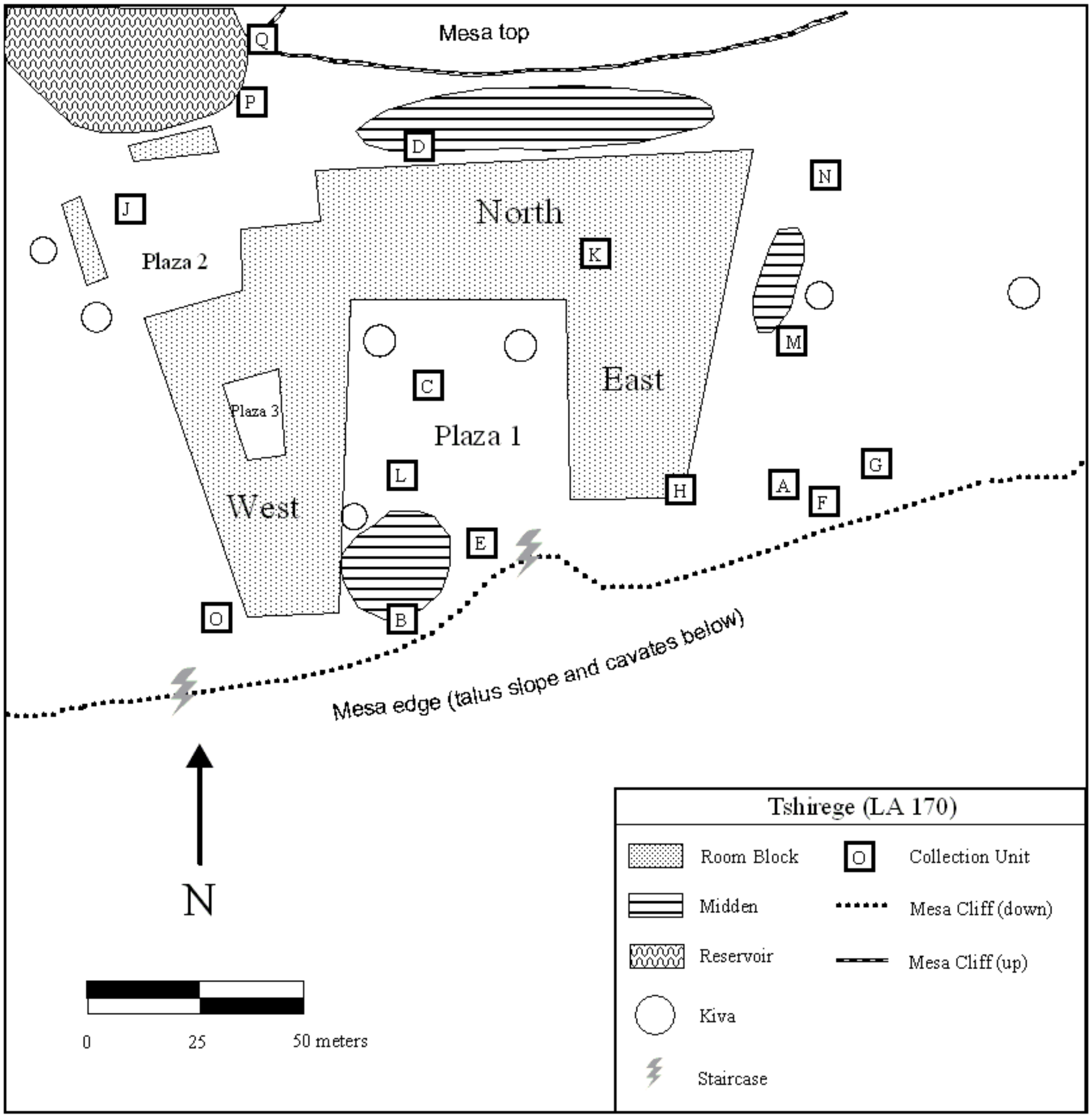


Figure 77.3. Map of Tsirege (LA 170) and PARP collection units.

Tsirege consists of three large connected roomblocks (described in this analysis as the Eastern, Western, and Northern roomblocks) surrounding a main plaza. Each roomblock has an associated midden that was the focus of testing for much of the PARP collection units. In the northeastern portion of the site, there are two small roomblocks with a plaza and two associated kivas. Although no official midden is documented, the plaza contains a great deal of sheet trash (PARP 1979). It is likely that this area represents an older (or first) occupation of the site, a question that will be tested in this subsequent analysis.

Tsirege is an important site because, like Otowi, it is regarded as an ancestral home to the residents of San Ildefonso Pueblo. It also holds a great deal of interest to archaeological researchers for it is regarded as a Late Classic period site near the border of the traditional Tewa/Keres boundary. It is also a pueblo that was likely recorded by early Spanish explorers associated with Coronado's exploration up the Rio Grande (Schroeder and Matson 1965).

THE NORTHERN RIO GRANDE CERAMIC ASSEMBLAGE

Tewa Series

The Pajarito Plateau has traditionally been classified as part of the "biscuitware" area that also includes the Chama drainage to the north. The region correlates with the spatial extent of historic Pueblo linguistic groups; the Tewa pueblos are most likely the descendants of these archaeological communities. The area is unique from other regions in the northern Rio Grande for while areas to the south began to produce glaze-painted pottery, a black-on-white ceramic tradition continued and evolved. The first systematic study of ceramics from the region was by A. V. Kidder (1915) who later chronologically seriated the entire region's pottery from ceramics found in the deeply stratified contexts of Pecos Pueblo (1936). Formal names were given to these types in Kidder's monograph (1936) as well as in the seminal work by H. P. Mera (1932, 1935). Numerous other syntheses and chronological reevaluations took place mid-century (see Wendorf and Reed 1955) but in an important work, Harlow (1973) laid out the general date ranges for the ceramics from the biscuitware pueblos, also known as the Tewa series. In the past 30 years, several periods of refinement have come to bare, and the dating that is used in this report is described in Table 77.3.

Table 77.3. Types of Tewa Series pottery and associated date ranges.

Type	Dates	References
Kwahe'e Black-on-white	1075–1175	Habicht-Mauche 1993
Santa Fe Black-on-white	1175–1425	Habicht-Mauche 1993
Wiyo Black-on-white	1250–1475	Habicht-Mauche 1993; Wendorf 1953:45
Abiquiu Black-on-gray	1375–1450; to 540(?)	Breternitz 1966:69; Habicht-Mauche 1993
Bandelier Black-on-gray	1400–1550	Breternitz 1966:70
Cuyamungue Black-on-cream	1475–1600	Harlow 1973
Sankawi Black-on-cream	1550–1650	Breternitz 1966:94; Harlow 1973; Smiley et al. 1953:58
Tewa Red/Polychrome	1650–1730?	Harlow 1973; C. Schaafsma 2002:149

Kwahe'e Black-on-White

Dating from the 11th and 12th centuries, Kwahe'e Black-on-white was the dominant ware across the Rio Grande region. This also includes the Taos Region to the north and east, which has a local variety termed Taos Black-on-white (Fowles 2004). It appears to be an indigenous phenomenon that marks the beginning of a long tradition of black-on-white painted pottery production unique to the region (Habicht-Mauche 1993:15). Although the paste is similar to the succeeding Santa Fe Black-on-white ceramics (quartz sand and volcanic ash), the paint is mineral based versus the carbon (organic) based paints of later traditions (Habicht-Mauche 1993). Ending at the end of the 12th century, the type correlates with the later part of the Developmental period (AD 600–1150), although the type is found among the surface contexts (rarely) of Coalition period sites on the Pajarito Plateau (de Barros 1981).

Santa Fe Black-on-White

During the 13th century, this ware spread rapidly over the entire northern Rio Grande region, dominating the ceramic assemblage of all sites through the 14th century. The type is easily distinguished by its carbon paint and distinctive blue-gray paste (Mera 1935). Santa Fe Black-on-white has been described as remarkably uniform in both color and texture (Habicht-Mauche 1993:20), although recent petrographic work suggests that regional variations in tempering material exist (Wilson and Castro-Reino 2005). Regardless, it appears that the type was made locally by potters across a wide region who probably shared in some sort of regional identity (Futrell 1998; Graves and Eckert 1998). Although it is believed that this type was replaced by Wiyo Black-on-white (and later Abiquiu Black-on-gray) by the beginning of the 15th century, Habicht-Mauche (1993:19) argues that there is evidence (both tree-ring and archaeomagnetic) that Santa Fe Black-on-white was being produced up through the first quarter of the 1400s, at least after AD 1410.

Wiyo Black-on-White

Compared to its predecessor, Santa Fe Black-on-white, Wiyo Black-on-white has a limited geographic area restricted to the Tewa region (lower Chama River drainage, Espanola, Valley, and the northern Pajarito Plateau). The type has a dark black organic paint on a polished (sometimes slipped) surface with design elements that resemble the earlier Santa Fe Black-on-white ceramics. The real difference that distinguishes this type is the clay body composition, with a trend toward fine-grained tuff and smaller amounts of sand/silt inclusions. It is this quality that caused both Kidder and Amsden (1931) and Mera (1935) to call this type "biscuitoid." Wiyo Black-on-white is widely believed to be the predecessor of the later biscuitwares. The type is associated with Late Coalition/Early Classic period sites.

Abiquiu Black-on-Gray (Biscuit A)

Also referred to as Biscuit A, Abiquiu Black-on-white ceramics have thick walls and fine textures and light paste, hence looking like unfired porcelain, or *bisque*. This type is restricted almost entirely to bowl forms where the exterior is rough and unpolished and the interior is polished, often slipped, and has striking dark organic paint painted in broad lines. The production area for these wares appears to be centered on the Española and Chama Valleys, and perhaps the northern Pajarito Plateau, although this has not been substantially tested (Habicht-Mauche 1993:26). The distinguishing features of the biscuitwares are their thick, porous, and light clay body and paste. Previous analyses have indicated that these wares are untempered, with fine tuff paste. Abiquiu Black-on-white sherds from Arroyo Hondo, however, had 20 percent of the sherds with quartz sand inclusions (Habicht-Mauche 1993). Clearly, the range of diversity in both temper material and paste has yet to be fully explored. Technologically, it appears that the clay used to manufacture the biscuitwares is difficult to work and fire (Shepard 1936), thus raising some interesting technological questions of procurement and production. The wares were traded in moderate quantities to the glazeware producing areas to the south (Kidder 1936).

Bandelier Black-on-Gray (Biscuit B)

This type is nearly identical to Abiquiu Black-on-white in terms of technological considerations of paste and temper, although Shepard (1936) identified through oxidation experiments differences in clay procurement between the two types. Bandelier Black-on-gray, unlike Abiquiu Black-on-gray, was made as both bowls and jars. Bowls are polished and sometimes slipped on both sides. Design elements are similar to that of Abiquiu Black-on-gray with dark organic paints painted in broad lines, although the painting appears to be less exact (Kidder 1936). This type, although overlapping with Abiquiu Black-on-white, is generally believed to have been produced later in time, until the middle part of the 16th century.

Cuyamungue Black-on-Tan (Biscuit C)

Cuyamungue Black-on-white is described by Harlow (1973) as a third type of biscuitware, postdating Bandelier Black-on-white, ending near the turn of the 17th century. It is generally tan in color versus the white-gray of the earlier biscuitwares, with a more upright, square rim form. The design elements are generally less precise than Bandelier Black-on-white.

Sankawi Black-on-Cream

Sankawi Black-on-cream is the next in the Tewa Series and was produced in the same area and replacing the biscuitwares. Produced as both bowls and jars, vessels are generally tan in color with thin, hard walls (Wendorf 1953). Bowls are polished and slipped on both sides, and jars are polished and slipped on the exterior, with smoothed interiors. Paint is organic and uses the same design elements as the biscuitwares, although line width is thinner and less complex (Harlow 1973).

Potsuwi'i Incised

Potsuwi'i Incised is technically an utilityware that dates from AD 1450–1550 (Jeancon 1923; Mera 1932). Although unpainted, the surface is incised with rectangular geometric designs. Vessel forms are predominantly jars or ollas; bowls are rare. The type is thought to be produced somewhere in the Tewa area, most likely at Classic period sites in the Rio Chama drainage. The temper and consistency of paste most resembles that of Sankawi Black-on-cream with both tuff and quartz sand inclusions.

Glaze Series

The classification of the Rio Grande Glaze Series is based on Mera's (1933) revision of Nelson's (1914) and Kidder and Kidder's (1917) analyses of rim form and surface treatments from stratified, datable contexts. Six types (A–F) that seriate through time have been securely established by petrographic analyses (Shepard 1942; Warren 1979). Rio Grande glazeware was produced widely across the region from the southern portion of the Pajarito Plateau south to Socorro. Unlike the whiteware tradition of the Tewa area, during the Late Coalition/Early Glaze periods, glazeware replaced earlier traditions. Becoming widespread across the Rio Grande Valley and beyond, it appears that the ware was produced in many different localities, with each large Pueblo producing and exchanging glaze pottery (Habicht-Mauche 1993). Interestingly, although biscuitware and later ceramics were imported from the Tewa area, very low percentages of glazewares were imported north into the region. Glazewares vary across time, but a unifying characteristic is glaze paint (mineral-based paint with the addition of a flux, such as galena [Habicht-Mauche et al. 2000]) on a red or yellow clay body.

The current project examines two large Classic period pueblos that most likely span a large time period. Therefore, all Glaze Series types are relevant, from early Glaze A to later, historic Glaze F. The dates of each type and their associated characteristics are listed in Table 77.4. Kidder's (1936) rim seriation used in typing is displayed in Figure 77.4.

Table 77.4. Types of Rio Grande Glaze Series pottery and associated date ranges.

Glaze Series	Type	Characteristics	Dates	References
Glaze A	Agua Fria	Direct parallel-sided rimes, red surfaces inside and out, design elements simple, crushed sherd or rock temper	1315–1425	Schaafsma 2002:195; Vint 1999:391,
	Cienegulla	Same but polychrome, with glaze outline by red matte design elements		
Glaze B	Largo	Thickened expanded rim, crushed rock temper, cream or white slip on both sides, can be polychrome	1415–1450	Schaafsma 2002:195
Glaze C	Espinoso	Shorted everted or beveled rim, crushed rock temper, polychrome	1450–1500	Schaafsma 2002:195
Glaze D	San Lazaro	Long thickened rims (everted), crushed rock temper, polychrome	1490–1525	Schaafsma 2002:195
Glaze E	Puaray	Long thickened rims, crushed rock temper, polychrome, late types have runny paints	1515–1625	Vint 1999:391; Schaafsma 2002:195
Glaze F	Kotyiti	Long parallel sided rims, runny glaze paint	1625–1700	Harlow and Lanmon 2003:32; Schaafsma 2002:195

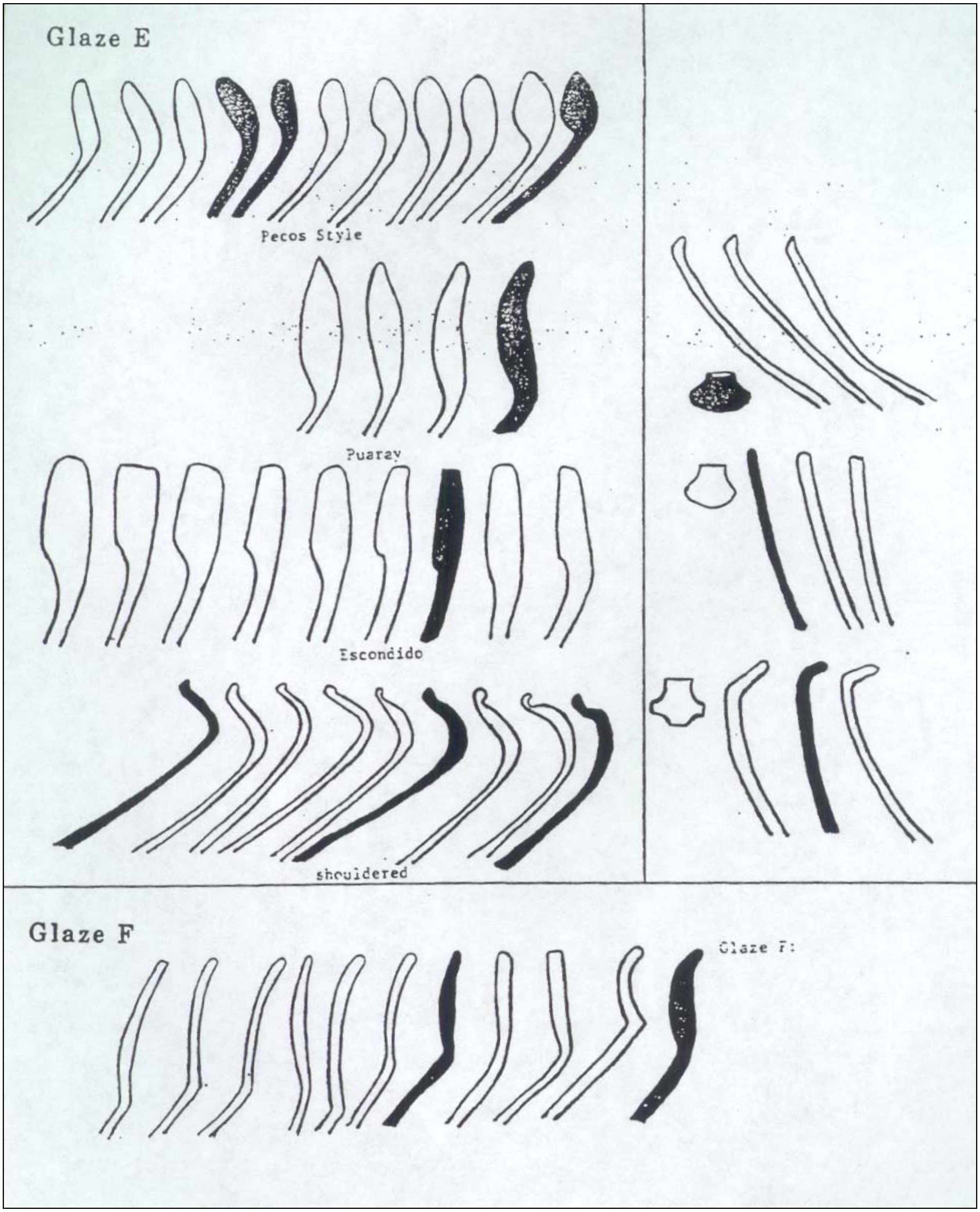


Figure 77.4. Kidder's (1936) Glaze Series rim seriation chart.

Utilitywares

As for vessel function, ethnographic and archaeological evidence has shown that painted ceramic vessels were mostly used as serving vessels and articles for gifts and exchange. Unpainted utilitywares are generally considered to have fulfilled the role of cooking and storage of food products. In the Tewa area generally and on the Pajarito Plateau more specifically, these ceramics took the form of graywares.

The literature dealing with these wares is frustratingly silent and ambiguous. Throughout time and depending on who was publishing the data, the grayware from the Pajarito Plateau has taken on a variety of names based on surface treatment (plain, indented corrugated, smeared-indented corrugated, obliterated corrugated) and presence of mica. Some researchers have been splitters creating many different types, whereas other have been lumpers. For this project, a middle ground is taken in which two general types of grayware are defined and whose primary distinguishing feature is the presence/absence of a mica slipped exterior. Although many more attributes were recorded (see full data table), these two categories appear to be most faithful to past research and the present ceramic assemblage (Table 77.5).

Table 77.5. Types of Utility grayware and associated date ranges.

Type	Dates	References
Tesuque Gray	1250–1500	Habicht-Mauche 1993; McKenna and Powers 1986; Mera 1935
Sapawe Washboard	1425–1600	McKenna and Powers 1986; Mera 1935
Potsuwi'i Incised	1550–1650	Harlow 1973
Kapo Black	1680–1760	Mera 1939:14; Harlow 1973:40; Schaafsma 2002:150

Besides sherds that fall into other categories such as plain and clapboard surface treatment, two major types were delineated amongst the Pajarito Plateau graywares. Tesuque grayware is a general description of smeared-indented corrugated ware that can have either the presence or absence of micaceous inclusions (Habicht-Mauche 1993; McKenna and Powers 1986; Mera 1935). It has been proposed that the Tesuque grayware samples with mica inclusions date later than pots with no mica, although this is highly untested (National Park Service 1991). From personal observations this type can and does vary tremendously across a single large pot, with the neck being clapboard and the body alternating between smeared and obliterated indentations.

Sapawe Washboard is a type of this smeared to obliterated corrugated construction, with thin walls and a mica wash or slip creating a brilliant gold color. Dating from AD 1425–1600, it has been widely thought to have originated and possibly produced in the Chama River valley north of the Pajarito Plateau (McKenna and Powers 1986; Mera 1935). It is also thought to be a later ware than the Tesuque Gray although there is a large chronological overlap in contemporaneity.

Historic Wares

Tewa Red/Polychrome

Tewa Red/Polychome, a historic ware produced between the mid-16th and mid-17th centuries (Harlow 1973; Schaafsma 2002:149), has an orange-tan paste slipped with either red or red and white (on polychrome) and is decorated with a black organic paint. Both bowls and jars are present. Both the red and polychrome varieties are combined in this analysis because the ceramics are in surface contexts and are small; a polychrome vessel may produce sherds that appear to be only black-on-red. Paste and temper resembles other types in the Tewa series with fine tuff and few sand grains. It is believed that this type was produced exclusively at the Tewa Pueblos along the northern Rio Grande.

Kapo Black

Kapo Black is a historic utilityware that was manufactured in the Tewa area from the late 17th century to the middle of the 18th century (both before and after the Pueblo Revolt of 1680) (Harlow 1973:40; Mera 1939:14; Schaafsma 2002:150). Generally, a dark black color that results from sooting in a reduced atmosphere, the ware is smoothed and polished with no additional decoration. The paste is similar to earlier Tewa wares, which consists of a fine tuff with little to no sand inclusions. Both bowls and jars were produced.

Imported Wares

White Mountain Redware

A small percentage of non-painted redware that, based on microscopic temper analysis, was neither glazeware or Tewa Red/Polychrome. Temper was sand and sherd based, leading to the interpretation of these unidentifiable ceramics as belonging to the White Mountain Redware category. Early varieties of the ware (St. Johns Polychrome) were found at Arroyo Hondo (Habicht-Mauche 1993) and Pecos Pueblo (Kidder 1936), and later ones were found at Classic period sites in the Chama such as Te'ewi (Wendorf 1953) and Howiri (Fallon and Wening 1987). White Mountain Redware was produced in east-central Arizona and it is not unlikely that interaction (as seen by pot mobility) occurred between the Rio Grande and Western pueblos.

CERAMIC ANALYSIS METHODOLOGY

All ceramics collected by PARP crews from Otowi and Tsirege (n = 8457) were sorted into previously described types. The descriptions by Kidder and Amsden (1931) and Habicht-Mauche (1993) proved most helpful, although the ceramic guide from Bandelier National Monument (National Park Service 1991) was also consulted. Understanding and dealing with the diversity of both biscuitware types and corrugated ceramics was greatly aided by discussions with archaeologists currently working in the northern Rio Grande (Kurt Anscheutz, Jim Vint, Richard Ford, Diane Curewitz; personal communications), as was an afternoon at the Laboratory of Anthropology in Santa Fe examining the Mera type collection.

Following Gauthier's (1987a) suggestion, one previously discussed Tewa Series type, Cuyamungue Black-on-tan, was not sorted for. The type is described by Harlow (1973) as being differentiated from Bandelier Black-on-gray by a tan paste and a "square" shaped rim. Gauthier (1987a) found that rim type and paste/slip color are not correlated and that classifying sherds in this category has the potential to cause serious errors in subsequent analyses.

To ensure data compatibility when the data from this project is evaluated in terms of previous analyses performed by LANL and the Laboratory of Anthropology at the Museum of New Mexico, the Museum's ceramic analyses framework was used to structure a methodology that measures multiple facets of prehistoric pottery. This includes sorting by pottery ware and type, vessel form, pigment type, interior and exterior modifications, temper and paste composition, rim sherd size and diameter, sherd weight, and vessel wall thickness. The only exception to the above traits measured is with the corrugated utilityware (n = 2612), in which vessel wall thickness was not measured due to time constraints (see Appendix CC).

Although the type of inclusions for all sherds was analyzed, a detailed examination was performed on the biscuitwares (Abiquiu Black-on gray and Bandelier Black-on-gray) to understand the range of diversity. This analysis will support any interpretations based on the aforementioned theoretical framework.

The subsequent statistical and spatial analyses were performed on all sherds that could reasonably be typed into one of the described categories. Unidentified sherds or ones that were incompletely coded (e.g., undifferentiated whiteware, undifferentiated biscuitware) were excluded from these analyses, although the data have been provided with this report.

Clay oxidation analysis using the refiring technique were conducted on multiple sherds (n = 335) of both Abiquiu Black-on-gray and Bandelier Black-on-gray bowls. The former were analyzed from surface units at both sites with substantial amounts of each ware and encompass the full range of temper and paste characteristics. The latter were taken from a unit at Tsirege that had a large amount of both ceramic types that included both micaceous and non-micaceous varieties. Clay oxidation does not provide the detailed provenance information of petrographic and chemical composition, but it does provide an inexpensive and expedient method of assessing the relationships between raw materials (clay) and the finished pottery found in archaeological contexts (Bubemyre and Mills 1991). Refiring sherds drives out organic impurities and chemically changes major components in the clay body. The most important of these is iron, which is converted to a reddish shade. Paste color results from firing conditions, atmosphere (oxidized or reducing), maximum temperature, duration of firing, and most importantly, clay composition (Mills 1987:186). Simply put, the more iron in the sample, the redder (darker) the color. Experiments by Shepard (1936, 1971) have shown that the ideal temperature to refire sherds for this intended purposed is at 950 degrees C (1750 degrees F) for 30 minutes. The resulting color was then measured with a Munsell® color chart.

The underlying assumption is that within both the biscuitwares and corrugated ceramics different clay sources were used, indicating change of procurement strategies over time or pot mobility. Because no raw material analyses (clay sources) were analyzed for this project, the former possibility is most easily testable. This analysis will help to lend interpretative strength to arguments about chronology, technology, identity, and craft specialization.

THE OTOWI (LA 169) CERAMIC ASSEMBLAGE

Tewa Series

Kwahe'e Black-on-White

As is to be expected for the surface assemblage of a large Classic period site, no sherds of this type were found. This does not negate the fact that a possible Coalition period occupation directly under the Classic period architecture contained some Kwahe'e Black-on-white; however, it is apparent that the site was densely and intensely occupied during the Late Coalition and Early Classic periods, if not later (Table 77.6).

Table 77.6. Percentages of decorated ceramic types by PARP collection in the Otowi surface assemblage.

Unit	Santa Fe B/w	Wiyo B/w	Biscuit A	Biscuit B	Sankawi B/c	Potsuwi'i	Glaze	Imported	Historic
A (*n* = 208)	1%	7%	30%	41%	14%	2%	4%	0	0
B (*n* = 150)	5%	17%	13%	45%	9%	3%	4%	0	3%
C (*n* = 369)	5%	16%	11%	44%	17%	3%	4%	<1%	<1%
D (*n* = 72)	6%	0%	28%	44%	11%	3%	8%	0	0
E (*n* = 441)	3%	6%	29%	41%	15%	2%	4%	0	0
F (*n* = 109)	14%	17%	19%	27%	17%	1%	6%	0	0
G (*n* = 42)	2%	0	12%	55%	17%	0	14%	0	0
H (*n* = 51)	0%	0	20%	51%	18%	4%	8%	0	0
J (*n* = 37)	3%	0	22%	41%	30%	3%	3%	0	0
K (*n* = 61)	20%	0	30%	23%	20%	2%	7%	0	0
L (*n* = 27)	7%	0	26%	44%	15%	0%	7%	0	0
M (*n* = 38)	5%	8%	16%	42%	8%	5%	11%	5%	0
Total (*n* = 1605)	5%	9%	22%	41%	15%	2%	5%	<1%	<1%

Santa Fe Black-on-White

Santa Fe Black-on-white occurred infrequently in the entire surface assemblage of Otowi, with only 78 sherds (5%) being reliably typed. This is probably not too surprising given that the site has traditionally been dated to the Early Classic period whereas Santa Fe Black-on-white is generally considered a Coalition period ceramic type. However, the analysis of the type at Arroyo Hondo placed later varieties into the first quarter of the 15th century (Habicht-Mauche 1993), allowing for the possibility of Santa Fe Black-on-white being present in larger quantities. Because this is a surface assemblage without stratigraphic cross-dating, the small amount of this type can be interpreted two ways: either Santa Fe Black-on-white is not being produced in great quantities at Early Classic period sites on the northern Pajarito Plateau, or Otowi dates around to or later than AD 1425. Although it is not possible to disprove the latter, the former proposition appears to be more favorable due to the large amounts of biscuitware and Sankawi Black-on-cream in the ceramic assemblage. With early 20th century excavations and pot hunting activity over the past century, the surface assemblages are far from representing a pristine abandonment context. These events surely mixed earlier and later pottery types thus allowing for Santa Fe Black-on-white to coexist among Sankawi Black-on-cream sherds.

Santa Fe Black-on-white was present in nearly every surface unit collected except for Unit H, which has a relatively small sample size (*n* = 51). The type dominates in two units: F and K. Unit F is located in the midden area of Roomblock A of what Wilson (1916a) described as the "old pueblo," or the original roomblock in the building sequence of the site. Subsequent surface analysis by LANL teams also arrived at this conclusion based on the predominance of early ceramics (LANL 1999). Unit K is located to the east of Roomblock B and was collected by PARP crews, "to obtain ceramics from earlier occupations" (PARP 1978). Although there is no indication of what these early occupation could have been based on, notes and maps created by these crews suggest it is likely the remains of a prior Coalition period site that sits below the Classic period architecture at Otowi.

Wiyo Black-on-White

Wiyo Black-on-white ceramics were found at approximately half of the units collected, with 9 percent (*n* = 147) reasonably typed. This type was found at Arroyo Hondo until AD 1475 and appears to occur with Abiquiu Black-on-gray, although it appears to have ended somewhat earlier and can be dated as an earlier type (Habicht-Mauche 1993). Units G, H, J, K, and L all had sherds present, and due to their location (spread out in all collected areas and nearby units with Wiyo Black-on-white was present) this can possibly be explained based on a small sample size.

Three collected units (B, C, and F) had a large amount (>15%) of Wiyo Black-on-white present. Units B and C are located to the south of the main plaza. Unit C is located on top of the mound that was recorded by PARP crews as "possible backdirt" from the excavations of Hewett and Wilson. Although as discussed above, this description is possibly incorrect. Unit C is adjacent to the central midden in which Unit B was collected. Both units are probably the result of mixing of the ceramic assemblages of the entire site. As such, there appears to be a middle 15th century occupation of Otowi, which would fit its definition as an Early Classic period pueblo.

Unit F is located in the midden of Roomblock A, which has been described as the oldest architecture of the site. This unit also had a large amount of Santa Fe Black-on-white ceramics, thus lending support that this was probably the earliest portion of the site to be occupied.

Abiquiu Black-on-Gray (Biscuit A)

Abiquiu-Black-on-gray has been dated from the late 14th century through possibly the middle of the 16th (Habicht-Mauche 1993), although it is considered a 15th century type. The type accounts for 22 percent (*n* = 346) of the ceramic assemblage at Otowi. Every unit collected on the site had Abiquiu Black-on-gray ceramics of relatively similar quantities (11% to 30%), which were considerably smaller compared to the amounts of Bandelier Black-on-gray sherds. Areas of low concentration (Units B and C) were located in the central midden and appear to have a mixed context of all ceramic types found at the site. Although these small amounts are puzzling, it appears that this was a result of sampling error as both of these contexts had high amounts of both Wiyo Black-on-white and Bandelier Black-on-gray, two types that bracket Abiquiu Black-on-gray in time.

For this project, samples of both Abiquiu Black-on-gray and Bandelier Black-on-gray bowl sherds were analyzed from Otowi and Tsirege to understand the degree of variability within and between sites and types. Five temper types were classified: primarily tuff, tuff and quartz sand, tuff and quartz sand and volcanics, tuff and quartz sand and plutonics, and a type with all the above inclusions.

Traditionally, the biscuitwares were thought to have been tempered (or self tempered) primarily with volcanic tuff (Mera 1932). Additional inclusions, either accidental or intentional, have been seen as the exception rather than the rule. However, when examining Abiquiu Black-on-gray vessels from Arroyo Hondo, Habicht-Mauche (1993) found that approximately 20 percent of the biscuitware sherds were tempered with quartz and other inclusions. Similar results are seen in the analysis of Abiquiu Black-on-gray sherds from Otowi, although the average from sample units with large quantities of the type are larger, averaging approximately 30 percent (Table 77.7). The majority of these tempered sherds have only quartz inclusions, and judging from the edges of the grains under 40x magnification, these are most likely sand. Whether this sand was intentionally added to the paste cannot be concluded at this time without analyses of the clay procurement areas, for sand may be naturally occurring and not separated from the raw clay used for pottery building.

Two other types of temper categories were discovered in this analysis: tuff with quartz sand and volcanics and tuff with quartz sand and plutonics. The first has dark igneous volcanic rock inclusions while the second has plutonic rocks such as granite. Although not well-represented in the Otowi Abiquiu Black-on-gray assemblage, these temper types may indicate non-local ceramic provenance, or perhaps differing raw material sources. This is especially the case for the plutonics. Because the traditional area of Tewa pottery is geologically volcanic, these inclusions could point toward ceramic mobility into the pueblo. Units (with substantial sample size, or greater than 40 sherds) with a small sample of plutonic tempered ceramics are Units C and A, with Unit A having a relatively larger amount (10%). Unfortunately, these two units are located on the earthen mound in the central plaza of Otowi making any spatial analysis void, for these ceramics could be associated with any of the roomblocks from the pueblo. However, the fact that these different tempers exist leads to further research questions about ceramic mobility and technology, as will be discussed in a later section of this report.

Table 77.7. Percentages of temper types by unit for Abiquiu Black-on-gray bowl sherds from Otowi.

Unit	Temper			
	Tuff	Tuff w/ sand	Tuff w/ sand + volc.	Tuff w/ sand + plut.
A (*n* = 62)	76%	21%	2%	2%
B (*n* = 20)	45%	50%	0%	5%
C (*n* = 41)	63%	22%	5%	10%
D (*n* = 18)	78%	11%	0	11%
E (*n* = 128)	70%	27%	3%	0
F (*n* = 20)	85%	15%	0%	0
G (*n* = 5)	20%	40%	20%	20%
H (*n* = 11)	27%	55%	9%	9%
J (*n* = 7)	29%	71%	0	0
K (*n* = 19)	68%	11%	11%	11%
L (*n* = 7)	86%	14%	0	0
M (*n* = 6)	100%	0	0	0
Total (*n* = 344)	70%	52%	30%	30%

Bandelier Black-on-Gray (Biscuit B)

Bandelier Black-on-gray is the predominant ware found at Otowi with 41 percent (*n* = 664) collected. The type has been dated from the early part of the 15th century through the middle of the 16th. Every unit collected had a large majority of this type. Using language that was in vogue in the early part of last century, this truly is a "Biscuit B pueblo."

Interestingly, two of the PARP units that had smaller amounts (<30%) of Bandelier Black-on-gray were the units of F and K, both of which had the largest amounts of Santa Fe Black-on-white pottery. Unit F is located in the midden of Roomblock A and Unit K is located to the west of Roomblock A. Both of these areas represent the earliest areas of occupation, with unit K in a possible Coalition period occupation and Unit F representing the first and oldest roomblock architecture.

The same sorts of temper categories that existed in Abiquiu Black-on-gray bowls are also present in bowl sherds of Bandelier Black-on-gray (Table 77.8). Units with substantial sample sizes encompassed the full range of this variability. Interestingly, the number of samples with plutonic inclusions outweighed those with volcanic temper (average of 1% versus 5%). This raises questions about where Bandelier Black-on-gray as manufactured and how it was brought into the site assemblage. This will be further discussed in a later section.

Table 77.8. Percentages of temper types by unit for Bandelier Black-on-gray bowl sherds from Otowi.

Unit	Temper			
	Tuff	Tuff w/ sand	Tuff w/ sand + volc.	Tuff w/ sand + plut.
A (*n* = 79)	65%	32%	1%	3%
B (*n* = 58)	60%	31%	2%	7%
C (*n* = 124)	81%	13%	1%	5%
D (*n* = 35)	57%	14%	26%	3%
E (*n* = 164)	71%	25%	1%	3%
F (*n* = 23)	70%	22%	9%	0
G (*n* = 18)	61%	39%	0	0
H (*n* = 25)	44%	48%	4%	4%
J (*n* = 15)	67%	13%	7%	13%
K (*n* = 12)	92%	8%	0	0
L (*n* = 12)	25%	33%	25%	17%
M (*n* = 15)	60%	27%	0	13%
Total (*n* = 665)	59%	21%	3%	4%

Sankawi Black-on-Cream

Sankawi Black-on-cream dates to the middle of the 16th to the middle of the 17th century (Harlow 1973), postdating all of the biscuitwares. The type is less prone to error in typing due to its distinguishing features (color, hardness, width) so its presence is securely recorded. The type was recorded in every collection unit at similar frequencies of 8 percent to 18 percent. The one exception was Unit J, which contained 30 percent in its assemblage. The unit is located to the far western portion of the site, and although it is intriguing to think that this could have been representative of a later occupation of the site, the sample size is too small (*n* = 36) to make any firm interpretations. Although Sankawi Black-on-cream is securely represented across Otowi, it is unlikely that this type was being used during the maximum occupation of the site, although it does suggest that we can evaluate the Bandelier Black-on-gray dating as weighing to the later end of its chronology.

Potsuwi'i Incised

Potsuwi'i Incised, which dates to AD 1550–1650 (Harlow 1973), can be seen as representing some of the latest occupation of the site. Although only present in two percent of the site assemblage (excluding the gray utilitywares), it is present in all units except for Unit G, which is located in the midden context of Roomblock A (the old pueblo). The percentage of Potsuwi'i Incised is nearly constant from 1 percent to 4 percent, making spatial analysis useless. The presence of this ware suggests that the site was occupied until the mid-16th century.

Glaze Series

Only three rim sherds with diagnostic characteristics were found to securely type into the Rio Grande glaze series. These samples are San Lazaro polychrome sherds that have been dated to

AD 1490–1525 (Schaafsma 2002:195), or more generically, Glaze D. Two sherds were found in Unit C on top of the earthen mound, and another was found in Unit E, located to the south of Roomblock A. Although the sample size voids any meaningful interpretations, it appears that the site was occupied through the first part of the 16th century. This is also substantiated by the amount of Sankawi Black-on-cream found in the assemblage.

Unidentified glazeware sherds were found in all units collected, although Units G and M had substantial amounts (>10%). Both are located in the midden area of Roomblock A, which is believed to be the oldest portion of the pueblo. It appears that the early occupation of the Otowi exchanged regularly with glazeware-making potters to the south.

Utilitywares

Overall, the grayware assemblage at Otowi was dominated by smeared-indented corrugated, both with (27%) and without (34%) mica inclusions (Table 77.9). The other large portion was Sapawe washboard (23%) although there was a small amount (11%) of indented corrugated ceramics found in surface contexts. Although the Bandelier Ceramic Guide (National Park Service 1991) tentatively puts micaceous smeared-indented corrugated chronologically later than the same type without mica, this cannot be tested due to mixed midden contexts. The highest concentration of Sapawe washboard (51%) was found in Unit A, located on the central mound in the main plaza. The type is dated to AD 1425–1600 (McKenna and Powers 1986; Mera 1935), making this deposit one of the latest of the site. This seems to fit well with other ceramic counts of the painted wares.

Table 77.9. Percentages of utility ceramic types by PARP collection in the Otowi surface assemblage.

Unit	Plain	Indented Corrugated	Smeared-Indented Corrugated	Plain Mica	Mica Smeared-Indented Corrugated	Sapawe Washboard	Striated	Clapboard
A (*n* = 105)	0	3%	12%	1%	30%	51%	0	3%
B (*n* = 54)	0	13%	30%	0	57%	0	0	0
C (*n* = 113)	7%	4%	26%	4%	31%	27%	0	1%
G (*n* = 42)	0	0	55%	0	43%	2%	0	0
H (*n* = 40)	5%	18%	0	0	48%	30%	0	0
J (*n* = 19)	0	32%	0	0	63%	5%	0	0
K (*n* = 102)	0	12%	39%	5%	19%	25%	0	0
L (*n* = 38)	0	0	53%	0	47%	0	0	0
M (*n* = 18)	0	100%	0	0	0	0	0	0
Total (*n* = 531)	2%	11%	27%	2%	34%	23%	0	1%

Historic Wares

Only five historic sherds were found at the site. All were unpainted redware with fine tuff temper and were typed as Tewa Red/Polychrome. This type dates from the middle of the 17th century to the early part of the 18th century. Four sherds (3%) were found in Unit B, located in the midden south of the main plaza and one sherd (<1%) was in Unit C located on the mound. Due to the lack of any sizable amount of historic wares at the site, it can be reasonably argued that there was no historic reoccupation of the site.

Imported Wares

Only three imported sherds were found in the surface collections from Otowi. All three were unpainted redwares with sherd and sand temper, thus typed as White Mountain Redware. One sherd (<1%) was found in Unit C, located on the mound south of the main plaza, and two others (5%) in Unit M in the midden area of Roomblock A.

Refiring Experiments

Refiring analysis was performed on 176 samples of both Abiquiu and Bandelier Black-on-gray bowls from Otowi, sampling to allow a full representation of all temper types classified. The results are listed in Table 77.10. It appears that there is variation between samples based on clay type, which, using a Munsell© color chart, were grouped into five main color groups: brownish yellow, reddish yellow, pink, brown, and yellowish red.

Table 77.10. Percentages of refiring colors in the clay oxidation experiments for both Abiquiu and Bandelier Black-on-gray bowl sherds from Otowi.

Abiquiu Black-on-Gray Bowl						Bandelier Black-on-Gray Bowl					
Unit	Brownish Yellow	Reddish Yellow	Pink	Brown	Yellowish Red	Unit	Brownish Yellow	Reddish Yellow	Pink	Brown	Yellowish Red
A	54%	38%	0	4%	4%	A	30%	55%	0	10%	5%
B	11%	72%	6%	11%	0	B	38%	54%	4%	4%	0
C	24%	62%	5%	10%	0	C	21%	75%	4%	0	0
E	41%	50%	0	9%	0	E	15%	59%	7%	15%	4%

All of the different clay types that the refiring experiment illuminated were present amongst both wares. It appears that brownish yellow and reddish yellow clay were the predominate types, with much smaller quantities of the others. There were no appreciable differences in spatial analysis aside from Unit E, which had a larger portion of Bandelier Black-on-gray bowls with reddish yellow versus brownish yellow. Because Unit E is located in the midden of Roomblock

E (the old pueblo) this raises an interesting question: do clay types seriate (or at least change somewhat) through time?

When comparing the Abiquiu and Bandelier Black-on-gray samples, it does not look as if there is a noticeable change of clay location between the two ceramic types. Brownish yellow and reddish yellow are the dominant color categories and both pottery types have similar amounts of the other colors as well.

Still another question remains: what can be made of the additional clay color categories? Do these represent additional ceramic provenances and hence ceramic mobility? Or are these rather the result of different clay procurement strategies across the pueblo, and time? Possible interpretations will be further elucidated by comparing the results of the refiring experiments with those of the temper analysis.

The refiring data were compared to that of the temper analysis (Table 77.11). It appears that there is no correlation of the two variables with the samples of both Abiquiu and Bandelier Black-on-gray bowl sherds with their associated temper types. The only interesting association is that the brown and yellowish red sherd samples were only associated with tuff and tuff and quartz sand tempered pottery. The same is true for the sherds that were pink in color aside from samples of Bandelier Black-on-gray pottery with volcanic inclusions.

Table 77.11. Percentages of samples of temper type by refiring color from biscuitwares at Otowi.

Unit A	**Temper**	**Refire Color**				
Abiquiu B/g		Brownish yellow	Reddish yellow	Pink	Brown	Yellowish red
	Tuff	30%	60%	0	10%	0%
	Tuff w/ sand	50%	40%	0	0	10%
Bandelier B/g		Brownish yellow	Reddish yellow	Pink	Brown	Yellowish red
	Tuff	30%	60%	0	10%	0%
	Tuff w/ sand	30%	50%	0	10%	10%
Unit B	Temper	Refire Color				
Abiquiu B/g		Brownish yellow	Reddish yellow	Pink	Brown	Yellowish red
	Tuff	10%	50%	10%	20%	0
	Tuff w/ sand	13%	88%	0	0	0
	Tuff w/ sand + plut..	0	100%	0	0	0
Bandelier B/g		Brownish yellow	Reddish yellow	Pink	Brown	Yellowish red
	Tuff	40%	50%	0	10%	0
	Tuff w/ sand	30%	60%	10%	0	0
	Tuff w/ sand + plut..	50%	50%	0	0	0

Unit C	Temper	Refire Color				
Abiquiu B/g		Brownish yellow	Reddish yellow	Pink	Brown	Yellowish red
	Tuff	20%	60%	10%	10%	0
	Tuff w/ sand	14%	71%	0	14%	0
	Tuff w/ sand + plut.	50%	50%	0	0	0
Bandelier B/g		Brownish yellow	Reddish yellow	Pink	Brown	Yellowish red
	Tuff	10%	90%	0	0	0
	Tuff w/ sand	33%	56%	11%	0	0
	Tuff w/ sand + plut..	20%	80%	0	0	0
Unit E	Temper	Refire Color				
Abiquiu B/g		Brownish yellow	Reddish yellow	Pink	Brown	Yellowish red
	Tuff	50%	40%	0%	10%	0
	Tuff w/ sand	44%	44%	0	11%	0
	Tuff w/ sand + volc	0	100%	0	0	0
Bandelier B/g		Brownish yellow	Reddish yellow	Pink	Brown	Yellowish red
	Tuff	20%	40%	0	30%	10%
	Tuff w/ sand	10%	70%	10%	10%	0
	Tuff w/ sand + volc	0	75%	25%	0	0
	Tuff w/ sand + plut.	33%	67%	0	0	0

Few interpretations can be made with this limited analysis. However, some plausible scenarios can be considered. Although it is possible that both the refiring and temper data exhibit the full range of technological variability for locally made pots, this is unlikely due to the specialization of biscuitware pottery shown by stylistic analysis (Hagstrum 1985). Because we have no data on local clay and temper sources this cannot be established. If different clay sources are being exploited, how do these relate to the variation of tempered samples? The question becomes: what's local? And which line of evidence most likely represents local versus non-local pottery? This will be further discussed in a later section of this report.

Comparison with LANL Collections

LANL crews revisited Otowi in 1999 (LANL 1999) and performed infield analyses of both ceramic and lithic artifacts in 12 units across the site. Of these units six corresponded with similar locations of the PARP collection unit locations (Table 77.12).

Table 77.12. Correlation of PARP and LANL testing units at Otowi.

PARP Unit	LANL Unit
A	11
C	12
D	4
G	6
J	7
M	5

Although the LANL analyses only included rim sherds, the sample sizes were big enough to compare to the ware and type counts made in this analysis (Table 77.13). On the whole, both the PARP and LANL analyses correlated well with the proportions of ceramics within 10 percent. Notable exceptions (in bold type font) are that some units contained Abiquiu Black-on-gray, Bandelier Black-on-white, and Sankawi Black-on-cream. These differences could be the result of many different kinds of phenomena, such as weathering and erosions (that covered or uncovered artifacts) during the 25-year duration between analyses, or illegal artifact collection. Other possibilities include the nearby but not perfect spatial comparison of PARP and LANL units or sampling error and lack of consistency in ceramic analysis by multiple persons. Most likely this is the result of a sample bias; PARP crews collected all ceramics and LANL crews only examined rim sherds. This explains the higher proportion of ceramic types in the PARP analysis.

Table 77.13. Comparison of percentages of decorated ceramics from both PARP and LANL analyses at Otowi.

Project	Unit	Santa Fe B/w	Wiyo B/w	Abiquiu B/g	Bandelier B/g	Sankawi B/c	Potsuwi'i	Glaze
PARP	A (*n* = 306)	1%	5%	20%	28%	10%	2%	3%
LANL	11 (*n* = 52)	0	2%	6%	21%	12%	4%	6%
PARP	C (*n* = 461)	4%	13%	9%	35%	13%	2%	3%
LANL	12 (*n* = 82)	1%	0%	13%	43%	7%	0	0
PARP	D (*n* = 72)	6%	0	**28%**	44%	11%	3%	8%
LANL	4 (*n* = 390)	0	1%	**12%**	39%	7%	0	2%
PARP	G (*n* = 84)	1%	0%	6%	27%	8%	0	7%
LANL	6 (*n* = 524)	2%	2%	16%	26%	5%	0	2%
PARP	J (*n* = 50)	2%	0	16%	**30%**	**22%**	2%	2%
LANL	7 (*n* = 82)	1%	0	13%	**43%**	**7%**	0	0
PARP	M (*n* = 36)	6%	8%	17%	**44%**	8%	6%	11%
LANL	5 (*n* = 256)	1%	3%	16%	**27%**	5%	1%	2%

Seriation and Chronology

Due to their location and size of ceramic assemblage, five units (Units H, E, G, A, and B) were selected to help understand the occupational sequence of Otowi. Unit H is located on top of Roomblock A (the old pueblo) and Units E and G are located in the roomblocks midden. Units

A and B are located on the earthen mound in the main plaza and the primary midden, respectively. Using the interpretations that were made for each ceramic type described above as well as the proportions of ceramic types and their associated dates, a table was constructed that dates these units from earliest to latest (Table 77.14).

Table 77.14. Selected units used to build site chronology from Otowi.

Unit	Santa Fe B/w	Wiyo B/w	Abiquiu B/g	Bandelier B/g	Sankawi B/c	Potsuwi'i	Glaze	Smeared IC	Mica SIC	Sapawe Wash.
H	0	0	12%	32%	11%	2%	5%	0	23%	15%
E	3%	6%	29%	41%	15%	2%	4%	NA	NA	NA
G	<1%	0	6%	27%	8%	0	7%	27%	21%	1%
A	<1%	2%	11%	15%	5%	1%	1%	5%	9%	50%
B	4%	13%	10%	35%	7%	3%	3%	8%	16%	0

Units H, E, and G are the oldest units and are associated with Roomblock A, which has traditionally been interpreted as the oldest portion of the site. Units A and B are associated with the rest of the site's architecture. To understand the relative dating of occupation at Otowi, a map was constructed (Figure 77.5). Roomblock A has been substantiated to be the oldest occupation, and Roomblocks B through E are chronologically later. Although there is no data to further understand this sequence and whether the whole site or just portions were occupied at the same time, it looks as if the pueblo grew from west to east, expanding from a small roomblock with one kiva to a large village pueblo with multiple kivas and a central plaza.

THE TSIREGE (LA 170) CERAMIC ASSEMBLAGE

Tewa Series

Kwahe'e Black-on-White

Like Otowi, no sherds of this type were found at the site, indicating a primarily Coalition period or later occupational sequence, at least for the upper strata of the site (Table 77.15).

Santa Fe Black-on-White

Santa Fe Black-on-white occurred infrequently in the Tsirege surface assemblage and was collected in half of the units in small quantities (>6%). This is not surprising due to the fact that even if the type was manufactured up until AD 1425, Tsirege has traditionally been dated to the Late Classic period.

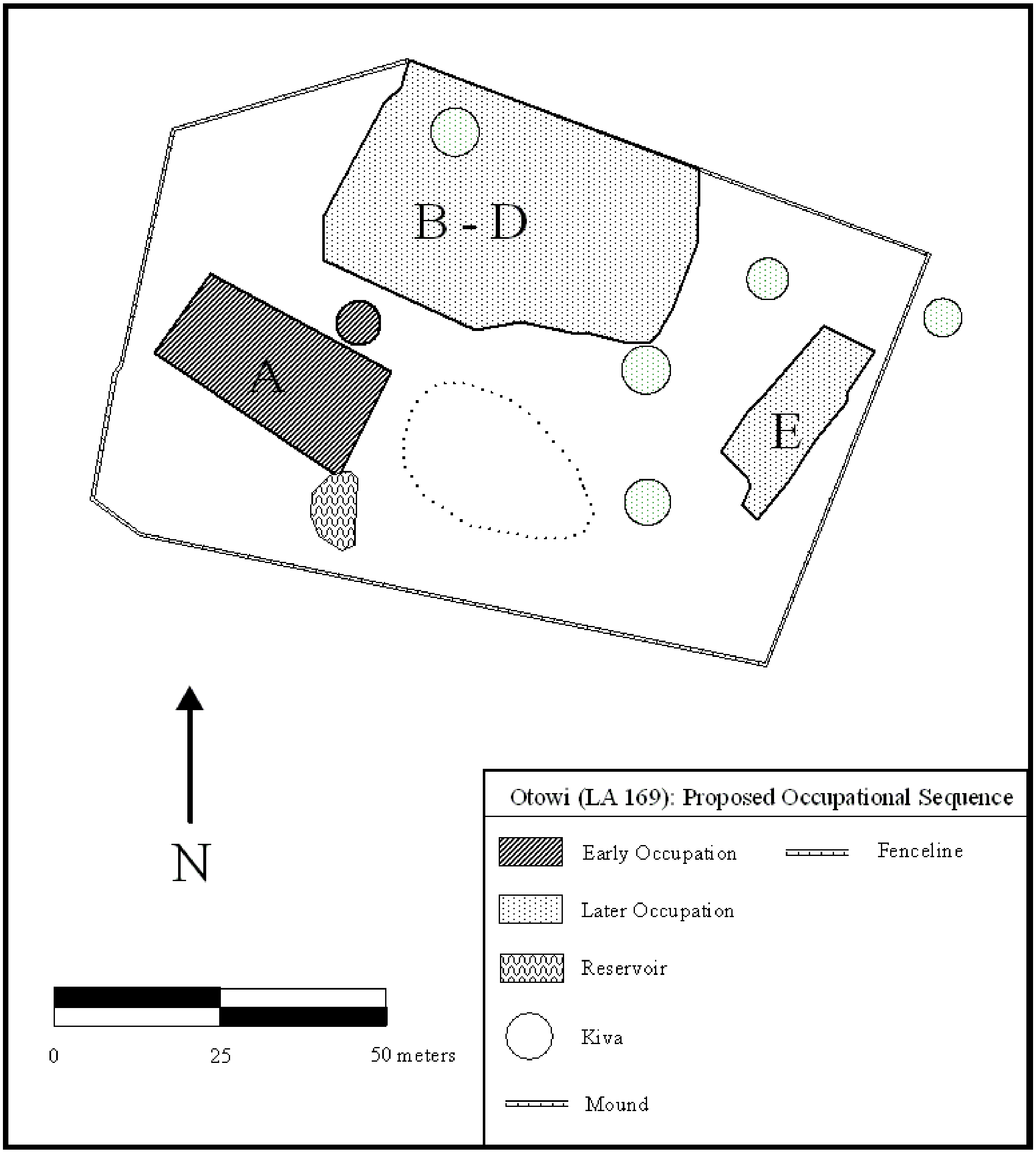


Figure 77.5. Proposed occupational sequence at Otowi.

Table 77.15. Percentages of decorated ceramic types by PARP collection in the Tsirege surface assemblage.

Unit	Santa Fe B/w	Wiyo B/w	Biscuit A	Biscuit B	Sankawi B/c	Potsuwi'i	Glaze	Imported	Historic
A (*n* = 805)	0	1%	2%	52%	28%	2%	12%	1%	1%
B (*n* = 1126)	1%	2%	12%	39%	34%	1%	9%	2%	1%
C (*n* = 59)	0	5%	3%	75%	8%	0	8%	0	0
D (*n* = 956)	0	<1%	2%	39%	43%	0	13%	<1%	2%
E (*n* = 7)	0	0	0	71%	29%	0	0	0	0
F (*n* = 33)	0	0	0	79%	9%	0	12%	0	0
G (*n* = 37)	3%	3%	11%	38%	35%	0	11%	0	0
H (*n* = 33)	0	0	3%	0	94%	0	3%	0	0
J (*n* = 156)	6%	2%	26%	19%	20%	1%	21%	1%	3%
K (*n* = 28)	0	4%	0	32%	50%	0	7%	0	7%
M (*n* = 238)	2%	3%	5%	35%	43%	1%	9%	2%	0
N (*n* = 164)	5%	8%	7%	32%	32%	1%	11%	1%	2%
O (*n* = 26)	4%	0%	8%	77%	12%	0%	0%	0%	0%
P (*n* = 10)	0%	10%	0%	80%	10%	0%	0%	0%	0%
Q (*n* = 359)	2%	0	6%	35%	36%	1%	18%	2%	1%
Total (*n* = 4037)	1%	1%	7%	41%	35%	1%	12%	1%	1%

Although all of the units had small amounts of Santa Fe Black-on-white, two of the PARP units (J and N) had 5 percent or greater. Unit J is located in the middle of Plaza 2 in the northwest portion of the site. The plaza is surrounded by two small roomblocks that are much smaller than the main architecture of the site and may be the remains of a Coalition period occupation. Unit N is located at the extreme northeastern section of the site. Although it is not affiliated with any mapped feature, the unit may also represent an earlier phase of occupation at the site. It is not uncommon in ancestral Tewa archaeology for earlier sites being dwarfed by Classic period building events, as demonstrated by the excavations at Te'ewi (Wendorf 1953).

Wiyo Black-on-White

Wiyo Black-on-white also occurred infrequently across the site being collected in small quantities (less than or equal to 10%) at most units. This type was found at Arroyo Hondo until AD 1475 and appears to coincide with Abiquiu Black-on-gray, albeit it appears to have ended somewhat earlier and can be dated as an earlier type (Habicht-Mauche 1993). Only Units E, F, and H did not have any sherds of this type collected most likely due to a small sample size. Two units had higher quantities of Wiyo Black-on-white present, although Unit P can be ignored due to its low total sample size (n = 10). Unit N had 8 percent (n = 13) of the sherds in its assemblage. Interestingly, this is also the unit with higher concentrations of Santa Fe Black-on-white ceramics, giving support that this unit represents an earlier occupation of the site (probably Coalition period) although there are no affiliated features.

Abiquiu Black-on-Gray (Biscuit A)

Abiquiu-Black-on-gray has been dated from the late 14th century through possibly the middle of the 16th (Habicht-Mauche 1993), although it is securely settled as a 15th century type. The degree of variation within these samples is shown in Figure 77.6.

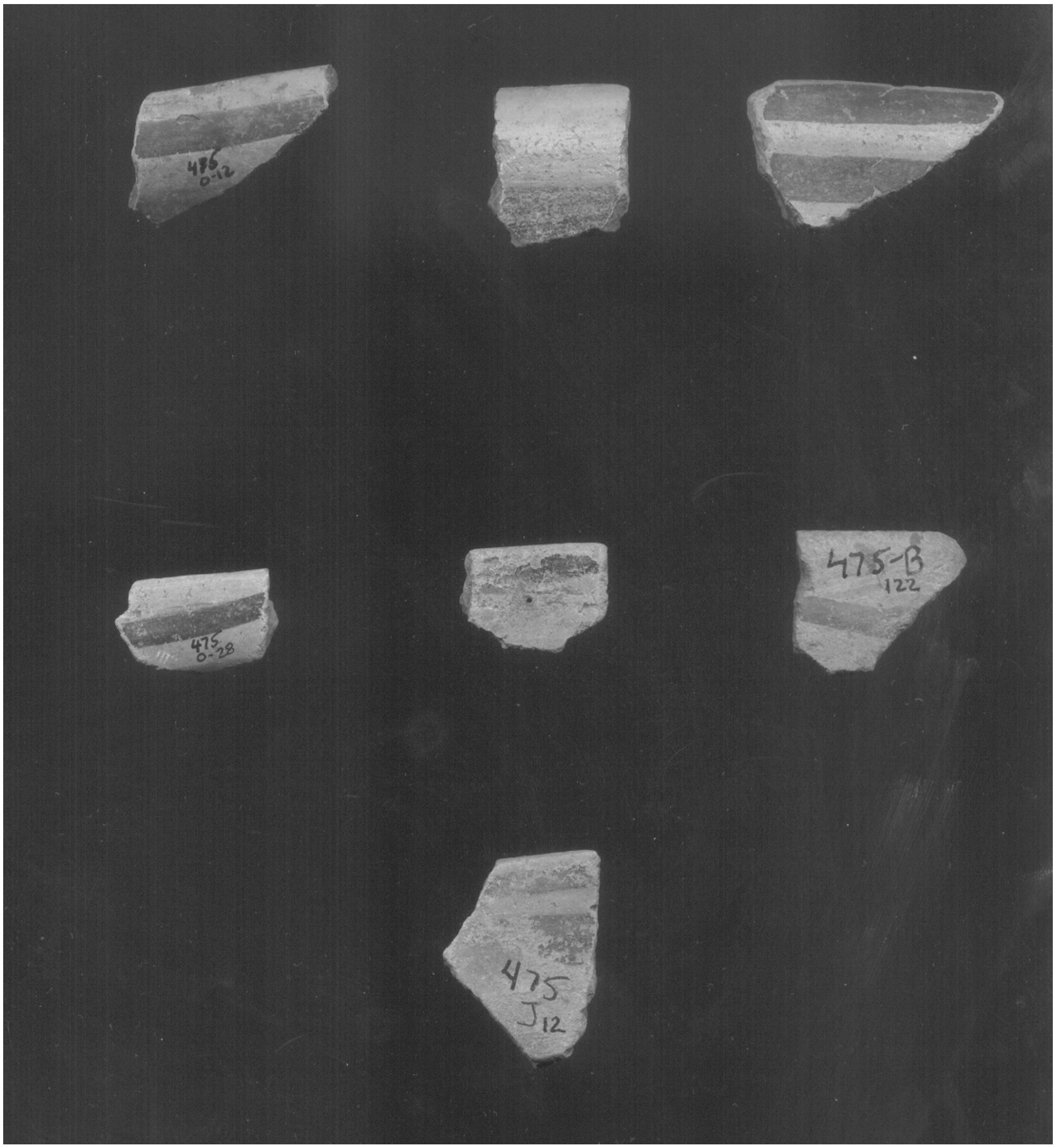


Figure 77.6. Abiquiu Black-on-gray bowl rim sherds from Tsirege.

The type is present at nearly every unit at Tsirege aside from Units E, F, and K, which have very small sample sizes. However, in the units where the type is present the concentrations are relatively low compared to later varieties of Tewa Series ceramics, ranging from 2 percent to 12 percent. The one exception is Unit J with 41 sherds (26%). This unit is located in the middle of Plaza 2 and is associated with two small roomblocks. The unit also had a relatively larger concentration of Santa Fe Black-on-white sherds, giving weight to the fact that although it appears that this was an early occupation, this area of the pueblo was occupied through the 15th century.

Unlike Otowi, the ceramic assemblage of Tsirege had much fewer samples of Abiquiu Black-on-gray bowls, which is understandable due to its later dates of occupation. However, like the samples from Otowi, the sherds broke down into four main categories during microscopic analysis (Table 77.16). Tuff was the dominant tempering material, with tuff and quartz sand being the second most common. However, unlike Otowi there were much fewer samples with plutonic inclusions. This could indicate differential access to resources or exchange networks, a question that will be addressed in a later section of this report.

Table 77.16. Percentages of temper types by unit for Abiquiu Black-on-gray bowl sherds from Tsirege.

Unit	Temper			
	Tuff	Tuff w/ sand	Tuff w/ sand + volc.	Tuff w/ sand + plut.
A (*n* = 20)	50%	40%	10%	0%
B (*n* = 136)	60%	27%	11%	1%
C (*n* = 0)	0	0	0	0
D (*n* = 17)	94%	0	6%	0
F (*n* = 0)	0	0	0	0
G (*n* = 4)	100%	0	0	0
J (*n* = 41)	41%	49%	10%	0
K (*n* = 0)	0	0	0	0
M (*n* = 12)	83%	8%	8%	0
N (*n* = 12)	92%	8%	0	0
O (*n* = 0)	0	0	0	0
P (*n* = 0)	0	0	0	0
Q (*n* = 19)	32%	53%	11%	5%

Bandelier Black-on-Gray (Biscuit B)

Bandelier Black-on-gray was found in nearly every unit collected (aside from Unit H that had a small sample size [*n* = 33]). The type has been dated from the early part of the 15th century through the middle of the 16th. The unit with the largest percentage of the type recovered from a collection with a substantial sample size (>100 sherds) was in Unit A, with 52 percent (*n* = 415). This unit is located in the midden area on the east side of the site and represents the ceramic assemblage of the Eastern Roomblock. At least this portion of the site can be considered a "Biscuit B" roomblock, dating somewhere in the 15th to middle of the 16th centuries. The degree of variation within the samples found at the site is illustrated in Figure 77.7.

Figure 77.7. Bandelier Black-on-gray bowl rim sherds from Tsirege.

Microscopic analysis has shown that the proportions of tuff versus tuff and quartz sand inclusions are well weighted toward tuff (Table 77.17). However, compared to Otowi the percentages of quartz-tempered Bandelier Black-on-gray pottery are smaller. All temper types were found at the site but with much smaller quantities of ceramic samples with plutonic inclusions. One exception to this is Unit N (18% plutonic-tempered samples) located in the northeastern portion of the site near Eastern Roomblock. Is this indicative of non-local pottery? The answer to this question can be aided by evaluating the clay oxidation analysis data.

Table 77.17. Percentages of temper types by unit for Bandelier Black-on-gray bowl sherds from Tsirege.

Unit	Temper			
	Tuff	Tuff w/ sand	Tuff w/ sand + volc.	Tuff w/ sand + plut.
A (*n* = 390)	62%	23%	15%	1%
B (*n* = 372)	57%	24%	16%	3%
C (*n* = 44)	68%	25%	7%	0
D (*n* = 347)	79%	17%	4%	0
F (*n* = 24)	71%	21%	8%	0
G (*n* = 5)	60%	40%	0	0
J (*n* = 12)	83%	8%	8%	0
K (*n* = 7)	71%	29%	0	0
M (*n* = 67)	82%	10%	7%	0
N (*n* = 39)	49%	33%	0	18%
O (*n* = 20)	75%	10%	15%	0
P (*n* = 8)	75%	13%	13%	0
Q (*n* = 112)	61%	32%	4%	3%

Sankawi Black-on-Cream

Sankawi Black-on-cream dates to the middle of the 16th to the middle of the 17th century (Harlow 1973), post-dating all of the biscuitwares. The type is present in all collected units, ranging from 8 percent to 94 percent. The degree of variation is shown in Figure 77.8. Of the units with a substantial sample size (>100 sherds), Units D and M had the greatest concentrations. Four-hundred-twelve Sankawi Black-on-cream sherds (43%) were recovered in Unit D, which is located in the large midden area north of the northern roomblock, and 102 sherds (43%) were recovered from Unit M, which is located in the midden area east of the eastern roomblock. Both of these units likely represent their respective roomblock. It can be interpreted that both the Northern and Eastern Roomblocks were the latest occupied areas of the pueblo.

Potsuwi'i Incised

Potsuwi'i Incised, which dates to AD 1550–1650 (Harlow 1973), represents some of the latest occupation of the site. The type is only found in the Tsirege ceramic assemblage in very small quantities (1%) in about half of the collected units. Because these units are distributed over all major features of the site, a spatial analysis was not possible. However, it appears that some Potsuwi'i Incised was used at the site, possibly in its later occupations. The proportions of the pottery type are lower than that of Otowi, which is surprising because of the larger proportions of later ceramics (Sankawi Black-on-cream and Glaze E and F). These problems will be discussed later in this report.

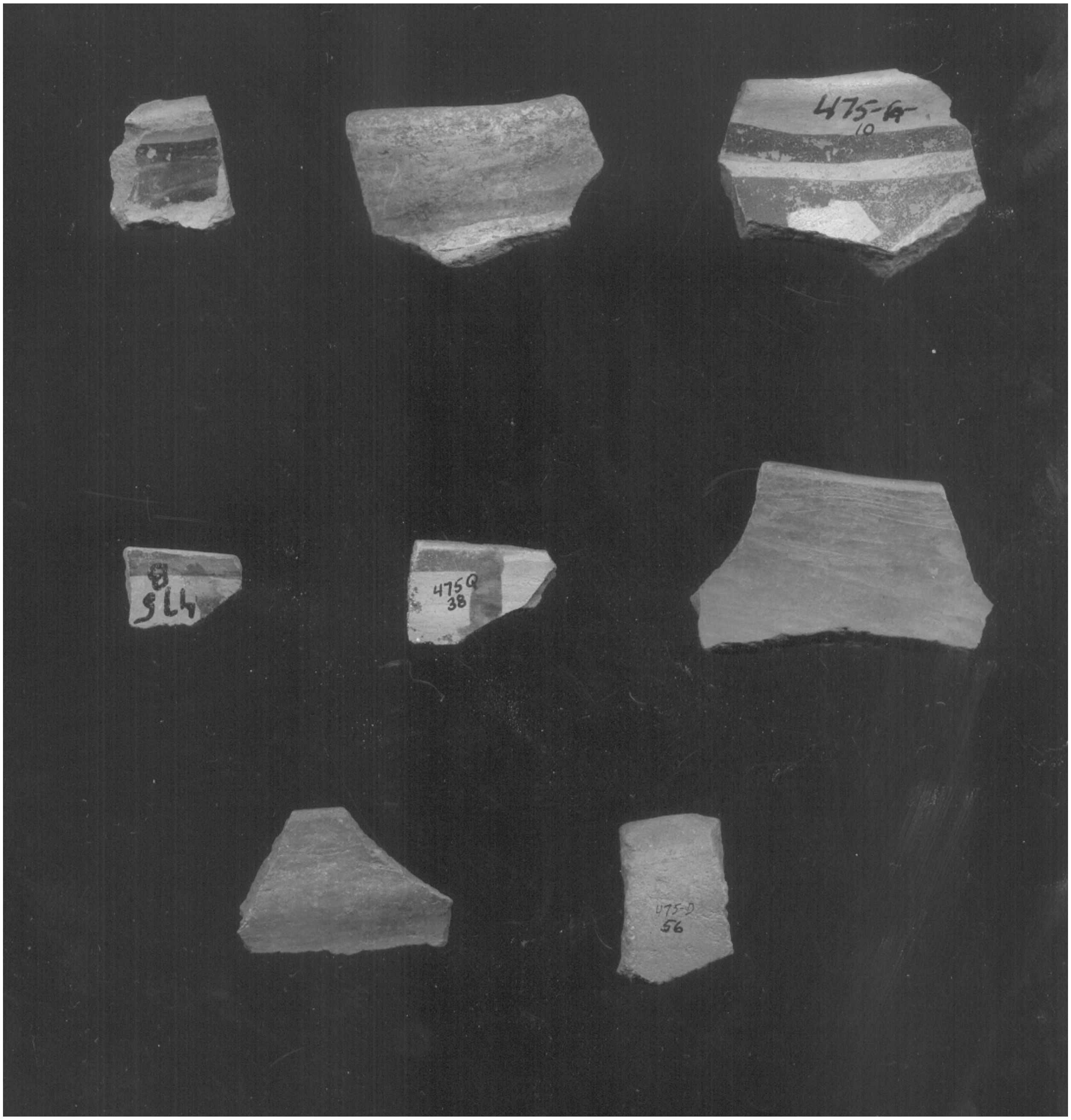


Figure 77.8. Sankawi Black-on-cream bowl rim sherds from Tsirege.

Glaze Series

The full range of Rio Grande glazewares were present on the surface context of Tsirege in all collected units. Although the glazeware counts are much higher than those of rim sherds (see

Table 77.18 for percentages of glazeware totals per unit), rim sherds provide a unique sample that allows for typing a vessel using only a small portion. Many of the units had only small amounts of glaze series rim sherds in their assemblages. However, three units (B, C, and Q) had substantial quantities (>10 sherds). Both Units B and C are located in the main plaza of the pueblo, with Unit B located in the midden (possibly more associated with the Western Roomblock?) and Unit C in the center of the plaza directly between the Eastern and Western Roomblocks. Unit Q is located in the northwestern portion of the site near the two small roomblocks. Interestingly, Unit Q is dominated by Glaze A ceramics, which date to AD 1315–1425 (Schaafsma 2002:195; Vint 1999:391). This further substantiates the fact that the small roomblocks in Plaza 2 represent the oldest visible occupation of the site. Units B and C are both dominated by Glaze D ceramics that have been dated to AD 1490–1525 (Schaafsma 2002:195). Although only very few sherds of Glaze E (AD 1515–1625) and F (AD 1625–1700) ceramics are present on the site, they are best represented in Units A and D, located in the midden areas of the Eastern and Northern roomblock, respectively. These two roomblocks appear to be the last occupied areas of the pueblo and could possibly extend the occupation of the pueblo into the 17th century.

Table 77.18. Percentages of glazeware rim sherd type by unit from Tsirege.

Unit	Glaze Series Type						
	Glaze A	Glaze B	Glaze C	Glaze D	Glaze E (early)	Glaze E (late)	Glaze F
A (*n* = 6)	17%	17%	0	33%	0	17%	17%
B (*n* = 13)	15%	15%	8%	38%	8%	15%	0
C (*n* = 17)	12%	29%	0	35%	6%	12%	6%
D (*n* = 4)	0	0	0	0	25%	50%	25%
G (*n* = 2)	0.5	0	0.5	0	0	0	0
M (*n* = 1)	0	0	1	0	0	0	0
N (*n* = 1)	0	0	1	0	0	0	0
Q (*n* = 12)	42%	0	33%	17%	8%	0	0

Utilitywares

Tesuque Grayware is the predominant utilityware found at the site (Table 77.19). Although it dates from AD 1250–1500 (Habicht-Mauche 1993; McKenna and Powers 1986; Mera 1935), the ending date has been largely untested. There is a dominance of the no-mica smeared-indented corrugated variety (62%), although 11 percent of the assemblage had mica-based Tesuque Gray as well. This causes doubt whether the mica inclusions really signify chronological change (the proportions are similar to the earlier site of Otowi) and whether these mica samples are the result of ceramic mobility.

Sapawe Washboard pottery was found in every context of the PARP surface collections and represents 23 percent of the utilityware assemblage. Of the units that are not classified as “pot hunters’ cache” and with substantial sample size, Unit A has the highest proportion of this ware.

Not surprisingly, this is in the midden of the Eastern Roomblock, which is thought to be part of the latest occupation of the site.

Table 77.19. Percentages of utility ceramic types by PARP collection in the Tsirege surface assemblage.

Unit	Plain	Indented Corrugated	Smeared Indented Corrugated	Plain Mica	Mica Smeared Indented Corrugated	Sapawe Wash.	Striated	Clapboard
A (*n* = 375)	2%	0	38%	0	27%	33%	0%	0
B (*n* = 331)	2%	2%	59%	2%	17%	17%	2%	1%
C (*n* = 257)	5%	2%	70%	0	4%	18%	0	1%
D (*n* = 736)	1%	<1%	78%	0	4%	16%	0	0
E (*n* = 5)	0	0	60%	0	0	40%	0	0
H (*n* = 82)	0	0	0	0	0	100%	0	0
J (*n* = 217)	5%	2%	65%	2%	11%	13%	1%	0
K (*n* = 10)	0	0	10%	0	40%	50%	0	0
Total (*n* = 2013)	2%	1%	62%	1%	11%	23%	<1%	<1%

Historic Wares

Only a small amount of historic sherds were found at the site (51 sherds, 1%). All were unpainted redwares with fine tuff temper and were typed as Tewa Red/Polychrome. This type dates from the middle of the 17th century to the early part of the 18th century. Tewa Red/ Polychrome ceramics were found in half of the PARP units, although in small percentage (1 to 2%) and were spread evenly across the site. It appears that, although these sherds were not part of the original occupation, they may represent a later reoccupation or visitation of the site in the 17th or 18th centuries.

Imported Wares

Forty-nine imported sherds were found in the surface collections from Tsirege. All were unpainted redwares with sherd and sand temper, thus typed as White Mountain Redware. These sherds, while present in very small quantities in seven of the 12 PARP collection units, were most abundant in Units A (10 sherds) and B (23 sherds). These units represent the Eastern and Western Roomblocks, respectively, indicating that exchange with distant regions likely happened throughout the occupational sequence of the pueblo.

Refiring Experiments

The clay oxidation refiring experiments performed on both Abiquiu and Bandelier Black-on-gray bowl sherds showed a much more limited degree of variability than those of Otowi (Table 77.20). No sherds were recorded as "pink" and only a very small amount of Bandelier Black-on-gray were classified as "brown." Dominant colors for both ceramic types were reddish yellow, brownish yellow, and yellowish red. There does not appear to be any spatial significance to the location of certain clay groups compared to others. When the two pottery types are compared there appears to be many more samples of yellowish red clay paste in Abiquiu Black-on-gray bowls, which possibly could be a function of changing clay procurement strategies or exchange interactions through time.

Table 77.20. Percentages of refiring colors in the clay oxidation experiments for both Abiquiu and Bandelier Black-on-gray bowl sherds from Tsirege.

Abiquiu B/g Bowl					Bandelier B/g Bowl				
Unit	Brownish yellow	Reddish yellow	Brown	Yellowish red	Unit	Brownish yellow	Reddish yellow	Brown	Yellowish red
A	0	38%	0	10%	A	0%	52%	0	48%
B	20%	55%	0	5%	B	15%	80%	3%	3%
D	8%	35%	0	0	D	31%	65%	0	4%

Like the analysis of Abiquiu and Bandelier Black-on-gray bowl sherds from Otowi, the results of the refiring analysis were compared to the temper data generated through microscopic analysis (Table 77.21). Because of the small amount of samples that were recorded as "brown" these samples were combined with the "brownish yellow" category.

Table 77.21. Percentages of samples of temper type by refiring color from biscuitwares at Otowi.

Unit A	**Temper**	**Refire Color**		
Abiquiu B/g		Brownish yellow	Reddish yellow	Yellowish red
	Tuff	0%	70%	30%
	Tuff w/ sand	0%	88%	13%
	Tuff w/ sand + vol.	0%	100%	0%
Bandelier B/g		Brownish yellow	Reddish yellow	Yellowish red
	Tuff	0%	50%	50%
	Tuff w/ sand	0%	30%	70%
	Tuff w/ sand + vol.	0%	30%	70%
	Tuff w/ sand + plut.	0%	75%	25%
Unit B	**Temper**	**Refire Color**		
Abiquiu B/g		Brownish yellow	Reddish yellow	Yellowish red
	Tuff	40%	40%	20%

Unit A	**Temper**	**Refire Color**		
	Tuff w/ sand	30%	70%	0%
	Tuff w/ sand + vol.	10%	90%	0%
	Tuff w/ sand + plut.	0%	100%	0%
Bandelier B/g	Tuff	10%	90%	0%
	Tuff w/ sand	0%	100%	0%
	Tuff w/ sand + vol.	33%	67%	0%
	Tuff w/ sand + plut.	22%	78%	0%
Unit D	**Temper**	**Refire Color**		
Abiquiu B/g		Brownish yellow	Reddish yellow	Yellowish red
	Tuff	20%	80%	0%
	Tuff w/ sand	0%	0%	0%
	Tuff w/ sand + vol.	0%	100%	0%
	Tuff w/ sand + plut.	0%	0%	0%
Bandelier B/g	Tuff	20%	80%	0%
	Tuff w/ sand	30%	60%	10%
	Tuff w/ sand + vol.	43%	43%	14%
	Tuff w/ sand + plut.	0%	0%	0%

Like the samples from Otowi there does not appear to be any correlation between temper type and refiring (oxidation) color. Possible reasons and interpretations of these two sets of data (provenance and technology) will be discussed in the next section.

Seriation and Chronology

Due to location and size of ceramic assemblage, four units were selected to help understand the occupational sequence of Tsirege in combination with the distribution of individual ceramic types described previously. The units and their ware count proportions are listed in Table 77.22 from latest to earliest occupation. Figure 77.9 is a map showing a reconstruction of possible occupation across the site.

Table 77.22. Selected units used to build site chronology from Tsirege.

Unit	**Santa Fe B/w**	**Wiyo B/w**	**Biscuit A**	**Biscuit B**	**Sankawi B/c**	**Potsuwi'i**	**Glaze**	**Smeared IC**	**Mica SIC**	**Sapawe Wash.**
A	0	1%	2%	36%	20%	1%	8%	12%	9%	11%
D	0	<1%	1%	22%	25%	<1%	8%	35%	2%	7%
B	0	1%	10%	32%	27%	1%	7%	14%	4%	4%
J	3%	<1%	12%	9%	9%	<1%	10%	41%	7%	8%

Units A and D are located in the midden contexts of the Eastern and Northern Roomblocks, respectively. The ware counts in Table 77.15 are similar, and the individual ceramic type/ware analysis indicates that the occupation for each of the roomblocks is contemporaneous (at least at the resolution of this analysis). Unit B is located in the midden for the Western Roomblock, which appears to date slightly earlier than the eastern and northern architecture. Unit J, located near the small roomblocks and kiva in Plaza 2, is obviously the earliest occupation of the site based on the number of Glaze A ceramics and the presence of Santa Fe Black-on-white pottery.

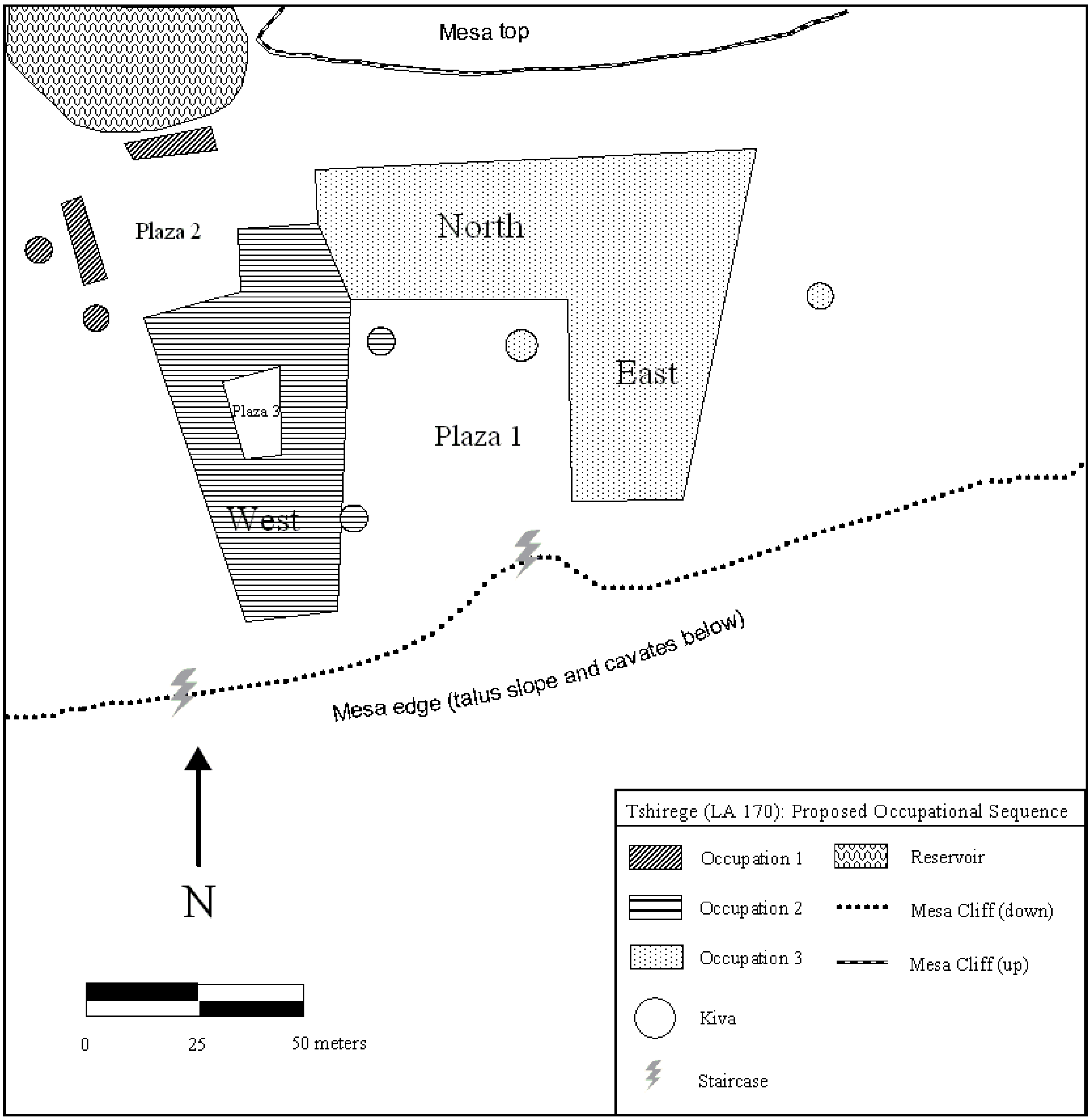


Figure 77.9. Proposed occupational sequence at Tsirege.

It is likely that the two small roomblocks represent the earliest phase of occupation of the pueblo (perhaps extending back into the Coalition period?). During the middle- to- late Classic period, the pueblo underwent a series of expansion events with first the Western and then the Eastern and Northern Roomblocks being built. At this point with limited analysis, it remains impossible to understand which architecture was being occupied contemporaneously, although it is likely that the entire pueblo of Tsirege was not being lived in at any one time.

DISCUSSION

Chronology

Wendorf and Reed (1955) formulated the regional chronology of the northern Rio Grande, a guide that is still relevant today. However, the assigning of specific dates to sites on the Pajarito Plateau has undergone multiple revisions and still appears to require work at a finer scale. Establishing and trusting a good chronology is inherently important in interpreting every question of prehistoric Tewa life on the plateau. This section describes previous research and proposes how this project will serve to clarify some unresolved issues.

Aside from rough approximations based on the presence of biscuitware and its correlation to the chronology presented by Wendorf and Reed (1955), there has been little work on the Pajarito Plateau to understand accurate dating of the Tewa pueblos. This, of course, is due in part to limited excavations and that PARP collections were primarily surface based. This is the case for the two large Classic period sites that this report has analyzed. After limited collections, de Barros (1981) performed microseriation analysis on the collections part of the PARP sites, including Otowi, which he tentatively dated to AD 1325/1350 to 1550/1575. LANL surveys have proposed that the end date be moved to AD 1600, or the end of the Classic period (LANL 1999). The other site, Tsirege (LA 170), remained undated for unknown reasons, perhaps being that not enough surface collection had been performed by the time of the analysis.

Although provenience is not well understood, the Laboratory of Tree-Ring Research (LTRR) at the University of Arizona has dated multiple samples that have yielded dendrochronological dates for the large pueblos of Tsirege and Otowi (see Chapter 7, Volume 1). Stallings' (1933) excavations of Tsirege procured 59 samples from the site. Of these, there were three cutting dates that range from AD 1559–1581, with overall occupation taking place primarily during the AD 1570–1600 time frame. Although Wilson (1916a) excavated Otowi with no collection of ancient wood (these excavations took place well before the advent of dendrochronology), tree-ring samples were collected by Stallings and submitted to the LTRR (see Chapter 7, Volume 1). Of these, five samples were dated, with one cutting data at AD 1414 and the rest suggesting occupation nearly a century of occupation in the AD 1400s.

Although the PARP surface collections do pose problems, such as the fact that these large pueblos were probably occupied over multiple centuries and this time span cannot be accurately recorded using surface collections alone, using relative frequencies of ceramics can inform researchers of general chronological trends. For this project it is important to compare the relative dates of occupation between Otowi and Tsirege, as well as construct an occupational sequence for each site.

Because of the mixed and unreliable contexts of the surface assemblages, as well as the known ceramic chronology with very large temporal time spans (some ceramic types are present for almost two centuries), the use of microseriation or mean ceramic dating (South 1977) seems inappropriate. This is compounded with the fact that the latter dates of the Tewa Series pottery is suspect, with the terminal dates ending with the assumed abandonment of Tewa sites not along the Rio Grande by the mid-16th century (Richard Ford, personal communication).

Both Otowi and Tsirege have small quantities of Santa Fe Black-on-white, which dates the early occupation of the site to at least the first part of the 15th century. The presence of this type is isolated to specific sections of both pueblos, which this report argues is evidence for the growth of the pueblo over time. No earlier Kwahe'e Black-on-white sherds were found at either Otowi or Tsirege, and the percentages of Santa Fe Black-on-white were relatively small. However, this does not refute the possibility that an earlier Coalition period occupation was dwarfed by later Classic period building and living events, as seen at other pueblos in the region (Wendorf 1953).

When compared to each other, and in concert with the available tree-ring dates (see Chapter 7, Volume 1), it does appear that Tsirege was occupied later than Otowi. The tree-ring dates for Otowi suggest that the site was occupied through the 15th century, but the small but present quantity of Sankawi Black-on-cream (15%) on the surface context suggests that the site was inhabited into the 16th century, most likely in Roomblocks B through E.

One tree-ring cutting date at Tsirege dates to AD 1581, suggesting that the site was most likely occupied through the end of the 16th century. This is supported by the large amount of Sankawi Black-on-cream pottery (35%). There is reason to believe that the pueblo may have been occupied into the 17th century, with the presence (although small) of Glaze E and F pottery found in the midden contexts of the Northern and Eastern Roomblocks. The very small quantities of historic ceramics do not suggest a reoccupation of the site, but rather a revisitation by later Pueblo people.

Although questions of identity, craft production, and socio-political structure are inherently important in understanding northern Rio Grande prehistory, a firm knowledge of the time-space systematics of the region are not only a desired, but a required, first step. Further research into this area could take the form of direct dating of the pottery itself as was conducted by Ramenofsky and Feathers (2002) to understand dates of abandonment of pueblos along the Rio Chama drainage.

Identity

Social identity has been described as "the ways in which individuals and collectives are distinguished in their social relations with other individuals and collectives" (Jenkins 1996:4). It is based on relativity: simply put, a group cannot have an identity without a comparison to another group of individuals, or using Jenkin's term, collective. The archaeological characterization of identity is important in understanding prehistory at a multi-scalar level, for it provides the researcher insight into migration, use of the physical landscape, and relationships with the larger world. As Mills (2002) points out, each turning point of Southwestern prehistory involved a restructuring and alteration of group identity. This is especially true for the northern Rio Grande in the Classic period where site aggregation rapidly consolidated populations with differing backgrounds and worldviews (Adams and Duff 2004).

The study of identity is the study of similarities and differences between groups of individuals. Although social boundaries have been notoriously difficult to delineate (see papers in Stark 1998) and are often permeable and "fuzzy," using a multi-scalar approach to understand identity such as that of Duff (2002), creates quantifiable tests to social boundedness. Social identity may be studied at the regional (Duff 2002), the community (Herbich 1989), and even at the intra-site level (Duwe 2006; Duwe and Neff 2006) using a variety of methodologies that attempt to record meaningful patterns in the material record. Social identity is important for two main reasons: the first is that some sort of measure of the group is necessary to facilitate archaeological comparisons between populations in both time and space, especially without the use of classic culture areas; and second, that social identity is fundamentally important to modern descendant communities who have a large stake in Native American Graves Protection and Repatriation Act-legislated cultural affiliation studies.

To qualify and quantify identity, researchers take measurements in material culture that reflect the day-to-day interactions between people. This testing of identity has taken many shapes over the past decade. Recently, it has relied on technological aspects of practice frameworks, using the ideas of *habitus* (Bourdieu 1977) that states that the ways of making material culture can be measured archaeologically and used to infer social identity. The ways in which this is done will be described in the next section. It can also be measured indirectly through interpreting the configuration and scale of craft production, specifically that of craft specialization. As will be illustrated below, craft production and identity are often interrelated in meaningful ways.

There is a very real cultural division across the Pajarito Plateau that was recorded into the historic period, and continues to exist in the modern era (Harrington 1916; Kidder 1936). The ethnohistoric record documents Tewa speaking people in the north and Keres speaking populations in the south, with the line drawn somewhere around east to west on the southern portion of the Pajarito Plateau near Frijoles Canyon (Harrington 1916). The earliest archaeological ceramic research verified this dichotomy with biscuitware producers in the north and glazewares to the south (Kidder 1915). Not only were the ceramic assemblages from prehistoric sites dominated by one class of ware or the other, it was stated as fact early on that this correlated to differences in production areas, with the Tewa pueblos not participating in the procurement and use of glazes and their dedication to the biscuitwares. This conclusion was later verified by Shepard (1936) in her technological analyses of pottery from Pecos Pueblo and surrounding regions.

Although modern researchers try to avoid the "pots as people" hypothesis without sound evidence, it appears that the "Tewa area," defined by the Tewa-Keres line in the south upwards into the Chama River basin and including the five modern pueblos of San Ildefonso, Santa Clara, San Juan, Tesuque, and Nambe (Harrington 1916), correlates well with what Mera (1935) called the "Biscuitware Pueblos." Recent research by Graves and Eckert (1998) and Futrell (1998) further support the argument that the apparent division of biscuitware producers to the north and glazeware producers to the south delineate Tewa and Keres ethnic boundaries, respectively. In addition, from ceramic counts given from preliminary PARP ceramic data and LANL infield analysis (LANL 1999), glazewares account for only 1 to 25 percent of the ceramic assemblage. This contrasts with the large amounts of biscuitware produced in the Tewa area and exported, with the most famous case being that of Pecos Pueblo where Kidder found the Keres pueblo to have 20 percent in the assemblage (Kidder 1936). Interestingly, these ceramic analyses contrast with studies of rock art on the Pajarito Plateau, in which there appears to be no striking difference between the northern and southern halves of the region (Munson 2002). This begs the questions: what was being traded for biscuitwares, and what sorts of economic relationships were happening between the Chama and the greater northern and central Rio Grande region? Do these reflect social or political networks? And most important to this proposal, what does this say about Tewa identity? Is the historic Tewa-Keres boundary really in such correspondence with pottery production and distribution? Are pots actually representing the relationships and identity of people? And finally, how do changes in ceramic production and exchange vary through time, specifically looking at the two sites of Otowi and Tsirege?

This project can only start to answer the above questions in small ways. Interestingly, although there is only a small amount of glazeware at Otowi there are much greater frequencies at Tsirege. Tsirege has been classified as a Tewa pueblo as it is located on the northern part of the Pajarito Plateau and has an abundance of prehistoric Tewa series pottery (biscuitware, Sankawi Black-on-cream) in its assemblage. If the above-mentioned assumptions are used to hypothesize the amount of glazeware at the site this should be very low (<5%) as is the case for other Tewa pueblos (Futrell 1998; Gauthier 1987a; Graves and Eckert 1998; Wendorf 1953). Interestingly, this is not the case. Tsirege has 8 percent glazeware in the site's overall ceramic assemblage and 12 percent among the decorated pottery. The question arises: what do these higher frequencies mean?

Perhaps the proposed ethnic Tewa/Keres boundary did exist in prehistory, although it was more permeable than previously thought. If this was the case, then a Tewa pueblo located near the boundary would likely have greater percentages of glazeware than those to the north. The proposed boundary based on ethnic identity could still have existed, although it is likely that there was much more interaction between groups near the Frijoles Canyon border. Future research could explore this boundary more fully, examining architectural and lithic evidence to further understand the degree and meaning of this proposed permeability.

Technological Considerations

Pfaffenberger (1992) argues that the study of technology in material culture "may significantly alter the way anthropologists analyze everyday life, cultural reproduction, and human evolution" (Pfaffenberger 1992:491). In the past three decades, archaeologists have become increasingly interested in style, specifically that of technology. Technological style has been defined by Rice (1987:201) as "a combination of experience and custom resulting in a body of information and practice governing the manufacture of material culture, which leads to a characteristic product with a unique range of properties." Many attributes of technological style can be seen only during the production phase of an artifact's life; therefore, the most likely way that these attributes could be precisely copied would be first-hand observation, such as a teacher-student relationship. This has a distinct advantage over other overt forms of style, such as painted designs, for archaeologists interested in understanding knowledge transmission. In short, there are many things about creating a pot, a point, a sandal, or any other object that cannot be mimicked by examining the finished product, but rather is learned in the process of knowledge transmission through forming communities of practice.

Many artifacts carry inherent messages about social identity not intended by their producers (Hegmon 1998). Stark (1998, 2005) discusses the theory of learning frameworks and *habitus* (*sensu* Bordeiu 1977), which is defined as culturally specific ways of doing things that are generally unconscious actions (Dietler and Herbich 1998). In essence, although there may be many ways to express oneself in the creation of objects such as pottery, many of the skills and ways of "doing things" are learned early in one's career and are perpetuated throughout life. Although specific technical choices are affected by multiple factors such as environmental constraints and behavioral decisions, the work of archaeologists (Crown 2001, 2002) and ethnoarchaeologists (Wallaert-Pêtre 2001) show that many aspects of technology (examined as technological style) remain relatively stable when passed down through apprenticeship relationships along social identity lines.

These arguments are also supported by ethnographic and ethnoarchaeological studies in the learning of motor skills, which are taught and not manipulated consciously by the student (Arnold 1985:235-237; Gosselain 1998). This is the basic assumption of the study of technological style and how it is used as a methodology for studying socially complex ideas of communities of practice and ancient apprenticeship.

Besides their ubiquity in the archaeological record, ceramics are also unique in the amount of data they carry about the technical choices of prehistoric potters. Because of this, pottery has become the primary material class in studying technological style and applying it to learning frameworks and communities of practice theory. Ethnoarchaeological studies are especially helpful in testing assumptions about the way in which knowledge is transferred. Herbich (1989) explains that the Luo of Kenya have specific "micro-styles," or distinctive combinations of technological, formal, and decorative features characteristic of different potting communities between separate villages. These communities pass knowledge of how to manufacture a pot from older to younger members. Kramer (1997) also describes ceramic knowledge transfer in an Indian study area of Rajasthan as that of mother-daughter learning.

Not surprisingly, prehistoric pottery has been a perennial focus for the analysis of technological style in the archaeological record. Clay preparation techniques (Gosselain 1998), temper types (Goodby 1998), vessel size and shape and wall thickness (Chilton 1998), and vessel forming techniques (Gosselain and Smith 1995; Miller 1985; Welsh and Terrell 1998) have all been examined as ways that covert, sometimes unconscious information is transmitted with the teaching and learning of how to create a pot. Even the painting style itself has been uniquely studied, such as the patterning of brush stroke sequences on White Mountain Redware in east-central Arizona (Van Keuren 1999, 2001, 2005).

In summary, by studying how a pot is made through its technological characteristics it is possible to make inferences about group identity at both a micro and macro scale and to understand the boundedness and interactions between these groups.

In recent years, the analyses of the technological aspects of artifacts have gained prominence in the archaeological literature, with talk of technological style affecting many of the anthropological theories currently being used by Southwestern researchers, including those of "communities of practice" and other models of knowledge transmission. This section details how analyzing the technological aspects of pottery from Classic period sites on the Pajarito Plateau will both help to understand social identity at a macro and micro level, and also help to answer basic unresolved questions of procurement and manufacture of northern Rio Grande ceramics.

As stated earlier, measuring the technological style of pottery, or the unconscious and non-signaling aspects of a pot's design, can be used to infer group identity. In short, in the American Southwest where ethnohistoric documents inform researchers that society was matrilineal and matrilocal, pottery was performed and instructed and learned by women. Therefore, certain "ways of doing" in the form of procuring raw materials (locations or in their mixtures), shaping a pot, mixing pigments, painting the design, and firing the final product will be similar within communities of practice, or what has become known as "potting communities" (Fenn et al. 2006). These special technological characteristics have been identified and measured in many ways. This project has focused on four characteristics: vessel wall thickness, vessel size and shape, temper type, and paste composition (on a crude scale by 20x microscope and paste color via Munsell© color classification). Samples were also selected for future compositional analyses of both chemical (using inductively coupled plasma-mass spectrometry) and mineralogical (using petrographic analysis).

The analysis of the technology of ceramics in the American Southwest is nothing new. Anna Shepard pioneered the use of optical petrography in understanding the provenance and material properties of pots in the first half of the 20th century. One of her most famous early studies was the analysis of pottery excavated at Pecos Pueblo by A.V. Kidder in the 1920s and 1930s. Her study (1936) examined not only ceramics produced at the site, but also those that were imported from other areas. She focused on the biscuitware series, and attempted to not only source the production area of the pottery, but also the technological steps that must have gone into making the pot, ideas that could fit under the rubric of *chaînes opératoires*. Interestingly, her study appeared so thorough that little if nothing has been written in succeeding years about the technology of the biscuitwares. These ideas have been applied to earlier periods on the Pajarito Plateau, however. Wilson and Castro-Reino (2005) used both the microscopic and petrographic analyses described above to understand differences or similarities in potting style amongst Santa Fe Black-on-white ceramics from Coalition period sites. They successfully interpreted the use of unique geologic resources from four sites as indicating local production, even in the face of a widely used regional painted tradition. These same problems have also been addressed across the entire Pajarito Plateau using a combination of microscopic and painted style analyses (Ruscavage-Barz 1999, 2002).

As noted by Mera (1932) and others, the biscuitwares were produced with a unique dark paste that fired to a light gray color and were tempered with volcanic tuff. On further petrographic examination, Shepard (1936:487) found this to be almost entirely true, with few other inclusions apart from quartz or feldspar grains, which she attributes to be naturally occurring in the clay. Other petrographic analyses revealed that the paste was unusually hard and had a preponderance of voids leaving the ceramics weighing less per volume than paste from contemporary wares. Refiring suggested that the pots were fired in an oxidizing (but not fully) environment at approximately 800°C.

Using her understanding of the geology of the northern Rio Grande, Shepard concluded that both the clay and temper used to make biscuitware originated in the Chama District, and hence were the product of local potters. The amounts of the ware found at Pecos were almost 20 percent of the assemblage (Kidder 1936) and were thus traded extensively to the south.

Most importantly, Shepard was able to reconstruct the technological processes of which the biscuitwares were made. Shepard (1936:491) discovered that the ware was unusually standardized in vessel form and design style. This has implications that will be discussed below. One of her main research questions was: what makes the paste so light and porous? Was it the kind of tempering material, the quality of the clay, the method of firing, or a combination of all three? And why would potters want these types of properties?

When examining local clay and temper from the Chama District, Shepard (1936:496) found that the firing temperature was unimportant to the porous nature of the ceramic, and that certain local clays and tempers were responsible for these properties. These tempers occurred in volcanic tuff outcroppings throughout the district, and the local clays that were believed to be procured for ceramic production were composed of high quantities of tuff. Using workability tests, Shepard also found that the clays necessary to make biscuitwares were extremely difficult to use, and based on this she made the inference that these clays were selected not for their ease of use in potting, but for their fired characteristics. But why use these types of clays and tempers? Shepard (1936:497) proposed that these materials, when fired, allowed for a dark gray paste that extenuated the black mineral paint well, creating an appearance unlike any other black painted pottery. In essence, the product's quality and visual appearance compensated for its difficulty in manufacture, perhaps giving worth to the vessel due to the skill and effort invested by the potter.

I have found no technological analyses of any of the other Classic period wares in the Tewa area, including the Pajarito Plateau that is as in-depth as Shepard's (1936) study of the biscuitwares. What is known about Potsuwi'i Incised and the micaceous and corrugated wares has been already stated in overviews by Mera (1932) and Wendorf (1953), as well as a recent study by Curewitz (2004a).

Basic technological understanding of the process of manufacture is imperative in understanding communities of practice and hence identity, as well as the mode and nature of craft production. Because no researchers have made any overall synthetic inferences on the ceramic technology from the Tewa area since the 1930s, the analyses in this report have attempted to add to the understanding of the nature and changes of biscuitware technology. Due to time and money constraints, as well as the limited scope of this project, the synthetic overview that is so needed is not produced here. Rather some interesting trends and characteristics were observed that will help future researchers to better understand the technological considerations of northern Rio Grande pottery. Data on temper and refiring oxidation experiments are summarized below. Although the interpretations may be misguided or faulty, the hope is that the data will be of some use.

The recording of temper attributes can assist in the inference of many archaeological problems, including craft production and specialization, prehistoric economics, and ceramic technology. However, one important observation is immediate before any future statistical and spatial analyses: temper inclusions in the biscuitwares are *extremely* variable. This high degree of variability is not stressed in many past writings (Kidder 1936; Mera 1932, 1935; Wendorf 1953), but has been described in more recent publications (Gauthier 1987a; Habicht-Mauche 1993). From the analysis of both Abiquiu and Bandelier Black-on-gray ceramics from both Otowi and Tsirege, one thing is striking: there is much more than tuff included in the paste. This includes quartz sand, but also to a lesser degree, volcanic and plutonic inclusions. Perhaps the sand was part of the raw clay material and was sorted out by some potters but not others? Or perhaps this is a function of time? Or maybe this is indicative of pottery made in other places and imported into sites on the Pajarito Plateau. Based on surface contexts with no established chronological control, these questions are impossible to answer, although it is likely that this technological aspect of making biscuitware pottery is socially meaningful. As for the additional inclusions of volcanic and plutonic material, this is likely indicative of pottery with provenance outside of the immediate area of the two studied pueblos. This is especially the case with the plutonic inclusions, although this will be further resolved with petrographic and chemical analyses.

To understand the provenance of the clay material itself, clay oxidation (refiring) analysis were performed on both Abiquiu and Bandelier Black-on-gray bowl sherds from both sites. This analysis was built on the work of Gauthier (1987a) who proposed that from refiring experiments from Bandelier Black-on-gray from Howiri, a large Classic period pueblo along the Rio Ojo Caliente (a tributary to the Rio Chama and one of the northernmost prehistoric Tewa pueblos), clay sources changed through time. He describes a general trend that was also observed by Shepard (1936) that clay sources gradually changed from light yellow clay to a darker yellow.

Of course, the surface contexts from Otowi and Tsirege do not have the luxury of chronologically controlled stratigraphy. However, when Gauthier's color chronology is applied to Bandelier Black-on-gray bowls from Tsirege, where this report has interpreted that the eastern and northern roomblocks were the latest occupied architecture at the site with the western roomblock slightly earlier, it does not hold up (Table 77.23). Perhaps this is due to the mixed contexts of these surface assemblages, or maybe (and most likely) that the potters on the Pajarito Plateau have access to different clay sources than their contemporaries to the north.

Table 77.23. The application of Gauthier's (1987a) clay oxidation color chronology based on Bandelier Black-on-gray ceramics at Tsirege.

Unit	Occupation	Roomblock	5YR (later)	7.5YR (earlier)
A (*n* = 34)	Later	Eastern	97%	3%
D (*n* = 26)	Later	Northern	42%	58%
B (*n* = 40)	Earlier	Western	60%	40%

The clay oxidation colors stated earlier in this report are representative of different clay sources, as the color reflects the amount of iron and hence the source's geological signature. There is a great deal of variability within the said analysis, and although no interpretations of provenance can be made until clay sources are evaluated, there was probably biscuitware being produced in multiple pueblos in the Tewa area and not just at one locale. The same is true with the variability in temper sources, and although there is no clear correlation between temper type and oxidation color, these data suggest that there is a great deal of potential in understanding which pueblos are producing pottery, the nature of exchange relationships and pottery mobility, and what technology can tell us about group identity.

Craft Specialization

Craft specialization is part of the larger method and theory addressing craft production, which "are a fundamental part of archaeological inquiry in that they are central to the reconstruction of ancient lifeways and the explication of sociocultural evolution" (Costin 2002). If the record of prehistoric peoples is inherently materialistic, then understanding how these artifacts are made and distributed can illuminate not only the actions of the craftspeople, but also those of their societies in general. The ways in which craft production has been characterized and analyzed has a long history in the field, but generally focuses on typologies, modes of production, parameters of variation, and specialization. Costin's (1991, 2002) view that studying a production system as an integrated whole that accounts for all actions and variables between craftspeople, technology, artifacts, exchange, and distribution is regarded as completely appropriate for this study, hence the heavy emphasis on technology. However, to address the more specific problems of identity and areas and intensity of production based on the ceramic assemblage, I focus here on craft specialization.

In essence, specialization of craft production means that "fewer people make a class of objects than use it" (Costin 2002:276). Although traditionally specialization has been used to explain and interpret cultural complexity, it has more recently been used in small-scale societies to infer ritual specialization and group identity and cohesiveness (Mills and Crown 1995). Costin (1991) has formulated four parameters in which to view craft production, in which specialization can be analyzed. The first is the *context* of production, which reflects the nature of the demand for a particular good. The second is *concentration* of production, which describes the spatial relationship between producers and consumers. The third is *constitution* of the production unit, which describes the group size and social relations of those individuals who regularly cooperate to produce a recognized corpus of goods (Costin and Hagstrum 1995). This is a continuum with one end being the household group and the other being the workshop. And the fourth parameter is the *intensity* of production, which describes the relative amount of time workers put into craft production in relation to other economic tasks.

These four parameters can be measured in various ways to understand the context, nature, and scale of craft specialization, which are often contextual to the artifact assemblage. The main advantage of a holistic approach to production is that is accounts for many kinds of variation and does not measure whether there is a presence or absence of specialization, but rather what kind of specialized production and by whom. After these questions are answered it is possible to infer what these newly found answers can tell us about social and technological identity.

As stated above, the study of ceramic craft specialization is helpful in understanding group identity and social boundaries. Prior work on the Pajarito Plateau used measurements of standardization and efficiency in pottery decoration. Melissa Hagstrum (1985) analyzed 12 Classic period Biscuit B bowls from Otowi (LA 169) and concluded that due to brush-stroke sequences used on the bowls, the painting style was increasingly standardized and more efficient than prior pottery. She uses this evidence to propose increasing ceramic specialization into the Classic period, which is concurrent with observations made by Kidder (1917), Shepard (1936), and Mera (1932, 1935).

Hagstrum's study used whole vessels from Otowi to present an accurate, yet minimal analysis of standardization and specialization of Classic period pottery. For comparison with Hagstrum's data and due to a large sample size of rim sherds, Bandelier Black-on-gray bowl rim sherds were compared between Otowi and Tsirege. Two measurements were used in this comparison: vessel size (the diameter of the bowl opening) and interior framing line width.

Vessel size and standardization differed between the two sites (Figure 77.10). In general, the mean size of Bandelier Black-on-gray bowls from Otowi was smaller than those from Tsirege (Table 77.24). Also, Tsirege had a much smaller standard deviation of bowl size than Otowi. If consistency of pottery is a sign of standardization, Tsirege is producing more standardized vessels, which could be interpreted as a higher degree of craft specialization.

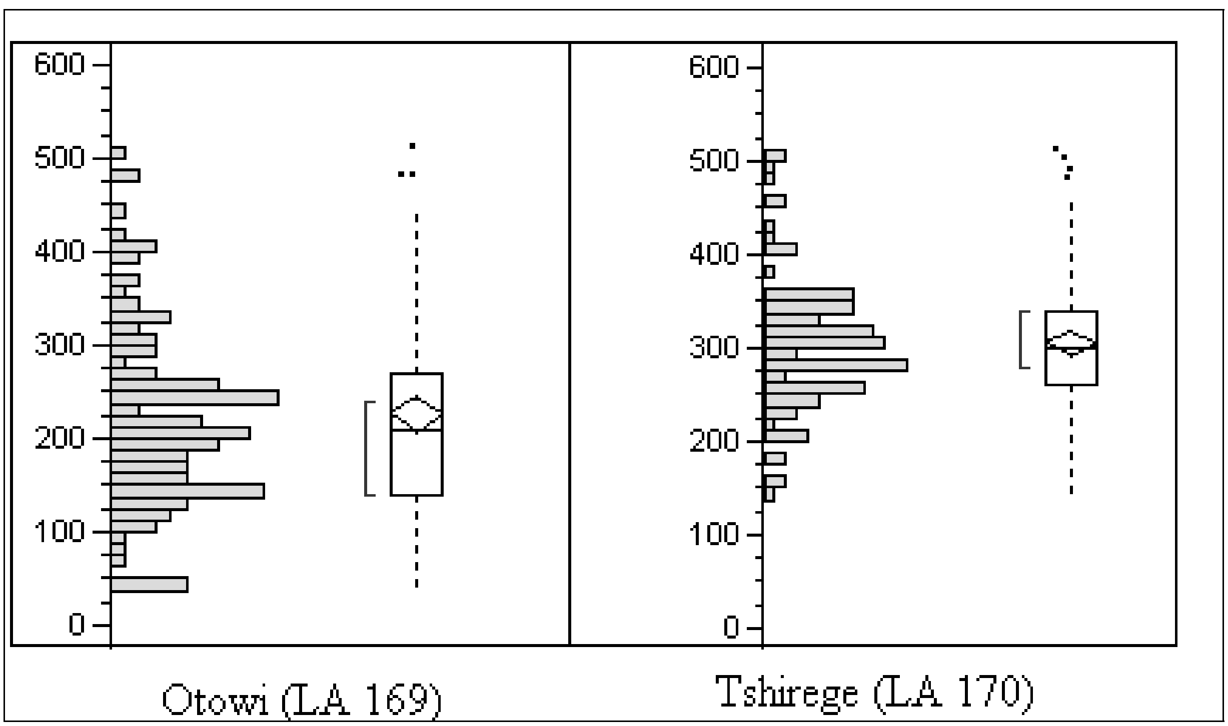


Figure 77.10. Distribution of rim diameter of Bandelier Black-on-gray bowls between Otowi and Tsirege.

Table 77.24. Statistics of the distribution of rim diameter of Bandelier Black-on-gray bowls between Otowi and Tsirege.

Site	# of Samples	Mean	Std. Dev.	Std. Err. Mean	upper 95% Mean	lower 95% Mean
Otowi	119	226.05	109.52	10.04	245.93	206.17
Tsirege	99	305.05	72.38	7.27	319.49	290.61

The same sorts of relationships between Otowi and Tsirege were also seen when comparing the width of the interior framing line between the sites (Figure 77.11). The standard deviation of framing line width was much smaller than that of Otowi, also suggesting specialization of pottery production (Table 77.25).

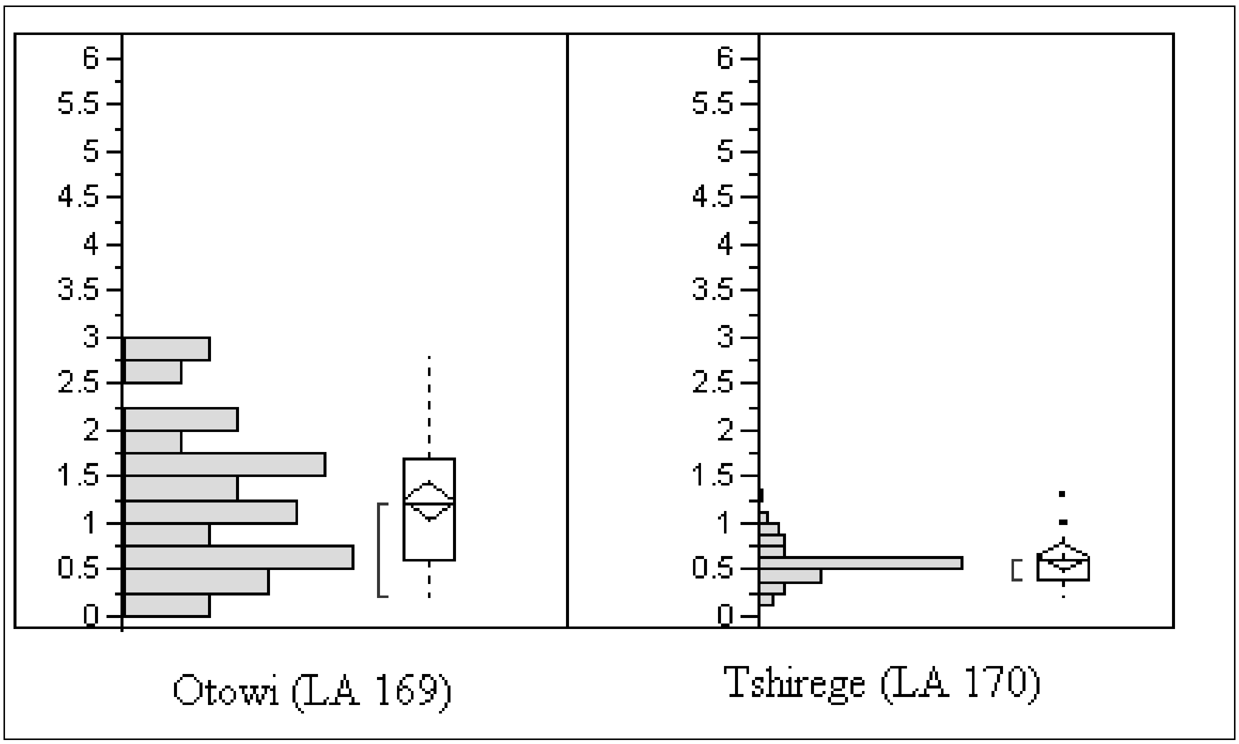


Figure 77.11. Distribution of interior framing line width of Bandelier Black-on-gray bowls between Otowi and Tsirege.

Table 77.25. Statistics of the distribution of interior framing line width of Bandelier Black-on-gray bowls between Otowi and Tsirege.

Site	# of samples	Mean	Std. Dev.	Std. Err. Mean	upper 95% Mean	lower 95% Mean
Otowi	47	1.24	0.75	0.11	1.46	1.02
Tsirege	76	0.65	0.65	0.07	0.80	0.50

With the limited context of this study it is not possible to address all of Costin's (2001) parameters of specialization. However, it does appear that Tsirege is producing standardized

Bandelier Black-on-gray pottery not unlike what was observed by Hagstrum (1985), at least compared to the Bandelier Black-on-gray pottery from Otowi. This argument is bolstered by the fact that there appears to be less variability in clay sources, as well as temper types, in the Tsirege assemblage as seen in the results of the clay oxidation experiments and microscopic analysis described earlier in this report.

Perhaps the degree of variation in the measured attributes of biscuitware pottery from Otowi results in regional exchange of ceramics whereas Tsirege is producing much of its own pottery, and probably much of the pottery for the northern Pajarito Plateau. Although this report cannot account for technological changes through time, it is most likely that there are real differences between biscuitware at the two contemporary Classic period pueblos. The importance of Tsirege as a central pueblo is also suggested by the larger rim diameter of the vessels found at the site, which is indicative of feasting events. These events brought people from the entire region together for social and most likely ritual purposes.

The importance of Tsirege as a central, large, and chronologically late occupied pueblo appears to be a fruitful research topic for future studies. The site is described multiple times in many Tewa oral traditions (Parsons 1994 [1926]). This research will aid researchers in understanding the scale and logistics of prehistoric Tewa social organization.

CONCLUSIONS

This project has sought to analyze and interpret both decorated and utility ceramics from two Classic period sites on the northern Pajarito Plateau. For the first time, the ceramic collections made by the PARP have been fully analyzed and the data made available to interested researchers. Interpretations have been made on the occupational sequences of both Otowi (LA 169) and Tsirege (LA 170), as well as their approximate dates of occupation in comparison to the northern Rio Grande chronology. Additionally, data have been generated relating to technological aspects of this pottery in which tentative interpretations have been made dealing with social identity, ceramic technology, and craft specialization of prehistoric Tewa potters from two large and understudied pueblos.

The following points summarize the findings and interpretations of this report:

1. Using relative frequencies of ceramics from surface contexts, the occupational sequence of both Otowi and Tsirege has been proposed.

2. Using these same frequencies, both Otowi and Tsirege have been situated chronologically within the culture history of the northern Rio Grande region.

3. Due to higher than expected frequencies of glazeware ceramics found at Tsirege, a new model of boundary permeability has been proposed for the prehistoric Tewa/Keres ethnic division across the Pajarito Plateau.

4. Both microscopic temper and clay oxidation experiments on biscuitware from Otowi and Tsirege suggest high variability in use of materials and technology of production, suggesting that these wares were being produced by many potters across the Tewa pueblos.

5. When comparing ceramic attributes of rim diameter and framing line width, as well as variability in the use of clay sources between Otowi and Tsirege, it appears that Tsirege produced much more standardized vessels. This suggests that the pueblo was an important producer of pottery for the region.

6. The rim diameters of Bandelier Black-on-gray pottery from Tsirege was larger than that of Otowi, suggesting that Tsirege was a pueblo of central importance in the region as evidence of feasting events.

This project has raised more questions than it has answered (the sign of interesting data) and it is hoped that these data will be helpful for future research in understanding how Classic period sites on the northern Pajarito Plateau interacted between and within themselves and with the larger Rio Grande region.

CHAPTER 78
AN ANAYLSIS OF MICACEOUS POTTERY FROM THE PAJARITO PLATEAU

B. Sunday Eiselt

INTRODUCTION

The current study is based on examination of 107 sherds representing 22 vessels distributed among four sites dating to the early Historic and Homestead periods at Los Alamos National Laboratory (LANL). This count includes nine sherds from the Serna Homestead (LA 85407), eight from the McDougall Homestead (LA 131237), four from one Apache campsite (LA 85864), and seven from a second Apache campsite (LA 85869). Seventy-seven sherds representing one isolated pot drop were also analyzed. With the exception of one likely commercial terracotta vessel, all ceramics were locally made and represent well-defined and dated northern Río Grande ceramic types attributed to Pueblo, Jicarilla Apache, and Hispanic potters. Examination of 164 clay fragments recovered from LA 131237 indicates that all of these pieces represent burned and unburned adobe plaster.

CERAMIC TYPE IDENTIFICATIONS

Ceramic analysis included examination of each sherd using a 40x Zoom microscope and standard measurement charts and templates. Sherds were classified according to form and origin of production through observations on shape, color, paste, and surface finish. Microscopic analysis was used to identify paste and surface characteristics. Tewa and Hispanic plainwares were identified based on typologies developed by Olinger (1992) and others (Carrillo 1986, 1997; Levine 1990, 2004). Micaceous sherd type identifications were based on descriptions provided in Carrillo (1997), Dick (1965a, 1968), Gunnerson (1969), Lang (1997), and Warren (1981). The characteristics used to define micaceous and plain paste ceramics are indicated in Tables 78.1 through 78.3, and additional descriptions may be found in Eiselt (2005, 2006).

Twenty-four historic ceramic types are currently defined for the northern Rio Grande region. These include plainware, decorated, and micaceous ceramics made by Pueblo, Jicarilla Apache, and Hispanic potters. Plainware types include Tewa and Hispanic redwares (17^{th} century to present), San Juan Red-on-tan (AD 1700 to present), Casitas Red-on-brown and Casitas Red-on-brown smudged (Hispanic: pre-AD 1672 to 1890), Kapo Black (Santa Clara Pueblo: 17^{th} century), Tewa and Hispanic polished blackwares (17^{th} century to present), and Carnué Plain (Hispanic: AD 1700 to 1895). Decorated wares include Tewa, Pojoaque, Ogapoge, Powhoge, and Nambé Polychrome and Powhoge Black-on-red. Micaceous types encompass residual paste and slipped varieties including Cimarron Micaceous (Jicarilla Apache: AD 1730 to present) and Ocate Micaceous (Jicarilla Apache AD ~1550 [1600]–1730), Taos Micaceous (AD ~1550 [1730] to present); Peñasco Micaceous and Vadito Micaceous (Picurís: ~1550 [1690] to present), Tewa Micaceous and Micaceous Slipped (17^{th} century to present), and Petaca Micaceous and El Rito Micaceous Slipped (Hispanic: AD 1690–1890).

Table 78.1. Distinguishing characteristics of Pueblo and Hispanic plainwares (from Carrillo 1997; Dick 1968; Levine 1990, 2004; Olinger 2004).

Ceramic Type	Forms	Surface Treatment	Paste Characteristics
Tewa Red and San Juan Red-on-tan	Large water and storage jars (unslipped, unpolished interiors). Bowls and soup plates also present. Flanged plates with well-defined flanges	Slip on exterior does not extend over rim and on to interior. Slip band below rim at shoulder; above band is polished not slipped (usually redware). Applied with a brush, producing a fine line with an even edge	Vitric tuff temper, often with pumice and/or fine sand mixed in. Soft paste with thicker walls (fired at lower temperatures?)
Casitas Red-on-brown and smudged	Bowls and soup plates dominate but larger jars also present. Flanged plates with poorly defined flanges	Thin slip not highly polished (streaky appearance), unevenly applied (with a rag?) leaving uneven edges between the band and the polished surface. Bowls: slipped on interior, slip extends to a narrow band on the exterior. Jars: narrow band of slip on exterior extends over the rim and to the interior. Decorations also include occasional scrolls, circles, and bulls-eyes on bowl interior	Vitric tuff temper, often with pumice and/or fine sand mixed in. Soft paste with thicker walls (fired at lower temperatures?)
Tewa polished blackwares	Large water and storage jars (unslipped unpolished interiors). Bowls and soup plates also present. Flanged plates with well-defined flanges	Thick slip, well-polished on exterior and interior of bowls with some crazing and cracking evident on the surface of thick slip pieces	Fine to medium sand temper, occasionally a very small amount of tuff or pumice. Friable but glassy paste (fired at higher temperatures?)
Hispanic polished blackwares	Bowls and soup plates dominate but larger jars also present. Flanged plates with poorly defined flanges	Thin slipped not highly polished (streaky appearance), unevenly applied leaving uneven edges between the band and the polished surface. Bowls: slipped on interior, slip extends to a narrow band on the exterior. Jars: narrow band of slip on exterior extends over the rim and to the interior	Vitric tuff temper, often with pumice and/or fine sand mixed in. Soft paste with thicker walls (fired at lower temperatures?)

Table 78.2. Distinguishing characteristics of micaceous slipped pottery (from Dick 1968; Eiselt 2005; Olinger 1992).

Characteristics	**Vadito Micaceous**	**Tewa Micaceous Slipped (Santa Clara, San Ildefonso)**	**Tewa Micaceous Slipped (San Juan)**	**Tewa Micaceous Slipped (Nambe/ Pojoaque/ Tesuque**	**El Rito Micaceous Slipped**
Forms	Large and medium-sized bowls and jars, storage vessels	Large and medium-sized bowls and jars, storage vessels	Large and medium-sized bowls and jars, storage vessels	Large and medium-sized bowls and jars, storage vessels	Large and medium-sized bowls and jars, storage vessels
Interior Surface finish/color	Sanded and polished raw clay (characteristic shimmering appearance). Reduced	Thick to thin reduced Santa Fe formation clay slip, highly polished. Dark brown to black in color (no mica)	Thick to thin reduced Santa Fe formation clay slip, highly polished. Dark brown to black in color (mica rare to common)	Thin oxidized plain clay slip. Mica content much greater than San Juan, Santa Clara, and San Ildefonso	Thick to thick reduced Santa Fe formation clay slip, highly polished. Dark brown to black in color (mica rare to common)
Exterior Surface finish/color	Fine silvery muscovite mica wash (reduced)	Golden yellow, orange, or gray primary micaceous clay slip (oxidized and reduced)	Golden yellow, orange, or gray primary micaceous clay slip (oxidized and reduced)	Distinctive salmon-pink to salmon-orange primary micaceous clay slip (oxidized)	Primary micaceous clay slip
Clay Paste	Muscovite mica, quartz mica schist	Plain (Santa Fe formation) with vitric tuff, pumice, and glass sherds that are easily mistaken for mica. Fine rounded sands common	Plain (Santa Fe formation) with moderate amounts of muscovite mica (biotite rare). Variably sized arkosic sands dominant.	Plain (Santa Fe formation) with abundant muscovite and biotite. Poorly sorted arkosic sands present	Plain (Santa Fe formation) with abundant arkosic sands (tuff, pumice and glass rare)
Core	Black to dark gray, laminated and coarse	Gray and dense (to ropey) or slightly granular with rounded aplastics	Black to burnt umber, granular and friable paste	Gray to light gray granular and friable paste	?

Table 78.3. Distinguishing characteristics of micaceous pottery (from Eiselt 2005).

Characteristics	Petaca Micaceous	Peñasco Micaceous	Taos Micaceous	Tewa Micaceous	Cimarron Micaceous
Vessel Forms	Small atole cups, jars, and bowls common, medium to large storage vessels and jars present but rare, pinch pots, candlestick holders, comales	Small bowls and jars, large storage vessels and jars, pitchers, figurines	Small and large bowls and jars frequently with multiple appliqués and spouts, pitchers, figurines	Small bowls and jars common, pitchers, figurines	Small and large bowls and jars, bag-shaped jars, medicine bowls, pitchers, pipes, pinch pots, figurines, appliqués common at neck and shoulder
Rim and Neck Forms	Everted (acute) on small vessels, gently everted on large vessels. Occasionally thickened neck wall below rim, inverted rim bowls common	Everted (acute) on small vessels, gently everted on large vessels, inverted rim bowls common	Gently everted to straight, inverted rim bowls common	Gently everted to straight, inverted rim bowls common	Gently everted to straight bowls and jars
Rim Margin	Undulating (uneven) and fluted/crenulated	Undulating (uneven) and fluted/crenulated	Undulating (uneven) and fluted/crenulated, indentations common	Undulating (uneven) and fluted/crenulated	Cut and straight (common). Occasionally fluted or crenulated (accompanied by y-shaped lip profile)
Lip Profile	Round (occasionally bulbous and thickened) and subangular	Round to tapered	Round to subangular with parallel-sided neck below rim	Tapered, round, subangular	Flat (square), expanding (keeled and y-shaped), sanded lip face,

Characteristics	Petaca Micaceous	Peñasco Micaceous	Taos Micaceous	Tewa Micaceous	Cimarron Micaceous
					occasional corn-cob indentations
Base Configuration	Rounded to flat	Conical to subangular, flat	Conical to subangular with occasional acute concave center	Rounded to flat	Conical to subangular with occasional slight concave center
Corn-cob Scrape Marks	Occasional, obliterated	Occasional, obliterated	Occasional, obliterated	Rare to absent, obliterated	Pronounced on interior and exterior necks and rims, partially obliterated through application of slip and/or slurry
Sanding	Heavily sanded and unslipped on some interiors, otherwise rarely sanded	Light sanding especially at interior and exterior rims	Light sanding especially on interior bowls, otherwise sanding rare	Light sanding especially at interior and exterior rims, occasionally highly sanded with mixed clays	Light sanding especially at interior and exterior rims
Slip/Slurry	Thick and uneven slurry on interior and exterior (slurry covers protruding aplastics or thin watery slurry that is prone to cracking and erosion)	Fine "silvery" muscovite mica wash (characteristic shimmering appearance)	Usually thick, even application	Rare with occasional presence of ochre	Usually thick, even application, with occasional presence of ochre
Buff/Polish	Light buffing only on some pieces. Wipe marks are present and pronounced on most pieces	Light buffing	Light buffing with a tendency towards high gloss finish on later pieces (20th century)	Light buffing	Moderate buffing especially on interior and exterior neck and rim

Characteristics	Petaca Micaceous	Peñasco Micaceous	Taos Micaceous	Tewa Micaceous	Cimarron Micaceous
Surface Compaction	Slight to none with most pieces rough to the touch	Slight to none with most pieces rough to the touch. Occasionally compacted through polishing	Slight to none with most pieces rough to the touch. Occasionally compacted through polishing	Slight to none with most pieces rough to touch. Occasionally compacted through polishing on interior bowls	Highly compacted and smooth to the touch with 'waxy' appearance
Smudging	Common to rare on interiors and exteriors	Common on interiors and exteriors	Common on interiors and exteriors	Rare with light gray to salmon-colored or orange oxidized clay	Common to rare on interiors and exteriors
Aplastic Size and Sorting	Coarse paste with large aplastics and poorly sorted aplastics (poorly cleaned clay). Aplastics range from 0.5 to 3.0 mm with large aplastics common in small, thin-walled vessels	Fine paste with small well-sorted aplastics (screened?). Mica "spalling" common on surfaces of some pieces	Fine paste with small well-sorted aplastics (screened?). Mica "spalling" common on surfaces of some pieces	Fine paste with small well-sorted aplastics (screened?). Occasional dense gray paste (evidence of clay mixing)	Generally well-sorted. Aplastic size varies with the size of the vessel
Aplastic Constituents	Quartz, muscovite mica, micaceous schist, Vadito group accessory minerals with hematite common	Quartz, muscovite mica, micaceous schist, Vadito group accessory minerals with garnet and feldspars common	Quartz, muscovite mica, micaceous schist, Vadito group accessory minerals with garnet and feldspars common	Quartz, muscovite mica, micaceous schist, Vadito group accessory minerals with biotite common	Quartz, muscovite mica, micaceous schist, Vadito group accessory minerals
Clay Constituents	Primary micaceous clay (no evidence of mixing)	Primary micaceous clay (evidence of mixing rare)	Primary micaceous clay (mixing rare)	Primary micaceous clay with some evidence of mixing w/ plain clays	Primary micaceous clay (evidence of mixing rare)

The ceramics identified for this project represent a limited but representative subset of these types including Cimarron Micaceous, Tewa and El Rito Micaceous Slipped, Tewa and Hispanic polished blackwares, and one prehistoric black-on-white sherd. Several indeterminate body sherds also were tentatively assigned to community based on similarities with known types. Nearly 91 percent of the total assemblage ($n = 96$ or 59 percent of the minimal vessel count) are ceramics made from primary micaceous clays or ceramics slipped with mica clay. Eight percent ($n = 9$ or 41 percent of the minimal vessel count) represent plain paste varieties.

SOURCE PROVENANCE DETERMINATIONS

Source provenance determinations for the LANL ceramics are based on visual examination of ceramic cross-sections and published descriptions of ceramics. Plain paste and micaceous ceramics may be assigned to producer community based on clay and temper identifications and ethnographic references to clay source utilization. Olinger (1992, 2004) has described the characteristics of plain paste temper that separate ceramics by Tewa Pueblo with a major axis of difference between Pueblos east of the Río Grande and those to the west. San Juan, Pojoaque, and Tesuque ceramics contain higher abundances of finely divided muscovite and biotite mica as a natural constituent of the Santa Fe Group clays used in ceramic production. These clays border a portion of the Sangre de Cristo Range that contains Precambrian mica-schist outcrops (as discussed below). Santa Clara and San Ildefonso ceramics are made from Santa Fe Group clays that rarely contain mica but instead are mixed with Tertiary volcanic sources to the west.

Pueblo plainwares are typically tempered with vitric tuff with smaller amounts of pumice, glass, and/or fine sand. These elements also occur as natural constituents of clays. Hispanic plainwares, in contrast, have fine to medium sand temper with occasional tuff or pumice (Carrillo 1997; Levine 1990; Olinger 1992). Pueblo pottery also is softer and the pastes are not as glassy as Hispanic types. Olinger attributes differences in paste fabrics to firing practices with higher temperatures achieved in Hispanic kilns (see also Carrillo 1997). D. Levine (2004:167) states, however, that the pastes of Hispanic wares are generally more friable than the tuff-tempered Tewa wares due to higher amounts of coarse sand temper. Geochemical analysis nonetheless suggests that Hispanic and Pueblo plainwares were made with the same geologic clays (Olinger 2004:137). Differences in paste related to Pueblo and Hispanic plainwares also extend to mica-slipped varieties, which can be further distinguished based on the color and aplastic constituents of the slip.

The micaceous clays of the northern Río Grande are located in the Sangre de Cristo Mountain Range and southern San Juan Mountains. Specifically, they occur in several Precambrian-cored topographic uplifts including the Brazos (Tusas Range), the Sangre de Cristo (Taos, Picurís, Truchas, and Santa Fe Ranges), and the Río Mora Uplifts (Rincon Range and El Oro Mountains) (Figure 78.1). The Precambrian complex is composed of metamorphic schists, quartzites, and other metarhyolites and metasedimentary rocks. Muscovite is the most common mica type found in these formations, occurring in pegmatite dikes and in quartz-muscovite schists (Austin et al. 1990). The largest deposits are associated with a middle Precambrian rock sequence called the Vadito Group, which contains an average of 38 percent to 50 percent muscovite by weight (Bauer 1988; Beckman 1982:37; Gresens and Stensrud 1974). Translucent and iron-stained quartz, feldspar, and quartz-mica schist account for 40 percent to 60 percent. Accessory minerals occur in trace amounts and include magnetite, biotite, hematite, rosy quartz, white quartz, and garnet primarily. Micaceous clay source districts and source areas are defined by regional variations in Vadito Group lithologies including trace element geochemistry of clay (Eiselt 2006). Figure 78.1 shows the locations of clay source districts and sampled source areas for comparison to LANL ceramics. Table 78.4 identifies major differences in trace mineral and rock abundances and other characteristics of micaceous clay that distinguish major source districts (Petaca, Picuris, Cordova-Truchas, and Mora) based on visual examination alone. These characteristics may be compared to ceramic pastes to determine source provenance of finished pottery. Source determinations, in turn, may be related to ethnographic accounts of clay harvesting practices by pottery producing community (Table 78.5).

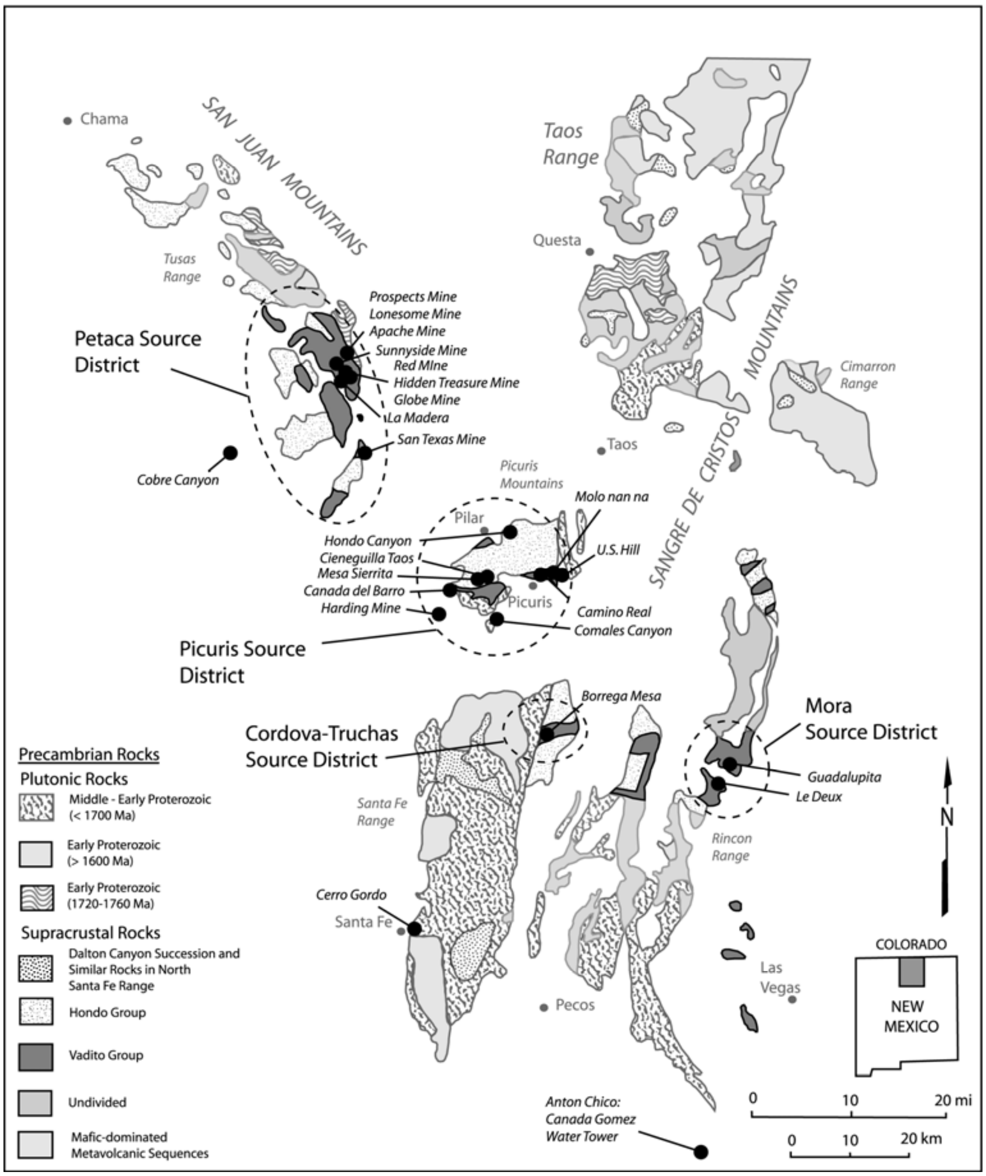


Figure 78.1. Map showing locations of predefined source districts and source areas (Redrawn from Bauer and Williams 1989).

Table 78.4. Summary of diagnostic traits for source districts (from Eiselt 2006).

High Abundance	Low Abundance	Other Characteristics	District
Quartz-mica schist (dominant). Hematite (large, common). Rosy quartz	White quartz. Booked biotite. Garnet	Medium-fine texture (mica and aplastics). Poorly sorted, angular aplastics. Red to pink muscovite	Petaca
Magnetite (dominant). Biotite (common). Garnet. Hematite (small, rare)	Quartz mica schist. Rosy quartz. White quartz (none).	Fine texture (mica and aplastics). Subangular to round aplastics. White to green muscovite	Picuris
Biotite (dominant). Magnetite. Booked biotite.	Quartz-mica schist (none). Garnet (none). Hematite.	Coarse texture (mica and aplastics). Poorly sorted, angular aplastics	Cordova-Truchas
Magnetite (dominant). Biotite. Quartz-mica schist.	Garnet (none). Booked biotite.	Coarse texture (mica and aplastics). Poorly sorted, angular aplastics	Mora

Table 78.5. Ethnographically recorded micaceous clay sources and communities.

Cultural Group	Location	Reference
Picuris	North side of Picuris Mountain on the trail from Ranchos de Taos to Picuris	Spinden 1916
Picuris	Three miles ENE of Vadito at the head of Osha Canyon (Molo nan na)	Dick 1990
Picuris	Molo nan na Proper (Destroyed)	Dick (undated map), modern potters
Picuris	Camino Real at the top of Picuris Mountain	Gunnerson 1970
Picuris	U.S. Hill	Dick (undated map), modern potters
Picuris	Cañada del Barro at Apache Springs	Modern potters
Taos	North side of Picuris Mountain	Parsons 1936; Spinden 1916
Taos	Arroyo del Alamo, on the north side of Picuris Mountain along the Camino Real trail leading to Picuris	Ellis 1974
Taos	Near the head of Arroyo Hondo Canyon near trail leading from Picuris to Ranchos de Taos	Modern potters
Taos	U.S. Hill	Modern potters
Taos	Red Mine and Apache Mine areas near Petaca	Modern potters
Jicarilla	North side of Picuris Mountain on trail leading from Ranchos de Taos to Picuris	Parsons 1936; Spinden 1916
Jicarilla	Ancient Sericit mica deposit (U.S. Hill)	Dick 1990

Cultural Group	Location	Reference
Jicarilla	In the mountains, 18 miles SE of Taos	Opler 1971a
Jicarilla	Petaca	Anonymous 1974
Jicarilla	Las Truchas	Gunnerson 1970; Schroeder 1974a, b
Jicarilla	West (north) side of Santa Fe Canyon about 1.5 miles above Santa Fe	Harrington 1916
Jicarilla	Clay bank located at San Jose, probably upstream on the Pecos River	Bender 1974; Carrillo 1997
Jicarilla	U.S. Hill	Modern potters
Jicarilla	Red Mine and Apache Mine areas near Petaca	Modern potters
Northern Tewa	Pokæn fu'a'a (south of Cundiyo and Nambe in the Cañon de Chimayo)	Harrington 1916
Northern Tewa	Pokæn fuk'ondiwe located two miles east of the town of Petaca	Harrington 1916
Northern Tewa	West (north) side of Santa Fe Canyon about 1.5 miles above Santa Fe	Harrington 1916
Northern Tewa	Borrega Mesa (south of Cordova)	Modern potters
Northern Tewa	Red Mine and Apache Mine areas near Petaca	Modern potters
San Ildefonso	Near Chamisal	Spinden 1916
San Ildefonso	North side of Picuris Mountain on the trail from Ranchos de Taos to Picuris	Spinden 1916
San Ildefonso	North side of Santa Fe Canyon	Spinden 1916
San Ildefonso	North side of Chimayo Creek near Truchas	Spinden 1916
San Ildefonso	Las Truchas	Guthe 1925
San Ildefonso	North side of Santa Fe Canyon	Guthe 1925
San Juan	Truchas Creek, a mile or two southeast of the town of Truchas	Harrington 1916
Santa Clara	Chimayo Valley	Hill and Lange 1982
Santa Clara	North side of Santa Fe Canyon	Hill and Lange 1982
Hispanics	Red Mine and Apache Mine areas near Petaca	Modern potters
Hispanics	Borrega Mesa (south of Cordova)	Modern potters
Hispanics	Las Truchas	Carrillo 1997

RESEARCH QUESTIONS

Ceramic analysis focused on answering several research questions related to dating historic sites and establishing the cultural affiliations of pottery. Specifically, the relative abundances of ceramics of different types were examined to investigate the timing of homestead and tipi ring occupations and the nature of ceramic exchange between site occupants and neighboring communities.

Temporal changes in the relative abundances of plain, decorated, and micaceous wares have been noted by several researchers working in the northern Rio Grande. Moore (1996) relates these changes to two factors: style and economy. The use of locally produced pottery varied as access to imported cooking, serving, and storage vessels changed after the colonial period. Tewa polychromes replaced glazewares by the late 1700s. Similarly, polished redwares comprise a large percentage of early colonial period assemblages by comparison to blackwares and decorated wares. Redwares waned in popularity through time, while blackwares increased until they were the most common types in the Santa Fe Trail and Railroad periods (ca. 1820s to 1890s). The use of decorated wares also decreased significantly during this time (D. Levine 1990, 2004; Moore 1996:149). Work by Carrillo (1997) and Levine (1990) in the Abiquiu area suggest that increases in blackwares may be explained, in part, by increased ceramic production in Hispanic villages during the 19th century.

Micaceous wares followed a similar trajectory to that of the blackwares, becoming the second most common category of ceramics by the 1820s. Carrillo (1997:131) relates the popularity of micaceous pottery to preferences associated with the cooking qualities of micaceous wares, and Eiselt (2006) additionally attributes the proliferation of mica pottery to the presence of Jicarilla Apache potters in the Chama after the 1840s. The removal of the Apaches to the Dulce Reservation and the increased availability of commercial cooking and serving wares after the 1890s led to significant declines in local pottery manufacturing, including plainware and micaceous ceramics.

Relative abundances of plain, decorated, and micaceous ceramics thus may be used to date archaeological assemblages to major periods including the early colonial (ca. 1590 to 1700), the late colonial (ca. 1700 to 1821), the Mexican and U.S. Territorial periods (roughly 1821 to 1890), and the pre-New Mexico statehood period (ca. 1890–1912).

Ceramic assemblages also may be related to patterns of economic exchange and interethnic relations including village-based specialization and trade in subsistence and ceramic goods between women (Brody and Colberg 1966; Carrillo 1997; Dickey 1949:90–91; Eiselt and Ford 2007; Ford 1972; Levine 2004; G. Schroeder 1964:46–47; Swadesh 1974:41; Thomas et al. 1992). Hispanics were primary consumers of Indian-made ceramics, although several villages in the northern Río Grande also produced and traded their own pottery (Carrillo 1997). Hispanic assemblages thus provide direct evidence for the organization of ceramic distribution and the scale of production and trade by pottery community during the Historic period. Village assemblages are typically dominated by Pueblo and Jicarilla pottery with lesser amounts of Hispanic wares (Eiselt and Darling 2007). The homestead sites on LANL present an excellent opportunity to examine patterns of exchange in the more remote areas of the plateau, particularly as this relates to ceramic trade with the Jicarilla and San Ildefonso Pueblo.

CERAMIC DESCRIPTIONS

Ceramic type identifications by site are provided below along with brief interpretations of assemblage characteristics at the end of each section.

McDougall Homestead (LA 131237)

The McDougall Homestead, occupied from around 1907 or 1908 to 1942 or 1943, was owned by Hispanic and Anglo families sequentially for relatively short periods of time (McGehee et al. 2006). The ceramic assemblage is likewise attenuated but is indicative of this multi-cultural occupation. A total of eight sherds representing six vessels were recovered (Table 78.6). Sherds are attributed to Hispanic, Jicarilla, and Pueblo potters, and a single terracotta fragment likely represents a commercially manufactured vessel of unknown origin dating to the Anglo occupation. Complete descriptions are provided below along with type identifications and probable source determinations where appropriate.

Table 78.6. LA 131237 ceramic counts.

Ceramic Type	Ceramic Form	Total Sherd Count	Minimum Vessel Count
Cimarron Micaceous	Medium- to large-sized jar (24 cm orifice diameter)	1	1
Cimarron Micaceous	Small- to medium-sized jar (unknown diameter)	3	1
Hispanic Blackware	Small- to medium-sized jar (unknown diameter)	1	1
Peñasco/Tewa Micaceous	Bowl/jar	1	1
Indeterminate Micaceous	Unknown	1	1
Terracotta (Commercial)	Unknown	2	1
Total		**9**	**6**

Ceramic Descriptions

Field Specimen (FS) 179 represents a definite Cimarron Micaceous ceramic rim sherd. Diagnostic characteristics include rim form and surface finish. The vessel displays a nicely finished expanding rim profile with squared edges and slight keeling to the exterior. Vessel walls have been smoothed (either with the hands or a rough stone) and then slipped with a relatively thick micaceous slurry that was subsequently rag polished to a mat luster on the interior. Polish extends on to the lip face. The vessel appears to represent a medium to large cook pot with an orifice diameter in excess of 24 cm. The dominant minerals in the paste include angular and poorly sorted translucent yellow quartz, quartz mica-schist, and muscovite mica. Accessory minerals include some garnet and possibly magnetite. The specific array of minerals combined with particle sizes, sorting, and angularity suggest that the clay for this vessel came from the Petaca source district.

The FS 432 sample represents a definite Cimarron Micaceous vessel. This sample includes one rim, a neck, and a body fragment that all appear to be part of the same small- to medium-sized cook pot or olla. The lip of the rim is flanged or crenulated. The margins of the rim are subangular, with a slightly squared and expanding profile. The lip face displays a slight, longitudinal finger groove, which is diagnostic for Cimarron Micaceous. Vessel surfaces are smooth and nicely compacted but are not sanded or polished. A thin micaceous wash has been applied to the surface. Wipe-marks are visible as faint striations. Corn cob scrape marks are absent. The interior portion of the neck fragment contains a dark encrustation or film that is likely carbonized food residue, which typically builds up on vessel bases and necks through repeated use. The dominant minerals in the paste include subangular sand-sized quartz and feldspars and muscovite mica. Inclusions are relatively well-sorted and fine. Accessory minerals include garnet, hematite, and minor amounts of biotite. These minerals are apparent in cross-sections and on the surfaces of pieces. Hematite fragments are visible in cross-section as dark black (reduced) areas that also have diffuse margins. The specific array of minerals combined with particle sizes, sorting, and angularity suggest that the clay for this vessel came from the Picuris source district. The general lack of quartz-mica schist further eliminates Petaca as a likely source, and the lack of white quartz and abundant biotite likewise eliminates Cordova-Truchas.

FS 84 represents a likely Hispanic rim sherd. Diagnostic characteristics include surface finish and paste characteristics. The vessel is reduced and a slip has been applied to the exterior. This slip extends over the rim and to the interior. The slip is thin and poorly polished, and the margin of the interior band is irregular, suggesting application with a rag as described by Levine (1990) and Carrillo (1997). The vessel appears to represent a small- to medium-sized jar with an unknown orifice diameter. The dominant minerals in the paste include fine, sub-angular to rounded translucent quartz and feldspars with minor amounts of microscopic glass fragments. Paste and surface finish characteristics are consistent with Hispanic blackwares dating to the Territorial period in Hispanic sites near Abiquiu (e.g., see Carrillo 1997; Levine 1990).

FS 430 is a micaceous rim sherd that contains ambiguous diagnostic traits that prevent a good identification. Most of the characteristics are consistent with Picurís pottery, but Tewa manufacture cannot be ruled out. Vessel form could not be determined. The rim profile is rounded and slightly bulbous, and a thin micaceous wash has been applied to the surface but is not polished. Paste texture and aplastic constituents also are most similar to Picuris district clays. The paste texture is fine, laminated, and well-sorted. Dominant plastics include angular to sub-rounded quartz and muscovite mica. Accessory minerals include feldspar, garnet, and possibly magnetite. Biotite is absent and this rules out the Cordova-Truchas clay district as a possible source for the clay. The general lack of quartz-mica schist and hematite also seems to eliminate Petaca. However, the vessel has not been greatly reduced in firing, which is a good characteristic for Peñasco Micaceous, and the mica content is low relative to typical Peñasco sherds. Round rims and oxidized firings are common features of Tewa micaceous ceramics. Tewa Micaceous cannot be ruled out as a result.

The FS 190 micaceous body sherd also contains ambiguous diagnostic traits that prevent a good identification. Clay paste is similar to FS 430 and may be from the Picuris district, but this cannot be confirmed. Vessel surfaces are smooth and compacted. A micaceous slip has been applied to interior and exterior surfaces, but is not polished.

The two FS 190 terracotta body sherds are likely commercially made and date to the Anglo occupation of the site. The form of the vessel cannot be determined but may represent portions of a flower pot.

Summary

The LA131237 ceramic assemblage, although small, is relatively diverse with input from Jicarilla, Hispanic, and Tewa or Picuris potters. Locally made ceramics likely date to the Hispanic occupation of the site, whereas the terracotta fragments were probably deposited during the later Anglo occupation. The earlier Hispanic assemblage is consistent with other Chama Valley homestead sites dating to the U.S. Territorial period, which typically include a diversity of ceramics attributed to Jicarilla, Pueblo, and Hispanic potters. The Hispanic blackware vessel may have been made at the homestead or it was procured from one of the known pottery-producing Hispanic villages in the Chama such as Abiquiú.

Although the historic documents indicate that the McDougall Homestead was established in 1907 or 1908, the ceramic assemblage suggests that the area may have been occupied at a slightly earlier date. The presence of Cimarron Micaceous, in particular, suggests a pre-1895 occupation that may overlap with nearby Jicarilla campsites (LA 85864 and LA 85869). However, the Jicarillas did continue to produce and use micaceous pottery at Dulce as late as 1909 to 1920 and individual families also regularly left the reservation covertly up to the 1920s. These off-reservation forays included hunting, clay harvesting, trade, and visiting friends or family members who were adopted or married into Hispanic and Pueblo households, particularly at Taos, Picuris, Abiquiu, and La Madera and La Petaca. These visits seem to have dropped off significantly after the 1920s, once the government improved conditions on the reservation, including the introduction of sheep in 1918 and the establishment of better health and educational facilities. There are no documented cases of Jicarillas visiting homesteads on the LANL, although the Jemez district was one of the favored fall hunting grounds of the Olleros from the 1850s to the turn of the last century. Cimarron Micaceous vessels therefore may have been obtained by the Hispanic residents of the site through trade with Apache visitors some time between 1895 and 1920. The possible presence of Peñasco Micaceous ceramics also may be attributed to Jicarilla trade. According to Schroeder (1964:46–47), the Jicarilla Apaches traded pottery from San Juan and Picurís Pueblos to Hispanics living near the Chama and upper San Juan Rivers during the 19th century.

The general characteristics of the McDougall ceramic assemblage are consistent with 19th and early 20th century patterns of interethnic exchange in ceramics reported by Carrillo (1997), Moore (1996), Eiselt (2006), and Eiselt and Ford (2007). All of the vessels identifiable to form represent jars and cooking vessels. Ceramic types and proportions, particularly the prevalence of micaceous and blackware ceramics, can be attributed to the Hispanic occupation of the site some time before 1920 and possibly as early as the late 19th century. The terracotta vessel post-dates this occupation.

The Serna Homestead (LA 85407)

The Serna Homestead was occupied at a slightly later date than the McDougall homestead and this is reflected in the ceramic assemblage. The post-1913 date for the Serna Homestead is associated with a general lack of residual micaceous pottery (particularly Cimarron or Peñasco

Micaceous) and the nearly exclusive presence of mica slipped and plainware ceramics made by Tewa potters. A total of 10 sherds representing nine vessels were recovered (Table 78.7). A total of 164 fragments of burned and unburned adobe plaster also were recovered from the Area 1 cabin and the Feature 1 horno. Complete descriptions are provided below along with type identifications and probable source determinations where appropriate.

Table 78.7. LA 85407 ceramic counts.

Ceramic Type	Ceramic Form	Total Sherd Count	Minimum Vessel Count
Tewa Blackware (San Ildefonso, Santa Clara)	Unknown	2	2
Tewa Micaceous Slipped (San Ildefonso, Santa Clara)	Large storage vessel?	2	1
Tewa Micaceous Slipped (Nambe, Tesuque, Pojoaque)	Unknown	2	2
Hispanic/Tewa buff/plain	Unknown	4	4

Ceramic Descriptions

FS 377-2 is a Tewa Blackware sherd likely originating in Santa Clara or San Ildefonso. Ceramic cross-sections reveal a fine but friable clay paste. The dominant constituents of the clay include vitric tuff, pumice, and fine sand temper. Interior and exterior surfaces are sanded, slipped, and polished. The exterior surface is a deep glossy black. The interior is polished to a lesser degree and is partially oxidized. Vessel form cannot be determined.

FS 346 is a Tewa Blackware sherd likely originating in Santa Clara or San Ildefonso. Ceramic cross-sections reveal a fine but friable clay paste. The dominant constituents of the clay include vitric tuff, pumice, and fine sand temper. Interior and exterior surfaces are sanded, slipped, and polished. Minor amounts of microscopic muscovite mica are visible on the exterior slip surface. Vessel form cannot be determined.

The FS 324 and FS 337 ceramics represent two Tewa Micaceous slipped body sherds likely belonging to the same vessel. Surface finish, wall thickness, and paste characteristics are identical. The form of the vessel cannot be determined, but it was likely a relatively large jar based on the wall thickness of the body sherds (7 mm). The pieces may represent portions of a storage vessel. Ceramic cross-sections reveal a fine but friable clay paste. The dominant constituents of the clay include rounded stream sands and microscopic glass fragments with minor amounts of vitric tuff and pumice. The interior of the vessel is sanded, polished to a mat finish, and reduced, but is not slipped. The exterior is slipped with a thin micaceous wash that contains an abundance of muscovite mica and no biotite. Paste characteristics indicate that the vessel was produced either in San Ildefonso or Santa Clara using local clay and temper sources.

The FS 117 body sherd represents a Tewa Micaceous slipped jar or bowl. Ceramic cross-sections reveal a relatively coarse and friable clay paste. The dominant constituents of the clay include subangular to rounded and poorly sorted stream sands and minor amounts of muscovite mica. The interior of the vessel is sanded, slipped with a thin slurry of plain clay, polished to a mat finish, and reduced. The exterior is slipped with a relatively thick micaceous slurry containing muscovite and biotite mica. Paste characteristics and surface finish indicate that the vessel was produced at San Juan, Nambe, Pojoaque, or Tesuque using local clay and temper sources.

The FS 305 body sherd is nearly identical to FS 117. Paste and surface finish are the same with the notable exception that biotite is not present in the micaceous slip of the FS 305 sherd. Paste characteristics and surface finish indicate that the vessel was produced at San Juan, Nambe, Pojoaque, or Tesuque using local clay and temper sources.

Four body sherds (FS 116, FS 135, FS 377-1, and FS 402) likely represent separate vessels but are otherwise very similar in appearance. Each is tempered with medium to fine and subangular arkosic sands. Interior and exterior surfaces are not slipped. Clay color is a light buff to brown. The general lack of tuff, pumice, glass, and mica suggests that the sherds may be Hispanic in origin, but the small size of the sherds prevents a definite identification. Vessel form cannot be determined.

Adobe Plaster

A total of 164 fragments of burned and unburned adobe plaster were recovered from LA 85407. Nearly all of them (n = 163) came from the Area 1 cabin, with the majority encountered in the Stratum 2 post-occupational fill. Plaster was present in most of the interior grid units but was concentrated primarily in Room 1. One fragment was recovered from the horno (Feature 1) in Area 3. There are no visible differences between the plaster from the cabin and the horno.

A number of characteristics separate adobe plaster from fired ceramics. The adobe paste consists of a fine, granular clay paste containing moderate amounts of rounded quartz and fine arkosic sands. Tuff and pumice aplastics are present but rare in most cases. Unburned fragments are buff to gray in color. Interior sides show signs of being attached to an adobe floor or wall substrate. Aplastics are exposed at the roughened contact surface. Exterior surfaces were buffed with a soft cloth, wool, or chamois. Striations are visible, the surfaces are compact, and some crazing is evident on the fine clay float or film. None of the pieces show any signs of sanding, polishing, or firing consistent with pottery and only a few display slight curvature. Several of the unburned pieces also contain fragments of a possible whitewash or paint, further suggesting wall plaster. In general, the adobe plaster is compact but not fused or vitrified through firing. Burned pieces also break easily and were likely baked in one or more of the post-occupational fires that destroyed the structure. The context, distribution, and physical characteristics of the plaster indicate that portions of the walls within the cabin were finished with adobe, possibly in the area of an interior wood burning stove or hearth in Room 1. Plaster from the area of the horno may have come from the interior or exterior of this feature.

Summary

The LA 85407 ceramic assemblage indicates that residents of the Serna Homestead obtained locally produced ceramics from the Tewa Pueblos almost exclusively. Vessels consist of blackware and micaceous slipped vessels, some of which may represent large storage vessels. Four of the sherds (40% of the total assemblage) appear to be Hispanic in origin, but this could not be verified. Despite the lack of diagnostic pumice, tuff, or glass in the temper, these unidentifiable fragments could represent Tewa vessels. Sixty-seven percent of the identifiable assemblage (n = 4, or 3 out of 5 vessels) originated either in Santa Clara or San Ildefonso, including both of the Tewa blackwares and one of the Tewa Micaceous slipped fragments. Thirty-three percent of the identifiable assemblage (n = 2, or 2 out of 5 vessels) originated east of the Rio Grande at Nambe, Pojoaque, San Juan, or Tesuque. Both of these vessels are Tewa Micaceous slipped fragments.

Ceramics were recovered from three features including the Area 1 cabin, the Area 4 circular rock alignment (Feature 2), and the Area 6 corral (Feature 3). All of the Santa Clara/San Ildefonso ceramics were associated with the cabin and all of the ceramics from Nambe, Pojoaque, San Juan, or Tesuque were associated with the circular rock alignment. Both features also contained unidentifiable Hispanic/Tewa buffwares and one unidentifiable buffware also was associated with the corral. Unfortunately, ceramic distributions do not contribute to a better interpretation of the circular rock alignment function, although it is interesting that all of the east-side Tewa ceramics were associated with this feature. The presence of ceramics in the feature, however, suggests that it may have functioned as a storage facility or outdoor food service or cooking area. The presence of adobe fragments indicates that portions of the cabin interior were prepared or finished with plaster.

The prevalence of Tewa ceramics and general lack of Jicarilla ceramics is consistent with the post-1920s occupation of the site. Residents interviewed as part of ongoing LANL research indicate that members of nearby Pueblos continued to use the mesa areas on the plateau for gathering, hunting, and religious activities. In particular, homestead farmers hired local Pueblo men to help with plowing and harvesting, and homesteaders also sold cane syrup and exchanged crop seed and information about medicinal plants with nearby Pueblos, especially San Ildefonso (Vierra et al. 2006:223–224). The LA 85407 excavations demonstrate that ceramics also were part of this exchange system. Ceramics from the Serna Homestead may be contrasted with the McDougall Homestead assemblage, which shows significant input from Apaches and likely represents a pre-1920s rather than post-1920s Hispanic occupation.

Apache Campsite: LA 85864

LA 85864 includes a rock ring alignment likely representing the remains of a wickiup or tipi foundation. Three micaceous sherds representing two vessels were recovered from this structure. Unfortunately, all three of the fragments represent small body sherds and could not be definitively identified to maker, but they were likely produced or used by the Jicarillas. A single Biscuit A fragment also was recovered from the site. Complete descriptions are provided below along with type identifications and probable source determinations where appropriate.

Both of the sherds from FS 575 likely came from the same vessel based on paste and surface finish characteristics. This vessel displays characteristics most similar to Cimarron Micaceous. Sherds contain only a moderate amount of mica. Rosy quartz and possible magnetite are present but rare and may indicate a Cordova-Truchas Source District origin for the clay. Exterior and interior sherd surfaces are burnished and compacted, unlike Tewa vessels. No corncob striations are present.

The FS 572 sherd appears to be made from an alluvial clay containing mica rather than primary micaceous clay. Mica fragments are silt- to clay-sized and larger fragments are rare. Aplastics are subangular to subrounded. The origin of the clays used to make this ceramic is unknown, although alluvial micaceous clays are present north of Abiquiu. Surface slip or float does not appear to be micaceous. Ethnic affiliation also is unknown.

The FS 574 fragment represents a small Biscuit A body sherd.

Apache Campsite: LA 85869

LA 85869 includes two rock ring alignments likely representing the remains of wickiup or tipi foundations. A total of six micaceous sherds representing two vessels were recovered along with a possible Tewa buffware fragment. The micaceous fragments represent small body sherds and could not be definitively identified to maker, but they were likely produced or used by the Jicarillas. Complete descriptions are provided below along with type identifications and probable source determinations where appropriate.

Both of the FS 309 sherds likely came from the same vessel based on paste and surface finish characteristics. This vessel displays characteristics most similar to Cimarron Micaceous. The ceramic paste contains abundant muscovite mica in a gradient of sizes. Biotite and booked biotite also are common. Aplastics include translucent to white quartz (dominant) and magnetite (rare). The abundance of booked biotite in combination with the presence of magnetite and white quartz indicate a Cordova-Truchas Source District origin for the clay. A micaceous float (slurry) was applied to the exterior surface. Exterior and interior sherd surfaces are burnished and compacted, unlike Tewa vessels. No corn cob striations are present.

All four of the FS 328 sherds likely came from the same vessel based on paste and surface finish characteristics. This vessel displays characteristics most similar to Cimarron Micaceous. Ceramic pastes contain abundant muscovite in a gradient of sizes. Quartz mica-schist also is common, and iron-stained quartz and magnetite are present. One small fragment of hematite was noted. The abundance of quartz-mica schist and the presence of iron-stained quartz and hematite strongly suggests a Petaca Source District origin for the clay. Vessel interiors are smudged. Interior and exterior surfaces are compacted by sanding and burnishing, but some wipe-marks also are visible.

FS 325 represents a probable Tewa buffware body sherd of unknown origin.

Summary

The small ceramic assemblages recovered from LA 85864 and LA85869 are consistent with other sherd assemblages found at 19th century Jicarilla Apache sites in the Chama District and elsewhere. Although type identifications are tentative, all of the micaceous sherds likely represent Cimarron Micaceous vessels based on paste characteristics and surface finish. The Petaca and Cordova-Truchas source districts are represented and these two districts were used extensively by the Jicarillas (Eiselt 2006). Vessel surfaces also are highly compacted through burnishing and polishing; traits that are likewise commonly found on 19th century Cimarron Micaceous sherds (Eiselt 2005). The Biscuit A sherd from LA 85864 may represent an earlier component at the site. The probable Tewa buffware sherd at LA 85869 was probably brought to the site by Apaches.

Isolated Pot Drop

The isolated pot drop is an excellent example of a medium-sized Cimarron Micaceous long-necked olla or cook pot with an orifice diameter of around 26 cm. The 77 recovered fragments include five rim sherds, three neck sherds, and 69 body fragments. Base sherds are not evident, suggesting that the vessel had a conical or rounded bottom. The neck is long and gently everted with vertical corn cob scrape marks on the exterior and horizontal corn cob scrape marks on the exterior. Interior and exterior surfaces have been lightly sanded and rag burnished. The rim is sharply keeled and expanding and shows evidence of being sanded and burnished. The paste includes residual micaceous clay that contains abundant quartz, feldspars, and mica-schist. Minor amounts of magnetite also are present. Paste texture is fine and laminated. A general lack of accessory minerals prevents a definite determination of source district, but Petaca or Picuris are likely candidates. The vessel likely dates from around 1850 to 1880 or 1890 based on similarities with dated types in the Río del Oso Valley (Eiselt 2006).

DISCUSSION

Summary counts and percentages from each of the four sites and the isolated pot drop are listed in Table 78.8. Cimarron Micaceous is the most numerous ceramic type in the overall assemblage and this type occurs at three of the four sites examined as part of this study. Ceramics originating in the Tewa Pueblos are the next most numerous categories and are associated with the homestead sites primarily.

Table 78.8. Ceramic summary counts.

Ceramic Type	Total Sherd Count	Minimum Vessel Count
Cimarron Micaceous	89 (83.2)	6 (27.3)
Indeterminate Micaceous (Cimarron?)	1 (0.9)	1 (4.5)
Peñasco/Tewa Micaceous	1 (0.9)	1 (4.5)
Indeterminate Micaceous	1 (0.9)	1 (4.5)
Tewa Micaceous Slipped (Nambe, Tesuque, Pojoaque)	2 (1.9)	2 (9.1)
Tewa Micaceous Slipped (San Ildefonso, Santa Clara)	2 (1.9)	1 (4.5)
Tewa Blackware (San Ildefonso, Santa Clara)	2 (1.9)	2 (9.1)
Hispanic Blackware	1 (0.9)	1 (4.5)

Ceramic Type	Total Sherd Count	Minimum Vessel Count
Hispanic/Tewa buff/plain	5 (4.7)	5 (22.7)
Prehistoric Biscuit A	1 (0.9)	1 (4.5)
Terracotta (Commercial)	2 (1.9)	1 (4.5)
Total	107 (100.0)	22 (100)

The content and diversity of the McDougall Homestead ceramic assemblage are characteristic of 19th century assemblages elsewhere in the Chama. These assemblages contain a mixture of Pueblo, Jicarilla Apache, and Hispanic ceramics with blackwares and micaceous wares being dominant up to the 1890s. Occupation of the McDougall Homestead may therefore pre-date the 1906 to 1907 patent by a few years. Some of the ceramics could represent heirloom pieces or micaceous tradewares produced by the Apaches after their removal to Dulce, but the overall assemblage composition is characteristic of 19th century ceramic production and exchange economies in the Chama (Carrillo 1997; Eiselt 2006; Moore 1996).

In contrast, the Serna Homestead site assemblage is consistent with a post-1920s occupation. Nearly all of the ceramics are attributed to the Tewa. Hispanic and Jicarilla Apache ceramics are lacking, and this can be attributed to a general decline of pottery making by these two groups after the 1890s. The Serna assemblage likewise reflects general trends in Chama Valley economies and trade relationships after the turn of the last century. These trade relationships involved the exchange of clay and pottery between Hispanic and Tewa villagers. For example, mica clay was obtained by San Juan potters from their Hispanic neighbors at Abiquiu (Schroeder 1964:46–47). Hill and Lange (1982:83) also note that Santa Clara potters obtained micaceous clays from neighboring Spanish-Americans (probably from Cordova or Abiquiu) who came to the pueblo to trade. Picuris and Taos likewise traded mica pottery to San Juan, Santa Clara, and San Ildefonso Pueblos to pay for curing ceremonies during the 20th century (Ford 1972:37–39), and Nambe produced cooking ware for trade with other Pueblos and Hispanics (Ford 1972:40).

Ceramic analysis and oral history testimony on the LANL demonstrate that these trade relationships also extended to the plateau and included neighboring homestead grants and Pueblos. Most of the Pueblo ceramics in both homestead assemblages came from neighboring San Ildefonso or Santa Clara Pueblos and Jicarilla Apaches, but Tewa Pueblos east of the Rio Grande are also represented. Although oral testimony makes no mention of exchange between women, they were undoubtedly involved in trading ceramics.

The presence of several Jicarilla Apache sites and abundant Cimarron Micaceous ceramics in the LANL assemblage is not surprising. During the 19th century, the Jicarilla traded their own ceramics in addition to pottery from San Juan and Picuris to Hispanic villagers living near the Chama and upper San Juan Rivers (Schroeder 1964:46–47). The Jemez Mountains were sacred to the Olleros, and Jicarilla hunting camps were located near Los Alamos according to oral testimony gathered by ethnographers and ethnohistorians during the 20th century (Goddard 1911:206; A. Schroeder 1974a:128, 1974b:445). Also, nearly 200 Olleros also stayed at San Ildefonso for several months in 1884 while they negotiated a permanent reservation (Tiller 1983:92–93). The archaeological sites and ceramics on the LANL thus may be attributed to the Ollero band of the Jicarilla as part of their occupation of the Española Basin. Specifically, they may belong to the *Saitinde* local group who regularly hunted the Jemez Mountains and Pajarito Plateau, but the *Dachizhozhin* cannot be eliminated.

By the 1850s, nearly all of the Olleros were living in the Lower Chama Valley from Canjilon to Española. The total population was around 300 people or six extended families divided into two local groups. The *Dachizhozhin* maintained their headquarters in the Petaca and El Rito areas, and the *Saitinde* took up residence near Española and Abiquiu. The favored hunting grounds of the *Dachizhozhin* included the Tusas and San Juan Mountains as far north as Colorado. The favored hunting grounds for the *Saitinde* were the Jemez Mountains. The 1869 census for the *Saitinde* lists a total of 170 people distributed among three extended families. One family occupied the Rio Puerco near Coyote, and the second lived in the lower reaches of the Rio del Oso (Opler 1971b:317). The third may have lived part time at Coyote and part time in the vicinity of Petaca. The headwaters of the Rio del Oso was a favored camping place for all of the *Saitinde* families moving into the Jemez Mountains for the communal fall hunts during the 1860s (Anonymous 1974:207). At the headwaters, these families traded ceramics and other items with Hispanic homesteaders at Los Rechuelos and San Lorenzo (Eiselt 2006).

The identification of Cimarron Micaceous sherds at the two tipi ring sites and at the McDougall homestead is important for two reasons. First it suggests that the Jicarilla continued to trade with Hispanic settlers as they moved in and around the Jemez Mountains and Pajarito Plateau during the communal fall hunts. Second, it reveals the itinerate nature of Jicarilla Apache pottery exchange, which involved villages and Pueblos along the Rio Grande in addition to individual homesteads in the mountains and plateaus surrounding the Española Basin.

CONCLUSION

Ceramics from the four LANL sites function as temporal and cultural indicators. The McDougall site assemblage reflects late 19th century patterns of ceramic exchange, with Jicarilla, Hispanic, and Pueblo sherds represented. The Serna site assemblage is consistent with the early 20th century date for this homestead and reflects a general decline in the diversity of ceramic production and ethnic communities producing ceramics after the 1890s. Nearly all of the sherds at the Serna Homestead are Tewa in origin, with most originating either at San Ildefonso or Santa Clara. The Serna assemblage also shows that trade between homesteaders on the plateau and neighboring Pueblo groups also included ceramics in addition to food, labor, and medicinal plants. The two tipi ring sites are attributed to the Jicarilla based on site features and ceramics. Historic documents suggest that they likely represent *Saitinde* seasonal hunting camps dating from the 1840s to the 1880s or 1890s. While on the plateau, Jicarillas interacted with local residents through the exchange of pottery.

CHAPTER 79
SETTLEMENT CHANGE AND DEMOGRAPHY ON THE PAJARITO PLATEAU

Brandon M. Gabler

PUEBLO AGGREGATIONS: A PERENNIAL PROBLEM IN PREHISTORY

Between AD 1250 and 1300, the social organization of Native American communities on the Pajarito Plateau underwent a profound shift known to archaeologists as "pueblo aggregation," in which large aggregated residential structures replaced smaller, more numerous, and widely dispersed households. Understanding aggregation and related processes is critical to southwestern archaeology, and these have been addressed through innumerable approaches for decades (Cordell et al. 1994; Orcutt 1991; see chapters in Adams and Duff 2004; Adler 1996; Cordell and Gumerman 1989; Kohler 2004; Neitzel 1999). These arguments have not yet developed a unified understanding of aggregation as an adaptive strategy by prehistoric populations throughout the U.S. Southwest. Sheer population growth could lead to increased density of small settlements. Instead, a new form of village settlement appeared (the large complex pueblo), likely coupled with a new form of social organization (Cordell et al. 1994). A possible ecological framework for this innovative qualitative change is offered by ecologist C. S. Holling's (Holling and Gunderson 2002; Holling et al. 2002) model of adaptive cycles. Holling's model proposes a fundamental relationship between growth and structural change, and so offers a candidate explanation. But testing the fit of the adaptive cycle model requires empirical data on paleoenvironmental change changes in farming and settlement patterns, and an analytical model that captures the essence of Holling's qualitative predictions.

The Ancestral Puebloan Pajarito Plateau is a dynamically coupled socio-ecological system (SES), in which migrant Puebloans from desiccated landscapes elsewhere on the Colorado Plateau (i.e., San Juan Basin) encountered local peoples during the last half of the Coalition period (AD 1250–1325; Cordell 1979b; Hill and Trierweiler 1986; Hill et al. 1996; Vierra et al. 2006:192; Wendorf and Reed 1955). The migrants brought with them alternate ideas of social structure, agriculture, tools, and the rituals and behaviors associated with these lifeways. Additionally, their arrival caused an increase in population unachievable by local reproduction alone, adding additional stress to an environment already under the pressure of the Great Drought (AD 1276–1299). There exist two narratives, elaborately intertwined, but potentially separable in order to understand the whole in more detail. The two stories are as follows: 1) the social institutions that allowed the application, development, and evolution of intensified agriculture on the Pajarito Plateau, and 2) the ensuing adaptation to changing climatic conditions, culminating in drastic reformation of settlement pattern into aggregated pueblos. The second story, which is the primary focus of this research, is the ecological half of the Pajarito SES. It is necessary to understand both stories independently for the purposes of modeling the SES as a whole—such is the nature of the study complex adaptive systems (CAS; see Lansing 2003 for a discussion of complex adaptive systems and emergent behavior). Any misunderstanding of the details of the parts will obviously lead to a gross misunderstanding of the sum of those parts, since the larger Pajarito system as a whole is—as with all CAS—greater than the sum of its parts. This study attempts to investigate several hypotheses that have been proposed for the

Pajarito Plateau, specifically, and the U.S. Southwest broadly.

The first hypothesis is that there is a significant, observable change in geographic location through time, specifically an increase in elevation, of agricultural (fieldhouses) structures (Preucel 1986; Hill and Trierweiler 1986; Vierra et al. 2006:202–203). The second is that population peaked during the Late Coalition period and declined again during the Classic period (Preucel 1986; Hill et al. 1996; Orcutt 1999). Finally, returning to the heuristic adaptive cycle model, the last hypothesis is that the patterns of population migration, expansion, aggregation, and eventual relocation off of the Pajarito Plateau fit a regional pattern of nested adaptive cycles on the Colorado Plateau (Crown et al. 1996; Holling and Gunderson 2002).

Understanding the ecological narrative is linked directly to the understanding of settlement pattern and location throughout the Coalition and Classic periods (Table 79.1). There exists a developing set of ecological theories revolving around ideas of resilience and complexity, with conceptual models based on Holling's heuristic models of nested adaptive cycles (Holling and Gunderson 2002). In the confines of this project, the information revealed by the first two hypotheses above is employed to test the adaptive cycle models as productive means for exploring and describing the complex SES of the central Pajarito Plateau. Finally, future work is discussed as a direct result of the inability to fully center the Pajarito Ancestral Puebloan system within the framework of adaptive cycles.

Table 79.1. Ancestral Puebloan chronology for the Pajarito Plateau.

Period	Dates
Early Developmental	AD 600 to 900
Late Developmental	AD 900 to 1150
Early Coalition	AD 1150 to 1250
Late Coalition	AD 1250 to 1325
Early Classic	AD 1325 to 1400
Middle Classic	AD 1400 to 1550
Late Classic	AD 1550 to 1600

The Pajarito Plateau is a series of interconnected mesas, and as such is a relatively bounded system of high- and low-elevation flat lands, amenable to agriculture but subject to annual climate fluctuation. The region covers approximately 700 square km (270 square miles) and ranges in elevation from 1500 to 3000 meters (4920 to 9840 feet). It is bounded by Santa Clara Canyon to the north, Cochiti Canyon to the south, the Jemez Mountains to the west, and the Rio Grande to the east (Vierra et al. 2002:195). The Pajarito Plateau, as a geographically bounded system, provides an ideal opportunity to examine local pueblo aggregation as well as the functioning of adaptive cycles. Events such as initial occupation and abandonment—critical to panarchy, or nested adaptive cycles—are apparent from the material record. It is essential to test the Pajarito Plateau data against a heuristic model of adaptive cycles at multiple scales, following Holling et al. (2002). The patterns of aggregation throughout northern New Mexico and southern Colorado suggest that at a super-regional level, aggregation may have been cyclic with migration serving as the destruction/reorganization phases of Holling's adaptive cycle discussed below.

METHODS AND THEORY

The key challenge for models of resilience and adaptation in the Southwest is to determine the scale at which to view cycles of agricultural intensification, aggregation, demographic change, and migration to eliminate noise but capture the system as a whole. Pueblo aggregation cannot be understood by simply assessing the movement of individual households. Detail of individual households will likely be necessary, but it is the system as a whole that develops aggregation, in turn causing changes in population size, agricultural strategies, and migration. The entire plateau region must be addressed to understand the processes driving the formation of large pueblos throughout the Rio Grande Classic period.

Testing Pueblo Aggregation

This research builds on the work of Schiffer (1976) and Reid et al. (1975) who developed principles of behavioral archaeology to frame the material record of the past in terms of past and present human behavior and its impact on the environment. Cordell et al. (1994) and Orcutt (1991) proposed that settlement relocation and aggregation at the end of the Coalition period was, at least in part, due to decreased precipitation, because the events coincide in time. Strategies 1 and 3 of the four behavioral archaeology strategies are of importance here, because they deal with the use of past material culture to understand past (Strategy 1) and present (Strategy 3) human behavior. Strategy 1 of behavioral archaeology properly addresses Cordell et al. (1994) and Orcutt's (1991) formulation of these assumptions that dictate the change in settlement patterns. While their conclusion may be appropriate and logical, there could be other driving factors as well. Models of aggregation and the processes driving it in the Southwest will be useful for analyzing aggregation or similar settlement patterns in other archaeological systems. Thus Strategy 3 becomes important to the question of aggregation, for through the analysis of the Pajarito populations in terms of adaptive cycles, the research uses the material record about the past to make statements of wider applicability throughout various systems in the past and present. Like other questions posed and addressed through Strategy 3 (Reid et al. 1975:865), general processes of aggregation may exist with the potential to be identified through the study of individual instances. Those with high data resolution, like the case on the Pajarito Plateau, provide the most promise for developing general laws about aggregation.

Panarchy: Adaptive Cycles for an Ecological Perspective

Within archaeological research, there is a growing concern with connecting the behaviors of people in the past to those in today's world. Holling (1973) and Gunderson and Holling's (2002) theory of nested adaptive cycles, or *panarchy*, seeks to explain resilience of natural ecosystems. The adaptive cycle is divided into four phases: exploitation or rapid growth (r), conservation (K), release or destruction (Ω), and reorganization (α). Panarchy is applied to socio-ecological systems (Carpenter et al. 2001; Holling et al. 2002; Westley et al. 2002) to explain resilience of human systems to ecological disturbance and vice versa. Though the adaptive cycles likely will not *explain* the variation observed through time on the Pajarito Plateau, they may provide a framework within which patterns may be observed to fit, or not fit, the expected cyclic patterns.

The long time-depth of archaeological systems combined with the high-resolution data on the Pajarito Plateau makes these Ancestral Puebloans ideal for testing against the panarchy model, especially as they operate at and across multiple scales (Levin 1992). If fitted to a panarchy, the Pajarito Plateau story (Figures 79.1 and 79.2) may appear as follows. Exploitation is a phase of economic optimization, and where the adaptive cycle would have "flipped" into a mode of agricultural production in the prehistoric Southwest. On the Pajarito Plateau, agricultural groups are moving toward the conservation phase by AD 1150. During this phase, small pueblo sites develop at low- and high-elevation mesas, capitalizing on widespread precipitation and varying levels of soil nutrients. Populations reach carrying capacity during this phase, and beginning around AD 1250 or 1275, a brief release phase occurs, potentially at the hands of the Great Drought (AD 1276–1299). Immediately, the Puebloans would begin a phase of restructuring. It is within this phase that aggregation occurs, as a response to either the massive release of resources during the Great Drought, or more likely the immense immigration of Puebloans from the San Juan Basin to an already depleted Pajarito Plateau resource area.

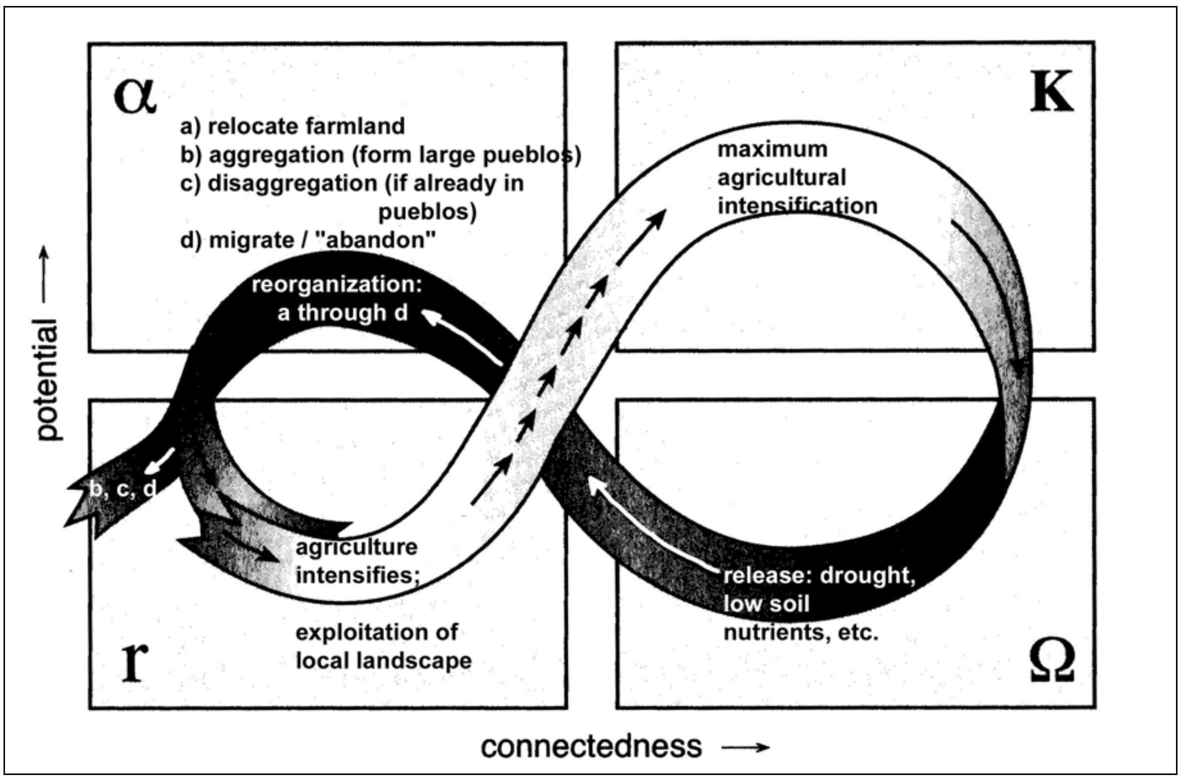


Figure 79.1. Adaptive cycle for village farming societies in the U.S. Southwest (adapted from Holling and Gunderson 2002:34, Figure 2-1).

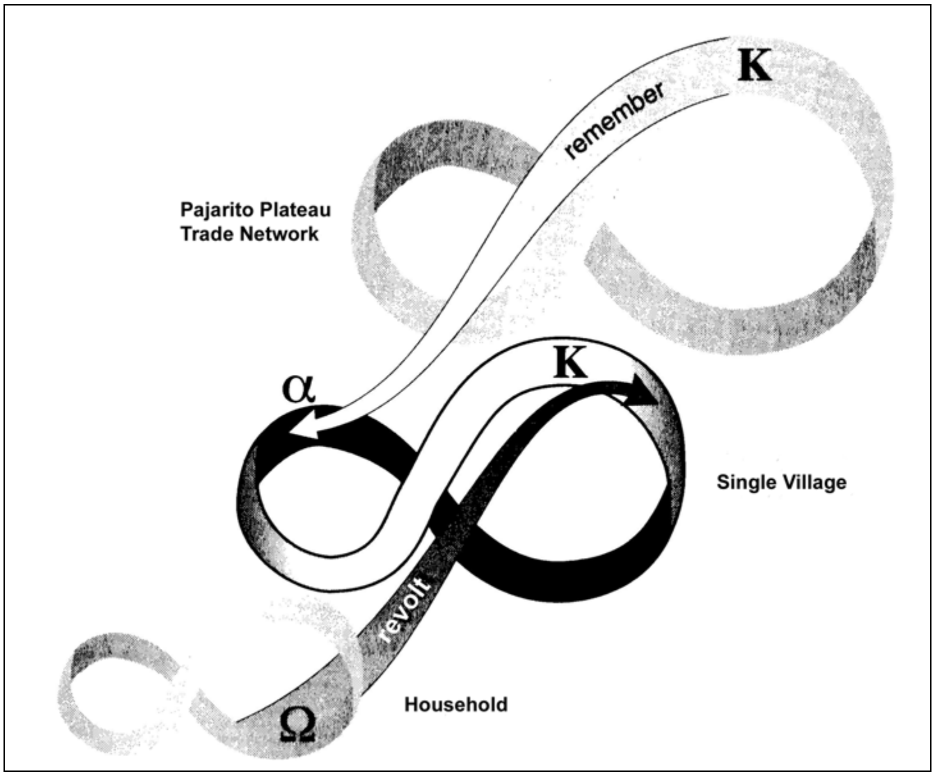


Figure 79.2. A panarchy representing the multiple levels of adaptive cycles for the pre-aggregated Pajarito Plateau (adapted from Holling et al. 2002:75, Figure 3-10).

The questions raised by an adaptive cycle relate to causes of change at the end of each phase and to the potential lack of a second cycle on the Pajarito Plateau. Cordell (1989) and Orcutt (1991) argue for a reorganization of massive pueblos at low elevations during the AD 1300s as a direct result of climate change. However, there is evidence for an aggrading environment (AD 1295–1330; see Chapter 7, Volume 1) following the Great Drought, suggesting that social factors must have influenced the continued organization into aggregated pueblos—one such idea is that of populations migrating out of southern Colorado and western New Mexico, where Puebloans had established cliff dwellings and large pueblos before abandoning them by AD 1300.

The Pajarito Plateau archaeological environment provides data rich with potential for testing the emergence and dissolution or migration of an agricultural society against the assumptions included in framing the system within Holling's adaptive cycles. Single households, villages, trade networks, and migration patterns may serve as the multiple spatial scales necessary to test the cyclic nature of human behavior, while growing seasons, generations, and settlement relocation in pre-state agricultural societies of the Southwest should provide the multiple temporal scales.

Holling's adaptive cycle model will be tested through the analysis of settlement patterns and change through time as the Pajarito farmers develop aggregation. As shown in Figures 79.1 and 79.2, there are multiple processes operating at each stage of the cycle, and various cycles occurring at different scales. To disconfirm the adaptive cycle model, it may be necessary to show that the cycle does not repeat, and therefore is not a cycle at all, rather a trajectory.

Additionally, it may be possible to show that the Great Drought did not constitute a great enough drain of resources to influence the reorganization phase. If this is the case, then it is social, not ecological, properties driving reorganization into aggregated pueblos, suggesting that the Pajarito system follows some other adaptive process uncaptured by Holling's model.

Data, Resolution, and Application

Agriculture on the Pajarito Plateau began between AD 900 and 1150 as small-scale horticulture, and was thoroughly established by AD 1150 at the start of the Coalition period. Throughout this time, population growth steadily increased followed by decreased precipitation during the mid to late 1200s culminating in the 'Great Drought' throughout the region. This period is also when the plateau experiences its greatest population growth rate and the beginning of major pueblo aggregation. By AD 1325, the beginning of the Classic period, nearly all agriculturalists occupying the plateau lived in a few large (>300 room) pueblos, as opposed to the more abundant smaller roomblocks (8 to 30 rooms, with a maximum around 100 until the large, 200- to 250-room structures appeared during the latest Coalition period) consistent throughout the Coalition period (Vierra et al. 2002). Through high-resolution LANL data, it is possible to test ideas relating to adaptation and resilience in the prehistoric American Southwest.

Cultural Resource Information

The research presented here uses existing field survey and excavation data as well as various sources of climate and landscape information for the Pajarito Plateau. The Conveyance and Transfer (C&T) Project involved excavation of nearly 30 fieldhouses, several pueblo roomblocks, and field survey and site recording on several thousand acres of land on the Pajarito Plateau. These sites comprised agricultural period artifacts and structural materials, much from the Coalition (AD 1150–1325) and Classic (AD 1325–1600) periods. The fieldhouses and pueblo roomblocks are a large portion of the current investigation of settlement pattern on the plateau to determine causes of aggregation and provide glimpses into the daily lives of village farmers. Grid gardens and check dams provide useful information about where the Ancestral Puebloans were routinely farming and where they may have avoided with relative consistency. The C&T Project added to an existing substantial database generated by past archaeological research on the plateau. These investigations include those before LANL by Hewett (1904, 1905, 1906, 1908a) and Wilson (1916, 1917, 1918b); and the LANL-era investigations conducted by Steen (1977, 1982), Worman and Steen (1978), and the Pajarito Archaeological Research Project (PARP) led by Hill (Hill et al. 1996). Additional investigations on the Department of Energy’s LANL property have been conducted until the present under the supervision of various LANL archaeologists (Vierra et al. 2002; Vierra et al. 2006). The cultural resource database lists sites by their standard attributes (location, area, survey name, eligibility) as well as classifies each by type (Table 79.2) and likely affiliation (Table 79.3).

Table 79.2. Archaeological site type categories present at LANL and used in this research (Vierra et al. 2006:183–185).

Type	Description
Cavate	Isolated, multi-roomed contiguous, or adjacent groups of rooms that are carved into cliff faces within the Bandelier Tuff geological formation.
Complex or plaza pueblo	One or more pueblo roomblocks enclosing a plaza; generally (but not always) larger than pueblo roomblocks.
Pueblo roomblocks	Contiguous, multi-roomed habitation structures of more than four rooms, lacking a plaza, and constructed of adobe, jacal, or masonry.
One- to three-room structures	Small surface structures, consisting of rectangular or D-shaped rock alignments, no more than three rooms, and constructed of unshaped dacite cobbles or shaped and unshaped tuff blocks. Often referred to as "fieldhouses."

Table 79.3. Temporal affiliation categories assigned to LANL archaeological sites (Vierra et al. 2006:180).

Affiliation	Dates	Comments
Coalition	AD 1150–1325	The majority of LANL Ancestral Puebloan sites fall within this period; first widespread agricultural success, beginning of aggregation at end of 1200s.
Late Coalition/ Early Classic	AD 1250–1400	Overlaps Coalition and Classic periods, generally used for sites that are confirmed multi-component after excavation, or whose surface deposits are deemed to span both periods based on survey (i.e., presence of multiple painted wares, especially Wiyo Black-on-white [see Chapter 76, this volume]).
Classic	AD 1325–1600	Major settlement reorganization during this period, when aggregation into a few large plaza pueblos occurred.

Ecological Information

The data pertinent to this project include elevation (LIDAR data as a digital elevation model at a cell resolution of 16 feet), paleoclimate (annual precipitation reconstructed from tree-ring indices for AD 680 through 2002; see Chapter 7, Volume 1; Dean and Robinson 1977) soil samples and types across the plateau, hydrology, and vegetation/land cover. Department of Energy/LANL owns the majority of the central Pajarito Plateau (north of Frijoles Canyon), which is the area of interest for this research.

Methodological Applications

The open source GRASS geographic information system (GIS) program (GRASS Development Team 2006) is used to operationalize the data and analyze potential settlement patterns within the Pajarito system. These localized interpretations are available for multiple regions in the Southwest, providing insights into cross-cultural similarities in pueblo social organization, response to changing climate, and population dynamics. The GIS framework of settlement pattern analysis will become the foundation for building an agent-based model of individual household interaction (Box 2002; Kohler et al. 2005; Lim et al. 2002). An agent-based model applied in this fashion will allow for intensive experiments with control over agent behavior, landscape change (i.e., erosion or modification by humans), and climate factors, while providing the possibility for emergent properties of the archaeological system as a complex adaptive system (Lansing 1991, 2003).

Humans adapt not only to their perception of the environment, but also to the cultural system in which they live. Puebloan society transforms due in part to climate response and in part to the growing complexity of society through pueblo interactions, religious beliefs, and changing community dynamics of cooperation and trade. Societies generally only adapt to the extent that is necessary based on changing conditions (Trigger 1995:450), and what they leave behind forms the archaeological record, which anthropologists must make sense of to determine the extent of adaptation required by the past populations.

Data Shortcomings

It is critical to bring to the forefront two issues with the archaeological data used in conducting statistical tests and creating models throughout this research. First, archaeological sites lacking a constrained chronological period are not included in the analyses. Table 79.1 contains the broadest scale chronological information deemed acceptable for inclusion. Various sites in the LANL database have been coded as “Undetermined Prehistoric” or “Undetermined Anasazi” and as such are not useful to the present analyses. Second, there seems to be some difficulty in ascribing chronological time ranges of Coalition or Classic period based on surface surveys using ceramic seriation, considering the abnormally long ranges of painted wares such as Santa Fe Black-on-white. This ceramic type, for example, spans 200+ years and overlaps the Coalition and Classic periods considerably, causing considerable haze during the Late Coalition/Early Classic transition, especially if other ceramic types were not sufficiently visible on the surface. Included in future work for this project will be a return to the original field notes of the Steen, PARP, and other LANL surveys to attempt to bring further chronological control to some of the sites, particularly those currently defined as undetermined thus far.

Geographic Location and Culture Change

As stated above, it has been proposed through past research on the Pajarito Plateau (Crown et al. 1996; Hill and Trierweiler 1986; Hill et al. 1996; Vierra et al. 2006) that the mean elevation of agricultural structures increases through time. Specifically, Preucel (1986) suggests that there is an observable shift to higher elevations during the Classic period, potentially suggesting movement into the uplands to aid in capturing moisture for agricultural purposes.

Using the LANL cultural resources database within GRASS, sites were separated into different files based on the site type and affiliation classifications (see Tables 79.2 and 79.3). Only those sites with assigned cultural affiliation were used for these analyses. Out of a total of 823 sites meeting these criteria, 422 are Coalition period roomblocks or cavates with more than three rooms (Figure 79.3), 146 are Coalition period one- to three-room structures (Figure 79.4), 53 are Late Coalition/Early Classic structures with more than three rooms (Figure 79.5), 46 are Late Coalition/Early Classic one- to three-room structures (Figure 79.6), 37 are Classic period structures with more than three rooms (Figure 79.7), and 98 are Classic period one- to three-room structures (Figure 79.8). These data and the other site types are summarized in Table 79.4. For purposes of calculations, sites are grouped as either large sites (those with four or more rooms, including all types of pueblos and cavates that have been identified as contiguous) or small sites (those with one to three rooms). These categories are intended to avoid bias between functionality of sites as well as differences in the actual occupants of sites; therefore, all rooms are equal in the initial assumptions, as in Orcutt's momentary population calculations (1999).

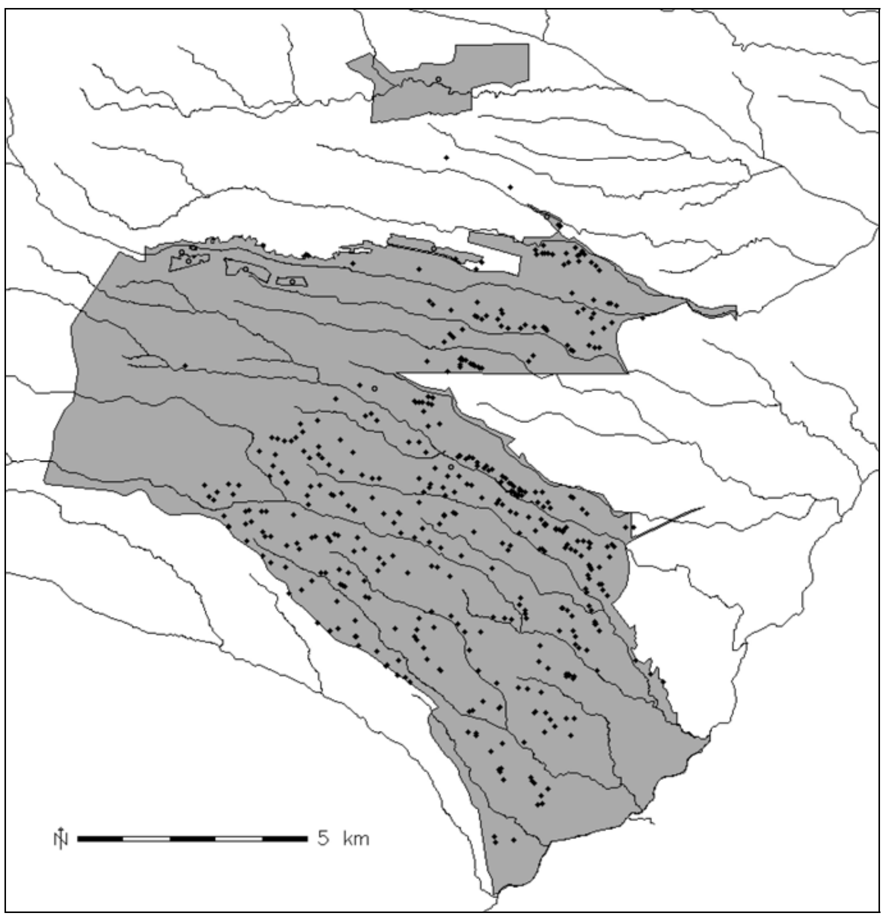


Figure 79.3. Coalition period pueblos with more than three rooms. LANL region shaded.

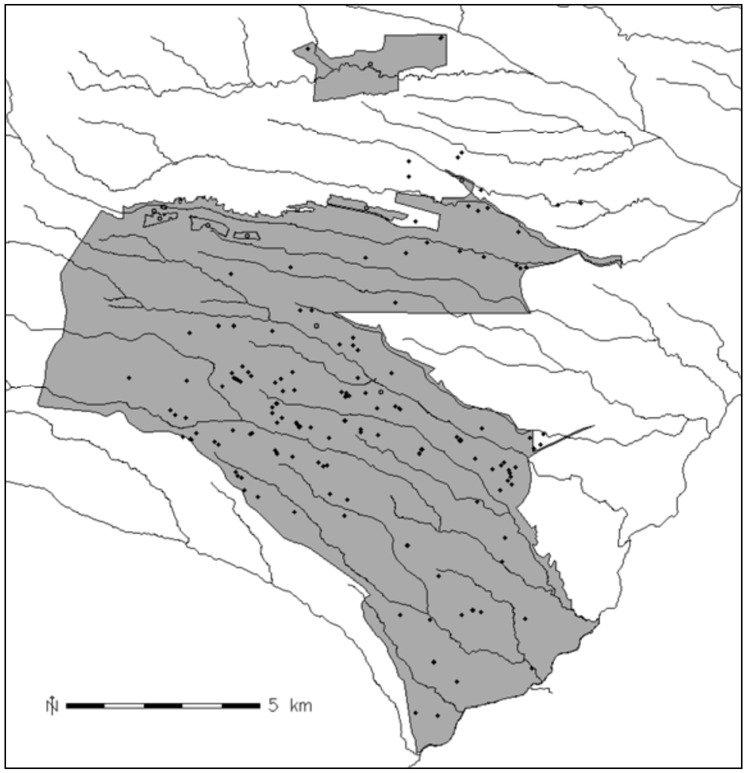


Figure 79.4. Coalition period small (one- to three-room) structures.

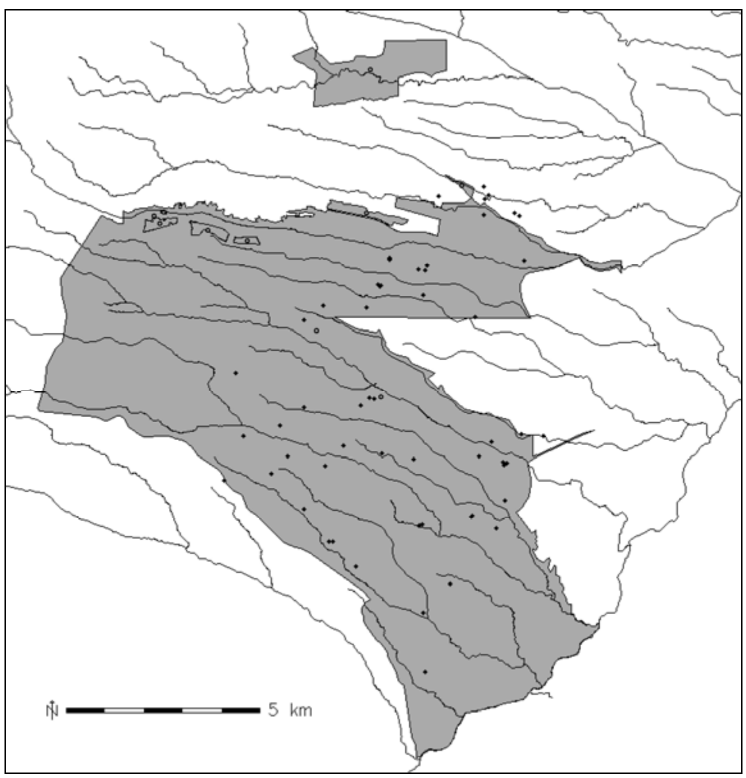


Figure 79.5. Late Coalition/Early Classic period pueblos with more than three rooms.

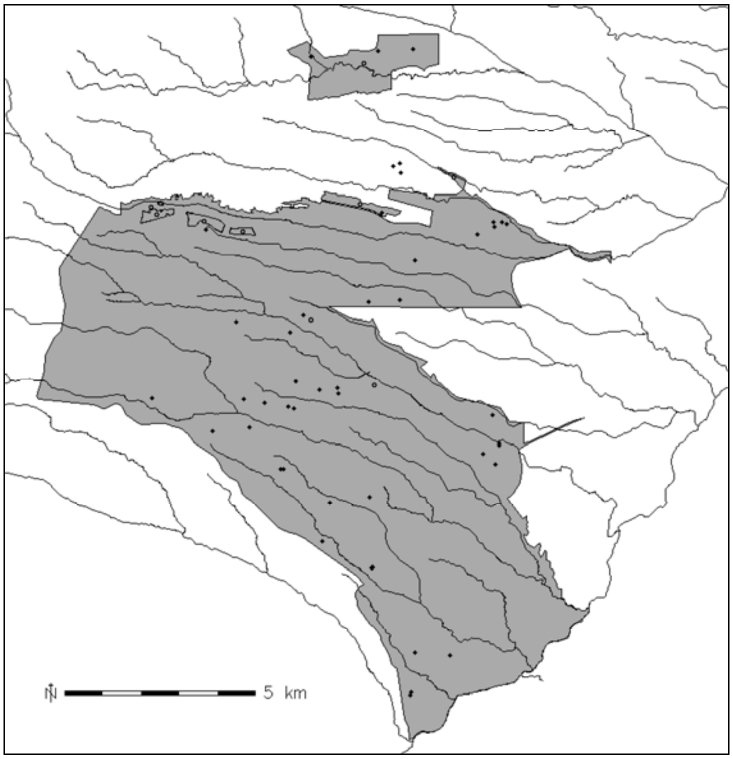


Figure 79.6. Late Coalition/Early Classic period small (one- to three-room) structures.

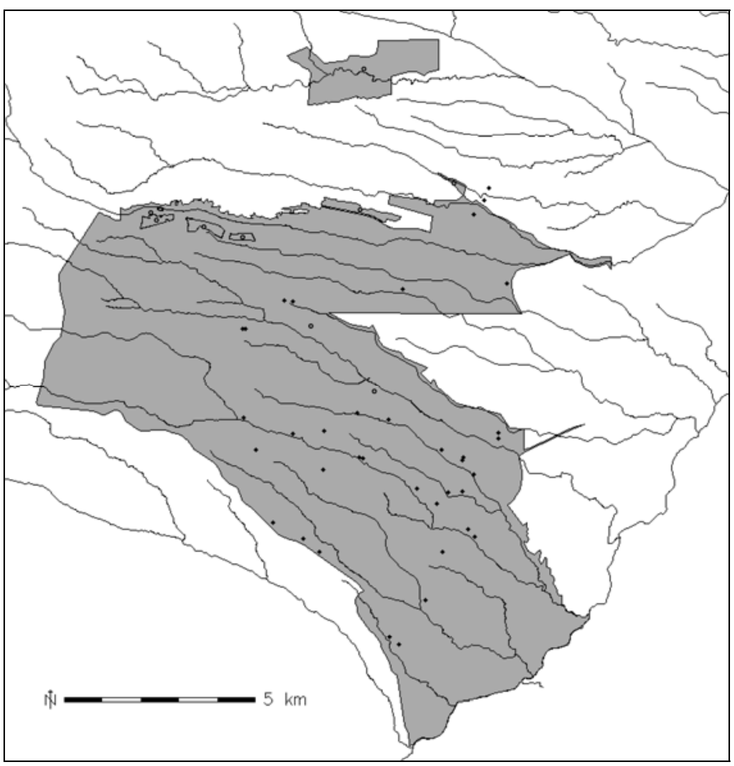


Figure 79.7. Classic period pueblos with more than three rooms.

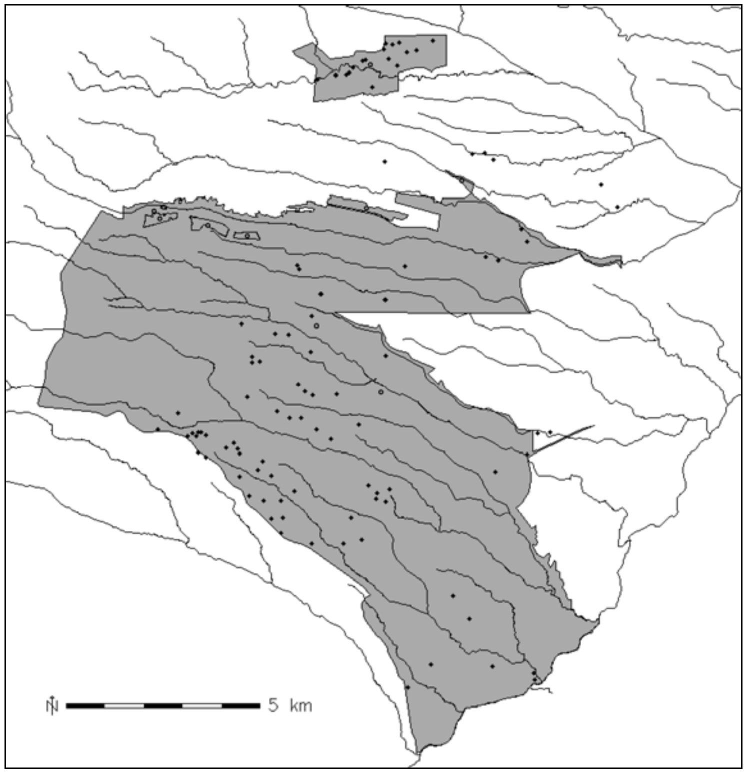


Figure 79.8. Classic period small (one- to three-room) structures.

Table 79.4. Relevant categories and summary statistics of identified archaeological sites.

Period	Type	Sites (*n*)	Mean Elevation (ft)	Number of Rooms (number of sites with estimates)
Coalition	Small (1 to 3 rooms)	146	6864	261 (n = 146)
	Large (>3 rooms)	422	6778	5159 (n = 293)
Late Coalition/ Early Classic	Small (1 to 3 rooms)	46	6865	69 (n = 46)
	Large (>3 rooms)	53	6773	1104 (n = 33)
Classic	Small (1 to 3 rooms)	98	6898	164 (n = 98)
	Large (>3 rooms)	37	6694	1706 (n = 10)

Testing the Change in Agricultural Site Elevation

After computing the mean elevation for each individual site (due to the fine grid resolution of the digital elevation model), it was possible to test Preucel's observation of a change in elevation through time on the Pajarito Plateau. Table 79.5 presents a summary of the frequency of archaeological sites in the same elevation zone categories as in Hill and Trierweiler (1986:Table 7), using the current archaeological site database of categories and types. Brief visual inspection of the table suggests that there is a slight shift in number of sites to higher elevations, but this is based on the assignment of categories with intervals of 350 feet and somewhat arbitrary breaks.

Table 79.5. Frequency of sites by elevation and period, using elevation categories from Hill and Trierweiler 1986:Table 7 and Vierra et al. 2006:Table 9.4). Includes water control and grid garden sites (*n* = 21).

Elevation (m)	Coalition	Late Coalition/ Early Classic	Classic	Elevation (ft)
2400+	0	0	0	7900+
2300–2400	0	0	0	7550–7900
2200–2300	41	5	13	7220–7550
2100–2200	189	38	61	6900–7220
2000–2100	207	37	34	6550–6900
1900–2000	142	22	29	6200–6550
below 1900	2	0	3	below 6200
TOTAL	581	102	140	--

Given the large number of sites within each category, it was determined that formal hypothesis testing should result in the ability to say whether or not the mean elevation of sites actually changed between the Coalition and Classic periods. Two hypotheses were interpreted from the prior hypotheses of Hill and Trierweiler (1986), and they are as follows:

> Null hypothesis 1: The mean elevation of all Coalition period sites (μ_1) is equal to the mean elevation of all Classic period sites (μ_2).
> Alternative hypothesis 1: $\mu_1 \neq \mu_2$
>
> Null hypothesis 2: The mean elevation of Coalition period small sites (one- to three-room structures; μ_3) is equal to the mean elevation of Classic period small sites (μ_4)
> Alternative hypothesis 2: $\mu_3 \neq \mu_4$

Table 79.6 provides a summary of the means, sample sizes, and results of the independent sample tests. In each of these cases, the independent samples test failed to produce a significant result, meaning that currently there is not enough evidence to suggest a change in elevation between the Coalition and Classic periods on the Pajarito Plateau (see also Figures 79.9 and 79.10). It is even more important to note that a misleading feature of Table 79.5 (constructed using the same categories as Hill and Trierweiler 1986:Table 7) is that the observable elevation shift may be due to the fact that the mean elevation for small fieldhouse sites is 6898 feet, and the table breaks elevation at exactly 6900 feet.

Table 79.6. Statistical results of hypothesis testing for mean elevation change of agricultural sites between the Coalition and Classic periods.

Hypothesis	Period	*N* (sites)	Mean Elev. (ft)	St. Dev.	*t*-value	*p*-value
1) All sites	Coalition	581	6798.56	284.86	-1.278	0.202
	Classic	140	6833.96	329.95		
2) Small sites	Coalition	146	6863.94	325.00	-0.803	0.423
	Classic	98	6898.70	340.98		

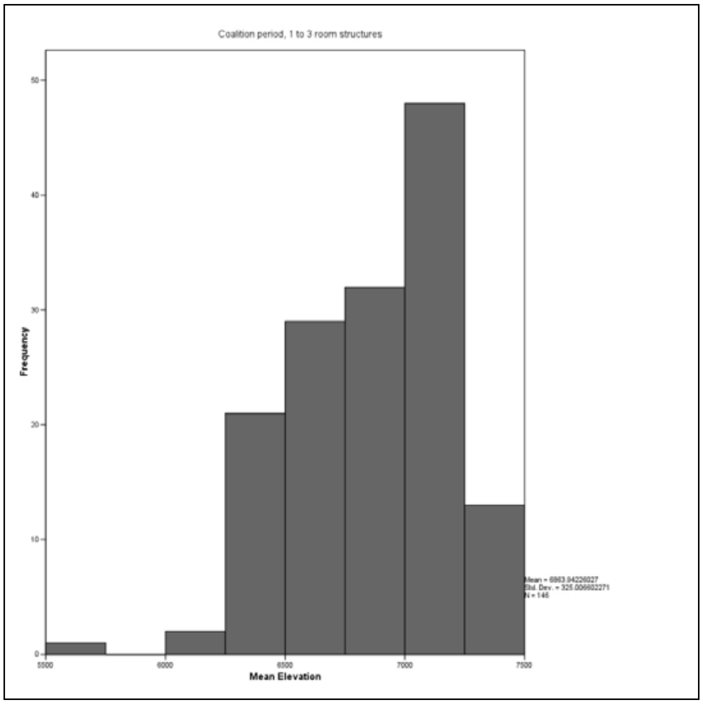


Figure 79.9. Distribution of Coalition period one- to three-room structures with respect to elevation.

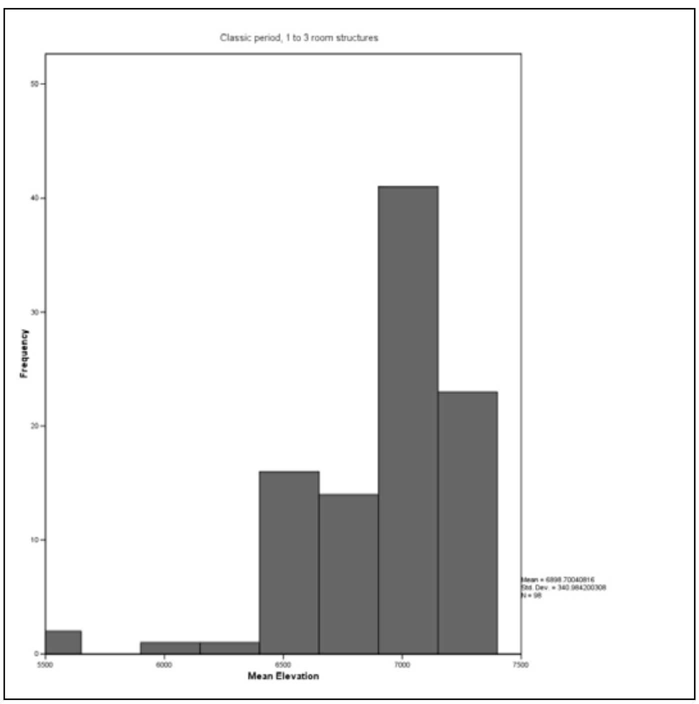


Figure 79.10. Distribution of Classic period one- to three-room structures with respect to elevation.

One may question the ability to reject outright the claims of elevation change in the Classic period, and there certainly may be evidence of an increase in elevation *during* the Classic period, but the chronological resolution for the majority of surveyed sites does not allow the assessment of a more refined chronology than that presented in Table 79.2. Perhaps most important is to note that these tests merely refute the claim that central Pajarito farmers relocated to higher elevations through time *on the central Pajarito Plateau*. The section on population modeling, discussed below, reiterates Crown et al. (1996:195–197) and Orcutt (1999) in showing that population declines sharply on the central Pajarito, with approximately 85 percent of its population moving to the southern Pajarito and, therefore, to lower elevations.

Exploring Other Geographical Features of the Pajarito System

Due to the failure to accept alternative hypotheses about changing elevation through time, it became necessary to conduct a series of exploratory statistical tests so that other features of the landscape that potentially correlate with cultural adaptation were not overlooked based on prior hypotheses.

These tests include two other strictly geographical relationships on the landscape: the geographic distance of each site to the nearest major drainage, and the average slope (degrees) of each site. Hypotheses similar to those for elevation were constructed for each of these variables, resulting in, again, no significant relationship between time and the geographic distance to the nearest drainage. Multiple reasons for a lack of relationship exist. First is the possibility that there truly is no change in the distance of sites to the nearest drainage. Alternatively, since direct Euclidean distance was used for these calculations, it is possible that the landscape has not been accounted for properly regarding cost to travel into, and back out of, canyons to carry water.

A comparison of slope, however, suggests a very strong significant decrease ($t = -6.37$, $p<0.001$) from the Coalition to the Classic periods for the location of sites larger than three rooms. The cultural significance of this change has not yet been investigated, and the substantial difference in number of sites (Coalition = 422, Classic = 37) generates some cause for concern, because the cavate rooms during the Coalition period are outliers (cavates are located in places with the highest slopes) but during the Classic period, they are not. However, Levine's statistic confirms that equal variance in the means can be assumed, given the distribution of the slopes for the two periods. Even without the assumption of equal variance, the test statistic remains significant. To confirm this, a Mann-Whitney test and a Kolmogorov-Smirnov test were conducted, both resulting in significant ($p<0.001$ in both cases) differences between the Coalition and Classic period slopes. As these tests were not originally part of the hypotheses under consideration, they are not explored in more detail here for cultural significance, but they do produce a thought-provoking argument that site location choice shifted at the end of the Coalition period, perhaps in connection with increasing population density and a more stressed environment. On the contrary, the difference could simply be a relic of the small number of large sites during the Classic period. Understanding the relationship between elevation, slope, and distance to major year-round water sources is inherently conjoined with the concept of aggregation on the Pajarito and throughout the U.S. Southwest.

The final missing piece, which is substantial in relation to the tests conducted on large sites, but not so much in connection with those on small sites, is the lack of Tsankawi in the current database, as it is a large Classic period pueblo on the northern Pajarito Plateau but is part of Bandelier National Monument, not LANL. The data for the northern portion of Bandelier have recently been acquired and will be recoded and entered into these tests. However, as the location is on the eastern end of the plateau, the lack of significance between agricultural sites and increased elevation is not likely to change.

Demographic Models of the Northern Pajarito Plateau

Following Orcutt (1999) and Newcomb (1999), it was desirable to subject the current LANL database of sites to the same population estimate models to which the PARP data had been subjected (Orcutt 1999). Past investigators of LANL sites estimated room counts while surveying, and excavated sites have complete counts provided in the field reports. However, the majority of sites recorded in the LANL database lack estimates of room counts; therefore, it was first necessary to develop a methodology for converting site size (generally, the mound size created by structural rubble) into number of rooms (the primary statistic used by both Orcutt and Newcomb for estimating population in the Southwest).

Average mound size, where available, for excavated sites on LANL property was calculated and then compared with the total number of rooms discovered on the site. Additionally, the average room size including wall width for a number of excavated sites, where this information had been documented, was calculated. The numbers are, of course, rough estimates and should not be used to determine specific numbers of rooms for individual sites, except to then calculate regional room counts. Most variation in mound size and room size will be accounted for at the regional scale. On average, it was determined that there is approximately 1.5 m of extra mound in each direction, so that amount was subtracted from mound length/width measurements before dividing total area by the average room size of 9.6 m^2. This was tested with acceptable accuracy on sites with known room counts, and therefore applied to the rest of the sites in the database that had either site maps or mound size estimates in the field notes or Laboratory of Anthropology site files. In total, it was possible to add room counts for 625 of the 802 sites with identified chronological periods.

Orcutt (1999:220–230) used population models to reconstruct room counts and population from the PARP data (Hill and Trierweiler 1986; Preucel 1986). This involved dividing the chronology of the Pajarito into five periods: Early Coalition (AD 1150–1250), Late Coalition (AD 1250–1325), Early Classic (AD 1325–1400), Middle Classic (AD 1400–1550), and Late Classic (AD 1550–1600). Orcutt standardized the number of rooms per period in order to distribute rooms from sites evenly through time. Figure 79.11 reproduces the chart from the PARP data with respect to roomblock area. Reproducing Orcutt's methods as described for number of rooms (1999:224–225), the shape of the curve remains nearly identical (Figure 79.12) even with the addition of hundreds of sites to the database since the PARP. (The sites with room counts in the current database now cover approximately 48% of LANL land. This is lower than the actual amount of LANL land that has been subjected to archaeological investigation, because room counts for 30% of the pueblos are not available at present.)

Figure 79.11. Roomblock area for PARP survey (after Orcutt 1999:Figure 5.1).

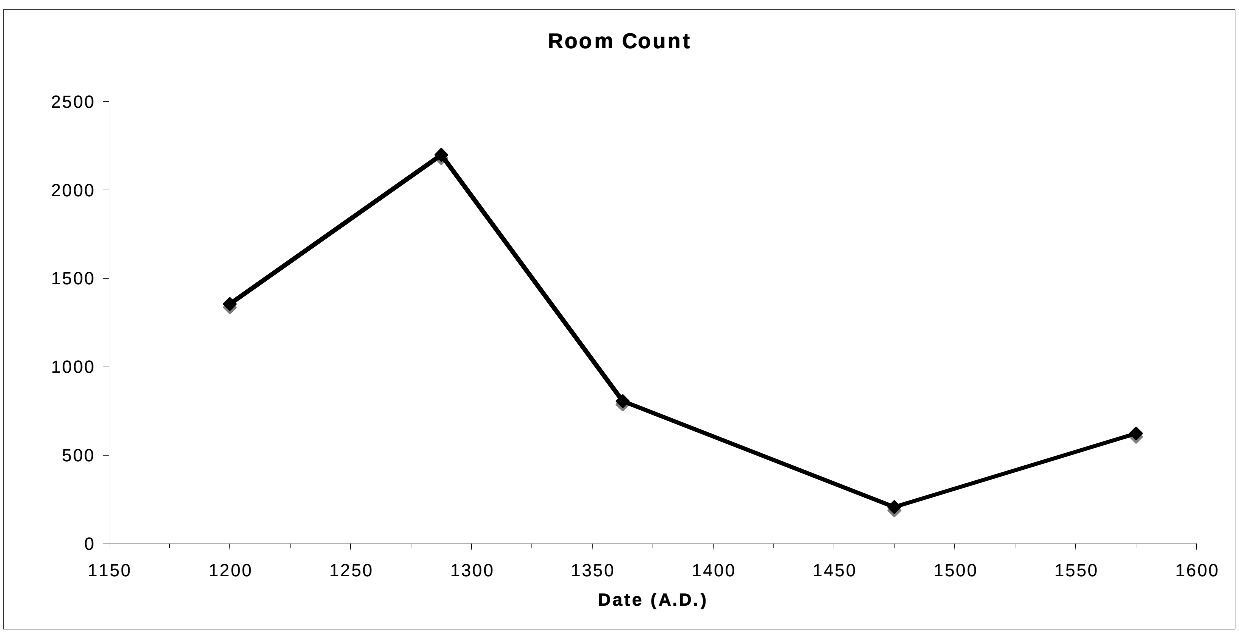


Figure 79.12. Room count on LANL region based on Orcutt (1999) room distribution methodology.

Various methods exist for estimating momentary population from room counts (Newcomb 1999; Orcutt 1999; Plog 1974; Preucel 1990). Following Orcutt (1999:225–229), use-lives of 15, 35, and 50 years were used for the Coalition, Late Coalition/Early Classic, and Classic periods, respectively. Occupancy rates, or the percentage of rooms in use during each specific period, were estimated at 100 percent, 80 percent, and 50 percent for the same respective periods. These numbers were justified by Orcutt (1999:226) as the result of archaeological testing throughout the Southwest. Orcutt lists alternate use-lives and occupancy rates for calculating minimum and maximum populations, but these are not applied at present, given the desire of strictly testing the robustness of the PARP population estimates. Following Kintigh (1985:105) and Schlanger (1988:783), the equation for calculating momentary population is

$$\text{momentary population} = \frac{(\text{num. rooms x occupancy rate) x use - life}}{\text{length of period}} \text{ x people per room} \qquad (1)$$

Five different curves were generated for the LANL Pajarito Plateau, one using Orcutt's five periods (Figure 79.13) and four using the following methodology described by Newcomb (1999; Figure 79.14), all with the same equation (1). The projected population in Figure 79.13 is based on dividing momentary population by 0.48, the approximate percent of surveyed LANL property with room count estimates.

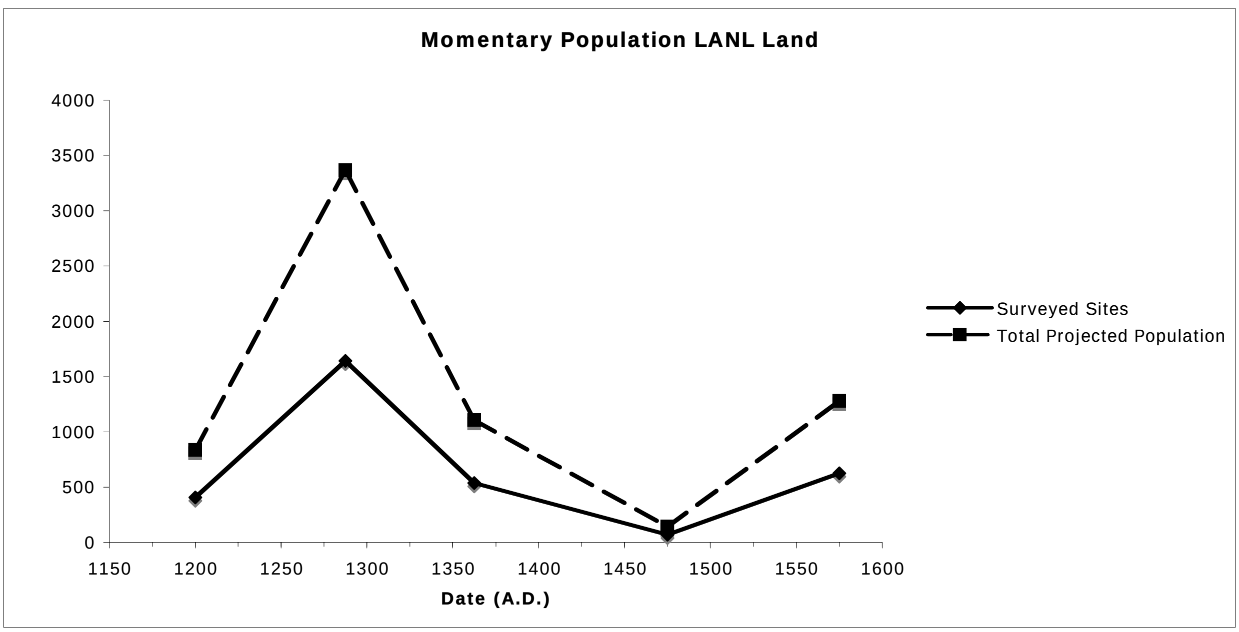


Figure 79.13. Momentary population estimates for LANL region using Orcutt's (1999) methodology

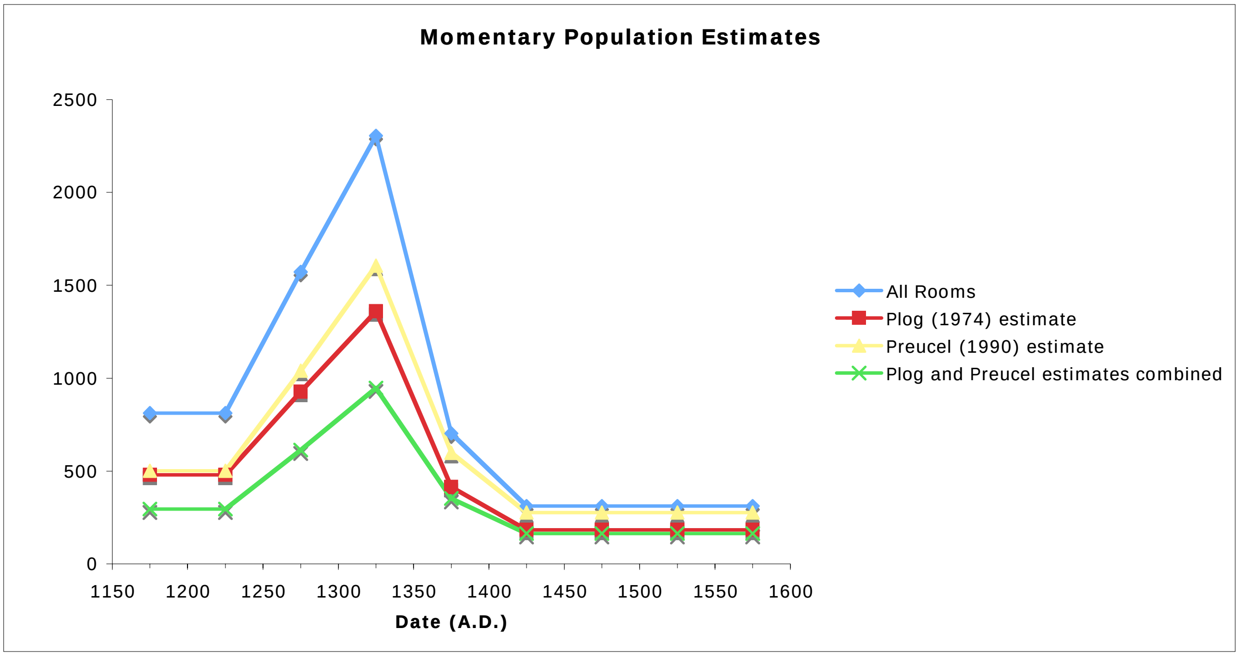


Figure 79.14. Momentary population estimates for LANL region using various strategies: 1) based on all rooms in region; 2) based on removal of 41 percent of rooms (Plog 1974); 3) based on removal of sites smaller than four rooms per period (Preucel 1990); 4) combination of Plog (1974) and Preucel (1990).

Rather than divide the time scale into the five unequal periods of culture chronology, Newcomb advocates dividing the entire span into equal 50-year intervals, and dividing the number of rooms for each site evenly across the periods. For example, a site defined as Coalition period with 40 rooms would result in 10 rooms in each range of 50 years (from AD 1150–1200, 1200–1250, 1250–1300, and 1300–1350). A site defined as Late Coalition/Early Classic with 60 rooms would result in 20 rooms each from AD 1250–1300, 1300–1350, and 1350–1400. The use-lives and occupancy rates remain consistent with Orcutt's, and people per room in all cases is constant at two, again consistent with Orcutt's assessment for the Pajarito Plateau (Orcutt 1999:226).

The variation in population estimates based on Newcomb's calculations is due to several realizations and corrections of assumptions (Newcomb 1999:40–41). First, it is highly unlikely that throughout the study region there was year-round occupation of all rooms every year. Second, seasonal occupation of small sites, such as the extremely large number of one- to three-room structures, has the potential to nearly double the population during the Early and Late Coalition, and make the population appear 10 percent to 15 percent larger throughout the Classic period. Finally, Orcutt's initial population reconstruction, and the curve based on it in this study (see Figure 79.13), assumes that all rooms are habitation rooms.

Plog (1974) and Newcomb (1999:43–44) proposed that after AD 1150, 41 percent of rooms should be subtracted from the total, to account for seasonality, storage, and manufacturing rooms. Doing so produces the second curve in the legend of Figure 79.14. Preucel (1990:165) suggests that small sites may act as territorial markers rather than habitation sites, and Newcomb

(1999:44-45) also argues that the removal of small sites (less than four rooms per 50-year period), especially after aggregation occurs, may help to account for this. The third curve in Figure 79.14 reflects the removal of small sites. Combining the propositions by Plog and Preucel, the fourth population curve is produced, which greatly reduces the overall population, but also reduces the drastic increase at AD 1325, and subsequent sharp decline post-1325. Figure 79.15 shows the momentary population of the entire LANL region, divided by the 48 percent survey value. Figure 79.16 shows the same line, but smoothed.

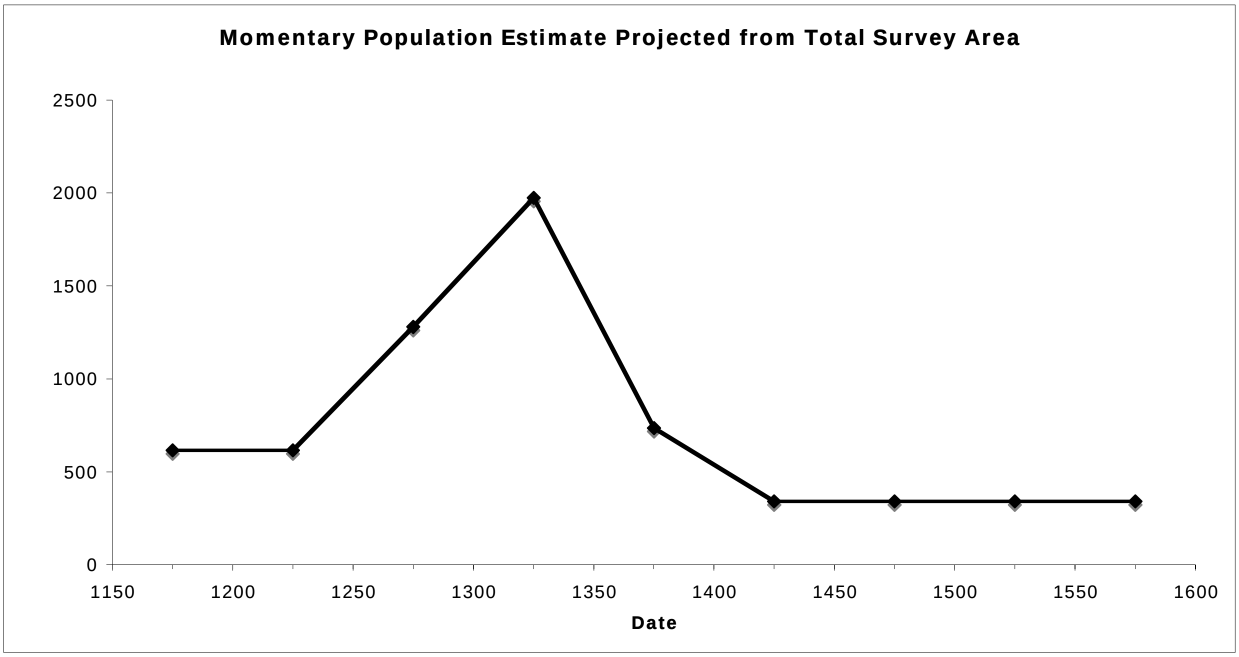


Figure 79.15. Momentary population estimate for LANL region, projected for the entire LANL-owned property, both surveyed and unsurveyed, based on the combined Plog (1974) and Preucel (1990) population estimate method.

All of the curves reflect the same basic population trajectory; it should be noted that the population of the Classic period should be adjusted upward to account for Tsankawi—as noted above, the sites in the Tsankawi member of Bandelier National Monument will be added to the database in the near future. The importance of determining accurate representations of momentary population enters the picture as the intended models based on these data become more complex. Once the methods for reconstructing population are proven to be robust, they can be used within later modeling techniques to distribute agents on the landscape. Additionally, the amount of space "leftover" from the total number of rooms available provides a starting point for determining if there is enough storage and activity space available for populations of the projected size. Obviously, these numbers will be in constant flux; as number of occupied rooms increases, the number of observed storage rooms decreases even though it is a fact that the amount of storage space should necessarily increase as well.

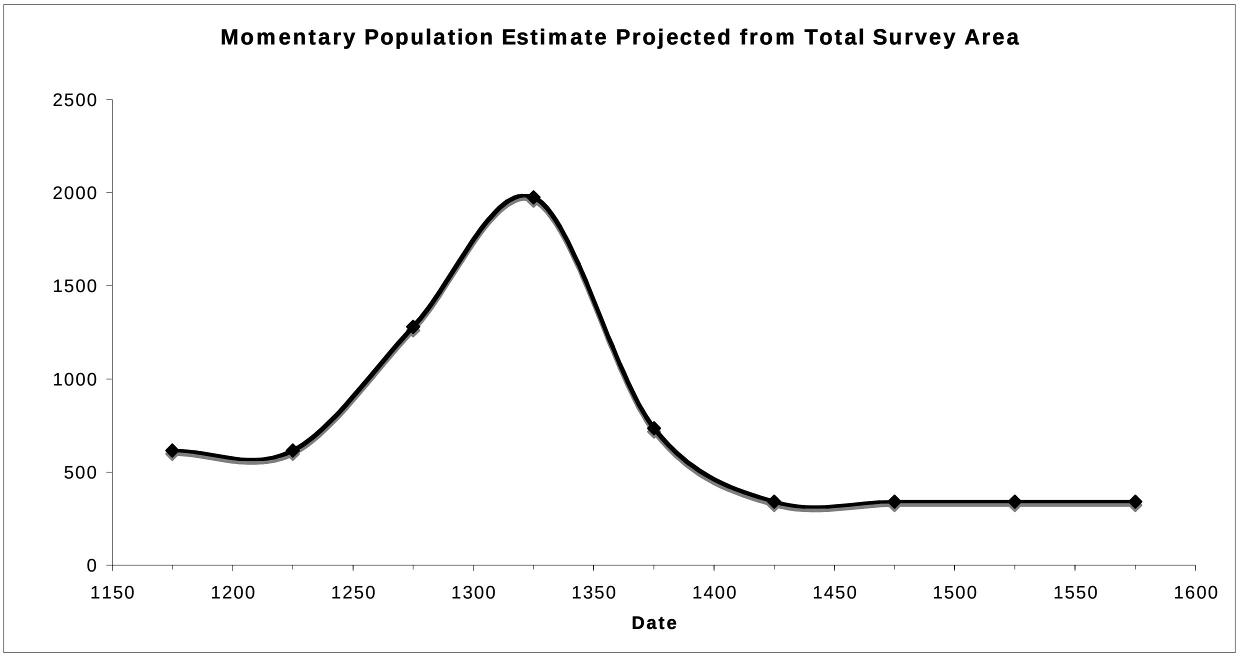


Figure 79.16. Momentary population from Figure 79.15, smoothed through time.

A final note about the room count and population estimates must be stated. There is reassurance of sound information based on the much smaller PARP sample sizes. The curves, though slightly varying, are generally equivalent in trajectory. This is good news for the usual 8 percent to 10 percent surveys that are conducted in most areas.

What Can Adaptive Cycles Reveal about Pueblo Adaptation?

Incorporating these data into the adaptive cycle heuristic model is largely theoretical, but may provide a framework for understanding change on the Pajarito Plateau as more than simple responses to climate change via relocation. The story of the Pajarito system from the Archaic through the Developmental periods (until AD 1150), and likely even through AD 1230–1250, is one of expansion, adaptation, and resource specialization—the r phase of the adaptive cycle (see Figure 79.1). This is known as the period of exploitation, where the species in a given ecosystem are not yet packed. Those occupants—in this case, including Ancestral Puebloans—continue to expand their ecological niche, and in many cases begin to specialize.

However, as this population is, on its own, reaching the K, or conservation, phase, the Great Drought begins *and* there is a migration of the San Juan Basin people to the Pajarito Plateau. This influx of peoples is well-represented by the K phase, given the immediate and widespread impact on the Pajarito environment. This occurs at the same time as the other half of the SES, the environment, is in a period of drought—a LFP (low-frequency process) that is of lower magnitude than droughts that pre- and post-date it; however, the timing of this drought with an influx of people—and therefore an increased stress on wild food resources in addition to resources stored in the soil for agriculture—provided the unfortunate combination of circumstances that caused a rapid release phase (Ω; see Figure 79.1; Figure 79.17; Dean 1988:26–36).

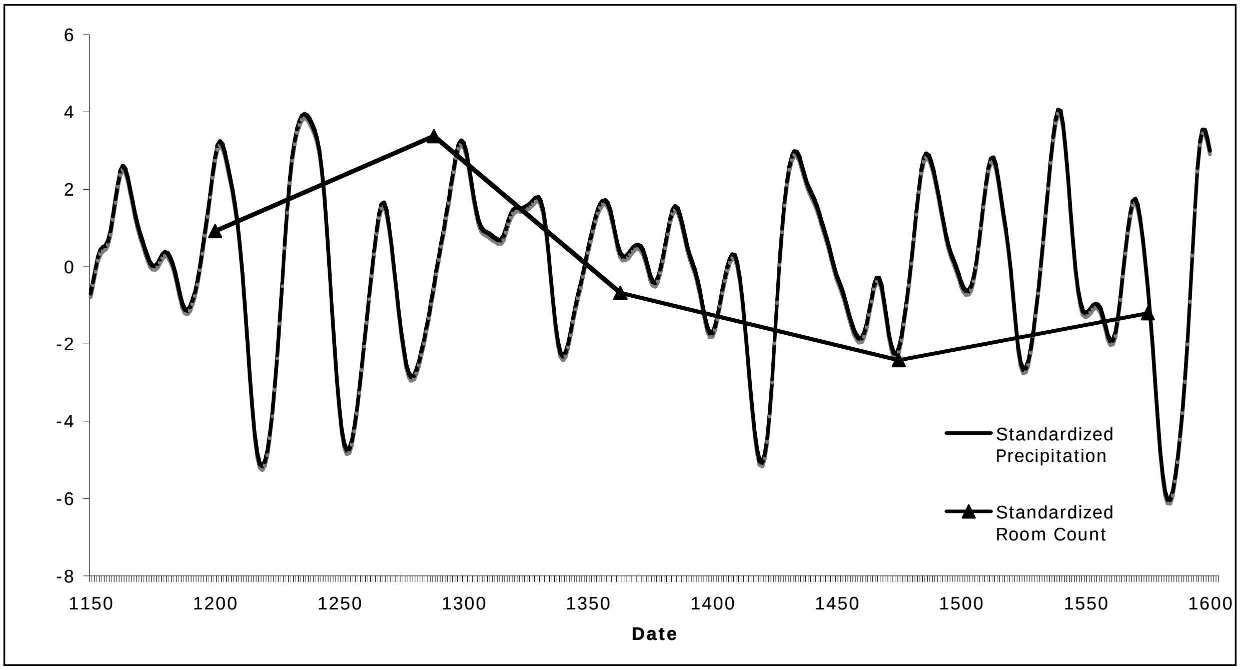


Figure 79.17. Room count for LANL region matched against precipitation reconstructed from tree-ring indices (20-year spline; Chapter 7, Volume 1) shows the greatest population increase for the region during the middle of the Great Drought (AD 1276–1299).

Why did population drop, and so rapidly, after AD 1325? Newton's infamous Third Law proposes that every action is responded to by an equal and opposite reaction—the influx of too many people + a strained environment = one of two things: 1) a decrease of population through out-migration, or 2) at worst, conflict over resources resulting in the death of many people, possibly simply through starvation.

The rapid release, though, also causes an immediate reorganization phase, and the potential for leaving one cycle and entering another. The migrants arrived on the Pajarito Plateau, began building large aggregated communities. After the release, this structure continued to develop, expand, produce more crops, add to storage and surplus when possible, and likely become more selective about where to plant and live each season. The development of more complex social systems of hierarchy, property ownership, common law, and ceremonial activity would have been inevitable.

DISCUSSION

Future work will involve an attempt to piece together this story, especially the bit discussed immediately above. Analysis within the GIS framework using spatial logistic regression models should be able to reveal more descriptive settlement patterns. A major goal will be to identify whether later settlements occupied a more refined, selective subset of the previous Coalition period's wide range of occupied elevation, soil types, geologic landforms, and vegetation communities (Vierra et al. 2006:226).

Would the Puebloans have responded the same under different environmental conditions? Or in a region with very different topography from the undulating finger mesas of the Pajarito Plateau? Agent-based modeling using the GIS framework will reveal much of this information. The understanding of the Pajarito Plateau Puebloan communities as complex systems will aid in developing an understanding of aggregation as a potential, but not necessarily, emergent property.

CONCLUSION

The Pajarito Plateau archaeological study area is a data-rich test area for the analysis of pueblo aggregation against the adaptive cycle model. The time-depth of the archaeological past, combined with the high-resolution nature of archaeological and chronological data in northern New Mexico, provides the essential combination necessary for testing traditional hypotheses of processes driving prehistoric aggregation.

It has been argued that previous hypotheses about changing elevation on the Pajarito Plateau through time are not supported by the current data. The implications of this conclusion are potentially far-reaching, for the continuous occupation of similar elevations creates more questions than it answers. This research also suggests that mean slope of site locations changes through time, and this may or may not be significant to the past cultural behavior; further investigation will inform this idea.

Further models revealing the full range of ecological habitat selection on the central Pajarito are under construction, taking into account regional vegetation, soils, hydrological features, geological formations, reconstructed precipitation, and social variables (including distance to contemporaneous sites and prehistoric trail locations). Models of population size and trajectory are robust and can be confidently used in the next generation of models of Puebloan communities in this region. The demographic models support population trends proposed by PARP (Hill and Trierweiler 1986) data.

Utilizing the demography models within an agent-based model ensures that population is not under- or overestimated differently in each period. With the support of data and models of the Pajarito Plateau system, long-term cross-cultural comparisons should be possible. There are many separate pueblo groups in prehistory that may have been driven to large, aggregated structures by similar processes to those on the plateau, but until these models are formed, tested, and applied elsewhere, the problem will remain unsolved. Additionally, there are various native groups still occupying different niches in the modern Southwest, and these models will lead to a detailed understanding of the scales and processes on which their behavior operates.

CHAPTER 80
ELK REMAINS AT ARCHAEOLOGICAL SITES IN THE SOUTHWESTERN UNITED STAES

Kari M. Schmidt

At archaeological sites throughout the American Southwest, elk (*Cervus elaphus*) remains are often less abundant (or non-existent) relative to other artiodactyl remains (e.g., pronghorn, deer, and bighorn sheep) in faunal assemblages (see Table 80.1). In xeric areas of the Southwest (i.e., lowland areas), this is to be expected given the lack of suitable grassland habitat for elk populations. In more mesic areas (i.e., upland areas), such as is found in the Jemez Mountains and on the Pajarito Plateau, the prehistoric absence of elk is purported to be anomalous since research suggests that habitat composition may have been just as, if not more, favorable to supporting and sustaining elk populations. Some researchers in the northern Rio Grande area have argued that elk were not indigenous to the area, and that they were a recent introduction (Allen 1996, 2004; Bryant and Maser 1982; Eberhardt et al. 1996; Kay 1994; Truett 1996; White et al. 1998).

To address the apparent dichotomy between the expected and observed occurrences of elk at archaeological sites, I conducted an extensive review of the archaeological literature from all areas of the Southwest to see if and where elk remains were recovered in archaeological faunal assemblages. I present the data recovered in the literature review, which show that elk remains were recovered at a number of archaeological sites (Table 80.1), including in areas of the Pajarito Plateau and Jemez Mountains. Elk were identified in a variety of areas in Arizona, New Mexico, Colorado, and Utah. Additionally, occurrences of elk are also noted in both open lowland areas (e.g., the Donaldson site in the Cienega Valley, Arizona, University Indian Ruin in the Tucson Basin, and Bat Cave in New Mexico) and more wooded upland areas (e.g., Mogollon Village in New Mexico, McEuen Cave in Arizona, and many sites in the Mesa Verde/Mancos area of Colorado). Finally, elk were identified in assemblages that span over 9000 years from Early Archaic sites in Colorado to the original Tucson Town Site (1890–1914) in Pima County, Arizona.

Table 80.1. Elk remains at archaeological sites in the southwestern United States.

Location	Citation/Source	Habitat type	Elevation (ft)	NISP[1]	Elements	Date/context	Curation location
Donaldson Site (AZ EE:2:30), Cienega Valley, Arizona	Huckell (1995), Eddy (1958, Table 11)	grassland	4500 (average)	4	Antler	800–400 BC	ASM, Tucson
McEuen Cave (AZ W:13:6), Graham County, Arizona	Schmidt (2001)	Oak-juniper woodland	4400	2	Thoracic vertebra, distal humerus	AD 200 to present; Pit Feature	UNM, Maxwell
Kinishiba Pueblo, Fort Apache, Arizona	Cummings (1940)	P/J	?	4	Antler	AD 1050–1350	?
Tse-Ta'a (White House Ruin), Cañon de Chelly, Arizona	Mathews (1966)	?	?	1	Subadult long bone	AD 1300–1600	?
Tse-Ta'a (White House Ruin), Cañon de Chelly, Arizona	Mathews (1966)	?	?	5*	?	AD 1300–1600	?
Show Low Ruin (AZ P:12:3), Forestdale Valley, Arizona	Haury (1985) citing Hough (1903) and Haury and Hargrave 1931	P/J	?	?	?	AD 1300–1400, Canyon Creek Phase	?
Pottery Hill Ruin, Forestdale Valley, Arizona	Haury (1931) citing Hough (1903)	P/J	?	?	?	AD 1200–1300, Linden Phase	?
AZ O:11:91, Star Valley, Gila County, Payson, Arizona	Lindauer et al. (1991)	Semi-desert grassland	5000	1	?	AD 1000–1350	?
University Indian Ruin, Pantano Wash, Tucson, Pima County, Arizona	Hayden (1957)	Lower Sonoran	2500	?	Long bones, antler, and worked specimens	AD 1200–1400	?
Original Tucson Town	Jones (1997)	Lower	2375	2	Mandible, long	AD 1870–1914	?

Location	Citation/Source	Habitat type	Elevation (ft)	NISP[1]	Elements	Date/context	Curation location
Site, Block 180, Pima County, Arizona		Sonoran			bone shaft		
AZ AA:16:346 (West Branch Site), Pima County, Arizona	Szuter (1986)	Lower Sonoran	2300	3*	?	AD 900–1100	?
AZ BB:2:2 (Big Ditch Site), Arizona	Johnson (n.d.)			4			
AZ EE:2:116, Anamax-Rosemont Project	Glass (1984)			1*			
Gayler Ranch, AZ EE:2:76, Anamax-Rosemont Project	Glass (1984)			4*			
Ballcourt, AZ EE:2:105, Anamax-Rosemont Project	Glass (1984)			22*			
Bumblebee, AZ EE:2:113, Anamax-Rosemont Project	Glass (1984)			10*			
AZ EE:2:129, Anamax-Rosemont Project	Glass (1984)			1*			
Dairy Site (AA:12:285), Pima County, Arizona	Szuter (1987)			4*		Early Colonial Period	
Hodges, (AA:12:18), Pima County, Arizona	Yoshikawa (1986)			3*			
Las Colinas AZ T:12:10	Szuter (1989)			15*			
El Polvoron AZ U:15:59, Salt Gila Aqueduct Project	Szuter (1984a, b)			2*			
Las Fosas AZ U:15:19	Szuter (1984a, b)			94*			

Location	Citation/Source	Habitat type	Elevation (ft)	NISP[1]	Elements	Date/context	Curation location
Tanque Verde Wash, (BB:13:68), Pima County, Arizona	Szuter and Brown (1986)			1*		Tanque Verde Wash I	
Tanque Verde Wash, (BB:13:68), Pima County, Arizona	Szuter and Brown (1986)			1*		Tanque Verde Wash II	
Tanque Verde Wash, (BB:13:68), Pima County, Arizona	Szuter and Brown (1986)			8*		Tanque Verde Wash III	
The Jurgens Site, Greeley, Colorado	Wheat (1979)	?	?	15	Axis, C Vert, L Vert, premaxilla, tooth, antler	9070 +/- 90 BP	?
Gordon Creek Burial, Lindenmeier, Colorado	Cassells (1983)				Perforated and broken incisors interred with a female skeleton	7700 BC	
Castle Park, Dinosaur National Monument, Colorado	Burgh and Scoggin (1948)	P/J (Upper Sonoran)	5500	?	?	AD 400–800	?
Mustoe Site, Hovenweep/Cortez, Colorado	Gould (1982)	P/J	6740	9	4 proximal ulnae (1 burned), 1 calcaneus, 1 1st phalanx, 1 distal phalanx, 1 distal tibia. 3 MNI	PII-PIII (AD 900–1231); 1 in PII, 3 in PIII	?
Site 875, Mesa Verde, Colorado	Lister (1965)	P/J	7700	?	?	AD 950–1075	Boulder?
Badger House (Site 1676), Mesa Verde Nat'l Park, Colorado	Hayes and Lancaster (1975)	P/J	6888	6	?	AD 631–700	?
Badger House (Site	Hayes and	P/J	6888	1*	Antler	AD 631–700	?

Location	Citation/Source	Habitat type	Elevation (ft)	NISP[1]	Elements	Date/context	Curation location
1676), Mesa Verde Nat'l Park, Colorado	Lancaster (1975)						
Mug House, Mesa Verde Nat'l Park, Colorado	Rohn (1971)	P/J	6888	1	Antler	AD 700–800	?
Lion House (5MTUMR2156), Mancos Canyon, Mesa Verde, Colorado	Nickens (1981), Harrill (1976)	P/J	6806	14*	?	AD 1150–1250	Fort Lewis College?
Hoy House (5MTUMR2150), Mancos Canyon, Mesa Verde, Colorado	Nickens (1981), Harrill (1976)	P/J	6806	2	?	AD 1100–1250	Fort Lewis College?
Mesa Verde National Park, Colorado	Anderson (1961)	P/J	6920	?	?	AD 1961	Historic sighting
5MTUMR 2785, Mancos, Colorado	Emslie (1977)	P/J (Upper Sonoran)	5640	1	Vert. fragment	Mancos Phase, AD 975–1075	?
5MTUMR 2785, Mancos, Colorado	Emslie (1977)	P/J (Upper Sonoran)	5640	1	Immature animal	McElmo Phase, AD 1075–1150	?
5MTUMR 2559, Mancos, Colorado	Emslie (1977)	P/J (Upper Sonoran)	5560	1	phalanx	Mancos Phase, AD 975–1075	?
5MTUMR 2346, Mancos, Colorado	Emslie (1977)	P/J (Upper Sonoran)	5520	1	Immature animal	Mancos Phase, AD 975–1075	?
5MTUMR 2347, Mancos, Colorado	Emslie (1977)	P/J (Upper Sonoran)	5440	1	Metapodial, bone awl fragment	Piedra Phase, AD 675–900	?
5LP478B, La Plata	Akins (1988)	?	?	2*	Antler	AD 750–800	?

Location	Citation/Source	Habitat type	Elevation (ft)	NISP[1]	Elements	Date/context	Curation location
County, Colorado							
5LP630, Durango, Colorado	Duke (1985)	P/J	8200	3	2 parietals, 1 metacarpal	AD 700–900	?
5LP110, Durango, La Plata County, Colorado	Gooding (1980)	P/J	6478	10	Antler (1 worked)	AD 650–750	?
5LP111, Durango, La Plata County, Colorado	Gooding (1980)	P/J	6478	1	Antler (rubbing tool)	AD 650–750	?
Ken-Caryl Ranch, Felteron? County, Colorado	Somer (1997)	Plains grassland	6300	?	?	AD 1970 (Historic sighting)	?
Pueblo Bonito, Chaco Canyon, McKinley County, New Mexico	Pepper (1920)	Grassland, scrub	6500	3*	All scrapers from a humerus	AD 1050–1150	UNM, Maxwell?
Pueblo del Arroyo, Chaco Canyon, McKinley County, New Mexico	Judd (1959)	Grassland, scrub	6500	At least 2	Antler, tibia dagger	AD 1050–1150	UNM, Maxwell?
BC 51, Chaco Canyon, McKinley County, New Mexico	Kluckhohn and Reiter (1939)	Grassland, scrub	6500				UNM, Maxwell?
Pueblo Alto, Chaco Canyon, McKinley County, New Mexico	Mathien (1985)	Grassland, scrub	6800	1	Mandible	PII/PIII, AD 920–1020	UNM, Maxwell
Chaco Project, 29SJ 423, Chaco Canyon, McKinley County, New Mexico	Mathien (1985)	Grassland, scrub	6500	2	Metapodials	BMIII/PI, AD 500–600	UNM, Maxwell
Chaco Project, 29SJ 627, Chaco Canyon, McKinley County, New Mexico	Mathien (1985)	Grassland, scrub	6500	5	Innominate, meta-carpals, metatarsals	PII/PIII, AD 1000–1080	UNM, Maxwell

Location	Citation/Source	Habitat type	Elevation (ft)	NISP[1]	Elements	Date/context	Curation location
Chaco Project, 29SJ 628, Chaco Canyon, McKinley County, New Mexico	Mathien (1985)	Grassland, scrub	6500	1	Innominate	BMIII, AD 700–820	UNM, Maxwell
Chaco Project, 29SJ 629, Chaco Canyon, McKinley County, New Mexico	Mathien (1985)	Grassland, scrub	6500	1	Metapodial	PII/PIII, AD 975–1040	UNM, Maxwell
Leyit Kin, Chaco Canyon, McKinley County, New Mexico	Dutton (1938)	Grassland, scrub	6500	?	?	AD 1000–1050, Area NE of Kiva A, Kiva B	MONM?
The Crawford Site (LA 26749), Crownpoint, McKinley County, New Mexico	Whitten (1982)	Open grassland and P/J	6810	1	Rib	AD 700–900	?
Shabik'eshchee Village, Chaco Canyon, McKinley County, New Mexico	Roberts (1929)	Grassland, scrub	6500	1	Antler (flaking tool)	AD 700–900	?
LA 50364, Ambrosia Lake, McKinley County, New Mexico (Chaco outlier)	Bertram (1990)	Open grassland	6979	4	Antler	AD 1050–1200	?
LA 73518, Horse Canyon, San Juan County, New Mexico	Bertram (1996)	P/J	5920	8	Antler and long bone fragments	AD 1100–1300	?
LA 81694, Los Pinos River, San Juan County, New Mexico	Bertram (1999)	P/J	6680	1**	Tibia	AD 640–875	?
LA 81694, Los Pinos River, San Juan	Bertram (1999)	P/J	6680	--	--	1999	Historic sighting

Location	**Citation/Source**	**Habitat type**	**Elevation (ft)**	**NISP[1]**	**Elements**	**Date/context**	**Curation location**
County, New Mexico							
Salmon Ruins, San Juan County, New Mexico	Harris (1980)	P/J, open grassland	5500	1	?	AD 1050–12500	San Juan County Museum
LA 2506, Muddy Wash Site, Tohatchi Flats, San Juan County, New Mexico	McVickar and Kearns (1998)	Open grassland	6099	15*	Antler	AD 500–700	?
LA 11568 (Mogollon Village), Alma, Catron County, New Mexico	Cannon (1999b)	P/J woodland	5150	3*	Antler	2 from Feature 43, 1 from Feature 44, both AD 200–550	OU, Norman, or Maxwell
LA 11568 (Mogollon Village), Alma, Catron County, New Mexico	Cannon (1999b)	P/J woodland	5150	2	Cheek tooth fragments	Feature 12, AD 700–825	OU, Norman, or Maxwell
Tularosa Cave, Catron County, New Mexico (near Apache Creek)	Heller (1976)	P/J (Upper Sonoran)	6762	7**	Long bone (GT); dentary, rib, long bone, sesamoid (SF); rib and long bone (Tularosa)	AD 500–700 Georgetown; AD 700–900, San Francisco; AD 1100–1250 Tularosa phases	MONM
Tularosa Cave, Catron County, New Mexico	Hall and Kelson (1959), Findley et al. (1975)	P/J (Upper Sonoran)	6762	?	?	AD 1976	Historic sighting
Cave 3, Gila Cliff Dwellings, Catron County, New Mexico	Anderson et al. 1986	P/J (Upper Sonoran)	6000	4	?	AD 1200–1300	?
Caves 4-5, Gila Cliff Dwellings, Catron County, New Mexico	McKusick (1986b)	P/J (Upper Sonoran)	6000	1	?	AD 1200–1300	?

Location	**Citation/Source**	**Habitat type**	**Elevation (ft)**	**NISP**[1]	**Elements**	**Date/context**	**Curation location**
Bat Cave, Horse Springs, New Mexico (Catron County)	Dick (1965b), Wills (1988)	Grassland (plains of San Augustin)	6800	?	?	1500 BC	Maxwell Museum? Peabody?
LA 676 (Mattocks), Mimbres Valley, Grant County, New Mexico	Gust-Schollmeyer (1999)	P/J	5750	2	?	AD 1000–1130	UNM, Maxwell
Disert Site, Mimbres Valley, Grant County, New Mexico	Nelson & LeBlanc (1986)	P/J, riparian	5650	1	Mandible fragment	AD 1350–1430	UCLA? or Maxwell
Ormand Village, Cliff, Grant County, New Mexico	Wallace (1998)	Grassland, scrub	4522	24*	Antler	AD 1250–1450	MONM?
Wind Mountain, Cliff, Grant County, New Mexico	Olsen and Olsen (1996)	P/J	5680	2	Proximal humerus (OO), C vert Room 3)	AD 890–1160; House OO, Surface Room 3	Amerind Foundation, Dragoon, AZ
Ridout Locus, Wind Mountain, Cliff, Grant County, New Mexico	McKusick (1986a, b)	P/J	5680	?	?	AD 620–710 (Georgetown)	Reference in McKusick 1986 to elk but I couldn't find any id's to elk
LA 49000, Black Range, Sierra County, New Mexico	Gust-Schollmeyer (1999)	P/J		1	?	AD 1000–1130	UNM, Maxwell
LA 3769, Black Range, Sierra County, New	Gust-Schollmeyer (1999)	P/J		2	?	AD 1130–1200	UNM, Maxwell

Location	Citation/Source	Habitat type	Elevation (ft)	NISP[1]	Elements	Date/context	Curation location
Mexico							
LA 613, Black Range, Sierra County, New Mexico	Gust-Schollmeyer (1999)	P/J		7	?	AD 1130–1200	UNM, Maxwell
LA 82575, Valle Grande, Sandoval County, New Mexico	Acklen (1997)	Ponderosa pine	8590	1**	Long bone shaft fragment	AD 1278–1663	?
LA 66870 (SW of Abiquiu), Rio Arriba County, New Mexico	Acklen (1997)	P/J	7800	1	Tooth	AD 900–1200	?
LA 82615 (SW of Abiquiu), Rio Arriba County, New Mexico	Acklen (1997)	P/J	7900	1	Antler	2290–1528 BC (Feature 1; large thermal feature)	?
LA 66868 (SW of Abiquiu), Rio Arriba County, New Mexico	Acklen (1997)	P/J	7880	13	2 mandible frags, 2 radii, 1 innominate, 2 tibiae, 1 astragalus, 1 1st Phalanx, 1 2nd Phalanx, 3 3rd phalanges		?
Poshuouinge, Chama River near Abiquiu, Rio Arriba County, New Mexico	Jeancon (1923)						
LA 12117, Cochiti Lake, Sandoval County, New Mexico	Guthrie (1982a)	P/J	5600	6	?	1000 BC to AD 1600	WACC, Tucson
LA 13659 (Supply Cave), Cochiti Lake,	Guthrie (1982a)	P/J	5600	2	?	1000 BC to AD 1600	WACC, Tucson

Location	**Citation/Source**	**Habitat type**	**Elevation (ft)**	**NISP**[1]	**Elements**	**Date/context**	**Curation location**
Sandoval County, New Mexico							
LA 60550, Frijoles Canyon, Sandoval County, New Mexico	Trierweiler (1989)	P/J	6800	1	Tibia shaft, worked	AD 1375–1525	WSU? MONM?
Arroyo Hondo (LA 8874), Santa Fe County, New Mexico	Lang & Harris (1984)	P/J	7100	1	?	AD 1300–1315	MONM
Arroyo Hondo (LA 8874), Santa Fe County, New Mexico	Lang & Harris (1984)	P/J	7100	1*	?	AD 1300–1315	MONM
Arroyo Hondo (LA 8874), Santa Fe County, New Mexico	Lang & Harris (1984)	P/J	7100	1	?	AD 1315–1330	MONM
Arroyo Hondo (LA 8874), Santa Fe County, New Mexico	Lang & Harris (1984)	P/J	7100	1*	?	AD 1315–1330	MONM
Arroyo Hondo (LA 8874), Santa Fe County, New Mexico	Lang & Harris (1984)	P/J	7100	3	?	AD 1330–1340	MONM
Arroyo Hondo (LA 8874), Santa Fe County, New Mexico	Lang & Harris (1984)	P/J	7100	20*	?	AD 1330–1340	MONM
Arroyo Hondo (LA 8874), Santa Fe County, New Mexico	Lang & Harris (1984)	P/J	7100	1	?	AD 1340–1355	MONM
Arroyo Hondo (LA 8874), Santa Fe County, New Mexico	Lang & Harris (1984)	P/J	7100	25*	?	AD 1340–1355	MONM
Arroyo Hondo (LA 8874), Santa Fe	Lang & Harris (1984)	P/J	7100	2*	?	AD 1355–1365	MONM

Location	Citation/Source	Habitat type	Elevation (ft)	NISP[1]	Elements	Date/context	Curation location
County, New Mexico							
Arroyo Hondo (LA 8874), Santa Fe County, New Mexico	Lang & Harris (1984)	P/J	7100	4*	?	AD 1365–1370	MONM
Arroyo Hondo (LA 8874), Santa Fe County, New Mexico	Lang & Harris (1984)	P/J	7100	3	?	AD 1380–1410	MONM
Arroyo Hondo (LA 8874), Santa Fe County, New Mexico	Lang & Harris (1984)	P/J	7100	3**	?	AD 1380–1410	MONM
Arroyo Hondo (LA 8874), Santa Fe County, New Mexico	Lang & Harris (1984)	P/J	7100	4	?	AD 1410–1425	MONM
X29SF6, Nambe Falls Reservoir, Santa Fe County, New Mexico	Skinner et al. (1980)	P/J	?	2	Rib fragment, sacrum fragment	AD 900–1600	?
X29SF7, Nambe Falls Reservoir, Santa Fe County, New Mexico	Skinner et al. (1980)	P/J	?	2	Calcaneus, metatarsal	AD 900–1600	?
LA 71 (Howiri Pueblo), Ojo Caliente, Taos County, New Mexico	Mick-O'Hara (1987)	P/J, grassland	6380	1	Proximal right radius	AD 1400–1450, Plaza Room 5	MONM?
Picuris Pueblo (San Lorenzo), Taos County, New Mexico	Adler and Dick (1999)	P/J	7300	1	?	AD 1375–1490	UTEP?
Taos Pueblo, Taos County, New Mexico	Bodine (1979)	P/J	7098	?	?	Reference to elk still present and used in 1840	?
Pot Creek Pueblo, Taos, Taos County,	Wetherington (1968)	P/J (Upper	7400	At least	1 metapodial bone flesher,	AD 1000–1300	Fort Burgwin

Location	Citation/Source	Habitat type	Elevation (ft)	NISP[1]	Elements	Date/context	Curation location
New Mexico		Sonoran)		1	several bone awls		Research Center or Maxwell
Pot Creek Pueblo, Taos, Taos County, New Mexico	Wetherington (1968)	P/J (Upper Sonoran)	7400	?	?	1968	Historic sightings around Taos
Tijeras Pueblo, (LA 581), Bernalillo County, New Mexico	Young (1980)	P/J	6500	9	?	AD 1200–1325	MONM
Paa-ko (LA 162), San Antonito, Bernalillo County, New Mexico	Lambert (1954)	P/J, Ponderosa pine	6250	?	Antler, modified long bones (metatarsal), and food remains (no counts)	AD 1300–1450	MONM?
LA 53662 (Belen Bridge Site),Valencia County, New Mexico	Akins (1994)	Semi-desert grassland to grassland	4825	4*	Antler	AD 1200–1300	MONM?
Rowe Pueblo (LA 108), Pecos, San Miguel County, New Mexico	Cordell (1998)	P/J	6800	8	?	AD 1350 (BHT2), T305, T306	On site-Sandoval family (San Miguel county)
Pecos, San Miguel County, New Mexico	Kidder (1932)	P/J, Ponderosa pine	6900	?	Antler, modified long bones (metatarsal), and food remains (no counts)	AD 1250–1800	MONM?

Location	Citation/Source	Habitat type	Elevation (ft)	NISP[1]	Elements	Date/context	Curation location
Las Humanas (Mound 7), Gran Quivara, Torrance County, New Mexico	McKusick (1981)	P/J, grassland	6800	1	Antler, worked	AD 1300–1672	?
Crockett Canyon (LA 2315), Angus, Lincoln County, New Mexico	Speth and Scott (1992)	P/J, Ponderosa pine	6974	6	4 skull frags, 1 metatarsal, 1 2nd phalanx	AD 1000–1350	MONM?
Clovis, Curry County, New Mexico	Cotter (1938)	Open grassland	?	?	?	Paleoindian 9500–5500 BC	?
Townsend Site, Roswell, New Mexico	Akins (personal communication)			1	Acetabulum	500 BC to AD 1150	
Peña Blanca (LA 6170), Cochiti, New Mexico	Akins (personal communication			At least 11***	Articulated hind foot, tooth, vertebra (1), ribs (4), scapulae (2), distal tibia, femur	AD 600–900	?
Peña Blanca (LA 6170), Cochiti, New Mexico	Akins (personal communication			1	?	AD 900–1200	?
LA 3333, Galisteo Basin, New Mexico	Akins (personal communication)						
San Antonio, Tijeras Canyon, New Mexico	Akins (personal communication)						
Chiricahua Apache	Opler (1941:325)	Various	Various	?	?	PV (AD 1600 to AD 1850)	“there were plenty of elks” and “the elk is not as smart as the deer

Location	**Citation/Source**	**Habitat type**	**Elevation (ft)**	**NISP[1]**	**Elements**	**Date/context**	**Curation location**
							and is easier to get”
42SA6396, Bluff, San Juan County, Utah	Emslie (1985)	Open grassland	5610	1	Split metatarsal (worked)	AD 750–850	?
Alkali Ridge, San Juan County, Utah	Brew (1946)	P/J	6400	?	?	AD 700–1300	?

[1]NISP is number of identified specimens *Cervidae (*Cervus/Odocoileus*); ***Cervus elaphus/Bison bison* (elk or bison); *** includes portions of an articulated hind foot

CHAPTER 81
ANCESTRAL PUEBLO TRAILS OF THE PAJARITO PLATEAU: A SUMMARY OF RECENT RESEARCH

James E. Snead

Old-time trails across the rock
Knee-deep nearly, sheerly worn
Here converge and interlock
Old when Babylon was born

- From "Tsan-Ka-Wi," by John H. Underwood; *El Palacio* 1916 4(3):9

INTRODUCTION

The Ancestral Pueblo trails of the Pajarito Plateau have been a source of curiosity and contemplation since Euro-American explorers first entered the region in the late 19th century. Thoroughly photographed, described in letters, articles, even poems, as the excerpt above, referring to trails near the pueblo now called Tsankawi, indicates, these features have nonetheless confounded archaeological analysis. Hard to follow, difficult to date, enigmatic in design, trails (or paths) are difficult to understand through standard approaches. They also subvert our traditional categories, since they are not truly *places*; no one lived on a trail, or grew their crops in its ruts, or made tools there, except perhaps, in passing. Instead, trails represent the linkages *between* places. They are thus the physical embodiment of immaterial processes such as movement and relationships, things incompletely captured by pottery, stone, and bone. Only recently have archaeologists realized that these connections are of equal value to the places that they join together, and that, in certain, favorable conditions, we can study such relationships through the traces of the process itself.

The Pajarito is one of the rare regions where such evidence is preserved for the archaeologist. The consolidated, pyroclastic ash flows that represent the foundation of the plateau are sufficiently erosive so that the passage of foot traffic over time wears a groove directly into the rock. The soft surface can also be intentionally carved and shaped, a phenomenon that gave rise to the famous cave dwellings of the vicinity but which also means that stairways and even trails themselves could be pecked out by hand. These circumstances, and the fact that the mesas and portreros of the region were relatively isolated throughout most of the post-Columbian period, mean that in the present day it is possible to literally walk in the footsteps of the ancestors.

The archaeological challenge presented by this pattern is to sort out the evidence of the trails created and used by the Ancestral Pueblo people of the Pajarito, but to also unravel their meaning. The Pajarito Trails Project (PTP) was created with that purpose in mind; this report collates three seasons of fieldwork (1991, 1999, and 2001) with scattered records from other projects that have recorded trails in the region. As with most archaeological efforts it is a work in progress, part method, part data, with a few tentative conclusions. The extraordinary cultural landscape of the Pajarito provides a great opportunity for archaeology: trails, while merely one element of this complex whole, represent one way to draw us into that world, and to let us see it through other eyes.

METHOD

The study of ancient trails and paths is in its infancy. Archaeologists have made a sharp distinction between these features, argued to be informal and ephemeral, and *roads*, which, by virtue of their greater formality, are more visible and present fewer problems of method (Trombold 1991:3). Their functional implications and labor requirements have meant that roads are also considered a hallmark of complex social systems, long a subject of archaeological interest (cf. Earle 1991). Thus, while a number of substantive studies of ancient roads have been published (Hererra and Cardale de Schrimpff 2002; Hyslop 1984; Laurence 1999; Vermuelen and Hageman 2001), issues of evidence and preconceptions about the "significance" of trails have hindered research.

In the absence of formal roads, discussion of movement through the landscape has traditionally adopted a large scale and emphasized *routes*, rational patterns of travel mandated by topography. Archaeologists are familiar with maps that feature lines and arrows "documenting" directions of trade and interaction, often based upon the watercourses, passes, and similar features of terrain that make such movement possible. Physical evidence for the use of such routes is often sought in the distribution of artifacts and raw materials across space, rather than in documentation of the process of movement itself. Such an approach is unsatisfactory on several counts, among which are the vast scale at which such models must be structured and the multitude of natural/cultural factors which can account for artifact distribution. By emphasizing exchange, this approach also emphasizes only one of the many different types of movement that would have occurred along such routes, skewing our perception of those doing the traveling.

In some cases, evidence for routes of transit is sought in historical records. In the mid-20th century, considerable effort was devoted to combing documentary sources for information about Native American trails in colonial North America (cf. Ayres 1940; J. Davis 1963; Hindes 1959; Myer 1929; Sample 1950). In most cases no physical evidence for any of these routes was available. Even in cases where eyewitness descriptions of trails were relatively recent, identifying them "on the ground" proved challenging, as the experience of a 1960s project to find the historically documented "Comanche War Trail" in southwest Texas suggests. "We found many abandoned roads and numerous animal trails, but nothing identifiable as a Comanche trail. As a matter of fact, we found no artifacts that could be identified with the Comanche" (Campbell and Feld 1968:140).

It is evident, however, that in some cases material evidence for trails and paths *is* preserved in the archaeological record. This is particularly true in arid locations. Several studies in the Mohave and Colorado deserts, for instance, have documented long-distance trails with clear pre-Columbian associations (Campbell 1931; Harner 1957; F. Johnson and Johnson 1957; Rogers 1966:47; Von Werlhof 1988). Trails associated with springs and water catchments were recorded in the Great Basin (Ives 1946) and the Southwest (Britt 1973), while evidence for trails in the Great Plains has also been recorded (Blakeslee and Blasing 1988). With the urging of Carling Malouf (1961, 1980), a number of studies were conducted on trails in the northern Rockies, culminating in an entire issue of *Archaeology in Montana* [21:3] devoted to the archaeology of trails (1980).

Failure to incorporate data for trails into our interpretations of the past can thus be more a question of research bias than of evidence, per se. With increasingly detailed recording of archaeological data, trails and related features are now commonly noted in archaeological reports (e.g., Boyer et al. 2002; Van Zandt 1999). Systematic analysis remains uncommon, however, and the discussion of movement continues to emphasize routes and roads. Recent literature on the Chaco period in the greater San Juan Basin of New Mexico, for instance, features a flourishing discussion of the formally constructed Chaco "roads" (cf. Hurst et al. 1993; Kanter 1997; Marshall 1997; Mathien 1991; Roney 1992; Severance 1999; Vivian 1997a, b; Windes 1991). References to the network of trails that must also have been a component of the Chacoan landscape, in contrast, are scarce. The fact that 148 stairways or sets of steps were documented in the course of the Chaco surveys (Pattison 1985:63), most of which would necessarily have been associated with local trail systems rather than the roads themselves, is an indication that when such data appeared they were relegated to the back pages of reports.

In addition to the fact that "evidence" for trails is increasingly difficult to ignore, the body of ethnographic and theoretical discussions of these features increasingly makes the case for their importance. Indigenous perceptions of pathways are much more elaborate than previously credited; more than expedient means to get back and forth, trails are complex, tangible metaphors of interaction and association (cf. Ballard 1994; Laird 1976; Parmentier 1987; Weiner 1991). Recent reports on trails in the Southwest have also emphasized this ethnographic dimension (e.g., Hart and Othole 1993; Stoffle et al. 1977). Finally, "paths" are an important part of the evolving theoretical discussion of landscape, space, and place in archaeology (see Barrett 1994:141; Ingold 1993:167; Thomas 1996:90; Tilley 1994:31; Zedeño and Stouffle 2003).

It is within this increasingly productive context for the archaeological study of paths and trails that recent field research in the Southwest has developed. Consideration of trails at Hopi (Zedeño 1997), Hohokam "roads" (Motsinger 1997), and Navajo pathways at Cañon de Chelly (Jett 2001) all point to the importance of understanding how people of the southwestern past moved through their landscape. My own work, published (Snead 2002a, c) and unpublished (Snead 2000, 2001b), has made use of the optimal preservation conditions for trails on the Pajarito Plateau to develop ideas about the history of settlement in the region, political interaction, and the human role in the structuring of the landscape. From this expanding body of work it is evident that the traditional distinction between *roads* and *trails* is no longer tenable. Both serve, in the words of one author, as "paths of political control, of social rhythms, military tactics, religious observances, and economic endeavors" (Darnell 2002: 114). The complexity of paths and trails as categories of information should not interfere with our acknowledgment of their importance, but instead spur us to find new and creative ways to redress the limits of our methods.

Recording Strategies

All of the archaeologists that work with trails and paths grapple with three linked problems of evidence:

A. Chronology. Trails are very difficult to date directly, since almost by definition they are worn down rather than built up. Does a trail across the mesa top date to the Ancestral Pueblo period, or is it a 19th century stockmen's route?

B. Association. Since the use of a trail may leave very little evidence beyond footprints, linking trail-related activity with other evidence from the surrounding area is particularly complicated. A cairn may mark the course of a trail, but does it date to the era when the trail was initially blazed, or is it a more recent addition?

C. Contiguity. Because trail preservation is a factor of local geology, topography, and ground cover, it is rarely possible to estimate their true extent and interrelationships. Does this trail climbing out of a canyon relate to the small fieldhouse on top, or did it eventually connect with the major trail running along the mesa? Or both?

There is obviously no simple answer to these problems, but they figure heavily in limiting the amount of research on trails that has been conducted in the Southwest. In a case from the early stages of the recent Bandelier Archaeological Survey (BAS), a major Ancestral Pueblo trail and staircase entering Frijoles Canyon was initially recorded as an "isolated occurrence" from which minimal information was collected. The recording protocol had no category for such a feature, which was of uncertain extent, and, regardless, couldn't be dated directly. Ultimately it was re-recorded, but the dilemma facing the crew that first encountered it is real.

The critical approach to analyzing trails in the archaeological record concerns establishing *context*. Trails in isolation appear as enigmatic fragments, but trails in context with other trails and the surrounding cultural landscape become much more comprehensible. In this way it is possible to compare trails with each other to identify salient characteristics, shared and different. It also becomes possible to more clearly identify nodes and places linked by particular trails; since those features are often more "datable" than the trails themselves, they introduce a more specific chronology. It is certainly true that some trails, once established, will remain in use for centuries or millennia. Patterns of human movement do change over time, however, and trails, like the places they connect, may not only go out of use, but also undergo structural change as the nature of use shifts. In a simple example, the routes taken by the US interstate highway system parallel, but do not entirely obliterate, earlier roads, which were built for different types of traffic and often go in slightly different directions. Trails function in similar ways, and in many cases the resultant differences can be seen archaeologically.

Trails as a category of archaeological information are a poor fit for the traditional idea of the "site." Sites are usually contiguous or closely proximate clusters of features and artifacts, distributed across finite space. We use this concept to divide a complex body of information into units that are manageable and can be compared with each other. Trails, in contrast, are "anti-sites," being the tangible connection *between* sites. They may go on for miles, but are usually intermittent, and also will intersect with other trails that, at least in theory, extend throughout a region. They are understandable only in a landscape context, in which they exist in various relationships with an array of other features across an unbounded space.

In practice, I have approached trails as assemblages of different but related types of evidence. A recording protocol developed in the course of the Pajarito research (Snead 2000) and under continual revision, goes some way toward addressing these concerns, and has three basic components:

A. Recording of trail features as <u>segments</u>. It is increasingly standard practice among archaeologists working on trails and roads to record them as segments of a potentially larger feature (e.g., Marshall 1991). Segments, of which an infinite number are possible, can be distinguished by visibility, surrounding terrain, or any other characteristic that distinguishes parts from the whole. Decisions as to what this "whole" may consist of (and whether it should be classified as a "site") are thus left in abeyance until later in the analysis.

B. Consideration of <u>trail structure</u>. This includes both the *fabric* of the trail itself, the characteristics (width, depth, steps/stairs, etc.) of the feature underfoot, but also *associated features* (cairns, walls, etc.). Not all elements of trail structure need be contemporary, but all are functionally related to the trail itself. Treating this array of features collectively allows for the complexity of the trail to be accurately portrayed.

C. Evaluation of the <u>trail network</u>. The spatial organization of an array of trails, both as they potentially connect with each other and as they articulate with other nodes in the landscape, provides critical evidence regarding the context of the entire system. In this case neither trails nor their destinations are treated generically, but instead as aspects of a larger, interconnected landscape.

These approaches are sufficiently general to be adaptive to different circumstances; my application of them to the Pajarito case is outlined below. In principle, however, they provide a way for us to bring a fresh perspective to the archaeological study of paths and trails. This potential is seen in a wave of recent studies on the subject, ranging from using remote sensing to study trails buried by volcanic ash deposits in Costa Rica (Sheets and Sever 1991), historical records to augment fieldwork on indigenous Hawaiian trails (P. Mills 2002), and geographic information system analysis to identify routes of local travel in prehistoric Europe (Bell and Lock 2000; Bell et al. 2002). As the roads/trails dichotomy breaks down, the greater potential for developing an archaeology of human movement is realized, enriching our knowledge of the cultural landscape.

BACKGROUND

Natural and Cultural Setting

The Pajarito Plateau is a region of north-central New Mexico bounded by the Jemez Mountains to the west and the Rio Grande to the east, extending from roughly Santa Clara creek on the north side to the Rio Chiquito on the south. The plateau itself consists of a basalt substrate overlain by consolidated pyroclastic flows of Pleistocene date (Ross et al. 1961). Erosion of this friable material has created a topography of flat-topped mesas and "portreros" separated by sheer-walled canyons. Permanent water flows in a small number of these streams; the lower elevations of the plateau along the Rio Grande are dominated by piñon pine and juniper, with ponderosa more prevalent towards the Jemez further west.

Ownership of the Pajarito is divided up several ways. Most of the southern plateau falls within Bandelier National Monument, while the central plateau is under the jurisdiction of Los Alamos National Laboratory (LANL), with sizable acreage also governed by San Ildefonso Pueblo. Smaller tracts include substantial private land around the town of White Rock and the Tsankawi Unit of Bandelier National Monument. Much of the northern plateau is part of the Española Ranger District of the Santa Fe National Forest, with Santa Clara Pueblo owning land along Santa Clara creek. The diverse ownership of land on the Pajarito Plateau has had a demonstrative affect on trail archaeology in the region, as will be seen below. From a preservation perspective, however, the significant level of public ownership and the relative remoteness of the area (until recently) has provided remarkable protection for local archaeological resources.

This evidence suggests that Archaic period hunter-gatherers were the first inhabitants of the Pajarito, but the primary Ancestral Pueblo occupation of the area began during the AD 1100s. During the Coalition (AD 1150–1325) and subsequent Classic (AD 1325–1550) periods, the region was home to a significant human population, who farmed the canyon bottoms and mesa tops (for an overview, see Powers 2005; Powers and Orcutt 1999b). An initial pattern of dispersed small residences close to the fields evolved into one characterized by a few large "community houses" surrounded by hinterlands with seasonally occupied fieldhouses. The most prominent of these are (from north to south) Puyé, Otowi, Tsankawi, Navawi, Tsirege, Tyuonyi, and Yapashi, although dozens of smaller pueblos as well as extensive cliffside cavate pueblos are preserved. Other elements of a diverse cultural landscape include petroglyphs, reservoirs, field systems, shrines, and trails. The permanent population of the plateau appears to have declined over the course of the late pre-Columbian period, and by the early 1600s it seems to have been used largely as a seasonal hunting ground. Descendant populations of the Pajarito inhabitants are to be found in the Tewa pueblos of Santa Clara and San Ildefonso as well as the Keres pueblo of Cochiti.

Previous Research

The first recorded mention of the Ancestral Pueblo trails of the Pajarito Plateau comes from Col. James Stevenson of the Smithsonian's Bureau of Ethnology, who mentioned trails at the Pueblo of Puye in 1880 (J. Stevenson to J. W. Powell, 27 October 1880:BAE). Adolph Bandelier's

Cochiti guides took him along the old trails further south on the Pajarito during the same period (Bandelier 1892:147), routes used by many others over the subsequent decades (cf. Prince 1903). A typical experience was recorded by J. A. Jeancon, reporting to Edgar Lee Hewett about a visit to Tsankawi. "The trail leading across the solid stone is worn in some places to a depth of three feet," he wrote. "This is most remarkable when one stops to consider that the Indians wore only moccasins or went barefoot" (89ELH.081; LOA). Hewett's own work contains numerous references to trails, including several published photographs (cf. 1909:437; 1953). Although he described plans to publish a report focusing on trails (1908b:18), it was never completed. Related ethnographic information was collected by J. P. Harrington, whose *Ethnogeography of the Tewa* contains descriptions of 17 different trails, including several on the Pajarito (1916:412).

Trails make only rare appearances in discussions of Pajarito archaeology over the next two generations, circumstances that I have argued reflect the dominance of a "chronological perspective" in Southwest archaeology for which landscape features were largely irrelevant (Snead 2002b). It wasn't until the 1970s, when surveys of lands associated with LANL were begun, that interest in the archaeological potential of trails reemerged. Charlie Steen (1977) documented several individual trails in the central plateau, which although lacking in detail provided a baseline for future research.

A new and more systematic approach for Pajarito archaeology was inaugurated in the late 1970s with the Pajarito Archaeological Research Project (PARP), which conducted intensive surveys to test hypotheses concerning the response of the Ancestral Pueblo population to environmental stress. In the process, more than 800 sites were recorded from all parts of the plateau, including numerous trails (see Hill and Trierweiler 1986; Hill et al. 1996). Despite the processual strategy and the more rigorous fieldwork, however, the PARP analysis was similar to more traditional research in its concentration on chronological information and residential sites. Landscape features such as trails were recorded, but did not play a substantive part of the discussion. A more holistic strategy was adopted by the BAS in the 1980s; over five years more than 3000 sites of 50+ types were recorded within the national monument. The discussion of trails in the project's final report was brief but substantive, notable in view of the extraordinary quantity of archaeological data that had been generated (Van Zandt 1999).

As of the early 1990s the Ancestral Pueblo trails of the Pajarito were thus widely known among archaeologists but had never been systematically documented. The considerable information provided by the PARP and BAS field crews, however, had generated a detailed landscape within which the trails could be placed. Attempts to use existing information to evaluate the trail networks themselves, however (Snead 1991) were problematic, largely because of the methodological issues discussed in the introduction. It was often impossible to tell from existing site records, for instance, whether trails on adjacent sites were actually different segments of the same larger-scale feature or were entirely unrelated. On another level, the different jurisdictions on the plateau created obstacles for trail recording, since they rarely stopped at modern boundaries. If the Pajarito trails were to contribute to our understanding of the Ancestral Pueblo world, then a new project would have to be developed to address the issue directly.

The Pajarito Trails Project

The PTP began in 1991 as an exploratory survey of land belonging to San Ildefonso Pueblo in the vicinity of the Navawi community house (Snead 2002c). Working with a permit from the pueblo, I spent two weeks documenting a series of trails and related features associated with Navawi and other habitation sites in the area. This work produced substantial new information, particularly since the area had not been the scene of archaeological work for decades; but the level of documentation was uneven, particularly since it was only after beginning that I became aware of many of the complexities of trail recording.

The PTP was revived in 1999, when an opportunity for fieldwork in both Bandelier and Los Alamos lands opened up. In the meantime a number of new theoretical approaches to space and landscape had also been developed, making the work timely in a way that it had not been eight years before. Accordingly, three weeks in 1999 and one week in 2001 were devoted to the recording of trails in the central and southern portions of the plateau.

The methodology of the project developed largely along the lines discussed above. Rather than survey entirely new areas, the project focused on the re-recording of trail sites that had already been identified. Seven areas, containing 32 recorded trail sites, were emphasized. These include: Frijoles Canyon (Bandelier), White Rock Canyon (Bandelier), Lummis Canyon (Bandelier), Yapashi (Bandelier), Capulin Canyon (Bandelier), Tsankawi (Bandelier), and Otowi/Sandia Canyon (LANL).

The characteristics of trail structure (Table 81.1) were derived from existing records and modified in the field. Since many of the terms developed at the time will appear in the following section, I will reproduce them here:

A. Fabric

1. Cleared talus. Cleared talus indicates construction of a trail by moving larger stones and cobbles from its path (Figure 81.1).

2. Wearing. Wearing, also called "incision," "erosion," etc., refers to areas where the trail has been worn into the bedrock surface by friction caused by foot traffic, leaving a tangible imprint (Figure 81.2). Trail wearing can range from a faint "shadow" on the ground to deep worn segments a meter or more in depth.

3. Construction. Construction indicates formal excavation of trail into the ground or physical modification of the trail surface by means other than gradual erosion (i.e., wearing). It is assumed that this means pecking or grinding through the use of tools made of basalt or other hard stone (Figure 81.3). Construction is considered to reflect a formal process of trailbuilding. Construction must also be argued rather than assumed, since it is difficult in most cases to distinguish wearing from construction. The dilemma is illustrated in Van Zandt's summary of BAS trail data, which lists nine "pecked" trails, 20 "excavated" trails, 32 "worn" trails, and nine considered to represent a "mixture" of fabrics (41). These categories reflect the assessment of field teams, rather than any standard measure. Steps and similar features, while more clearly evidence for formal construction, are covered by their own category, below.

Table 81.1. Characteristics of trail structure developed for the recording of Pajarito trails (modified after Table 1 in Snead 2000).

Trail Structure (Pajarito)	
Fabric	**Associated Features**
Wearing	Berms
Cleared Talus	Flanking Walls
Construction	Shoring
Braiding	Cairns
Switchbacks	Trail Markers
Hand and Toe Holds	Architecture
Steps (One-foot, Two-foot, and Basin)	
Stairs	
Ramps	

Figure 81.1. LA 134901 as it descends from the Portero del Rito into White Rock Canyon, illustrating cleared talus trail construction.

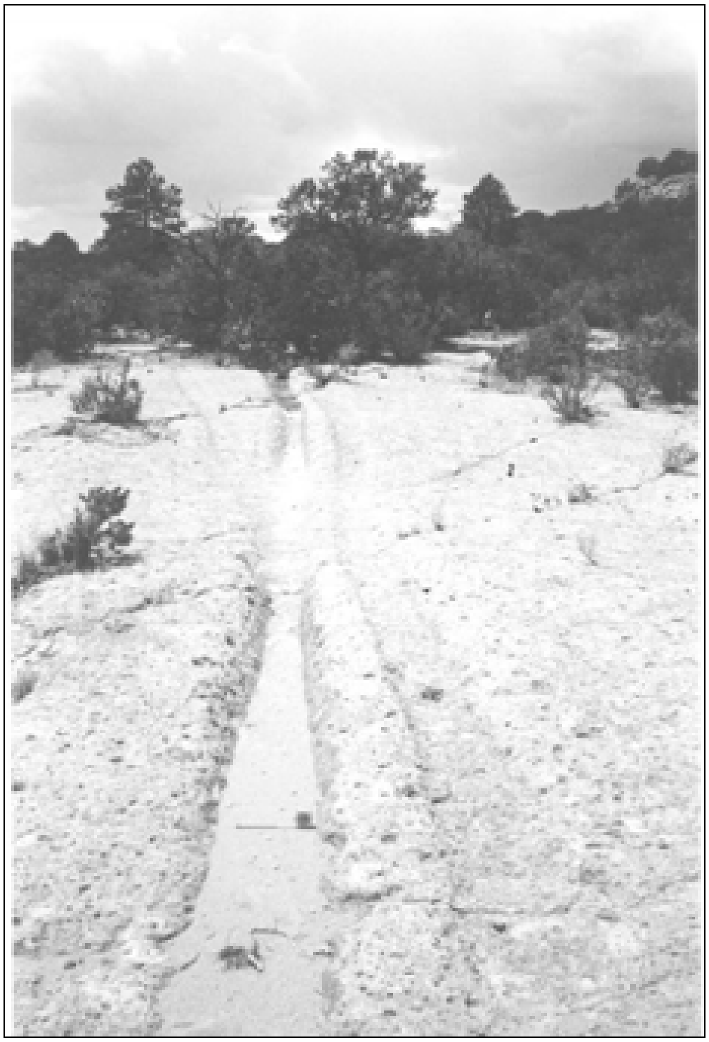


Figure 81.2. LA 66885, the Sandia Canyon Trail Network (Segment 03), illustrating wearing and braiding (10 cm scale).

4. Braiding. Braiding, also called "multiple routes," is the duplication of a trail into parallel and often interwined paths within a relatively restricted area. Operationally, braided trails are usually no more than 10 m apart, or they were considered separate (if possibly related) segments (see Figures 81.4 to 81.6). It should be noted that braiding can be both informal (a product of slight modifications in a trail's route over a period of time) and formal (the intentional re-alignment or re-construction of a trail). Distinguishing the two is not straightforward and has been done inconsistently by the PTP. The trail depicted in Figure 81.2 illustrates braiding as an informal process, while the braided trails in Figures 81.7 and 81.8 show evidence of more formal construction.

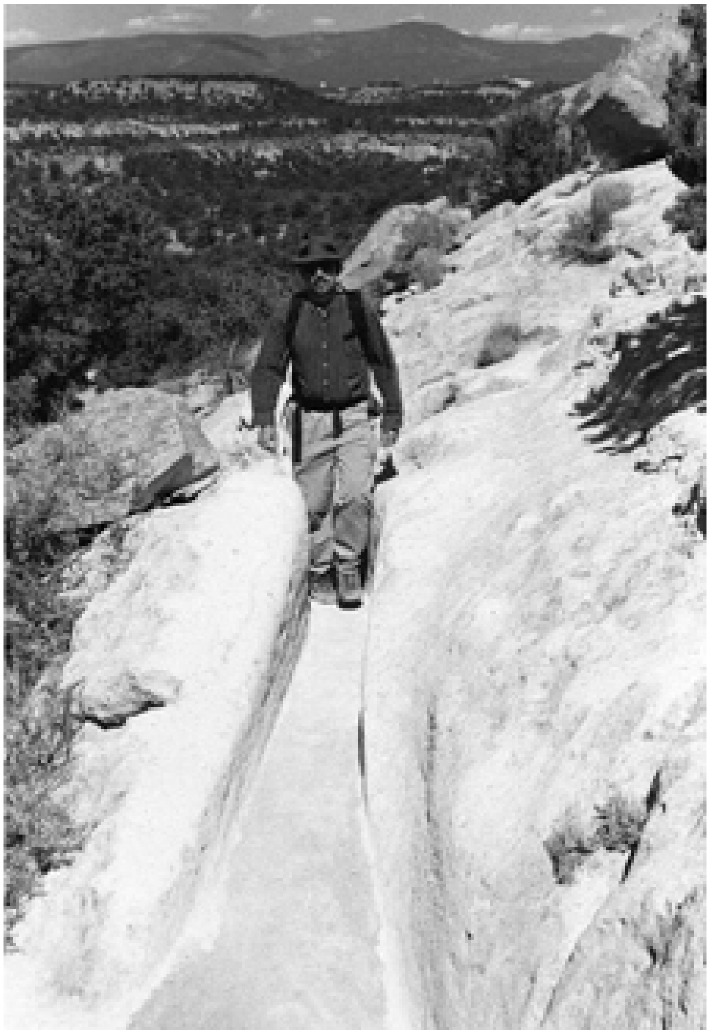


Figure 81.3. LA 70989, the Tsankawi Mesa Trail network (Segment 01), illustrating wearing and probable construction. J. Snead in photo.

5. Switchbacks. Switchbacks refer to trails that angle back and forth across a slope. Switchbacks are sometimes thought of as a Euro-American introduction, but also appear on trails that are clearly associated with the Ancestral Pueblo period.

6. Hand and toe holds. Hand and toe holds are modifications of the tuff surface designed to facilitate climbing up steep boulder/cliff faces. Hand and toe holds usually consist of shallow "cups" pecked into the rock surface and demonstrate a minimum of effort. In some cases hand holds are found in association with steps.

7. Steps. Steps are modifications of the trail surface designed to facilitate climbing moderate slopes. They are generally larger and wider than hand and toe holds. Three general morphological characteristics of steps have been noted:

Figure 81.4. "One-foot" steps on Tsankawi Mesa. 1 m scale.

Figure 81.5. LA 77779, illustrating "basin steps." 10 cm scale, view from above.

Figure 81.6. LA 70989, the Tsankawi Mesa trail network, illustrating worn segment and associated steps. 1 m scale.

a. one-foot steps. These are steps large enough for a single foot. Unlike hand and toe holds, they have been cut straight down into the rock surface and are thus "open" at the top (Figure 81.4).

b. two-foot steps. Steps large enough for two feet side by side.

c. Basin steps. These are large steps that by design or subsequent erosion have a concave profile (Figure 81.5).

8. Stairs. Stairs are aligned sets of steps. Operationally, a set of five or more steps is here suggested to define "stairs" in relation to "steps." The term "staircase" is used for stairs that are qualitatively distinct (Figures 81.14 to 81.17).

9. Ramps. A ramp is a constructed or modified inclined plane by which a trail ascends or descends a section of slope. A ramp may be a section of bedrock that has been shaped to facilitate foot traffic down a short drop.

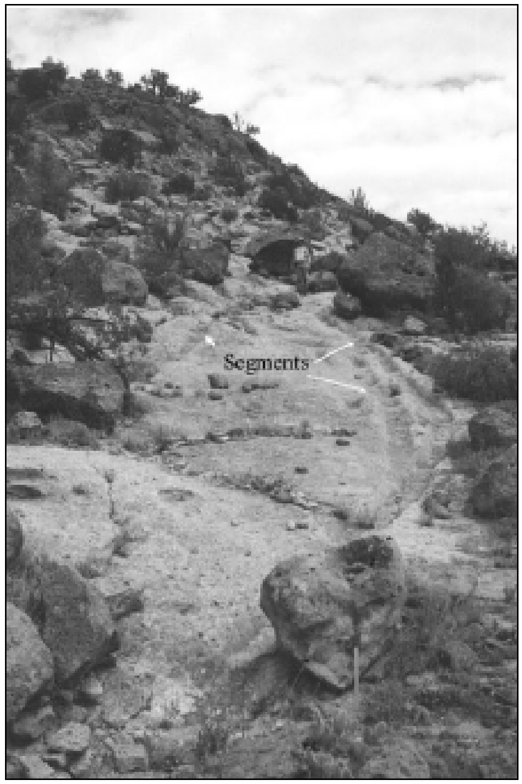


Figure 81.7. LA 65581, illustrating braiding associated with the Capulin Staircase.

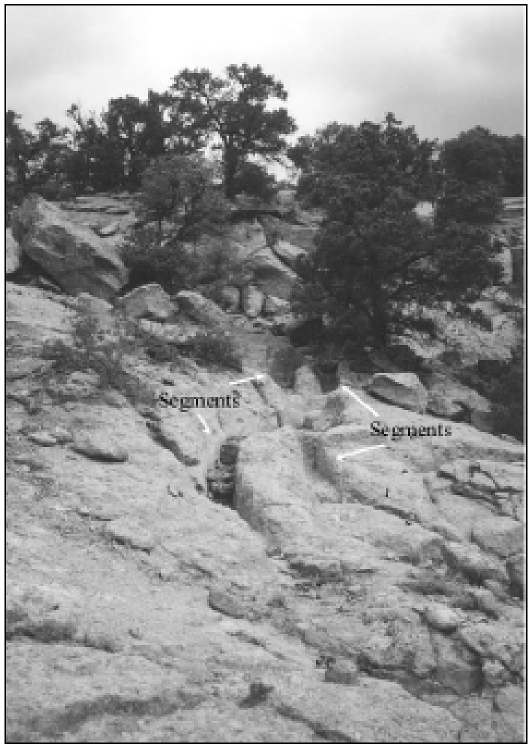


Figure 81.8. LA 66885, the Sandia Canyon trail network, illustrating braiding on Segment 6.

B. Associated Features

1. <u>Berms</u>. Berms are linear mounds of stacked cobbles and boulders found along trail margins parallel to the trails themselves. Typically, berms function to bound a trail's downhill side (Figure 81.13). Berms are another feature of possible Euro-American introduction, although in at least one case—LA 90799, associated with the Caja del Rio North community house—large piñon and juniper trees growing in the path suggest that the construction of the associated berm is of some antiquity. This trail is also quite distinct from an obviously historic example nearby, making a credible case that the berms at LA 90799 are Ancestral Pueblo in origin.

2. <u>Flanking walls</u>. Walls of stacked shaped/unshaped cobbles set perpendicular to the course of a trail. Flanking walls are typically found at mesa rims and appear to have been designed to limit access to the mesa tops by people traveling on the trail (Figure 81.9).

Figure 81.9. LA 125383, illustrating Segment 1 with flanking walls.

3. Shoring. Shoring refers to the stacking of cobbles or other construction material to level the downslope side of a trail.

4. Cairns. Cairns are piles of unshaped cobbles placed alongside trails to mark their routes. Dating is a particular challenge regarding associated features of these types. Most are associated with Historic period trail construction, but are present in sufficient numbers on trails that otherwise are clearly associated with the Ancestral Pueblo period that each must be considered on its own merits (Figure 81.10).

Figure 81.10. LA 84137, illustrating associated cairns of possible Ancestral Pueblo date.

5. Trail markers. Trail markers consist of petroglyph panels or isolated elements that mark trail routes. While some trails may lead to or pass near larger petroglyph panels, trail markers are directly associated with trails themselves (Figure 81.11).

6. Gametraps. Gametraps are pits excavated into the tuff bedrock that are believed to have been used in the hunting of deer. Several gametraps have been found in direct association with Ancestral Pueblo trails (Figure 81.12). My interpretation of these features, following Steen (1977:29), is that they date from the colonial or early modern eras, and were used by Pueblo hunting parties who came up on the plateau when the full-time residential population had largely departed. Otherwise they would have represented a dangerous obstacle for people using the trails.

It should be evident from this list that the Pajarito trails can be complex and quite variable, since some major trails included most of these aspects of trail structure. The results of the project were documented in three reports (Snead 2000, 2001b) and one publication (Snead 2002a) that focused on the trail segments of the southern plateau.

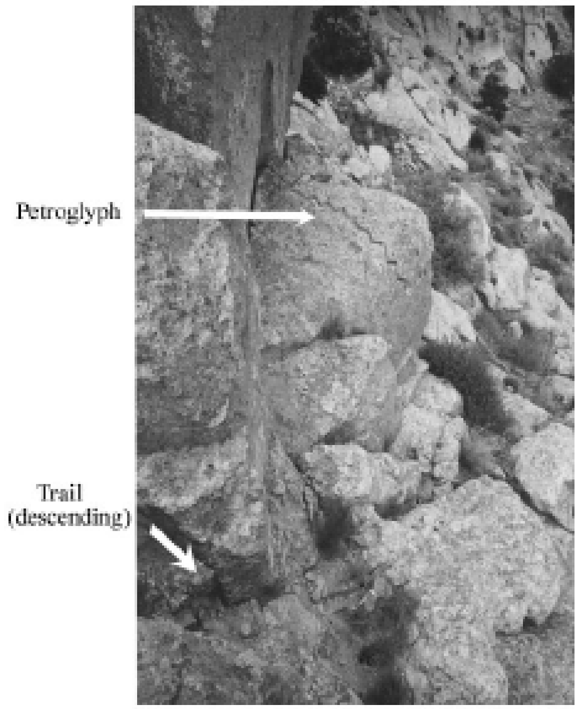


Figure 81.11. LA 21602, the Kwage Mesa trail network, illustrating Segment 4 with petroglyph trail marker.

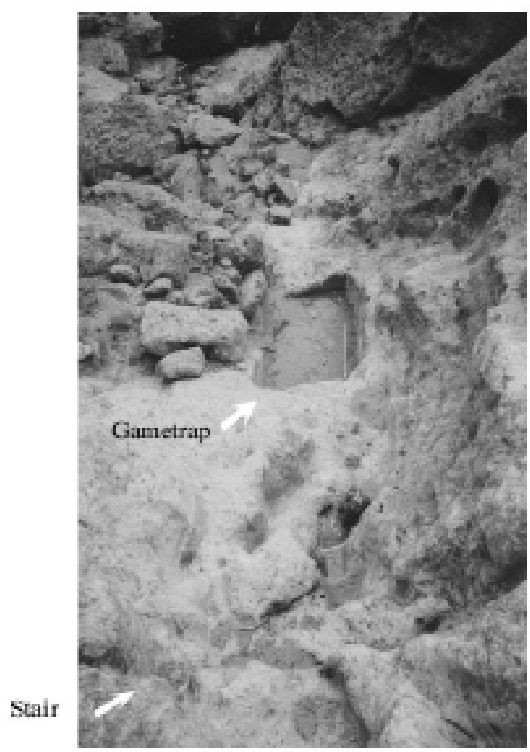


Figure 81.12. LA 66885, the Sandia Mesa trail network, illustrating Segment 6, with a game trap overlying descending stairs. View downhill, 1 m scale.

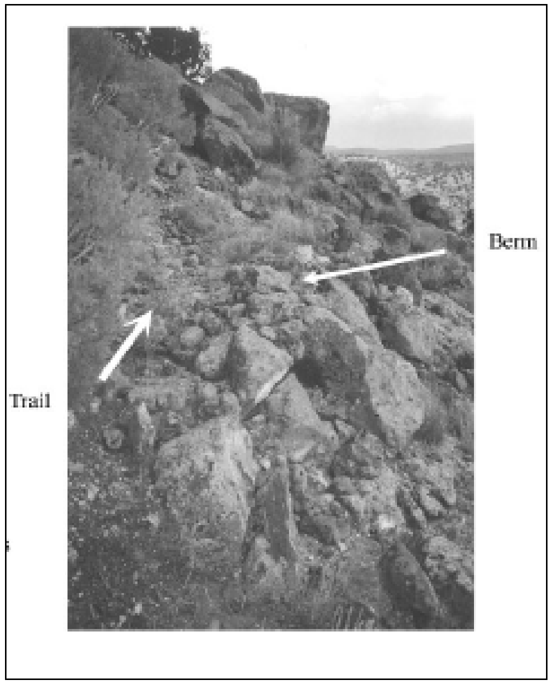


Figure 81.13. LA 84137, illustrating cobble berms associated with trail.

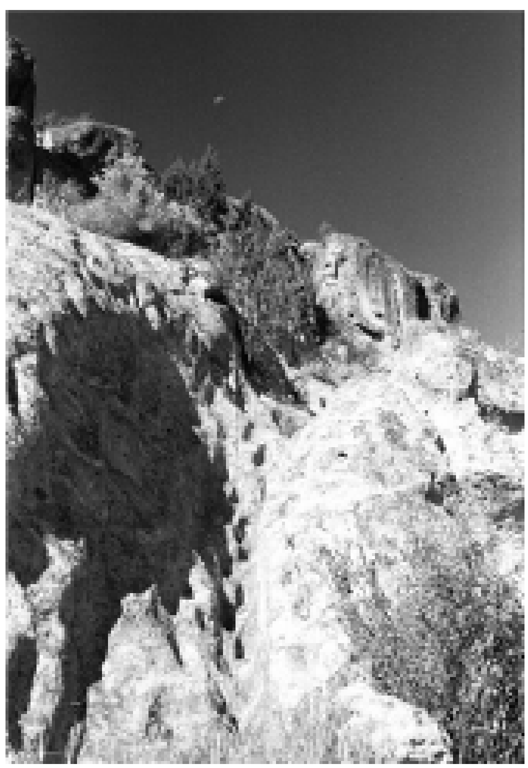


Figure 81.14. LA 70989, the Tsankawi Mesa trail network, illustrating Segment 69, part of the Tsankawi North Staircase.

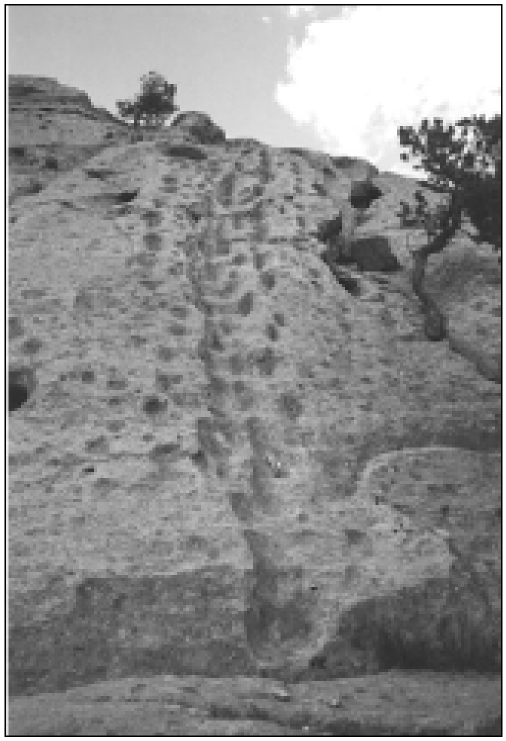


Figure 81.15. LA 21585, the Otowi Mesa trail network, illustrating Segment 07, part of the Bayo Staircase. 10 cm scale.

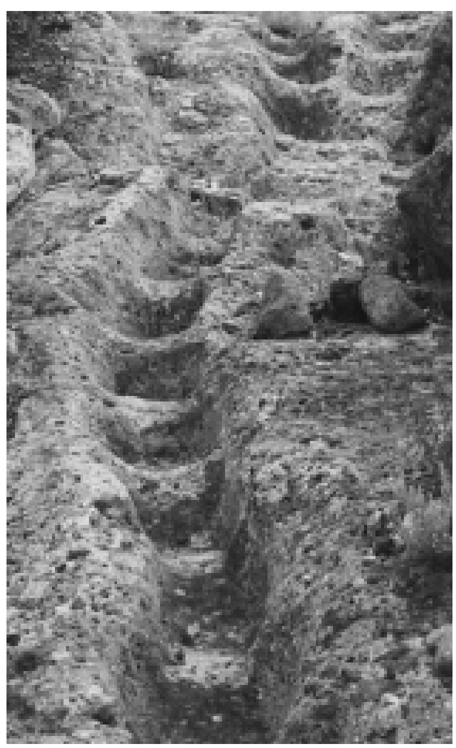


Figure 81.16. LA 134111, illustrating Segment 3, part of the Frijoles Staircase (detail).

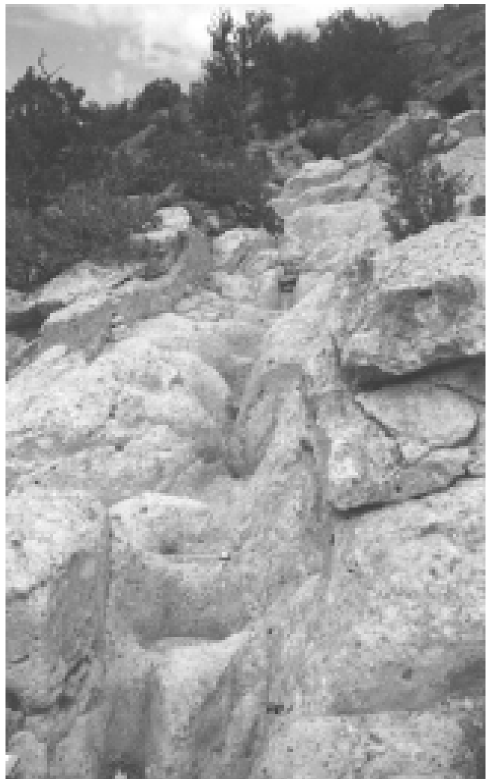


Figure 81.17. LA 65581, illustrating Segment 2, part of the Capulin Staircase. 10 cm scale.

ANCESTRAL PUEBLO TRAILS

In the following three sections I provide an overview of recorded Ancestral Pueblo trails of the Pajarito Plateau. They are the *Northern Pajarito*, defined as the area between Guaje and Santa Clara canyons; *Central Pajarito*, between Ancho and Guaje canyons; and *Southern Pajarito*, from Ancho Canyon south to the Rio Chiquito.

For several reasons, I do not provide a figure for the total number of sites recorded as trails in the Pajarito region. Detailed field checking has failed to confirm the presence of some of these features. Since many trails have been recorded as secondary features associated with residential sites, it is also often difficult to pick them out of site forms or databases. Hand and toe holds, for instance, are present at many sites but receive little or no mention. This would suggest that the number of sites that include trails or trail features is actually larger. In contrast, many of the more visible trails have been re-recorded or assigned different site numbers at different points along their length, as they pass near other features. In my own work, for instance, I have suggested that site numbers be assigned to particular, functionally interrelated trails, which would often subsume several different numbers. Numbers of trail sites thus reflects dueling strategies of record-keeping that only distantly approximate “real” conditions on the ground.

In the spirit of the "landscape" perspective towards archaeological trails that I advocate, however, recorded features presented below are divided into two categories. These are a) *local trails*, which appear to have had significance only to people living in the immediate vicinity, and *trail networks*, which either ran for longer distances or where multiple segments appear to have been functionally interlinked. Typically the local trails are identified by the LA number that has been assigned to them or another associated feature. They are listed in the associated table. I will list the LA numbers associated with the trail networks as well, but will also refer to them by names that represent the collective whole and will discuss them in the text.

The methodological difficulties described above will make it challenging to present trail data with any consistency until they are all re-recorded. This is particularly true since I am suggesting that some of the Pajarito trails have been erroneously recorded under different LA numbers, and that these should be consolidated. Thus in the case of trails and trail networks recorded by PTP, I indicate the LA numbers originally associated with the trail, the number under which I recommend that this information be consolidated, and the suggested name of the network. In cases where trails haven't been formally re-recorded but for which other information suggests that they form a network, I will list the relevant LA numbers and suggest a name for the network itself.

Northern Pajarito

Despite the fact that the Ancestral Pueblo trails of the northern Pajarito Plateau were the first to be noted by archaeologists, at present they are the least well-documented. This is in part because of the vagaries of land ownership and recent research; the area around Puyé (LA 47) has not been archaeologically examined in recent decades, and although numerous sites in Garcia, Chupaderos, and Guaje canyons were recorded by PARP, their sample transect strategy was ill-suited to the identification of trails. There is considerable anecdotal evidence for local trail networks throughout these canyons but formal documentation is almost entirely absent. Steen describes two sets of formal staircases associated with the Guaje Mesa site (LA 12900), both of which had been destroyed in recent rockfalls: "[t]he stairs were approximately 1.5 m wide and had fairly uniform risers of about 20 cm and treads of about 30 cm" (1977:30).

The only two trails that have been formally recorded in the area, LA 21444 and LA 21460, indicate the potential for further research. These trails are closely associated, running east (LA 21444) and west (LA 21460) from a prominent saddle on Chupaderos Mesa, the portrero separating Garcia and Chupaderos canyons. The saddle may be a node in the major north-south axis connecting more southerly areas with the vicinity of Puyé, with which these trails are closely articulated. A substantial Coalition community is present on Chupaderos Mesa (LA 21605), to which LA 21460 provides access from the west and north.

Another important northern Pajarito trail that has never been formally recorded is what I call the "Garcia staircase." The stair, located on a saddle between Garcia and Corral canyons, was originally noted by Hewett, who described the associated trail as "worn hip-deep in the rock by the attrition of human feet" (1906:16). A photograph of the stair was published in a subsequent report (Hewett 1908b:11). The Garcia staircase is a compact set of formal, constructed, braided steps climbing the west side of the canyon, not as long as many of the other Pajarito staircases but perhaps the most elaborate. Numerous minor trails/stairs are associated with the mesa top community to the west. The unique character of the Garcia staircase and its location roughly opposite the saddle associated with LA 21444 and LA 21460 suggests that it is probably related to the same north-south axis.

Central Pajarito

Research at the prominent community houses of the central Pajarito by Hewett and others in the early 20th century meant that attention was also paid to the associated trails. Photographs of the trails at several of the sites were published (cf. Hewett 1908b, 1909), and they appear on site maps (cf. Hewett 1906). These references, plus the recording of trail features by Steen, PARP, BAS, and LANL, have created a vastly larger body of data than is present for areas further north. This information was augmented by PTP work, first on San Ildefonso land in 1991 (see below), and subsequently on National Park Service (NPS) and LANL jurisdiction in 1999 and 2001.

Table 81.2 lists the different LA numbers associated with trails on the central plateau. Trails associated with Otowi, Tsankawi, and Sandia Canyon are described in greater detail in the relevant PTP reports (Snead 2000, 2001a). The list includes 129 trail segments grouped into 32 sites with LA numbers, representing four local trails, one major trail, and six trail networks. Trails in the San Ildefonso sacred area, which have not been assigned LA numbers, are treated separately.

Table 81.2. Ancestral Pueblo trails on the central Pajarito Plateau, listing alternative numbers and suggested names. The underlined LA number is that recommended for use when the different segments of a trail network are "consolidated."

LA #	PARP	LANL	PTP	NAME	SEGS	TYPE
12609				Sandia Pueblo Trail Network		?
16803				N/A		?
21585	266		4/5	Otowi Mesa Trail Network/Bayo Staircase	11	N
21602	500			Kwage Mesa Trail Network	11	N
21624	42			Old Pajarito Trail?	1	M
21629	47		6	Sandia Canyon Trail Network		
21632	50		6	Sandia Canyon Trail Network		
21634	52		6	Sandia Canyon Trail Network		
21635	53		6	Sandia Canyon Trail Network		
30639		TI-8		N/A		?
50976				Tsankawi Mesa Trail Network		
65661				Tsankawi Mesa Trail Network		
65683				North Mesa Trail Network		
65687				North Mesa Trail Network		
65714				Tsankawi Mesa Trail Network		
65716				Tsankawi Mesa Trail Network		

LA #	**PARP**	**LANL**	**PTP**	**NAME**	**SEGS**	**TYPE**
65738				North Mesa Trail Network	8	N
65740				North Mesa Trail Network		
65741				North Mesa Trail Network		
65743					7	L
65752				Tsankawi Mesa Trail Network		
65753				Tsankawi Mesa Trail Network		
65754				Tsankawi Mesa Trail Network		
65755				Tsankawi Mesa Trail Network		
65756				Tsankawi Mesa Trail Network		
65757				Tsankawi Mesa Trail Network		
66885		L-38	6	Sandia Canyon Trail Network 9	9	N
70956				Tsankawi Mesa Trail Network		
70989				Tsankawi Mesa Trail Network	74	N
70993					1	L
125383					3	L
127693		Q-29	3	Otowi East Trail Network	4	N

Segs = number of recorded trail segments; L = local (minor) trail; M = part of major (regional) trail; N = network of related trails

LA 12609. LA 12609 is the Sandia Pueblo trail network and is a series of stairs and trails leading up the north side of Mortandad Canyon to the mesa top community house. These trails have not been recorded in any substantive way. There is evidence that Sandia Pueblo is linked to the Sandia Canyon trail network (LA 66885), but this has not been confirmed by fieldwork.

LA 16803. LA 16803 is an unnamed trail on the north side of Mortandad Canyon that was initially noted in the 1970s and subsequently re-recorded by LANL. This trail appeared to be isolated, implying to Steen that it was of local significance, despite the fact that it is “deeply cut” (Steen 1982:7). The fact that LA 30639 was subsequently recorded nearby, however, makes it possible that the two formed part of a larger network, perhaps a major east-west trail ultimately linking up with the North Mesa trail (see below).

LA 21585. LA 21585 is the Otowi Mesa trail network. It is a series of 11 trail segments that consists of the Bayo staircase, which climbs out of Bayo Canyon north of Otowi (LA 169), a segment descending the north side of the mesa into Barrancas Canyon, and associated trail features to the east and west along the mesa top. LA 21585 was originally assigned to a set of hand and toe holds climbing up the south face of the mesa west of the Bayo staircase recorded by PARP; subsequent LANL fieldwork applied the number to other trail features on the mesa (Hoagland et al. 2000:7–81), while the segment entering Barrancas Canyon was added by PTP in 1999.

LA 21602. LA 21602 is the Kwage Mesa trail network. PARP recorded three segments of this trail ascending the toe of Kwage Mesa west of Otowi. These segments were re-recorded by PTP in 1999 with several additional segments recorded on the south-facing cliff of the mesa, where a possible rock-art shrine is present (Snead and Munson 2001). The total number of segments is

11. Since Kwage Mesa is not continuous to the west, these trails appear to be of local significance.

LA 21624. This trail is a short, deeply worn trail segment recorded by PARP and that crosses a narrow mesa neck south of Tsirege. The topographic location of this trail and the apparent depth of wearing evident suggests that this trail may have been a segment of a major north-south network.

LA 21629. This is a short trail that was recorded by PARP but not re-located by PTP. The original site form suggests that it is a local trail providing access to a mesa top summit north of Sandia Canyon; it is probable that this is actually Segments 5 and 6 of LA 66885 (see below).

LA 21632. See LA 66885.

LA 21634. See LA 66885.

LA 21635. See LA 66885.

LA 30639. This is a short trail segment recorded by LANL on Sigma Mesa north of Mortandad Canyon. There is a circular feature of unknown association at the toe of the mesa above the trail, suggesting that the trail may have provided local access to this feature; the proximity of LA 16803, however, suggests the possibility that the two trail segments may have been part of a trail network supporting east-west movement along the mesa tops.

LA 50976. See LA 70989.

LA 65661. See LA 70989.

LA 65683. Part of the suggested North Mesa trail network; see LA 65738.

LA 65687. Part of the suggested North Mesa trail network; see LA 65838.

LA 65714. See LA 70989.

LA 65716. See LA 70989.

LA 65738. LA 65738 is the North Mesa trail network. This series of a minimum of eight segments recorded under five LA numbers (65683, 65687, 65738, 75740, and 65741) represents access to the summit of Tsankawi North Mesa and travel along it to the east and west. These segments were visited in 2001 but not formally re-recorded, so that their definition as a trail network is incomplete.

LA 65740. Part of the suggested North Mesa trail network; see LA 65738.

LA 65741. Part of the suggested North Mesa trail network; see LA 65738.

LA 65743. This is a related set of minor trails associated with a group of cavates on a lower level near the west end of North Mesa. The articulation of these trails with the North Mesa Trail Network is unclear.

LA 65752. See LA 70989.

LA 65753. See LA 70989.

LA 64754. See LA 70989.

LA 65755. See LA 70989.

LA 65756. See LA 70989.

LA 65757. See LA 70989.

LA 66885. LA 66885 is the Sandia Canyon trail network. This series of nine trail segments recorded under five LA numbers (21632, 21634, 21635, poss. 21629, and 66885) represent a major route onto the mesa between Sandia and Los Alamos canyons and along it to the west. The recording of these segments has a complex history; see Larson (1987:11) and Snead (2001b) for further details. It is likely that these segments were originally a part of the North Mesa trail (see below), and also articulate closely with the Tsankawi Mesa trail network.

LA 70956. See LA 70989.

LA 70989. LA 70989 is the Tsankawi Mesa Trail Network. As defined in 2001, this network consists of 74 distinct trail segments associated with LA 214 (Tsankawi Pueblo), and was originally recorded under 12 LA numbers (50976, 65661, 65714, 65716, 65752-57, 70956, and 70989). The network includes features on the top and flanks of the mesas as well as stairways connecting the mesa top with the surrounding valleys. This is the most intricate trail network on the Pajarito, with a total measured length of 7.62 km (4.73 mi). The Tsankawi Mesa trail network connects both to the Sandia Canyon trail network to the west and the proposed North Mesa trail network to the north.

LA 70993. This is a minor trail running along the north flank of North Mesa, apparently below the upper cliff. No other associations noted in the site report.

LA 125383. This is a minor trail providing access to the top of “fence mesa” or “south mesa” immediately south of Tsankawi Mesa. Trail is notable for the flanking walls that restrict access to the mesa summit and between which the trail passes.

LA 127693. LA 127693 is the Otowi East trail network. As defined in 2001, this network consists of a minimum of four trail segments associated with the small mesa east of Otowi (LA 169), all of which serve to provide access to the mesa summit. Rough terrain inhibits movement further east.

Sacred Area Trails

In the summer of 1991, I spent two weeks undertaking reconnaissance survey of portions of the San Ildefonso Sacred Area, located on the Central Pajarito Plateau. This area is critical for an understanding of Ancestral Pueblo settlement in the region, since it includes much of the terrain between Pajarito and Sandia canyons and, in particular, the Classic period community house of Navawi (LA 214). Restricted access to this property means that knowledge of sites in this area is several decades old; my examination of these early records, however, suggested that trails were an important part of the archaeological record in the Navawi area. I accordingly applied to the Office of the Governor at San Ildefonso Pueblo for a permit to make a preliminary assessment of trails and related sites therein, which was granted with the proviso that respect be shown to any locations of a probable sacred nature. The informal nature of the project also meant that no reports were filed with the New Mexico Historic Preservation Division, nor were LA numbers assigned to the sites encountered.

The brevity of the project, the large area covered and the fact that I conducted the work by myself on all but a few days meant that the data were recorded in haste. This was also several years before I devoted much thought to developing a recording protocol for trail features. The result is a body of information that is incomplete and not directly comparable to records collected by the BAS or, later, by PTP. It is, however, suggestive of the full extent of the trail system on the central Pajarito, and fills an important spatial gap between the major communities. Further research in the vicinity, particularly with the advent of geographic positioning system recording of archaeological sites, is a high priority.

Of the 34 sites noted in the course of the Sacred Area survey, 17 were trail features, for a total estimated length of 1.61 km (1 mi). Several of these included multiple segments, as presently defined. All of the characteristics of trail fabric and structure noted elsewhere on the Plateau were present, with some segments worn or constructed to nearly 0.66 meters in depth. Cairns and berms were also noted. Minor trails linking mesa tops to canyon bottoms were distinguished in four cases; seven others can be collectively considered to form a Navawi Mesa trail network, linking the Navawi community house with the surrounding countryside. Among these can be included a series of four braided trails with associated stairs/steps at the mesa neck northwest of Navawi that is also the location of the famous "game trap" mentioned by Steen (1977:29). This seems to be the major "gateway" to Navawi itself. Several of the associated trails are highly formal. Another element of the Navawi Mesa trail network is a parallel set of stairs descending into the canyon due east of the community house, illustrating the redundant character of stairs known from other Pajarito examples.

One of the most significant aspects of the Sacred Area survey was the recording of five trail segments that represent long-distance travel across the central plateau. In particular, these link both the larger Coalition period settlements in the area and the three large community houses (Tsankawi, Navawi, and Tsirege) that dominate the settlement pattern in the subsequent Classic period. One major route is visible for a considerable distance traveling along the mesa top northwest of Navawi, passing directly through a substantial Coalition settlement before descending into Sandia Canyon close to New Mexico Highway 4. At this point, travel onwards towards Tsankawi, visible to the north, would pass through valley bottoms, but a route towards the Coalition site of Sandia Pueblo (LA 12609) to the northwest is equally plausible (and, since the mesa top trends in that direction, may be preserved archaeologically).

Between Navawi and Tsirege the route runs across the lay of the land and is largely visible where it crosses saddles on the low mesitas. To the southwest one of these segments ascends from the Cañada del Buey, only a short distance beyond Tsirege, while to the northeast the trail enters Mortandad Canyon directly west of the gametrap/trail complex on Navawi Mesa. These trail segments are uniformly short and widely separated but often deeply worn, showing signs both of construction and of long-term use. In this they are analogous to LA 21624, which may represent a similar major trail headed south from Tsirege. Perhaps the most dramatic trail recorded in the Sacred Area survey is on North Mesa at Tsankawi on the San Ildefonso side of the fence east of the monument boundary. Here a worn trail, sometimes divided into two clearly parallel routes, heads down the mesa in the direction of the Rio Grande, with recognizable segments extending to over one km in length. Associated stairways, including one formal feature that descends north into Los Alamos Canyon, indicate the importance of this route, which is clearly a continuation of the North Mesa trail network. In each of these cases the presence of worn trail segments far from the larger centers of habitation indicates frequent use over long periods of time (see below).

Southern Pajarito

Sites and trail network names recorded in the Southern Pajarito are listed in Table 81.3. This area has seen the most recent and intensive survey, and there is a correspondingly greater number of trail features recorded. The BAS recorded 49 trail features in the main section of the monument, of which several are otherwise clearly "historic." Table 81.4 includes lists of these latter sites as well as historic trails that have been recorded elsewhere on the plateau. In addition, some of the BAS trails could not be re-located in 1999 and should be considered questionable (see Table 81.5). An additional 27 sites were recorded as trails by BAS but were not re-recorded. The current list of recently documented trails thus includes 47 trail segments grouped into 15 sites with LA numbers, representing five local and 10 major trails. Further information on most of these trails can be found in Snead (2000).

Table 81.3. Ancestral Pueblo trails on the southern Pajarito Plateau, listing alternative numbers and suggested names.

LA #	BAS IO	PTP	Name	Segments	Type
60442			Portrero del Rito Trail		M
60494			Old Pajarito Trail	4	M
60495			Old Pajarito Trail	3	M
60496			Portrero del Rito Trail		M
60522				6	L
65581			Portrero de las Vacas Trail/ Capulin Staircase	4	M
65846			Portrero de las Vacas Trail?	5	M?
77779			Portrero del Alamo Trail	5	M

LA #	BAS IO	PTP	Name	Segments	Type
84137			Old Pajarito Trail?	3	M
84138				1	L
90799			Portrero del Rito Trail?	?	L
134110	325	2		1	L
134111	245	1	Old Pajarito Trail/Frijoles Staircase	5	M
134901		7	Portrero del Rito Trail 4		M

Segs = number of recorded trail segments; L = local (minor) trail; M = part of major (regional) trail; N = network of related trails

Table 81.4. An incomplete list of recently recorded Historic period trails on the Pajarito Plateau.

LA #	Location	Status
50950	Capulin Canyon	Site stake and other features found in 1999, but trail/groove segments originally recorded do not appear to be trail features
60521	Capulin Canyon	Site stake and other features found in 1999, but trail was not located
65611	Capulin Canyon	Apparent location of the site was investigated in 1999, but the site stake and the trail were not located.
65855	Capulin Canyon	The site was found in 1999; the trail feature was considerably more ephemeral than previously indicated, and is thus of questionable association

Table 81.5. Reputed Ancestral Pueblo trails on the Pajarito Plateau that could not be re-identified by PTP.

Identifier/LA #	Description
BAS IO 44	Minor trail near Corral Hill on the Portrero del Rito
BAS IO 430	Trail of uncertain associations north of San Miguel
LA 50933	Trail of uncertain associations on the Portrero del Alamo
LA 50909	Minor trail on the Portrero del Alamo. Not rerecorded
LA 50911	Trail of uncertain associations on the Portrero del Alamo
LA 50964	Minor trail associated with a small pueblo in Capulin Canyon
LA 50986	Trail of uncertain associations along a branch of Hondo Canyon
LA 53141	Trail of uncertain associations on the Portrero del Rito
LA 53167	Trail of uncertain associations on the Portrero del Rito
LA 60177	Trail of uncertain associations in Sanchez Canyon
LA 60446	Trail of uncertain associations on the Portrero del Rito
LA 60507	Trail of uncertain associations along west side of Capulin Canyon
LA 60508	Trail of uncertain associations along west side of Capulin Canyon
LA 60544	Trails of uncertain associations along west side of Capulin Canyon near its mouth
LA 65601	Trail of uncertain associations along west side of Capulin Canyon

Identifier/LA #	Description
LA 65670	Trail of uncertain associations above west rim of Capulin Canyon
LA 65689	Minor trail associated with a small structure in Capulin Canyon
LA 65701	Trail of uncertain associations in Medio Canyon
LA 65777	Trail of uncertain associations along Capulin Canyon rim
LA 65792	Minor trail associated with a small pueblo in Capulin Canyon
LA 70851	Trail of uncertain associations west of Capulin Canyon
LA 71008	Trail of uncertain associations along Hondo Canyon
LA 71013	Trail of uncertain associations along Hondo Canyon
LA 71036	Trail of uncertain associations along branch of Hondo Canyon
LA 71044	Major trail running down mesa south of Yapashi
LA 77707	Trail of uncertain associations on the upper Portrero del Alamo
LA 77762	Trail of uncertain associations on the Portrero del Alamo

LA 60442. LA 60442 is a major trail and is part of the Portrero del Rito trail (see below), which runs along the Portrero del Rito south of Frijoles Canyon. The site is associated with LA 60496 and LA 134901.

LA 60494. This is a major trail that is part of the Old Pajarito trail (see below). It consists of four recorded segments that climb the south side of Frijoles Canyon across the creek from the modern horse corral. It is associated with LA 60495. Some worn areas are evident, although the slope itself consists largely of loose talus.

LA 60495. LA 60495 is a major trail that is part of the Old Pajarito trail (see below). It runs parallel to LA 60494 but is less formal in its attributes. Three segments of the trail were recorded. Cairns associated with both of these trails are of uncertain association, particularly since modern travel is apparent on the trail.

LA 60496. This site is a major trail that is part of the Portrero del Rito trail (see below). It is associated with LA 60442 and LA 134901. Both LA 60496 and LA 60442 were quite ephemeral when originally recorded. Neither of the trails could be re-located in 1999, despite the identification of other features associated with these "sites," suggesting that the ongoing watershed restoration in the vicinity had impacted their visibility.

LA 60522. This is a minor trail that consists of six recorded segments climbing the east side of Capulin Canyon.

LA 65581. LA 65581 is a major trail that is part of the Portrero de las Vacas trail (see below). This site consists of five recorded segments that climb the east side of Capulin Canyon. This trail provides access from points to the south and west to the mesa top and ultimately, Yapashi (LA 250); it has been designated the "Capulin Staircase" because of deeply worn/constructed segments, braiding, and sets of stairs.

LA 65610. This is a minor trail that consists of six short recorded segments that are largely sets of steps. The area is notable for a petroglyph trail marker at the point where the trail meets the mesa rim.

LA 65846. This is a possible major trail of five segments that leads south from Yapashi (LA 250). This trail may be the initial stretch of the Portrero de las Vacas trail (see below) and link up with the Capulin Staircase (LA 65581), but it is also possible that it only went as far as a small mesa top summit that may have been the location of a shrine. This is the only recorded trail directly associated with Yapashi, which suggests that further survey in the vicinity would be valuable.

LA 70821. This is probably an historic trail northwest of Yapashi.

LA 77721. LA 77721 is an historic trail in Frijoles Canyon that is a possible former interpretation loop.

LA 77731. This is an historic trail in Frijoles Canyon that is a possible former interpretation loop.

LA 84901. This is probably an historic trail in Frijoles Canyon that is of uncertain association.

LA 110141. This is the Mattie Brook Trail located in DP and Los Alamos canyons (Hoagland et al. 2000:7-2).

LA 127624. LA 127624 is the Los Alamos Bench Trail that runs along the north rim of Los Alamos Canyon (Hoagland et al. 2000:7-3).

LA 127699. This site is the Camp Hamilton Trail, which is on the mesa south of Pueblo Canyon (Hoagland et al. 2000:7-149).

LA 138092. This is an historic trail that climbs the west side of Hondo Canyon. This route possibly intersects with that used by LA 65581, which was also used historically (Gauthier, personal communication, 2003).

LA 77779. LA 77779 is a major trail that is part of the Portrero del Alamo Trail (see below). It consists of five segments running from the mesa top down the west slope of a tributary drainage, ultimately leading toward the Rio Grande. LA 77779 is highly formal, with several step/stair segments and cairns of various dates. Large parts of the route are in view of the LA 12579 community house, which is across the river.

LA 84137. This site consists of a major trail of three segments linking the Portrero del Rito with the bottom of Lummis Canyon. Berms and cairns are present and the site is closely associated with LA 84138. This may be one of the primary routes associated with the Old Pajarito trail (see below), but further definition is required.

LA 84138. This is a minor trail of a single segment that provides access to a mesa top shrine overlooking the confluence of Lummis Canyon and the Rio Grande. LA 84137 is only a few meters distant.

LA 90799. LA 90799 is a major trail located on the east side of the Rio Grande across from the mouth of the Rito de los Frijoles. The site is associated both with LA 174, the Caja del Rio North community house, and LA 134901, which represents the easternmost extension of the Portrero del Rito trail (see below).

LA 134910. This is a minor trail that consists of a single recorded segment that descends into White Rock Canyon from the Portrero del Rito several hundred meters south of LA 134901. This trail is comparatively ephemeral and does not link to any previously documented routes.

LA 134111. This site consists of a major trail and is part of the Old Pajarito Trail (see below). It contains five recorded segments that climb up the east side of Frijoles Canyon. This highly formal feature, with stairs, braiding, and deeply worn sections, is also called the "Frijoles Staircase."

LA 134091. LA 134091 is a major trail that is part of the Portrero del Rito Trail (see below). It contains four recorded segments that descend into White Rock Canyon from the southeastern end of the portrero. Flanking walls are present where this trail crosses the canyon rim, and it is evident that this is the major route into the Frijoles area referred to by Hewett (1909:437) and Bandelier (1982:146–147).

LA 138059. This is a major trail that climbs the mesa in lower Hondo Canyon. The site was recorded by NPS in 2002.

DISCUSSION

There are several interesting points of comparison between the recorded trails from the Central and Southern Pajarito. Figure 81.18 depicts the general distribution of sites recorded since the early 1990s, either by the PTP, LANL, or post-BAS research within Bandelier (for clarity, sites recorded earlier have been omitted). Most evident is the impact of different survey regimes in different jurisdictions on the plateau, with the absence of recent work on the northern plateau creating an obvious and artificial gap in the record.

There is, however, an obvious pattern in the distribution of trails in the different defined categories. Although minor trails are distributed relatively evenly, trail networks are confined entirely to the central plateau. In contrast, segments of major trails dominate in the south but appear to be less common further north. Once again, this pattern appears to be less a product of human action and more attributable to geology and the parameters of modern land ownership. All of the trail networks on the central plateau are found on the relatively low, flat mesas of the area, where wide exposures of tuff are common. Such conditions favor the preservation of even relatively ephemeral trails. With the exception of Otowi, all of the Classic period community houses on the central plateau are located on such mesa tops, meaning that the dense patterns of activity associated with such sites have remained visible.

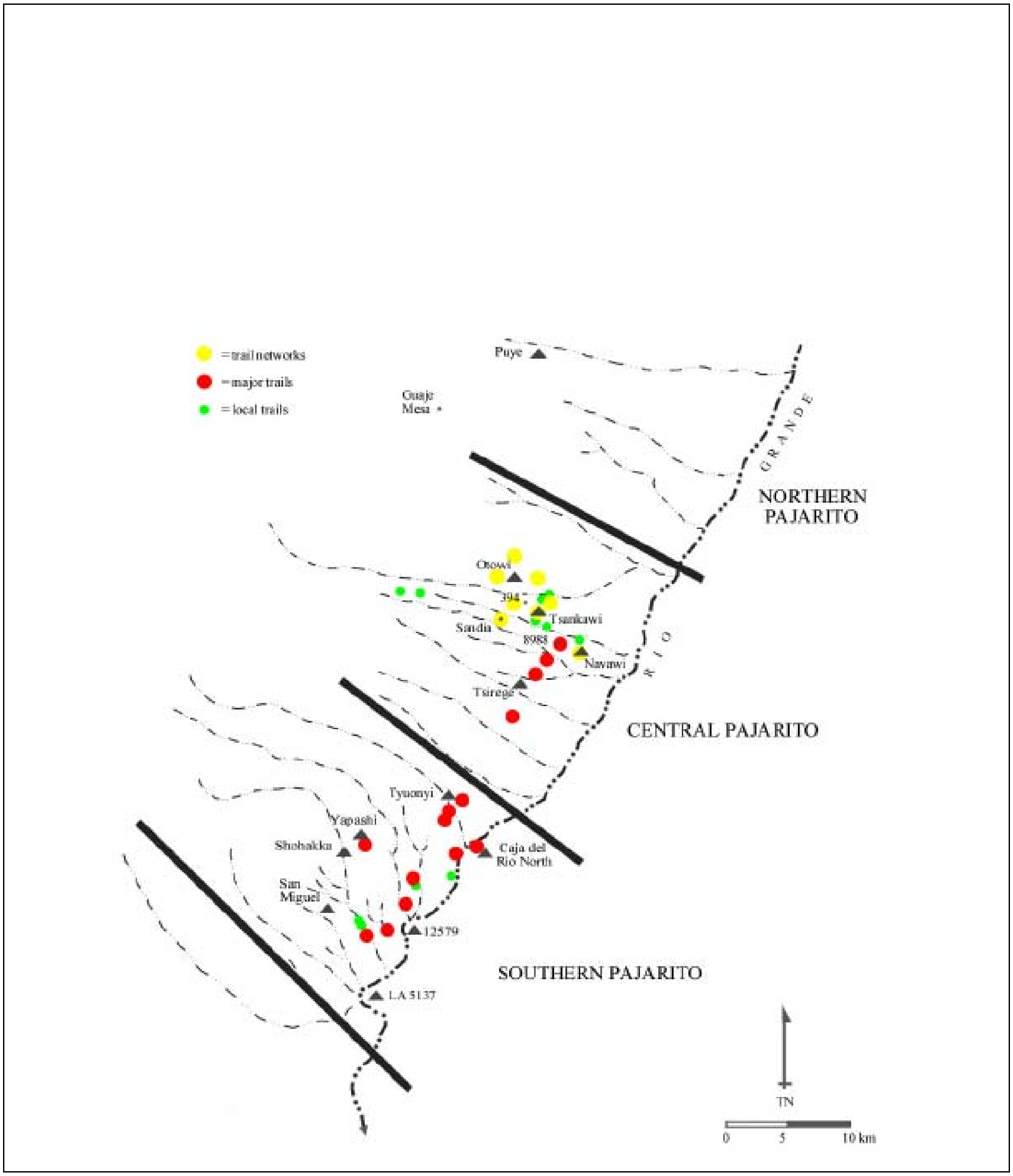


Figure 81.18. Ancestral Pueblo trails of the Pajarito recorded by PTP or other recent projects, along with other sites mentioned in the text.

In contrast, the community houses of the southern plateau are located either on tops of broad portreros (e.g., Caja del Rio North, Yapashi, and San Miguel) or in the canyon bottoms (e.g., Tyuonyi, Shohakka, LA 12579, and LA 56137), both locations where topsoil is relatively well-preserved. Such circumstances are not conducive to the preservation of trail networks as exist further north. Indeed, trails appear most clearly along the canyon rims, in some cases far from the community houses themselves. The cluster of major trails along the Rio Grande does reflect important patterns of movement, which will be taken up below, but the analogous terrain on the central plateau is presently unavailable for survey. Lastly, several of the trail networks of the central plateau are not directly associated with the community houses but instead represent major trails with associated alternate routes and feeder trails, rendered different in appearance to those further south by the vagaries of preservation but conceptually analogous.

In essence, we have yet to reach a point in the recording of Pajarito Plateau trails where the sort of broad spatial trends implied by Figure 81.18 can actually be relied upon. There remain, however, several areas of useful discussion.

Trail Names

The complexities of trail data that are hinted by Tables 80.2 and 80.3, in which minor trails, major trails, trail networks, and their constituent segments mesh uneasily with different site-numbering systems, are quickly becoming an impediment to understanding the data itself. My suggestion is that the nomenclature used here be expanded to incorporate the most spatially extensive scale of the trail system, thereby providing frames of reference more in keeping with the actual structure of the landscape and less entrapped by archaeological convention. This system is essentially hierarchical. The minimal units are aspects of trail fabric and features associated with particular trail segments. If necessary, closely related groups of segments can still be considered "sites," designated as either local trails or major trails by applying the criteria outlined above. More widespread use of the trail network concept, and consolidating them under one LA number, will result in a smaller number of sites being designated and thus streamline the process, but this will not be relevant in all cases.

At the maximal level, groups of related sites (or networks) should be linked together into "named trails" that reflect movement across the landscape at a large scale. Those names should be derived from traditional toponyms to reflect the relationship between trails and the surrounding terrain. Naming dozens of local trails would be as confusing as referring to them by LA number, but the data suggest that the numbers of major trails are relatively few. I suggest the following named trails, from south to north:

Portrero de las Vacas Trail. This would refer to all trails heading towards Yapashi from lower Capulin and, possibly, Hondo canyons, presently represented by LA 65581, the Capulin Staircase.

Portrero del Alamo Trail. This would refer to all trails leading north/northwest up the portrero between Alamo and Lummis canyons, presently represented by LA 77779.

Portrero del Rito Trail. This would refer to all trails heading north/northwest up the portrero south of Frijoles Canyon, presently represented by LA 60442, LA 60496, LA 134901, and, possibly, LA 90799, which although it is on the east side of the Rio Grande clearly articulates with LA 134901.

North Mesa Trail. This would refer to all trails headed east-west on the series of mesitas immediately north of Tsankawi, in particular the North Mesa trail network and the Sandia Canyon trail network. Note that not all of the potentially relevant major trails/trail networks listed in Tables 81.2 and 81.3 are covered by these names, since some spatial associations and relationships are less clear than others. All of those named here, however, represent long-distance, roughly east-west routes linking the Rio Grande with points close to the Jemez or San Miguel Mountains.

A final, and perhaps more controversial, trail designation is what I am calling the *Old Pajarito Trail*, which represents a north-south route that spanned the entire Pajarito Plateau. Identifying such a feature is challenging, since moving across the southeast/northwest-trending portreros might leave less evidence than following the terrain. It would seem to be just such a route that the early explorers followed, however, and physical evidence that such a major thoroughfare once existed is also accumulating. At present I would include LA 60494, LA 60495, LA 134111 (the Frijoles Staircase), LA 21624, several deeply worn trail segments on San Ildefonso land between Tsirege and Mortandad Canyon, LA 21585 (the Bayo Staircase), and the Garcia Staircase, with the trail ultimately coming to an end first at Shufinne (LA 795), and in subsequent centuries further east at Puyé. LA 81437, which descends from the Portrero del Alamo into Lummis Canyon near its confluence with the Rio Grande, may represent the point where the Old Pajarito Trail finally descends and begins to follow the river bottom towards Cochiti.

There is some logic to the terrain that such a route would have followed. From the top of the Bayo Staircase, for instance, the viewer looks through a gap in the north side of Barrancas Canyon, making for relatively unobstructed travel as far as Guaje Canyon. On a reconnaissance along that section of the Guaje Canyon rim in 2001, I located an old cairn that marked a likely spot for just such a trail to have descended. This is obviously ephemeral data, but my expectations are that when fieldwork is extended to parts of the plateau that are currently under-documented, such as the zone between Frijoles and Pajarito canyons and that between Guaje and Garcia canyons, more evidence for the Old Pajarito Trail will be forthcoming.

Dates and Routes

Dating the Pajarito trail system is largely a process of defining the association between the trails and other, more chronologically sensitive, features, so it is only with reference to the extensive databases established by the various Pajarito projects that any progress can be made on this issue. As empirical evidence for the extent of the trail system increases, the subtleties of these associations become clearer. There do appear to be morphological aspects of trail structure that pertain to different time periods, and some associated features, such as petroglyphs, contribute relevant information.

It can be assumed that the local trails were the products of patterns of movement through the landscape that may have been quite brief. LA 65610, for instance, is closely associated with a fieldhouse on the portrero east of Capulin Canyon, and it is logical to associate the relatively ephemeral trail with the use of that structure over only a few generations. A single Agua Fria

Glaze-on-red sherd found at the fieldhouse would thus suggest an Early Classic date for the entire complex. The associated trail marker, a single petroglyph of the outline of a human head adorned by a feather (see Snead 2002a:763), enforces the image of a pattern of use that was restricted in time and pertained to a particular circumstance.

A relative chronology can also be established for several of the major trails. In cases where a comparison between the trail system and the Coalition/Classic settlement pattern can be made, the Coalition sites appear to represent a better “fit.” This is particularly clear on the central plateau, where the trail from Navawi to Tsankawi intersects a clustered Coalition settlement (LA 8988), and the North Mesa trail appears to pass through LA 394 before merging with the Sandia Canyon trail network. The associated trail segments, including one continuing southwest towards Sandia Pueblo, are all heavily worn. In contrast, a branch of the trail that heads back east toward Tsankawi, is relatively ephemeral.

It is also interesting to note that the major trail represented by the Frijoles Staircase (LA 134111) and LA 60494/LA 60495, passes through Frijoles Canyon 800 meters south of the center of Classic period population in the canyon (e.g., Tyuonyi and Long House). This is despite the fact that, as demonstrated by the modern Frey trail, it is possible to descend the canyon’s north cliff much closer to Tyuonyi.

It thus appears that the major axes of movement on the Pajarito Plateau date to the Coalition period, suggesting that they were established during the early period of settlement on the plateau. When the settlement pattern shifted during the Classic period, short “feeder routes” developed that linked the new community houses more closely to the regional trail system. When these communities were abandoned, however, the traditional network appears to have resumed its original importance, with evidence suggesting use well into the Historic period.

Guard Pueblos

The concept of guard pueblos, which are small residential facilities established as outliers of community houses to provide warning or defense in case of attack, is widespread in southwestern ethnography (cf. Connelly 1979:540), and has recently been inferred to explain the distribution of sites in Frijoles Canyon (Snead et al. 2004). It is also closely correlated with trail systems, since it is the regional trail system that would bring outsiders into a community.

Identifying some of the smaller residential structures on the Pajarito as guard pueblos would be an important step in understanding the settlement pattern, and the relationship between these sites and the trail network would be important evidence of such a function. This close correlation exists in three cases; Duchess Castle (LA 42), Navawi Long House (LA 214), and Rainbow House (LA 217). Each of these sites can be considered a “satellite” of a nearby larger community house (Tsankawi, Navawi, and Tyuonyi, respectively), and each is directly associated with a major trail that passes near, but not directly through, the community house itself. Travelers from particular directions would only have access to the community core after passing the guard pueblo. The fact that Caja del Rio North commands a clear view of Tyuonyi several kilometers to the northwest and also sits on the trail leading to it suggests that it may have had a similar function.

Guard pueblos appear to have been a relatively late development, coming only with the 14^{th} century AD. It isn't clear whether this is due largely to the reorganization of settlement associated with the rise of the community houses, or whether some added constraint, such as increasing conflict, played a role. It does seem likely, however, that they are a reflection of an increased need to keep watch on the trails, a need taken to the greatest extreme in Frijoles Canyon, where Frijolito (LA 78) and the House of the Water People (LA 10942) in addition to Rainbow House may have created a formidable perimeter.

Labor Investment

The final point of discussion here is the issue of relative investment in trails. It was clear from the outset that not all trails were constructed in the same fashion, and the original designations "local" and "major" reflected more than function. Although both trail fabric and associated features provide evidence for levels of investment, fabric is more reliable since it is in that area that Ancestral Pueblo "style" is most distinctive.

It is typically argued that investment of labor in trails relates to increasing efficiency. It could thus be expected that more elaborate trails would be present in places where traffic was high and terrain difficult. This is to a certain extent true in the Pajarito case, since several of the more elaborate trails are found at topographic "choke points" or places where obstacles must be crossed. Pajarito archaeologists have frequently noted, however, that explaining the more labor-intensive trails in terms of "efficiency" is not always adequate. In many cases steps are pecked out to an extent that far exceeds functional requirements, and indeed makes climbing more difficult. Some sets of steps are also located on relatively gentle slopes where it is almost easier to walk beside them than in them.

It is increasingly clear that the Pajarito trails include some symbolic content that is expressed not only in the form of petroglyph trail markers but in the structure of the trails themselves. The most visible manifestation of such "meaning" are the remarkably elaborate staircases. The most prominent cases recorded to date, the Bayo, Capulin, Frijoles, and Tsankawi North staircases (Figures 81.14 through 81.17), are remarkable examples of the investment of labor in trails. Each of these cases includes sections of formal stairs, sometimes extending for more than 10 meters, with additional features such as hand holds also present. Braiding is also a recurrent feature of Pajarito staircases; all of those recorded are characterized by multiple routes, sometimes tightly interwoven, sometimes forming distinct parallel stairs up the sides of the canyon.

It is difficult to construct a functional explanation for the high level of formality in staircases. At the Frijoles Staircase, for instance, it is possible to walk up the slope alongside the most formal stair segment almost as easily as it would be to use the stair itself. There also seems to be only one such highly formalized staircase in association with particular sites; although there are numerous stairs in association with the Tsankawi Mesa trail network, the Tsankawi North Staircase is qualitatively distinct. The same holds true for Otowi, where despite the presence of trails and steps associated with travel east and west (the Kwage Mesa trail network, and the Otowi east trail network), neither approaches the high formality of the Bayo staircase. The nature of braiding at these sites is also distinct. Since the stairs are actually constructed, it is difficult to account for the existence of parallel routes as a simple factor of shifts in traffic over time. Parallel sets of stairs were intentionally constructed, and while it can be argued in some cases that such efforts would be necessary when some steps became too worn to be used efficiently, this is clearly not the case in all examples.

I have argued that these elaborate staircases represented formally designed entrances to the major communities, a feature I call "gateway trails" (Snead 2002c:763). As such, they are intended to symbolically inform the traveler that they were entering a new space, one directly associated with a community house and its residents. They would thus be a different iteration of a trail marker, in which the investment of labor in the trail itself would signify ownership, identity, or some related concept. In their original form, together with the cairns, berms, and other associated features that are now largely absent, such approaches would have been visually impressive symbols of community.

The issue of braiding/parallel routes may pertain to a related but distinct process. Within Pueblo society, repetition is a key component of ritual; such actions can involve the process of construction as well, such as the repetitive plastering of the inner walls of kivas and other ceremonial spaces. Watson Smith tabulated numerous archaeological sites where kivas had been plastered on multiple occasions, up to as many as 63 at Hawikuh; one of the kivas in his survey that featured 20 replasterings was in Frijoles Canyon (cf. W. Smith 1952:17). The construction and dismantling of altars for ritual practices in many of the pueblos also seems to reflect a similar process (see Parsons 1996 [1933]. In the case of gateway trails, the repetitive re-construction of trails may represent a formal renewal of the relationship between the community and the route, possibly conducted at particular intervals or at points of social/political transition. Under such circumstances, the establishment of parallel routes may not have reflected a need to speed up traffic or bypass an obstacle, but instead a desire to reestablish a ritual relationship between the community or some of its members and the trail itself.

Another intriguing possibility regarding trail symbolism concerns duality. In several cases, stairways are structured as two parallel and distinct routes in close proximity. The best example is the Bayo Staircase, where two stairways climb much of the distance to the mesa top 10 to 20 meters apart. This is echoed in a pair of stairs at Navawi, segments 7 to 8 of the Sandia Mesa trail network (and possibly segment 4; Snead 2001a:map 2), and perhaps in the Tsankawi North Staircase as well (segments 71 and 69), where two different stair segments can be distinguished on the exposed tuff. Such patterning may also be present in other trails on the central plateau; two braided routes are evident in the North Mesa trail east of the NPS boundary, and two clear, parallel routes are evident in segments 3 (Figure 81.3) and 6 (Figure 81.8) of the Sandia Mesa trail network. This pattern is not evident on the southern plateau, although further study may prove otherwise.

The consistent appearance of twinned routes on major trails and stairways of the central plateau present several intriguing possibilities. One is simply that the trails were established at different times, and, following the logic described for gateway trails, reflect different episodes of symbolic labor investment. If rebuilding one stairway was an important act, it is conceivable that building a new, parallel stair was an extension of the same practice. It is also possible that the different stairs reflect the presence of different users. If the Ancestral Pueblo occupants of Tsankawi, Navawi, and surrounding communities were organized into moieties like their Tewa descendants, their use of separate but aligned pathways is conceivable. The fact that only some of the stairs and trails show evidence of such a pattern suggests that such formality was not part of everyday life in the community houses, but instead linked to specific ritual practices. Just as repetitive construction of stairways may have been a symbolic act, so the use of those stairs at particular times may have been linked to specific ceremonial practices, and thus reflective of the internal structures of the community itself

Archaeological evidence from elsewhere in the Southwest suggests that some of the patterns documented for the Pajarito trails are not unique. Some twinned or parallel stairways are evident at Chaco Canyon; W. H. Jackson's photo of the famous Jackson staircase depicts an example of this (see Powers 1984:53). The anomalous presence of stairways in "relatively flat terrain," implying that they had other than functional significance, has also been documented (Pattison 1985:71). Mike Marshall describes a widespread pattern of parallel roads and paths in the Chaco region, for which he finds ample ethnographic documentation, including for the Tewa, where "double roads" leading south from the place of emergence are described over which the Tewan moieties diverged and rejoined in the ancestral journey to Ojo Caliente" (1997:69; see also Vivian 1997a, b).

Regarding the idea that twinned trails may be symbolically associated with ancestral migration and pilgrimage, it is interesting to note that many of the twinned segments documented here are associated with the North Mesa trail. This route, which appears to have run from the Rio Grande all the way to the Jemez, passes right through the center of Ancestral Pueblo settlement on the central Pajarito. Although it surely had extensive functional uses, it is intriguing to think that it served as a ceremonial route as well. It is, of course, difficult to determine whether these different patterns of movement would have been associated with the trail from the beginning, or whether they evolved over time. To return to Marshall, "[p]ilgrimage down these divergent corridors into parallel paths may have the reactualized and validated the origin myths and opened cosmological channels over which spiritual energy was conducted" (1997:69). It may be that the trail accrued symbolic importance over time, and that it could have been until the Historic period when this role became dominant. The likelihood that the twinned stairs were constructed when the community houses were occupied suggests that such a pattern had deep historical routes, but its longevity remains to be investigated.

CONCLUSIONS

Work on the Pajarito trails since the 1990s has been enormously productive. The insights of earlier generations of scholars, who saw great potential in studying the trails, were correct, and we are thus gaining a greater appreciation both for the complexity of the cultural landscape of the Pajarito and for the Ancestral Pueblo people for whom the trail network was an intrinsic part of their everyday lives.

Several contributions can be identified. The first is that the diverse morphology of the Pajarito trails is increasingly well-understood. Trail fabric and associated features are now thoroughly documented, providing scope for further analysis. The general parameters of the overall network are also coming into focus. The chronological approaches that will ultimately allow us to link changes in the settlements to shifting patterns of movement across the plateau are getting better. We also have a greatly improved sense of the role that the trail system played in politics, economics, and ritual in the Ancestral Pueblo world.

The preliminary nature of this research must nonetheless be emphasized. Less than half of the Pajarito trails for which some documentation exists have been re-recorded. Adequate documentation of the elaborate trail networks is time-consuming. Re-examination of areas that have been the subject of recent systematic survey has turned up new trail sites, suggesting that trails are elusive even when up-to-date field methods are applied. Large portions of the Pajarito have yet to be surveyed at all, including zones that lie between the major nodes of Ancestral Pueblo settlement. Administrative barriers remain, and the continuing physical remoteness of some parts of the Pajarito present considerable logistical difficulties.

The first priority for further research is completion of the re-documentation process. Revisiting known trails is an efficient and cost-effective means of expanding the body of available information, and ensures that all trails are recorded to a similar standard. New survey is, of course, also highly desirable. Given that the administration of large parts of the plateau are currently being reorganized, efforts to survey lands that will no longer be in the public domain (strictly speaking) are particularly vital. Recent work in TA-71 (Hoagland et al. 2000; Snead 2001a) is an example of what such targeted efforts can accomplish. Similar approaches need to be employed elsewhere, particularly on the northern plateau, where the baseline survey information is less accurate and the resources of the administrative agent less plentiful.

Priorities for further survey should also include detailed analyses of trail networks associated with the remaining community houses of the central plateau for which these have not yet been conducted. Tsirege is the most prominent example, since our knowledge of the trails associated with that site has not appreciably expanded for a hundred years. Another priority is Sandia Pueblo, particularly since a close examination of the site and associated lands along Mortandad Canyon will assist in determining the age of the trail network in that area. Finally, a targeted plan of research in the region south of Tsirege should be developed, since is in that area that evidence for an Old Pajarito Trail linking Frijoles Canyon with points farther north should be available.

In addition to providing a window on the Pajarito trails, the study of roads and trails present a unique opportunity for the archaeological study of trails in general. By breaking down the roads/trails dichotomy, we make further progress in understanding the relationship between movement and landscape in human societies. It is no longer possible to see trails as functional reflections of economic processes without either symbolic or political significance. Taking a serious look at trails has proved to be a major step forward in expanding archaeological perspectives on the past; the value of taking this study and related studies to new levels requires no further argument.

CHAPTER 82
ROCK ART OF LOS ALAMOS NATIONAL LABORATORY

Marit Munson

INTRODUCTION

This chapter discusses the rock art of Los Alamos National Laboratory (LANL), set within the broader context of relevant information from the Pajarito Plateau and the northern Rio Grande region. The chapter begins with a discussion of previous rock art research on the Pajarito, from the curiosity of late 19th century explorers to regional syntheses and systematic recording for management purposes. It then continues with a discussion of rock art styles generally applicable to northern New Mexico; these widely used style designations provide a broad regional chronology, yet they overlook significant variation within the Rio Grande Valley. Recent research has resulted in a more realistic stylistic chronology for Coalition and Classic period rock art of the Pajarito Plateau. The next section describes the dating methods in brief, then discusses the stylistic traits characteristic of each period.

The focus then shifts to spatial variation on two different scales. First, dramatic differences in the immediate context of Coalition and Classic rock art are discussed, as the images shifted from private functions to more public significance. The following section expands the geographic scale to consider variation across the Pajarito Plateau, specifically addressing the issue of boundaries between Keres and Tewa ancestors. The data collected in Munson's dissertation work (2002) indicate that the boundary is not visible in the rock art; instead, rock art imagery varies relative to specific communities, including an Otowi-Tsankawi community and a Tsirege community. Small-scale variations in more detail, highlighting issues specific to the rock art of LANL are then discussed. Finally, the chapter concludes with brief recommendations for rock art recording procedures and management issues.

PAST RESEARCH

Early Interest (1890s–1930s)

The prehistory of the Pajarito Plateau was not well known to the Anglo world until the late 19th century, when the area's proximity to Santa Fe encouraged the attention of explorers and the general public (Snead 2001b). Adolph Bandelier, a Swiss-born businessman and self-taught scholar, began a survey of the Southwest in 1880, under the auspices of the Archaeological Institute of America. Led by guides from the Keres pueblo of Cochiti, Bandelier traveled throughout the Pajarito Plateau, documenting sites and writing about the Pueblo inhabitants of the northern Rio Grande (Lange and Riley 1966). Although Bandelier occasionally noted rock art sites, his interest in the imagery was minor. Other than a brief note that "there are pictographs" in Frijoles Canyon (1892:143), he mentions just a single site on the entire Pajarito Plateau. Describing Painted Cave, located in Bandelier National Monument, he lists images at the site as including "clouds, sheet lightning, the sun, dancing-shields, and male and female dancers" (1892:156), then adds some information from his Cochiti guide:

> I was informed that in former times, whenever a pueblo was abandoned, it was customary to paint a series of such symbols in some secluded spot near the site of the village. Whether this is true or not, I do not know (Bandelier 1892:157, note 1).

In a later discussion of rock art in the Abo area, Bandelier again mentioned the information about Painted Cave, saying that "such records of the Cachina were usually executed whenever a pueblo was to be forever abandoned" (1892:278).

In 1896, Edgar Lee Hewett began an archaeological survey of the Pajarito Plateau and adjoining areas in the northern Rio Grande. Although Hewett worked throughout the Jemez Plateau (Hewett 1906), he was particularly enamored of the Pajarito; seeking to preserve it as his own personal fiefdom, he simultaneously limited other researchers' access and lobbied for the creation of a national park (Rothman 1992). Throughout the first decade of the 20th century, Hewett excavated at major pueblos across the southern and central Pajarito Plateau, including Yapashi, San Miguel, and Otowi. He ran several School of American Archaeology field schools in Frijoles Canyon, aided by a Tewa crew from San Ildefonso pueblo.

Hewett's perspective on Pajarito prehistory, and especially the relationship between modern pueblos and the prehistoric sites, was often contradictory (Snead 2001b:130–131). Initially, his interest in rock art on the Pajarito Plateau was rooted in his hope that "while some of these [images] represent nothing more than idle picture-making, perhaps most of them are of serious totemic, legendary, and religious significance" (1906:11). Thirty years later, however, Hewett simply illustrated a few examples of the more interesting rock art, writing that rock art from Puye was "far inferior to... the pottery designs" (1938:115). Comparing the imagery to kiva murals, "does not," he added, "give the impression that the Puye rock pictures were intended to be ceremonial or mythological records....They are a much less serious form of art, merely suggestive of the play of fancy that characterized the Indian mind throughout the Southwest, which reflected, to some extent, their attitude toward nature and life" (Hewett 1938:115). His disappointment that the rock art "had little function in recording facts" (Hewett 1938:115) is evident. Hewett had come to believe that there was a significant disconnect between prehistoric imagery in all media and early 20th century Pueblo designs, a break "so radical that it can only be accounted for on the ground of strong new elements intruding from an outside source" (Hewett 1938:104).

During Hewett's tenure on the Pajarito Plateau, a network of scholars, artists, and public figures developed that ultimately not only influenced research on the Pajarito, but shaped the course of Pueblo arts in the early 20th century as well. Intrigued by the "graphic art of the cave dwellers" (K. Chapman 1916), artists from Santa Fe often joined Hewett in the field. Kenneth Chapman, in particular, spent two field seasons recording images inside cavate rooms, concerned that the "picture writing" was "in danger of being obliterated both by the elements and by mutilation at the hands of vandal tourists whose activity was everywhere manifest" (K. Chapman 1917:1). Chapman's overviews of the rock art, published as part of Hewett's reports (K. Chapman 1916, 1917, 1938), were the first to speculate on the dates of the images, noting the potential temporal significance of soot blackening and plastering over the rock art (1938:142).

Chapman also mentioned that Hewett's Pueblo workers, who used some cavates as living quarters while in the field, produced designs of their own on the cavate walls, noting that "many of these might have been confused with the work of the ancient Pajaritans were it not for the freshness of their appearance" (K. Chapman 1917). The workers' exposure to prehistoric arts during the Pajarito fieldwork is often cited as a significant influence on the work of early 20th century Pueblo artists, including Crescencio Martinez (Brody 1997:22–24). Gustave Baumann, a well-known German-American artist, also drew inspiration from Hewett's fieldwork, eventually producing a series of woodcuts representing the images inside Pajarito cavates (Baumann 1939).

Defining Styles (1960s–1990s)

Research on the rock art of the Pajarito Plateau did not begin in earnest until the 1960s, when Charlie Steen and Polly Schaafsma both worked on defining temporally significant styles. Steen's work with Los Alamos rock art in the 1970s resulted in the definition of two distinct rock art styles (1977, 1979): the Frijoles Style and the Mortandad Style. He defined the Mortandad Style, using the Mortandad Cave Kiva (at LA 12609) as the type "site," as large, rough anthropomorphic figures pecked[1] into the walls and ceilings of densely sooted cavates (Steen 1979). Steen seldom mentioned exterior rock art, focusing instead on interior imagery that he felt was "of a religious nature" (1977:17). He believed that cavates with interior imagery served as kivas or, in the case of the smallest isolated and heavily soot-blackened rooms, "quiet retreats for individuals--small caves for prayer" (Steen 1977:17). Thus defined, the Mortandad Style appears to be confined to a handful of cavates in Mortandad, Ancho, and Sandia canyons. Although subsequent researchers sometimes refer to the Mortandad Style (H. Toll 1995:196–197), its limited geographic distribution makes its utility questionable and it has not been widely adopted.

Steen's Frijoles Style, defined in contrast to the Mortandad Style, is similarly problematic. The Frijoles Style consists of images incised into the plaster walls of cavates, including geometric patterns, realistic figures, and "life forms" (Steen 1979), or, the figures illustrated by Chapman (1938) (Figure 82.1). These interior scratched figures are often divided into prehistoric and historic categories, based entirely on subject matter. Images of hunters, dancers, kachinas, and various animals, for example, are often accepted as prehistoric (e.g., H. Toll 1995:196; Wellman 1979:93–96), while associated images of people on horseback or wearing broad-brimmed hats are classified as historic (Chapman 1938:141; Wellman 1979:96; see Liebmann 2002:136–138 for a more extreme example). However, the suite of scratched interior images appears stylistically consistent; given the depiction of horses and other historic subject matter, it is likely that this distinct scratched style is entirely historic, an idea given support by Chapman's (1938:141) accounts of Pueblo workmen producing images in the cavates during Hewett's excavations at Frijoles. As with the Mortandad Style, this Frijoles Style is geographically

[1] Steen uses the term incised, but inspections of the Cave Kiva and of his illustrations indicate that the images were almost certainly pecked.

limited; it is most common within Frijoles Canyon, with scattered examples from the north-central Pajarito.

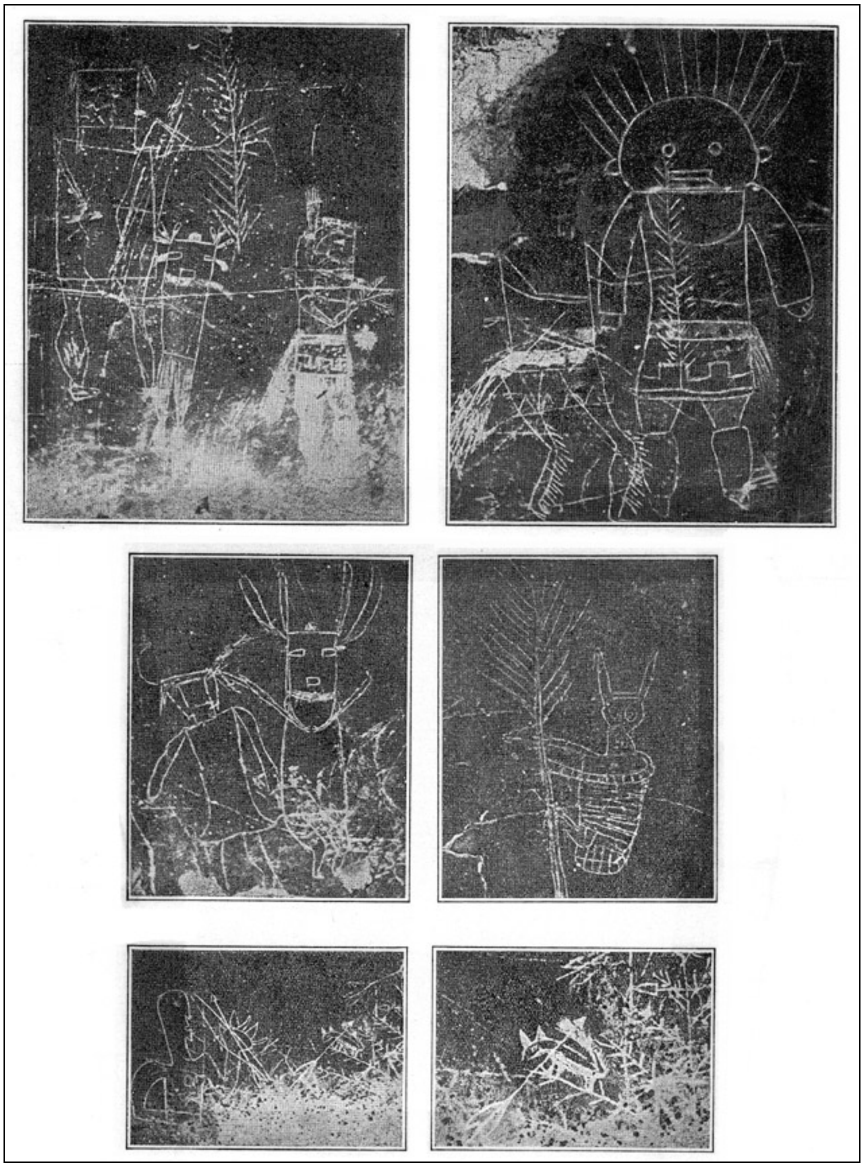


Figure 82.1. Historic incised or scratched rock art, as illustrated by Chapman (1938).

Schaafsma's broader classification of Rio Grande Valley rock art is much more widely accepted. Beginning with a 1966 rock art survey associated with the Cochiti Dam project, P. Schaafsma (1975) began to sketch in the rough outlines of a chronological sequence for Rio Grande rock art. By 1972, Schaafsma had defined the Rio Grande Style, which encompassed post-AD 1325 rock art within the Rio Grande Valley. Although she believed that all of this rock art "can be considered a single entity" stylistically (P. Schaafsma 1980:275), she also acknowledged distinct geographic differences, dividing the Rio Grande Style into five distinct provinces corresponding to the distribution of historic linguistic groups (P. Schaafsma 1972, 1992:87–113). The Rio

Grande Style is discussed in greater detail below, with specific attention to the Keres and Tewa provinces, which include the Pajarito Plateau.

Schaafsma's general outline of the prehistory of northern Rio Grande rock art, in which the distribution of motifs parallels the ethnic and linguistic boundaries visible in ceramics and ethnohistoric accounts, is widely accepted for the Pajarito Plateau. She proposes that the distinctions between the various provinces of the Rio Grande style are related to "variations in mythology, religious emphases, and values" (1992:113) throughout the Rio Grande Valley. For example, she suggests that the emphasis on themes of war and conflict in the Galisteo Basin reflects the presence of warrior societies to the east of the Pajarito, prompted by conflict with Plains tribes, while the lesser frequency of war iconography in other Rio Grande rock art may reflect competition among the pueblos. She also suggests that the steady decrease in the number and complexity of rock art masks from south to north along the Rio Grande reflects the "marginal nature" of the kachina religion in the northern Tewa pueblos (P. Schaafsma 1992:115).

Numerous other researchers have adopted Schaafsma's general chronological outline wholeheartedly, using it as support for studies of ethnic boundaries on the Pajarito Plateau. In their work on northern Rio Grande ceramics, for example, Graves and Eckert (1998) use Schaafsma's distinction of rock art provinces in support of their argument that differences in the color and iconography of decorated wares reflect the presence of different ideological systems. Nevertheless, it should be noted that Schaafsma herself recognized a certain continuity in style and content between the Keres and the Tewa provinces on the Pajarito Plateau (1992:111).

Site-Specific Research (1980s–1990s)

In 1989, Arthur Rohn published a general-interest book on the rock art of Bandelier National Monument. In it, he illustrates numerous rock art sites that are accessible to the public, setting them within the context of a brief prehistory of the Pajarito Plateau. He believes that the rock art is uniformly religious imagery, created during dances and ceremonies as a means of declaring clan or lineage membership (Rohn 1989). Although the book contains little analysis or support for these statements, its conclusions are widely cited.

Rohn's students at Wichita State University have since conducted a series of studies focused on the rock art of individual sites in the central Pajarito. Loy Neff (1990), for example, documented the rock art of Tsirege Pueblo in exhaustive detail, analyzing the layout of the images relative to clusters of rooms within the cavate pueblo. Cynthia Orr (1996) carried out a similar study at Tsankawi, although her recording was more limited and perhaps less accurate than Neff's work at Tsirege. In Neff's thesis, he concluded that Tsirege rock art is mostly related to marking sacred places and providing symbolic protection; imagery within the cavate pueblo, for example, marks different clan groups, while other images are placed in locations where they serve as protection for stairs and trails, as in the Awanyu at the main stairway. He proposes that more isolated rock art images provide protection to the village in general; such images include a series of large shields pecked on boulders that rest on the valley floor in front of the cavate pueblo. Neff briefly notes a variety of differences in the frequency, placement, and presumed function of motifs at

Tsirege compared to Frijoles Canyon, suggesting that the differences indicate belief systems that have diverged from a common antecedent, perhaps related to the Keres/Tewa boundary.

Broad Research Agendas (1990s–Present)

The most intensive research on Pajarito rock art has been focused on Bandelier National Monument. In Toll's (1995) study of variability in cavate architecture, he briefly discusses rock art within the cavates, partly refuting the notion that the presence of rock art indicates that cavates served as kivas. He attributes differences in the rock art of Frijoles Canyon and Tsankawi to differential preservation of the cliffs themselves (also see Crowder 1995). In addition, crews systematically noted rock art during the Bandelier Archaeological Survey (BAS), and several volunteers addressed the rock art directly (Crowder 1995; N. Olsen 1995, 1997). Olsen, in particular, launched an ambitious study of all of the rock art identified during the BAS. Focusing on patterning in the distribution of rock art motifs relative to a variety of geographic and archaeological features, she sought to demonstrate that rock art was a form of symbolic communication. Although some of the descriptive material may be useful, the multivariate statistical methods that she applied are inappropriate for the data, calling her conclusions into question. Crowder's work (1995), more limited in scope, provides a summary of the motifs present at various sites in Frijoles Canyon and within the Tsankawi unit of Bandelier National Monument.

Information from the northern plateau is less comprehensive; major projects, such as the Pajarito Archaeological Research Project, seldom recorded rock art, and data from LANL and the Santa Fe National Forest have never been incorporated into a broader study. Instead, most of the discussions of geographic variation in Pajarito rock art compare data from the entire bulk of Bandelier south of Frijoles Canyon against a few sites from the Tsankawi Unit, or compare extensive field data with more limited published accounts from elsewhere. Munson's dissertation (2002) sought to address this issue, examining rock art sites from across the Pajarito Plateau; the discussion below summarizes her findings.

Recording and Management (1990s–Present)

In addition to ongoing professional recording for management purposes at LANL, Bandelier, and the Santa Fe National Forest, two major projects have used volunteers to record and monitor the rock art of the Pajarito Plateau.

In Los Alamos County, two volunteers, Betty Lilienthal and Dorothy Hoard, have done extensive recording of the vast concentration of images near springs and other natural features along the Rio Grande; their publication (see Lilienthal and Hoard 1995) also includes some photographs of sites on tuff within Sandia Canyon and adjacent canyons. Their records, on file at the Laboratory of Anthropology, ultimately culminated in a National Register listing for the petroglyphs of White Rock Canyon. Their recording of the rock art is detailed and thorough, although it sometimes neglects archaeological remains associated with the petroglyphs.

In addition, Mike Bremer and other US Forest Service archaeologists have led a Passport in Time work program on the northern Pajarito for many years (e.g., Baldwin and Bremer 1999). This project, which uses volunteers from around the country to record archaeological resources on Forest Service land, has focused on sites in Garcia Canyon. Although the primary aim has been to record cavate pueblos, the crews have been diligent about recording associated rock art.

TEMPORAL VARIATION IN ROCK ART STYLES

Temporal control has always been a difficult issue where rock art is concerned. Although various direct dating methods are currently being developed (e.g., Rowe 2001), they are not yet practical for widespread use. Most rock art research still relies upon the definition of temporally significant styles (Francis 2001), defined through standard methods of relative dating (Keyser 2001; P. Schaafsma 1985:241–244). In the Rio Grande Valley, P. Schaafsma's (1980, 1992) decades of work have resulted in the following general classification of rock art styles through time.

Archaic and Developmental Period Rock Art

Archaic and Developmental rock art are little documented and poorly understood in northern New Mexico. Early rock art in New Mexico is referred to as the Abstract Style, loosely classified through the presence of heavy patination and stylistic similarities to early rock art elsewhere in the arid west. In fact, the style is sometimes known as the Great Basin Abstract Style, after its resemblance to Archaic rock art documented by Steward (1929) and Heizer and Baumhoff (1962). With a few exceptions, such as the array of petroglyphs dated through partial excavation at Glorieta Pass, the Abstract Style in the Southwest has never been properly dated; in the northern Rio Grande region, Abstract Style is believed to encompass petroglyphs from the Archaic through Basketmaker II, and perhaps even into later periods (P. Schaafsma 1980:77).

The Abstract Style (Figure 82.2) is characterized by zigzags that are either single or in parallel sets, straight and curved lines, rows of dots, curvilinear meandering lines, spirals, circles that are bisected, conjoined, concentric, with central dots, or with rays like sunbursts, rectilinear patterns such as "ladders," "nets," rakes, grid patterns, or rectilinear meandering lines, or representational figures, which are less common, but include stick-figure anthropomorphs, simple animals, and tracks.

Abstract Style petroglyphs usually occur on all sides of a boulder or cliff face, sometimes tucked into narrow cracks or formed to fit the shape of the boulder (Figure 82.3). Elements are often repeated in long rows (P. Schaafsma 1992:83).

Figure 82.2. Abstract style petroglyphs (from P. Schaafsma 1992:85).

Although poorly documented in the Rio Grande Valley, the Abstract Style is present at an array of sites in the northern Rio Grande. Black Mesa, near Leiden, includes boulders covered with completely repatinated abstract petroglyphs that probably date to the Archaic or Developmental periods (Boyd and Ferguson 1988). Heavily patinated petroglyphs at Arroyo Hondo are superimposed by Coalition period images (P. Schaafsma 1980:47), while Abstract Style imagery at other sites north of Arroyo Hondo is associated with a Basketmaker II site (P. Schaafsma 1980:47, 47). Pitted boulders occur in Arroyo Hondo, in the Galisteo Basin, and along the Rio Grande north of Cochiti (P. Schaafsma 1992:83); similar completely repatinated boulders in the Great Basin have been suggested to date between 5000 and 3000 BC (Heizer and Baumhoff 1962:234–235). Other Abstract Style petroglyphs are known from West Mesa (Albuquerque) and the Socorro area (P. Schaafsma 1992:83) and along the San Jose River (P. Schaafsma 1980:47).

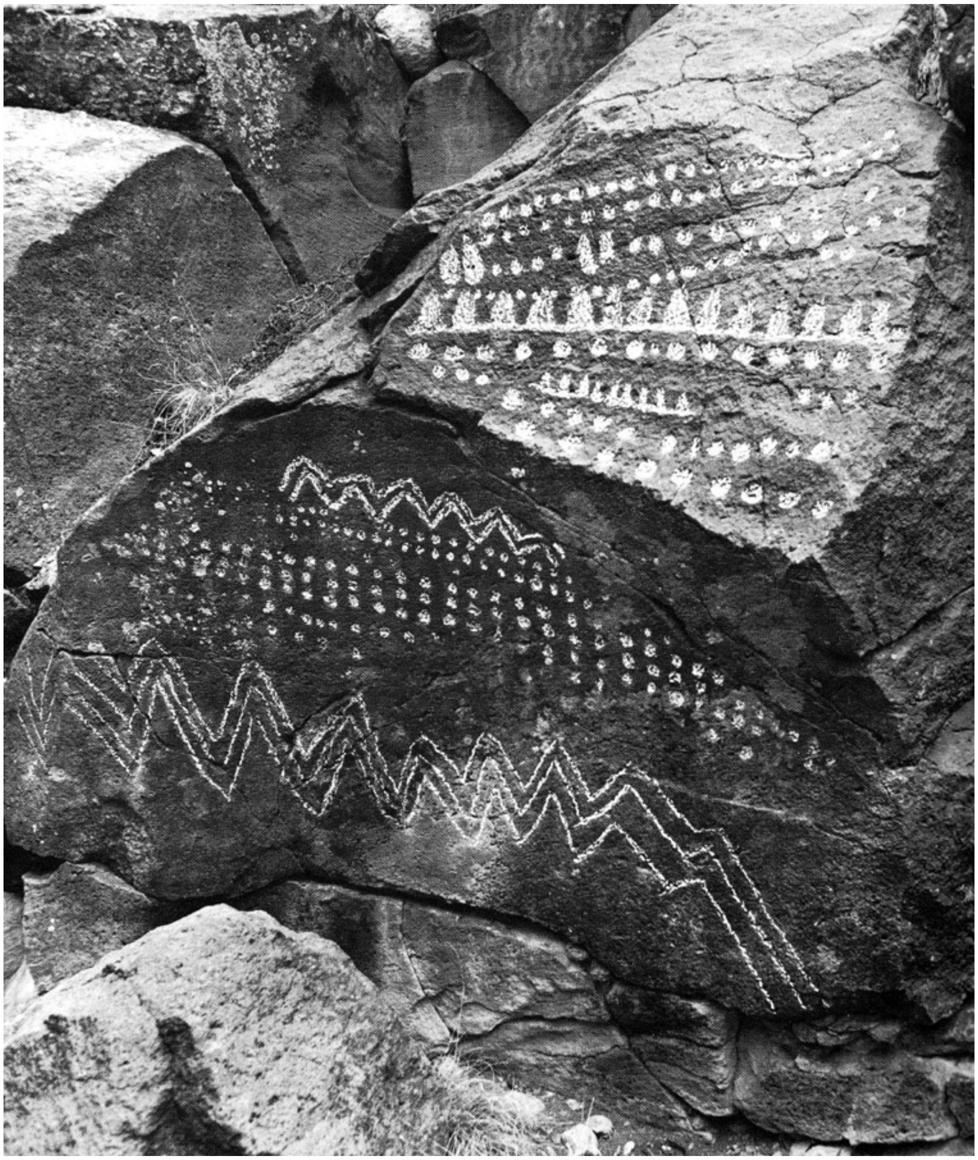


Figure 82.3. Abstract style petroglyphs, showing typical layout of elements (from P. Schaafsma 1992:84).

It should be noted that all of the northern Rio Grande rock art that is believed to predate the Coalition period is in the form of pecked images on basalt boulders; neither Abstract Style paintings nor petroglyphs on tuff have been identified on the Pajarito Plateau. There are several possible explanations. First, Abstract Style rock art is rare throughout northern New Mexico; low population levels on the Pajarito Plateau during the Archaic and Developmental periods make it unlikely that there was much associated rock art from these periods. Second, Archaic or Developmental rock art produced on the soft tuff available on the Pajarito Plateau may have eroded so heavily that it can no longer be recognized. Rock art on basalt has better resistance to erosion, but relatively little survey has been carried out in basalt-rich areas of the Pajarito Plateau. Finally, the Abstract Style is generally completely repatinated and usually lacks representational imagery; its subtlety makes it easy to overlook. Even in extensively recorded areas such as White Rock Canyon (Lilienthal and Hoard 1995), the Abstract Style may be unnoticed or simply neglected in favor of the more recent, visually dynamic work.

Coalition Period Rock Art

Schaafsma believes that most pre-14th century rock art in the Rio Grande Valley dates to the Pueblo III period, coinciding with a major population increase. She describes Pueblo III period rock art as generally similar to that of the Colorado Plateau, although it shows "considerable variability in style, content, and ... relationships to rock art in adjacent regions" (P. Schaafsma 1992:85).

In general, Pueblo III style rock art includes (Figure 82.4) solidly pecked life-forms including birds, deer, lizards, mountain sheep, and tracks; stick figures; flute players; human figures with oversized hands and feet, and scenes involving copulation are common in the northern Rio Grande (P. Schaafsma 1992:86); complicated geometric designs, similar to textile and pottery motifs; spirals and concentric circles; meandering lines, lines of dots, zigzags, and bisected and conjoined circles, elements that are typical of the Abstract Style but were also produced in Pueblo III rock art (P. Schaafsma 1992:87). The specifics of Coalition style rock art on the Pajarito Plateau are discussed in greater detail in the following section.

Classic Period Rock Art

Classic period rock art is usually discussed as part of a widespread fluorescence of visual arts in Puebloan society, beginning in the early 14th century (Brody 1991; P. Schaafsma 1992). The Rio Grande Style of the Classic period (P. Schaafsma 1992:91) is widespread and well known for its visually dynamic qualities and detailed representational imagery. The Classic Rio Grande Style (Figure 82.5) includes highly stylized outlined figures with considerable decorative detail and the human figures are often drawn with boxy bodies, large feet, knobby knees, and well-developed calves; masks and/or faces; mammals, birds, snakes, and horned serpents; shield bearers and shields; and cloud terraces, four-pointed stars, and crosses.

Schaafsma describes regional variation in the Rio Grande Style relative to historic linguistic groups, including the Keres and Tewa pueblos associated with the Pajarito Plateau. The southern Pajarito Plateau, up to Frijoles Canyon, is included in Schaafsma's Keres province. She describes Keres rock art as including simple faces, often consisting of a basic circular or square outline, "very simple headgear" (1992:106), and plain dots for facial features. Square masks are especially common north of Cochiti Pueblo, although some of these may have been made recently. Full anthropomorphs are depicted with stylized boxy bodies, often with an X across the torso. Fluteplayers are common, while shield bearers and shields are less notable. Lines of heads or masks on rectangular blanket-type designs are primarily found in the Keres province (P. Schaafsma 1980:275). Mountain lions are "emphasized" by their large size and prominence (P. Schaafsma 1992:108); portrayals of snakes and horned serpents are common, although they are less "dramatic" than in the northern and southern Tewa provinces (P. Schaafsma 1992:108). Spotted fawns, skunks, and other animals are also represented (P. Schaafsma 1992:105–108).

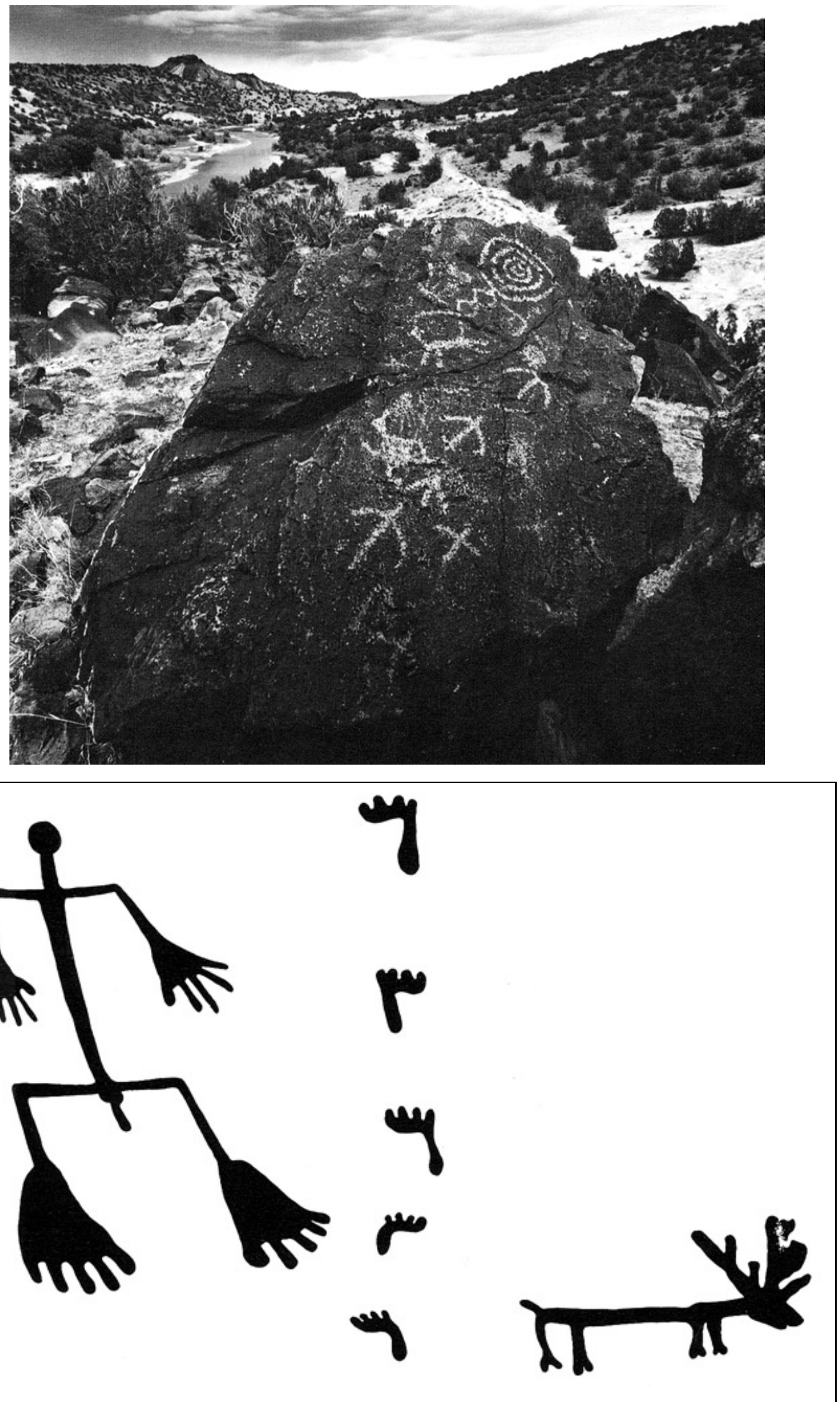


Figure 82.4. Typical Pueblo III rock art. Upper: Rio Grande Valley, north of Santa Fe (from P. Schaafsma 1992:87). Lower: Petrified Forest National Monument, Arizona (from P. Schaafsma 1980:157).

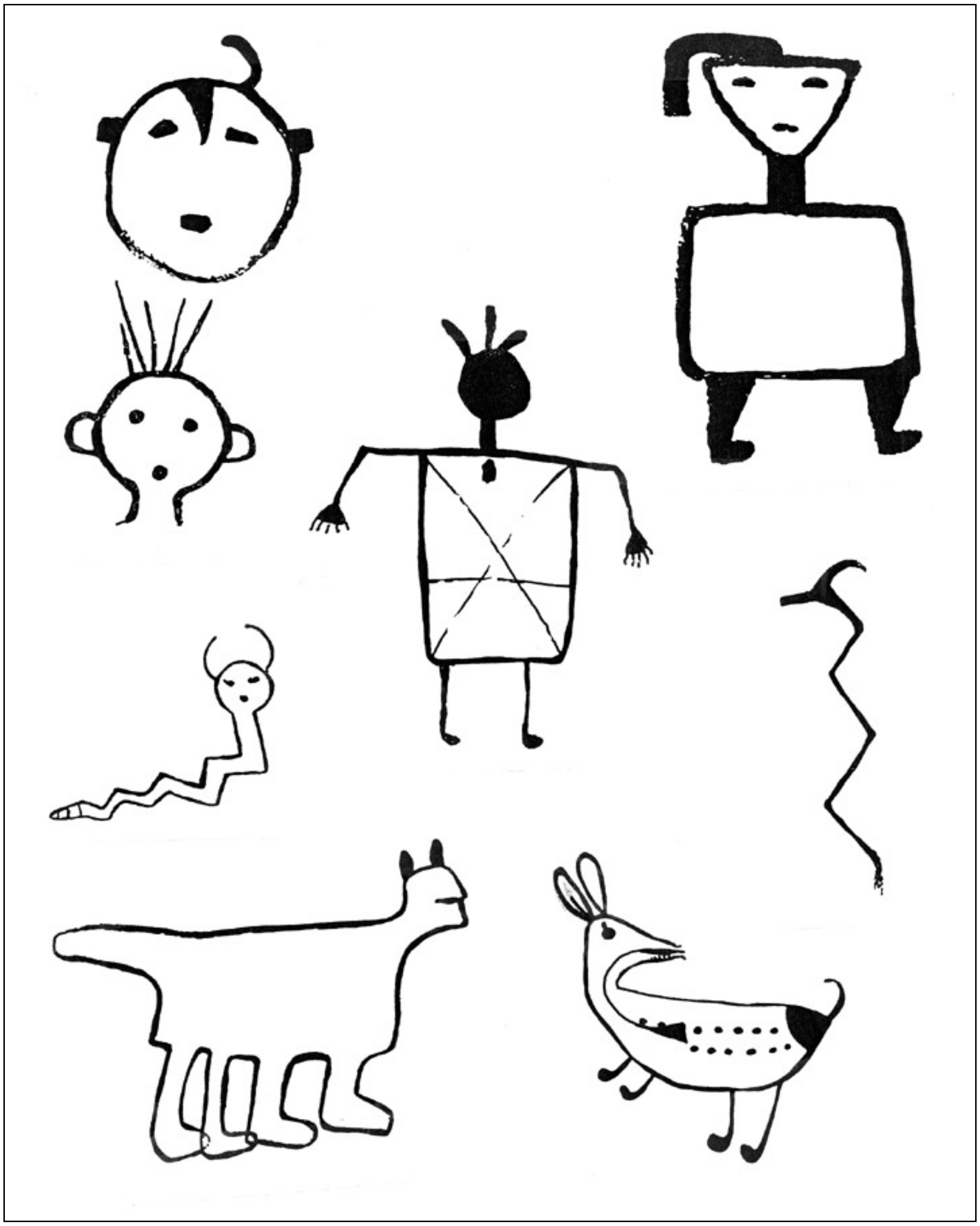


Figure 82.5. Rio Grande style petroglyphs, post-AD 1325 (from P. Schaafsma 1992).

The northern Pajarito Plateau, in contrast, is included in the northern Tewa province. Masks and human figures are less common than in other Rio Grande provinces, decreasing in frequency as one moves north along the Rio Grande (Boyd and Ferguson 1988; P. Schaafsma 1980:286). Instead, the images emphasize flute players, lightning arrows, birds, cloud terraces, and "fertility motifs" (Schaafsma 1980:286, 1992:111). Depictions of shields increase in size and detail (Schaafsma 1992:112). Horned serpents from the Northern Tewa area are depicted with horns pointing backwards; the horned serpent from Tsirege (LA 170) provides a classic example. Spirals and concentric circles are common elements. The specifics of Classic style rock art on the Pajarito Plateau are discussed in the following section.

Dating Pajarito Rock Art: Coalition and Classic Periods

Although Schaafsma's chronology is generally accurate, it has two major problems. First, it focuses almost exclusively on Classic period rock art. As P. Schaafsma puts it, rock art before AD 1300 is "overshadowed by the proliferation of petroglyphs in the [Classic] Rio Grande Style" (1980:160). Second, detailed studies have documented that her broad classification obscures significant geographic and temporal variation on the Pajarito Plateau.

Munson's dissertation (2002), the first project to focus on dating rock art on the Pajarito Plateau, dated the imagery in two distinct stages. First, association, superpositioning, and other relative methods were used to distinguish between rock art elements directly associated with the primary occupation of each site and those that post-date occupation. Then the primary elements were used as the foundation for stylistic seriation of rock art elements through correspondence analysis, an exploratory multivariate statistical method. Analyses indicated that there are few differences in the depictions of animals and in the use of geometrics through time; human figures change dramatically between the Coalition and Classic periods.

Seriation of human figures using correspondence analysis shows the relationship between the style of human figures and the sites at which they are located; a plot of the first two dimensions of the correspondence analysis has the characteristic horseshoe-shaped plot that indicates a linear relationship between the variables (Baxter 1994:119–120). This linearity could potentially be a function of any number of temporal, spatial, or functional patterns. Assessing its temporal significance must be accomplished by cross-referencing the independent dates, based on ceramic chronologies that are available for 22 sites dated by previous research projects (see Munson 2002). When the sites are arranged according to their values along Dimension 1, the independent dates are in chronological order, indicating that Dimension 1 orders the sites temporally. The most recent sites are indicated by negative values on Dimension 1, while the oldest sites have positive values. The array of stylistic traits in the correspondence analysis documents stylistic trends in the representation of humans through time. In general, this analysis indicates that there was a shift from naturalistic depictions during the Coalition period to increasing detail and iconicity during the Classic and into the Historic period.

Coalition Period: Naturalistic Figures

Coalition figures are often solidly pecked and are characterized by simple naturalistic bodies, necks, feet, legs, and arms (Figure 82.6). The majority of the human figures are shown in frontal view, as they are from all periods on the Pajarito Plateau. Only about 10 percent of the figures have facial features, in part because they are difficult to depict on solidly pecked heads. Depictions of male genitalia, common in Coalition figures, almost always take the form of an erect phallus from a figure shown in profile; although most common on Coalition period flute players, other individuals are also shown with penises. Ambiguous "lizard-men" that may be men with long penises or lizards with tails are also a part of this tradition. Female genitalia are usually not depicted; the two occurrences are of complex figures with solid or bisected ovals inside the outline of the body, at the base of the torso.

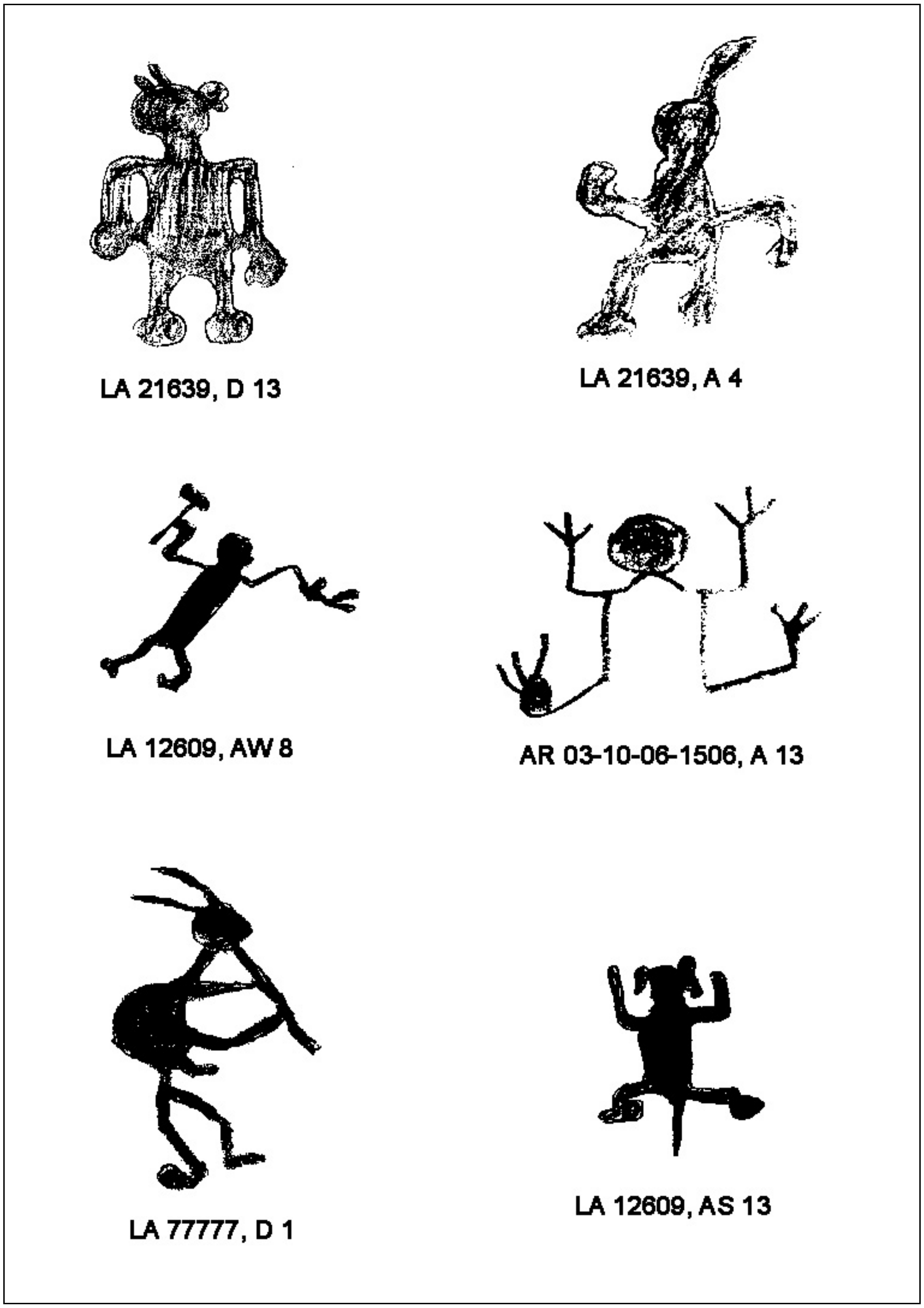


Figure 82.6. Coalition style human figures from the Pajarito Plateau.

In general, Coalition figures lack complex decoration, although some figures do have simple additions to their heads. Feathers are the most common; on individuals shown in profile (especially flute players), they are often just a single thick line, raking back from the head. In frontal view, they are usually shown in pairs, angling slightly outward, almost like antennae. A few individuals have short pairs of lines, often curved, emanating from the upper sides of the head; these are believed to represent horns. Projections from the sides of the head more often take the form of small circles, representing ears, or perhaps hair whorls; more distinct representations of hair whorls take the form of a stemmed "butterfly." Other possible depictions of headdresses are shown on an individual with horns with balls on the tips and a figure with thick straight lines from the top of the head, like rabbit ears.

Solidly pecked flute players, shown in profile, are quite common (Figure 82.7). Most have straight, downward-pointing flutes and humped backs, and are shown with bent legs, as if they are seated. These images are not only characteristic of the Coalition period on the Pajarito (P. Schaafsma 1980:160), but they are also typical of Pueblo II-III rock art on the Colorado Plateau (P. Schaafsma 1992:86).

Figure 82.7. Coalition style flute players from the Pajarito Plateau.

Classic Period: Geometric Figures

During the transition from the Coalition to the Classic, a new, geometric form of human representation was introduced (Figure 82.8). Although some figures that date to the Classic period are similar to the naturalistic Coalition style, the proportion of naturalistic portrayals of humans decreased rapidly; by the Classic period per se, 85 percent of the human figures were depicted with strict geometric shapes. This rectilinear style of representation is most noticeable in the shapes of bodies, heads, and necks. Almost a third of the Classic figures have rigidly rectangular bodies, and another 10 percent have square or triangular bodies. Figures are often depicted with a distinct "hollow" neck consisting of open, parallel lines; when no neck is shown, the base of the head usually opens directly into the body, indicating that the configuration of the shoulders and upper body was produced with the head shape in mind. Just half of the figures have rounded, naturalistic heads; the remainder are strict geometric shapes, such as squares, drawn with precise right angles. Downward pointing triangular heads, flat-topped heads (rounded along the bottom and sides but truncated with a straight flat line across the top), and tapered trapezoidal heads are also predominantly Classic.

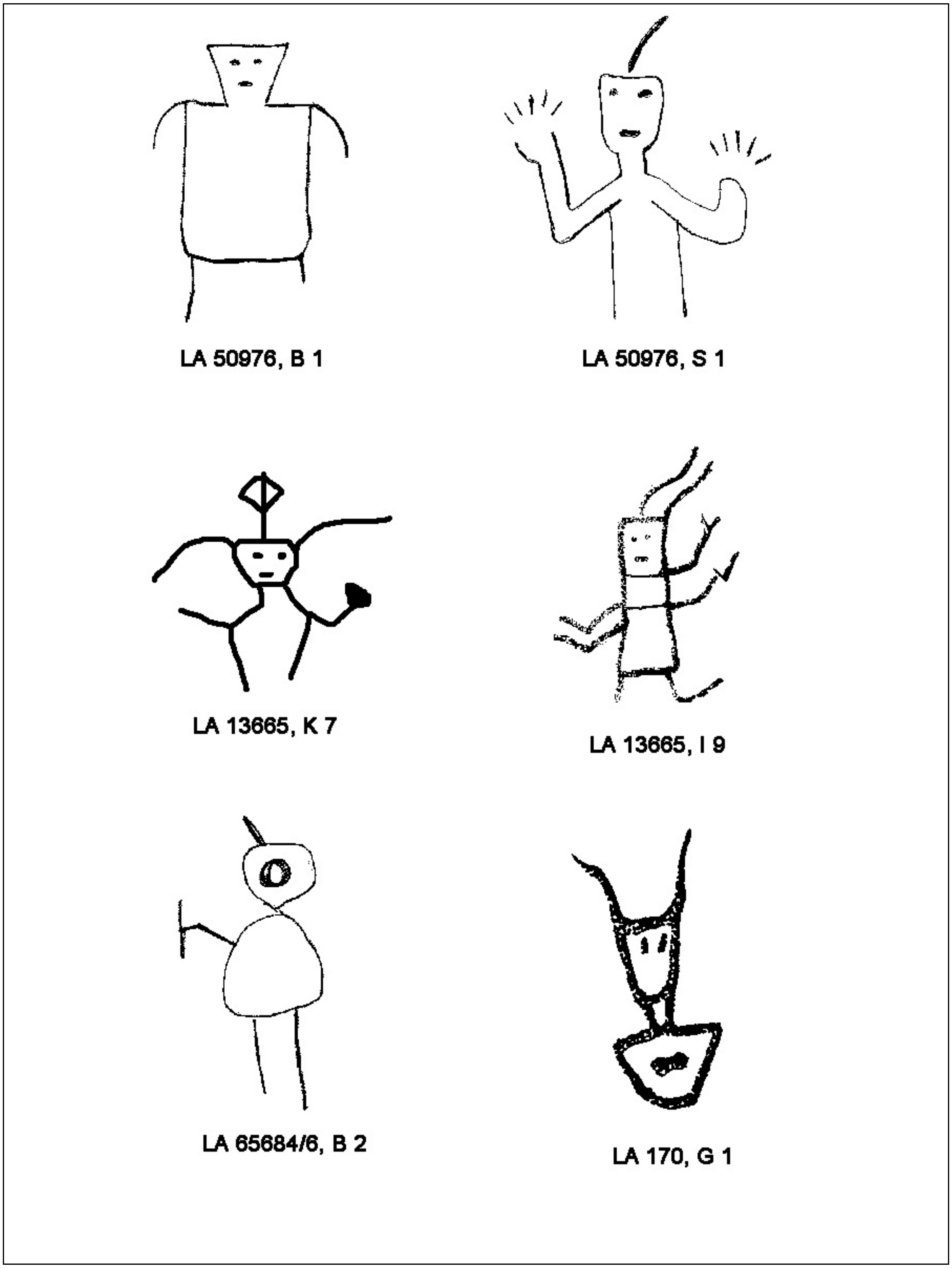


Figure 82.8. Classic style humans from the Pajarito Plateau.

In contrast to the largely geometric bodies and heads, other body parts are represented in an increasingly realistic fashion; almost two-thirds of Classic humans are shown with details such as fingers and facial features. Eyes are usually shown as simple dots or short horizontal lines, and mouths are seldom more than a straight horizontal line. Most forms of decoration are more complex than in Coalition period figures, although ears or hair whorls are rarer and less distinct in the Classic; the small circles on either side of the head are present in low frequencies, but clear depictions of hair whorls are rare. Feathers, although occasionally shown in the Coalition single-line style, are usually depicted as a series of long parallel lines, while more complex headdresses are shown in a wide range of forms. Some individuals have decorated torsos, such as chevrons, Vs, Xs, and diagonal lines, although they are relatively rare.

The proportion of figures that are outlined increases dramatically from the Coalition-Classic transition (slightly more than half) through the Classic (around 90%). Most of the depictions of female genitalia are from the Classic period. They take the form of individuals shown in frontal view, with a loop or two short parallel lines pendant from the base of the body, between the legs. Males are rarely indicated in the Classic period; like the females, they are usually depicted in frontal view. In the Coalition period, many of the male individuals are flute players; in the Classic period, only a single flute player is phallic. In addition, Classic period flute players are rendered in looping lines, completely unlike previous figures (Figure 82.9).

Historic Period: Elaborate Geometric Figures

Historic period rock art shows little change from that of the late Classic, although most of the trends in the Classic are somewhat strengthened (Figure 82.10). Less than 10 percent of human figures are naturalistic; rectilinear figures dominate. Rectangular heads are more typical of this late imagery. Details such as fingers, mouths, and eyes are increasingly common, reaching almost 75 percent. Almost two-thirds of these late figures lack arms and/or legs. The fact that prevalence within an assemblage is the main distinction between Classic and historic styles makes it difficult to distinguish between the two periods without specific historic imagery at the later sites.

However, the latest imagery includes various elaborations rarely seen in earlier imagery, such as legs drawn with bulging calves. Individuals may have Xs across the torso or carefully delineated belts, complete with tassels. Noses are indicated by a short vertical line at the forehead. Other figures are shown with elaborate hairstyles, such as "butterfly" whorls, plaits, and asymmetrical hair, or pointed caps. These decorative traits have strong similarities to ethnohistorically documented Pueblo paraphernalia, such as bandoliers (Strong 1979), hair whorls, and the pointed cap worn by warriors.

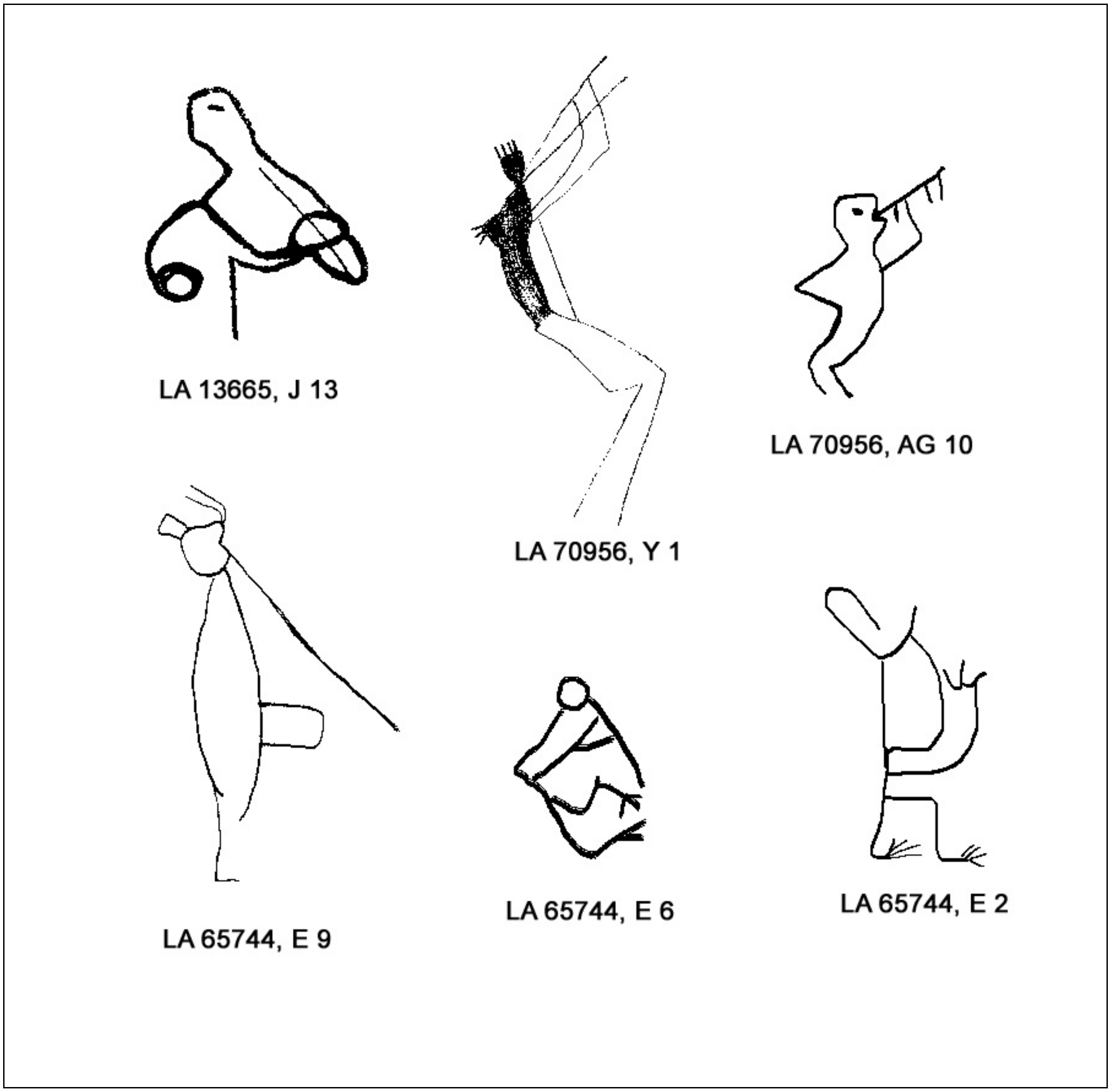


Figure 82.9. Classic style flute players from the Pajarito Plateau.

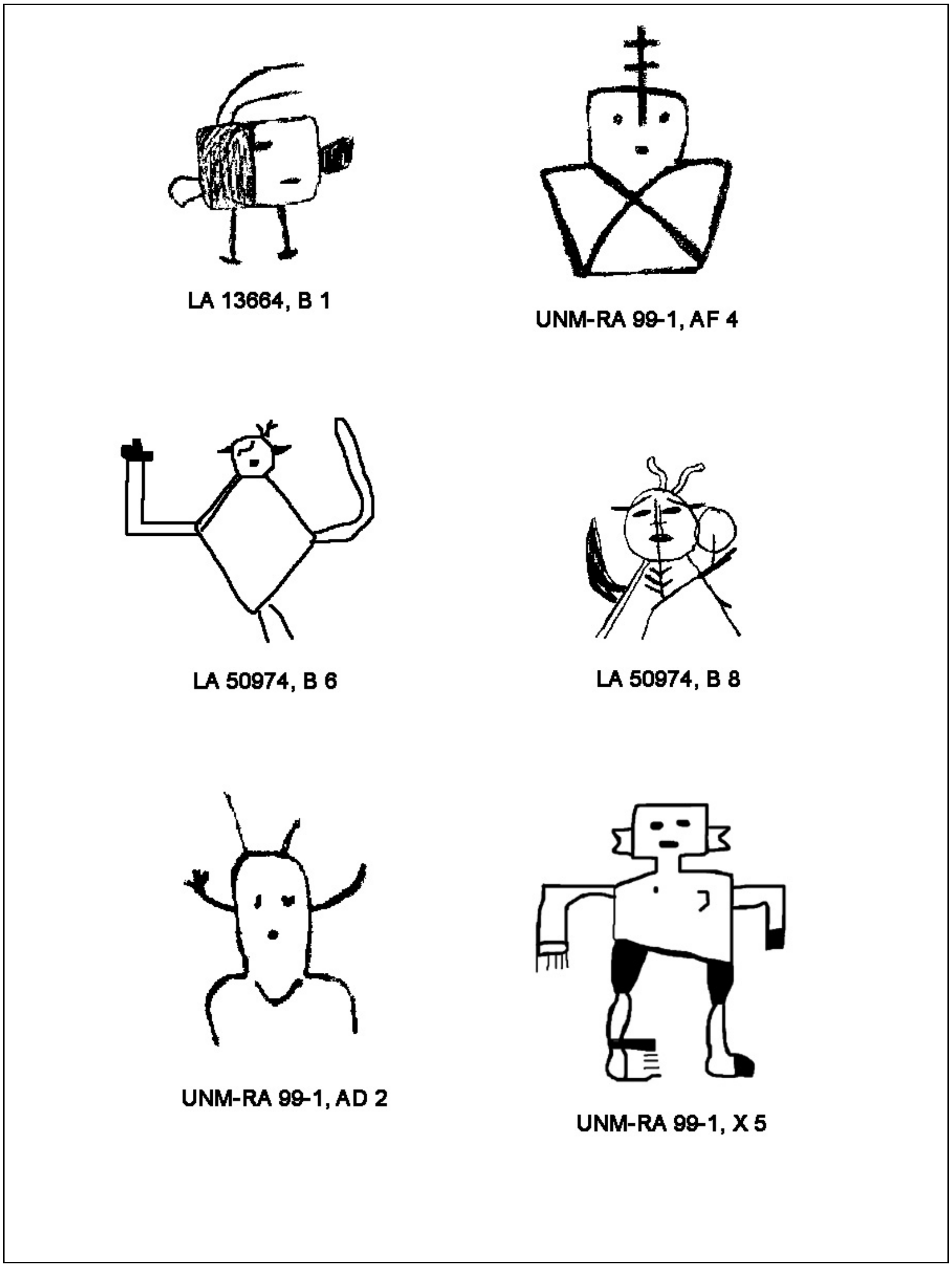


Figure 82.10. Historic style human figures from the Pajarito Plateau.

Depictions of Animals

Attempts to seriate depictions of animals were unsuccessful; correspondence analysis fails to show any linear relationship between the stylistic traits of animals and the sites at which the depictions occur. This result is rather surprising; given the range of variation observed in the field, it was anticipated that Classic period animals would show greater complexity and detail than those at Coalition sites. Classic birds, for example, seemed to be shown with feathered wings and precise fan shaped or feathered tails, while rare depictions of claws on quadrupeds or of rattles on snakes date to the Classic period or later (Figure 82.11).

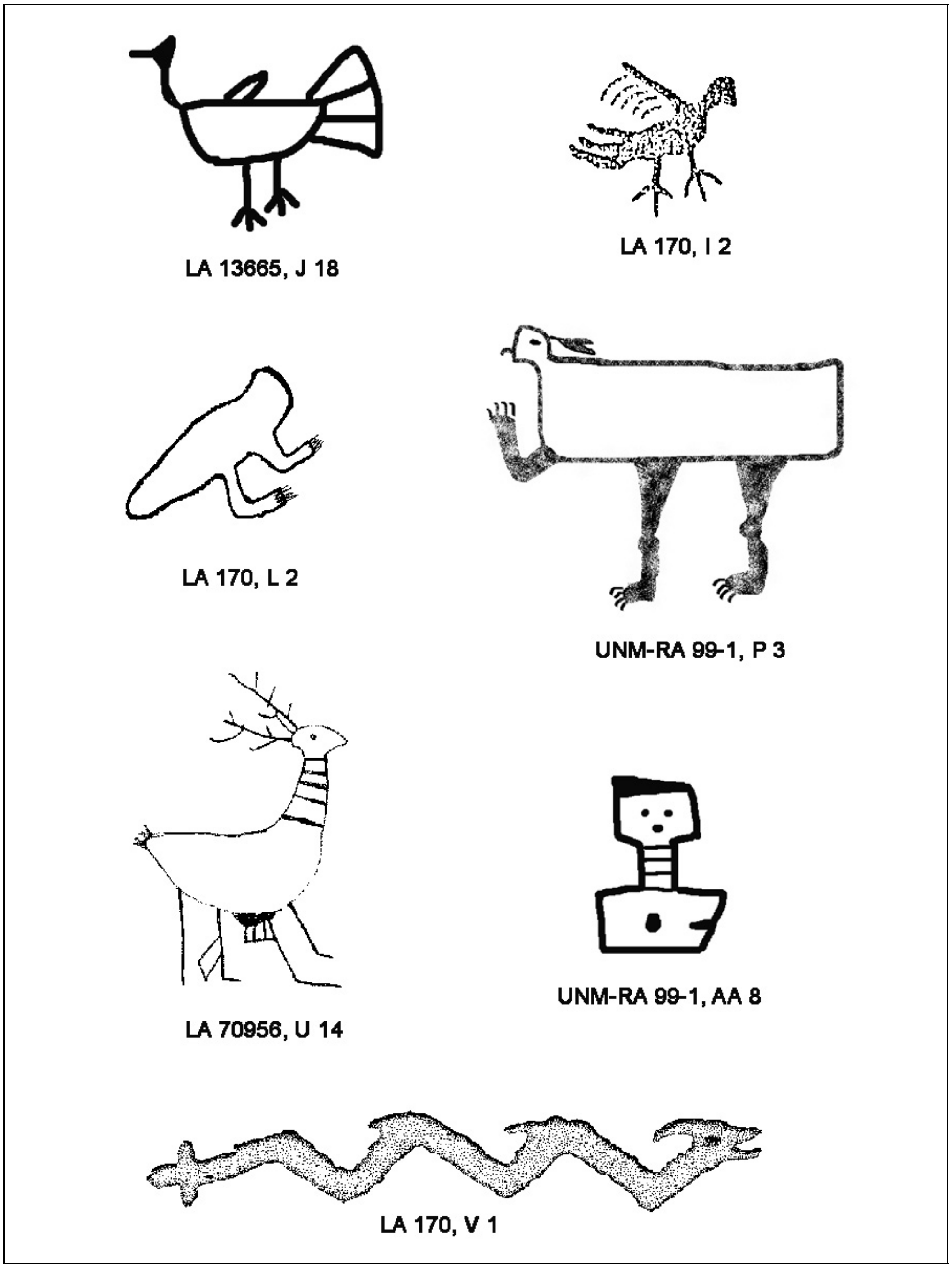


Figure 82.11. Detailed animals from the Pajarito Plateau. Most of the figures date to the Classic period; the mountain lion (UNM-RA 99-1, P 3) is from a historic site. The rectilinear human with striped neck (UNM-RA 99-1, AA 8) is also historic; it is provided as comparison to the deer with striped neck (adjacent).

A closer look at the data provides a partial explanation. For one thing, traits such as body shape may be determined more by the specific animal being depicted than by stylistic concerns. An artist is limited by the need to choose an appropriate combination of traits in order for the depiction to be understood (B. Smith 1998). For example, mountain lions in Puebloan imagery are often shown with long narrow bodies, a long tail stretched straight out, and short limbs and neck. The proportions of the tail, legs, and neck relative to the body are essentially fixed; lengthening the neck or changing the tail leads to ambiguity, such as that visible in the composite animals from LA 127636 (Figure 82.12).

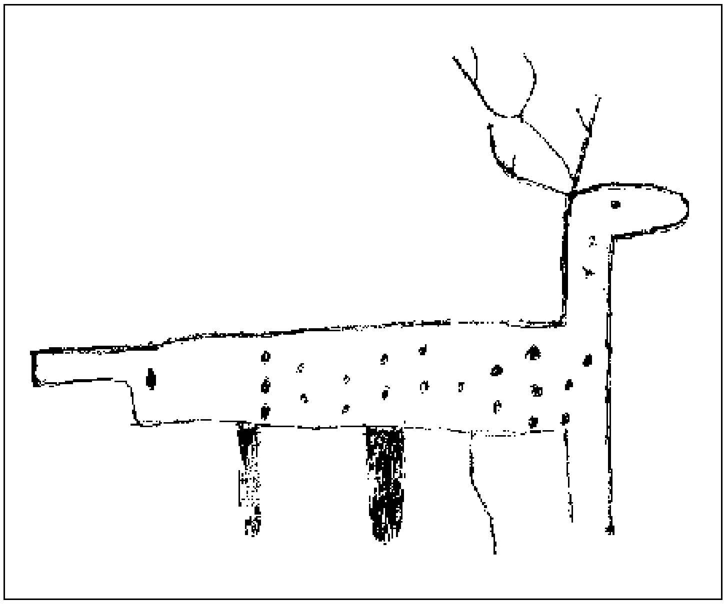


Figure 82.12. A composite animal from LA 127636, combining characteristics of a mountain lion and deer.

CONTEXTUAL DIFFERENCES THROUGH TIME

Context of Coalition Period Rock Art

In addition to dramatic shifts in style, Coalition and Classic period rock art also differ greatly in context. Coalition rock art is overwhelmingly found in private contexts. Of the images dating to the Coalition period, a full 80 percent are inside cavates carved into cliff faces. Some of these rooms are entirely enclosed by the rock, while others have openings in the front that were filled in with stone and mortar; all are small, enclosed spaces. They vary in size and quality of construction, but most are relatively small, with low ceilings. Some of the rooms have features such as niches, vents, and loom anchors, which are typical of cavates on the Pajarito (H. Toll 1995; Vierra et al. 2000).

Although in-depth analysis of cavates and cavate features is not the focus of this report, the cavates recorded during field work (Munson 2002) supported previous observations regarding the variability of features and finishes in cavate rooms (e.g., H. Toll 1995). Cavates with rock art are larger and have more features than those without; cavates with imagery average 5.1 square meters in size, and contain 5.0 features, while plain rooms average 2.7 square meters in size, with 2.2 features each. Rock art also tends to occur in rooms that are more formally prepared; 85 percent occur in cavates with a tan plaster dado on the lower walls and/or a thick coat of soot on the upper walls and ceiling. Most of the rock art is pecked or cut through the soot, exposing the light gray tuff below and creating high-contrast images (Figure 82.13).

Figure 82.13. High-contrast imagery inside a cavate at LA 12609.

Previous researchers have interpreted this interior Coalition period rock art as an indication that the rooms served as kivas (Rohn 1989; Steen 1977, 1979). Indeed, a few cavates are so distinctive in the amount of imagery, the relatively large size of the room, and the density of the features that they are likely ceremonial rooms. The Mortandad Cave Kiva, for example, is dramatically different from most cavates. One of the largest cavates on the Pajarito, the room is well-formed and has numerous features, including multiple niches, a firepit, a double doorway, and vent holes. The densely packed rock art crowded together on the cavate walls includes three times more imagery than any other cavate, and the combined scale, density, and iconography of the images is visually overwhelming (Figure 82.14). There is no coherent overall layout, but several of the images are integrated into small "scenes" of interacting figures. On the west wall, a person swings a club at a humped arrow swallower; on the east, two canids are shown muzzle to muzzle. Between and above the two doors is the dominant image, which is a large shield bearer with a feathered shield. The shield bearer holds a club in one hand and a horned serpent in the other. In addition, an arrangement on the wall opposite the doors pairs spotted mountain lion-type animals with two horned serpents; the serpents' bodies merge into a large arc over all four figures. Their symmetrical arrangement around a niche behind the fire pit is reminiscent of some northern Rio Grande kiva layouts (Smith 1990).

Nevertheless, most cavates with rock art are considerably simpler and are unlikely to have had primarily ceremonial functions. For example, of the 24 other Mortandad cavates with rock art, only five have even a fifth the number of images of the Cave Kiva; most have fewer than three scattered images and low to moderate numbers of features. The images could have been produced and viewed only by people with access to the rooms, whether inhabitants, kin, neighbors, or invited artists. The small size of the rooms effectively limited the audience to less than a dozen people, all sanctioned by the inhabitants of the room. The interior location of the rock art implies direct individual or family control over the imagery and its use. It is unlikely that these cavates were the functional equivalent of standard kivas (see H. Toll 1995:213–215).

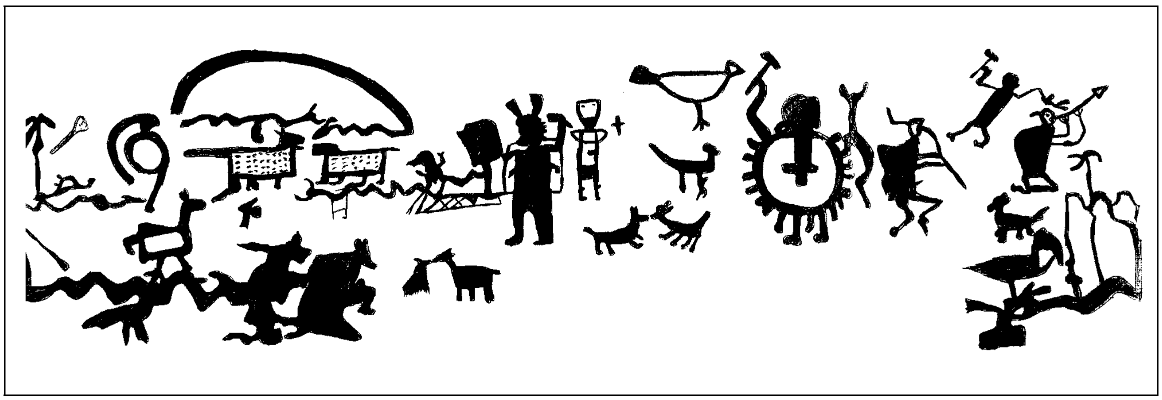


Figure 82.14. Interior petroglyphs from the Mortandad Cave Kiva.

Coalition rock art does occur in exterior contexts, but it is seldom directly associated with cavates. The Mortandad site, for example, has an unusually high proportion of exterior rock art: 18 of the 23 panels are on the cliff face. However, only a single element is actually on the lower level of the cliffs, directly associated with the cavates; the remaining 78 elements are on the caprock at the top of the mesa, linked to the cavate pueblo only by a trail and stairway leading to the masonry pueblo on the mesa above. Similarly, only three elements of the 348 at the Kwage cavates (LA 35003) are on an exterior panel. The only significant exterior rock art in the vicinity is at LA 21602, a single panel of fewer than a dozen images that is located high above the Kwage site, just below the top of the mesa (Snead and Munson 2001).

Informal field observations suggest a general division of Coalition period rock art between intensive imagery inside rooms at cavate pueblos and small quantities of exterior rock art scattered along upper cliffs away from habitation sites. The north side of Bayo Canyon, for example, consists of a long, steep talus slope topped by a series of cliff faces, one of which includes a number of cavates. At the top of the cliff is a sloping section of eroded bedrock and boulders, leading up to a second, shorter outcrop at the top of the mesa; this cliff is scattered with numerous small panels of rock art (Figure 82.15). The pattern of small rock art panels located in the vicinity of small Coalition period cavate pueblos is repeated in Sandia Canyon and along the Mesita del Buey, near Tsirege (Vierra et al. 2000). These panels have not yet been dated stylistically and they lack the close association with habitation sites that would allow them to be dated securely. These scattered panels, often too small to be documented as full-fledged sites, are probably under-reported in the literature; it they do indeed date to the Coalition period, they raise the possibility that Coalition rock art may also be under-reported.

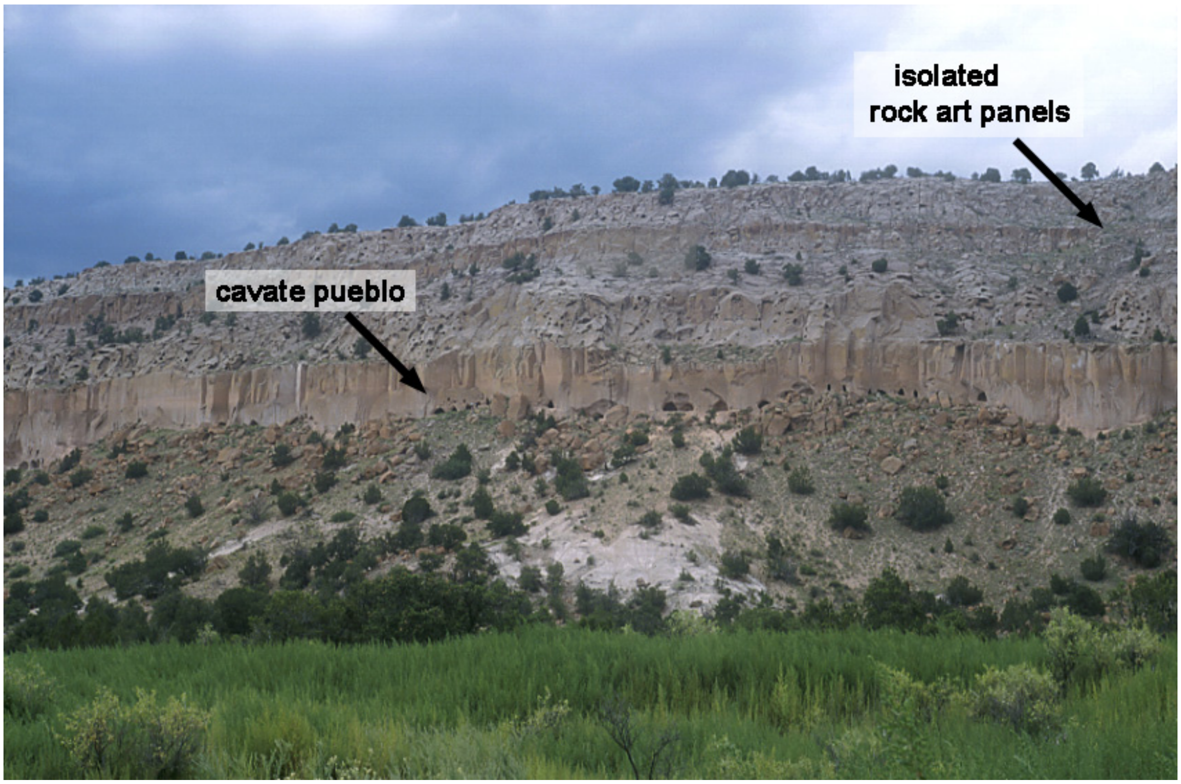


Figure 82.15. Location of isolated rock art panels relative to cavate pueblos in Bayo Canyon. The photograph was taken from Otowi Pueblo.

In the absence of additional information, however, the distribution of these panels relative to Coalition and Classic period sites provisionally suggests that this scattered rock art may be contemporaneous with small Coalition pueblos. If so, the dichotomy between dense interior rock art and scattered, distant exterior rock art indicates that each context had different audiences. The exterior rock art is relatively open, without physical barriers that would restrict its production or viewing, yet much of it is far enough afield that the images are less likely to have been seen frequently. The presence of trails leading from most of the Coalition cavate pueblos to the mesa tops (Snead 2002a) would have facilitated access to the rock art on the upper cliffs, but direct associations between trails and rock art are unusual (Snead and Munson 2001). At the Mortandad site, for example, the central stairs lead individuals within view of the most concentrated rock art, but not directly to it (Figure 82.16). Similarly, a major stairway at the east end of the mesa along Bayo Canyon provides access to the same level as the rock art, but only a single panel with a few elements is actually visible from the trail.

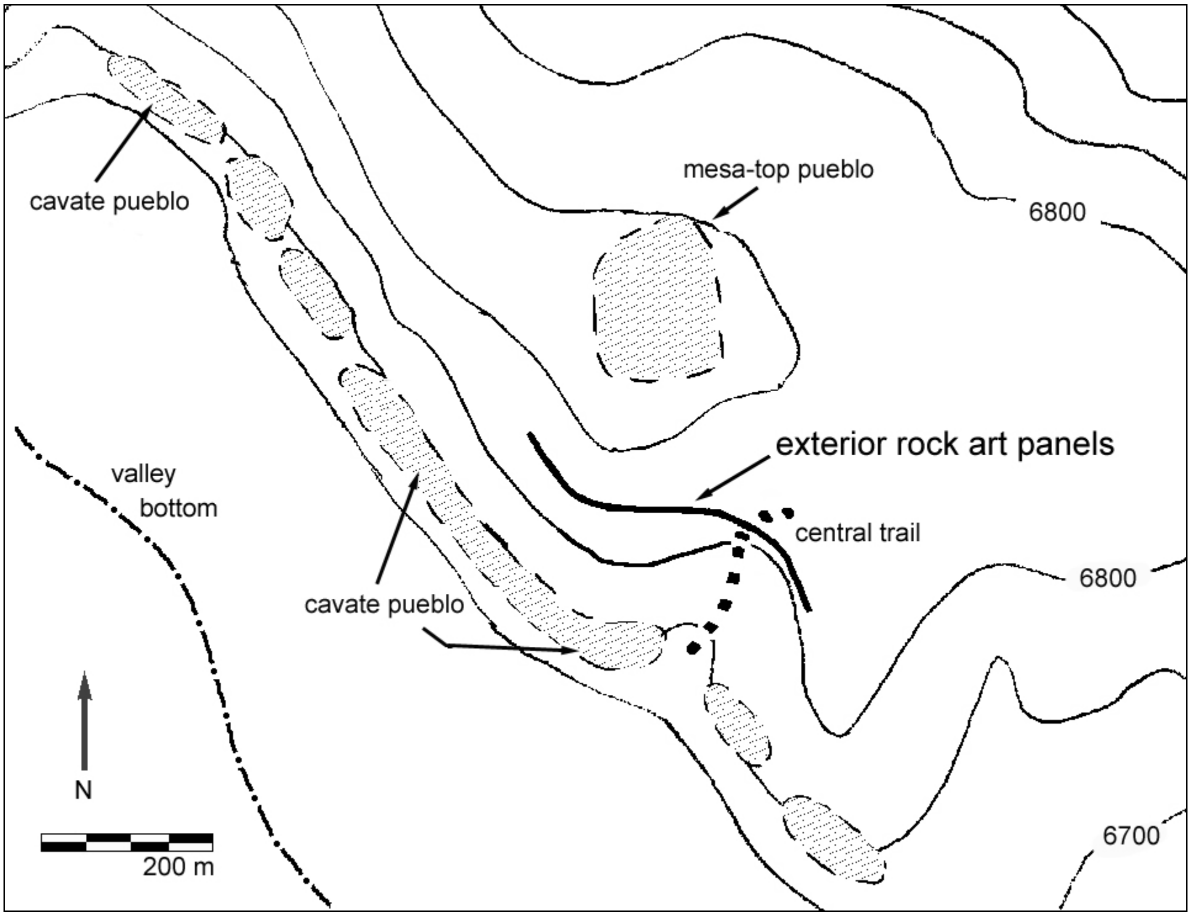


Figure 82.16. A plan map of the Mortandad site, showing the relationship of exterior rock art panels to other features.

Context of Classic Rock Art

While Coalition rock art is almost entirely in private contexts, 85 percent of Classic rock art in this study is located on exterior surfaces. Rock art on cliff faces is, of course, a logical accompaniment for the multi-story cavate pueblos that were common in the Classic period (Van Zandt 1999:387), as the very fabric of the cavate pueblos provided an expanse of cliff and walls suitable for rock art. However, many Coalition period sites, like the Kwage and Mortandad sites or smaller cavate pueblos like LA 21639, have ample cliff faces that were completely ignored by artists. There is no indication that Coalition period rock art was crowded onto insufficient space; more than 80 percent of the panels from both periods have light or moderate use of space, and only a small, uniform proportion of the panels have heavy use that might indicate crowding. In addition, the increase in large cavate pueblos in the Classic period would have provided ample interior space for rock art, space that these artists seldom used. The dramatic jump in exterior rock art, then, indicates a new emphasis in the Classic period on public locations for imagery.

Although the exterior rock art is large enough to be potentially visible from a moderate distance, only a small percentage is in the prominent locations visible to individuals approaching a site.

The primary audience for most of the external rock art was the inhabitants of each cavate pueblo, or at times individuals living within a segment of a pueblo (Figure 82.17). Closer examination of the distribution of Classic rock art highlights the existence of special-purpose locales, involving small platforms surrounded by extensive rock art imagery. These alcoves, visible from villages but somewhat removed from the traffic of daily life, are locations where small groups of individuals gathered periodically for rituals centered on the production of rock art.

Figure 82.17. The horned serpent at Tsirege (vertical panel at center of photo) is located along the main stairs leading to the mesa top pueblo. Although it would have been seen by anyone entering the site using this stairway, it is not readily visible to strangers at a distance.

GEOGRAPHIC VARIATION IN PAJARITO ROCK ART

Purported Differences in Northern and Southern Pajarito

As discussed earlier, much research on Pajarito rock art has relied upon Schaafsma's stylistic distinctions relative to historic Keres and Tewa boundaries. In broad outline, the geographic distribution of elements fits within P. Schaafsma's (1992) delineation of conflict-related Tewa rock art in the north and religious Keres rock art in the south. Rock art from the northern plateau, for example, includes most of the imagery with war-like connotations, such as shield bearers, weapons, arrow swallowers, thunderbirds, and mountain lions. Depictions of possible kachinas, in turn, are most common in or south of Frijoles Canyon.

Nonetheless, close examination of the distribution of rock art elements indicates that the greatest variability is actually among clusters of neighboring sites: those in Garcia Canyon, in the Otowi-Tsankawi area, the Tsirege area, Frijoles Canyon, and the southern Pajarito around San Miguel. For example, although flute players are numerically most common in the north, 90 percent of all flute players in the Pajarito sample are found in the Otowi-Tsankawi area. Similarly, the predominance of shield bearers in the north results from the fact that 88 percent of all shield bearers in the sample are limited to the Otowi-Tsankawi area. Weapons, thunderbirds, and arrow swallowers, limited almost entirely to sites on Tsankawi and north mesas, are even more restricted in distribution. In turn, the Otowi-Tsankawi area largely lacks elements such as individuals with torso Xs, possible kachinas, and the pointed-cap being, all of which are common at Tsirege and in Frijoles Canyon. Tsirege and the Frijoles sites also have numerous shields and concentric circles, but completely lack the shield bearers of the Otowi-Tsankawi area. The Frijoles Canyon sites are distinguished from Tsirege by their numerous faces and plain circles. The sites in Garcia Canyon, with large numbers of spirals and plants, are unusual enough that they were difficult to date stylistically, while the rock art on the far south Pajarito is also quite distinct from other locations. The imagery in the San Miguel area includes many pictographs, the unique star ceiling, and numerous faces pecked around corners. The following section describes the characteristic rock art of each of these geographic areas in greater detail.

The Northern Pajarito

The northern Pajarito rock art in Munson's dissertation consists entirely of Coalition period imagery from sites in Garcia Canyon. Although this sample is not an ideal representation of the northern plateau, it is sufficient to point out certain differences between Garcia Canyon imagery and the remainder of the Pajarito. The assemblage is dominated by spirals and zigzags. Animals and anthropomorphs are uncommon; the latter are often incomplete, as in the case of isolated legs and feet. The unique representations of plants are notable; the rare depictions of plants elsewhere on the Pajarito lack the rounded circles at the tips of the stems that make the northern depictions of plants resemble sunflowers. The sole shield is also unusual, with a lobed interior and a central face.

The North-Central Pajarito

The rock art of the north-central Pajarito Plateau is dominated by transitional Coalition-Classic elements and Classic period imagery. The areas around Otowi and Tsankawi, in particular, are mixed temporally, while the rock art at Tsirege is primarily limited to the Classic period. In addition to their temporal differences, these two areas within the north-central Pajarito have overlapping but different rock art motifs.

Compared to the rest of the Pajarito, the Otowi-Tsankawi area has the vast majority of the images relating to hunting or warfare, including most of the shield bearers and virtually all of the images of weapons. In the Coalition period, representations of weaponry are mostly bows and arrows, often with individuals using them to shoot quadrupeds, although sometimes as individual objects. A few human figures hold possible spears. Transitional Coalition-Classic weapons are entirely held by single individuals, including some shield bearers. In the Classic period, weapons are represented as isolated bows and arrows, a single object that appears to be a projectile point, and a shield bearer holding a possible spear. The Otowi-Tsankawi area also contains most of the arrow swallowers in the sample. These individuals are represented in profile and often look much like flute players. The earliest, from the Coalition period, is inside the Cave Kiva at Mortandad; the latest is a Classic period figure in Frijoles Canyon. The majority of these images, though, are Coalition-Classic transitional and are located at the Tsankawi Trail site.

Birds and unidentified quadrupeds constitute more than two-thirds of the animals in the Otowi-Tsankawi area. Canids are found in all periods, while depictions of deer or possible elk are limited to the Coalition and transitional Coalition-Classic. Mountain lions are common in the Coalition period, while transitional sites include the sole dragonfly and almost all of the thunderbirds in the sample. Horned serpents are common in the Otowi-Tsankawi area in the Coalition rock art, along with numerous zigzags that resemble snakes; although short or excessively meandering zigzags bear little resemblance to local conventions for depicting snakes, the long horizontal zigzags that encircle cavates are similar to the form of more direct depictions of serpents. Such "cavate snakes" are common in Coalition and Classic period cavates on the north-central Pajarito.

At Tsirege, in contrast, simple passive figures and simple faces dominate, each constituting about 30 percent of all human images. Elaborate humans are evenly split between active and passive forms. Two of the anthropomorphs represent a person with a pointed cap being and a beaked masked figure. Animals, as is typical of the Pajarito, are mostly birds and unidentified quadrupeds. Numerous canids are present at Tsirege, as is the only Classic mountain lion in the northern Pajarito sample. Horned serpents are unusually common, comprising more than 10 percent of the animals, while plain snakes are relatively rare; this is hardly surprising, given the presence of the Awanyu and other dramatic horned serpents. Only a single plant is present. Shields are common at Tsirege, including some that bear elaborate designs similar to historic pueblo shields (Wright 1976, 1992) and others that are decorated with concentric circles, lobes, or feathers. Large plain concentric circles, more common at Tsirege than in any other dated rock art site on the Pajarito Plateau, probably also represent shields, although this should not be assumed of all concentrics.

Frijoles Canyon

The most numerous, and most visually prominent, shields in the sample are from Classic and late sites in Frijoles Canyon. Long House, in particular, has 10 shields, and a careful examination of the canyon shows that most of the major cavate pueblos have at least one large shield prominently placed on the cliff face high above. Large concentric circles that may also represent shields are fairly common in Frijoles Canyon.[2] Single circles, which are quite common, could potentially evoke shields, although judging from their small size they might simply be incomplete or heavily weathered faces. As at Tsirege, Frijoles sites lack shield bearers and weapons of any kind.

[2] Cavate Groups A and M, for example, have large shield-like concentrics that are visible from the canyon bottom with binoculars.

Virtually all of the human imagery consists of faces; most are simple, but a few have sufficient detail that they could represent masks. The infrequent full human figures are mostly elaborate and active; they include a being with a pointed cap, a possible representation of Shalako, and the only arrow swallower outside the Otowi-Tsankawi area. Birds are by far the most common animal (35% of animals), followed closely by snakes and horned serpents (16% each). Unidentified animals and quadrupeds constitute only one-fifth of the animals, which represents a sharp break from other Pajarito Plateau rock art. A sole plant is the southernmost such image in the study. Though rare overall, terraces and sets of concentric arcs are more common in Frijoles Canyon than in other parts of the Pajarito.

The Southern Pajarito

The distribution of rock art in the sample makes it difficult to fully address variation across the southern Pajarito Plateau. The vast majority of the rock art in the south is from the vicinity of San Miguel. This southernmost rock art is almost half human figures, which is a full 25 percent more than any other area. About 30 percent of the humans are elaborate, including multiple representations of specific individuals. Nine of the human figures have a pointed cap and claw-like hands, two are Shalako, and three have a combined head and body. The only shield bearer outside the Otowi-Tsankawi area is a late figure in Capulin Canyon, although Painted Cave, which was not recorded, also includes some of the figures (Rohn 1989). The only exceptions in the distribution of weaponry in the Otowi-Tsankawi area are two late individuals on the far southern Pajarito, one with an arrow coming from the top of its head, another holding a possible spear.

The most elaborate depictions of humans are in the late sites of the far southern Pajarito. Some detailed faces are probably representations of masks, while particularly elaborate humans may be kachinas or supernatural beings, such as mudheads, the pointed cap being, Shalako, and ogres. Most of the human figures on the southern Pajarito are passive. Handprints, though infrequent, are almost entirely from the San Miguel area, probably due to the greater proportion of pictographs in the southern Pajarito. Simple faces are usually pecked around corners, a trait typical of Keres rock art (P. Schaafsma 1980:275).

Animals are quite rare, forming only 13 percent of the southern rock art. Horned serpents, zigzags, and snakes are correspondingly rare, although when they do occur it is often in complex forms, such as the serpent at the San Miguel Site that has a body of interlocking diamonds. Most of the clear depictions of mountain lions occur in this southern area, as do most of the weasel-like animals. The far southern plateau also includes the only thunderbird outside the north-central Pajarito. Dots and + signs are quite common, due entirely to the presence of the star ceiling at the San Miguel Site. Only a single terrace was recorded on far southern Pajarito, but anthropomorphized terraces are also present at Painted Cave (see Rohn 1989:112).

Taken in concert, this evidence suggests that the content of the rock art varies on a finer geographic scale than previously recognized. The relative size of this spatial distribution is in keeping with the imagery's apparent audience, the occupants of individual communities. These geographic differences also appear to persist through time. The weaponry depicted in the Otowi-

Tsankawi area, initially present in Coalition hunting scenes, is common at transitional Coalition to Classic sites, as well as in later Classic sites. Shield bearers, likewise, are found at a few Coalition sites in the area, then increase in number, particularly during the transition to the Classic period. Similarly, the Late Coalition images of detailed humans in the far south are predated by related Classic period depictions.

Geographic Factors Related to LANL Rock Art

Two specific issues relating to geographic variation are pertinent to the rock art of Los Alamos. First, the palimpsest effect in the Otowi-Tsankawi area is a potentially serious problem. Most sites were established in the Late Coalition period, with major occupation in the Classic period, and the whole area was intensively used prehistorically. Individual rock art sites or panels may have imagery with a wide range of dates, and differences in patination or style may not be great enough to distinguish Late Coalition period rock art from that of the Classic period. At best, much of the rock art within the Otowi-Tsankawi area may have to be designated as transitional in nature, rather than definitively assigned to a specific time period. This is particularly true of the small clusters of panels common on isolated cliffs not directly associated with habitation sites (discussed above relative to the context of Coalition images).

Second, there are considerable differences between rock art on tuff and that on basalt. Some of these differences are simply due to the nature of the material; it is impossible to create the same kind of fine detail on the soft, coarse tuff as on basalt. In general, petroglyphs on tuff are larger in scale and/or include less detail. Petroglyphs on basalt may have greater detail and are less likely to be solidly pecked, given the amount of labor required to work the surface of the hard basalt. As a result, the stylistic dating outlined above is not always sufficient to date rock art sites exclusively on basalt.

LA 49948, a petroglyph site located in Water Canyon, is a prime example of this problem. The site consists of small petroglyph panels scattered along talus slope boulders and low, broken cliffs of basalt on the north side of Water Canyon. With the exception of two small concentrations on the upper cliff, the panels are isolated spatially and do not seem to have been placed relative to each other or to any discernible feature of the landscape. The petroglyphs themselves include concentric circles, lobed figures and curvilinear meanders, small Xs, a lizard-like figure, and a few simple humans. The rock art at LA 49948 is closely related to that at LA 49944, LA 49945, LA 49946, and LA 49947, which are single panel rock art sites located just upstream on basalt boulders and cliffs. These elements strongly resemble Abstract Style rock art traditions (P. Schaafsma 1992), but the lack of heavy patination at the site argues against a date that old. Some elements have also been modified with historic scratching.

Rock art from White Rock Canyon, as recorded by Lilienthal and Hoard (1995), and from the Cochiti Dam area, as recorded by Schaafsma (1975), includes many similar elements that are cryptic in date, along with large, detailed images that are stylistically similar to historic Pueblo drawings. Petroglyphs on basalt should therefore be dated with great caution, relying heavily on patination and superpositioning (when available).

RECORDING AND MANAGEMENT ISSUES

Recommended Recording Procedures

In addition to standard archaeological recording procedures, there are several recommended procedures for recording rock art sites. A separate rock art sheet is desirable to ensure that the necessary information is collected without adding much time to the overall site recording process.

First priority, for quick recording:

• A photograph, with scale and date, of each panel. They provide a record of the exact condition of rock art at a given point in time, which is useful for monitoring changes in condition.

• A listing of all elements present. The terms used to describe the elements should be standardized in a field manual, with verbal descriptions as well as example illustrations. It is important that these categories are as explicit as possible, as one person's idea of a corn plant may be someone else's dance wand or prayer stick. If the elements categories are organized as a brief check list, the recorders can simply check to indicate which elements are present at a site.

• An estimate of the number of elements present. Again, this could be done with check boxes listing ranges of numbers (<10, 10 to 25, 26 to 50, 51 to 100, >100). This number is useful for determining how extensive the rock art is at a given site, should more detailed recording be desired at a later date.

• An indication of the techniques present at the site (pecking, incising, grinding, painting, combinations).

• An indication of the possible date of the imagery, the basis for the judgment, and/or the potential for dating. This would include check boxes for superpositioning, patination (including sooting or plaster in cavates), subject matter, stylistic variation, and comparison with other media. A comments field would help provide further details.

• A list of potential threats and/or management issues, including check boxes for erosion, plant growth, vandalism, heavy visitation, and other threats.

Second priority, for more detailed recording:

• All elements should also be drawn whenever possible, as field observations often show details that cannot be seen in photographs. Drawings should attempt to represent what can be seen as objectively as possible, without embellishment. If it is desirable to extrapolate from what can readily be seen (as is often useful for making sense of eroded pictographs), the reconstructed image should be clearly labeled as such.

• Each element should be given an identifying number or letter.

• Dating information should be recorded in detail for each image.

Superpositioning relationships should be stated clearly, in a form such as "X lies under (is older than) Y." If the relationship cannot be determined, that should be stated explicitly. Relative patination should be noted using standardized terms (such as complete, heavy, medium, light).

Dating petroglyphs within cavates is particularly important; the rock art within cavates in the central Pajarito Plateau appears to be a mixture of imagery contemporaneous with occupation and images post-dating occupation. When dealing with interior rock art it is important to remember that the rock art may be contemporaneous with the primary occupation of the site, or it may be more recent. Rock art on different panels within a site, or different elements within a single cavate may not be contemporaneous. Previous projects have typically failed to record information necessary to distinguish between the two. This can be addressed by explicitly recording information that may help in dating; specifically, photograph and document in writing:

• any indication of sooting, including an estimate of percent sooted, from 0 to 100 percent blackened,
• any superpositioning of plaster layers over images or parts of images,
• any differences in the color of the tuff itself. Color differences can be very subtle, and may differ depending on lighting. Recording the color of pecked areas and the background color of the tuff with a Munsell color chart may help identify color differences that could distinguish between fresh, modern images and earlier petroglyphs.

Erosion and Other Natural Damage

The volcanic tuff of the Pajarito Plateau, which is the substrate for the majority of the rock art, is generally soft and highly susceptible to weathering and erosion. However, tuff forms a hard weathering rind through time, and it appears that erosion from wind and water is not a major problem for most Pajarito rock art (Vierra et al. 2000). Likewise, growth of lichens and other plants also does not seem to pose a significant threat to most Pajarito rock art. Peeling plaster within cavates is a more serious threat, particularly to fine-line scratched historic images and inscriptions. Forrest's Master’s thesis in historic preservation (2001) may provide information useful for assessing the threat of plaster loss. Photographs are a useful means of monitoring changes in the condition of elements through time.

Vandalism

The major threat to Pajarito rock art is from human action. Field observation suggests that vandalism has not been a great problem in recent years. In some cases, this is due to the inaccessibility of sites; there is a sharp decrease in dated graffiti at a former party site on Kwage Mesa (LA 35003) following the construction of the sewage treatment plant directly below it. The cages on significant cavates in Mortandad and Sandia canyons, though visually disruptive, are highly effective in preventing vandalism. Less drastic measures, such as the warning signs posted at the entrance to the trail to the Mortandad site, also appear effective. The greatest potential threat is probably from unintentional damage. Visitors love to view rock art; most will touch the images. This should be discouraged as much as possible, especially for rock art on tuff. Rubbings, castings, moldings, and the addition of chalk or any other substance should never be permitted.

CHAPTER 83
FUEL LOADS AND WILDFIRE EFFECTS ON ARCHAEOLOGICAL SITES AT LOS ALAMOS NATIONAL LABORATORY

Bradley J. Vierra and Randy G. Balice

INTRODUCTION

Los Alamos National Laboratory (LANL) is located on the Pajarito Plateau in north-central New Mexico. Archeological surveys have recorded over 1000 archeological sites at LANL. The majority of these sites are located in the lower elevations and in areas dominated by piñon-juniper vegetation. The question is, what types of archaeological sites are at greatest risk to wildfires? Since most of the heavy forest fuel loads at LANL are at higher elevations, there is an inverse relationship between site density and fuel loads. Wildfires therefore pose the greatest risk to archaeological sites situated at higher elevations (e.g., temporary campsites and fieldhouses). However, several factors can affect wildfire behavior, with the potential of severe damage occurring to any archeological site. This chapter will present our research on the relationship between archaeological site distribution and fuel loads at LANL. A comparison will then be made between these data and the information collected on archaeological sites within the Cerro Grande fire burn area, including the Rendija Tract.

DISTRIBUTION OF ARCHAEOLOGICAL SITES

LANL occupies the central section of the Pajarito Plateau. The plateau covers an area roughly extending from Santa Clara Canyon on the north, to the mesas above Cochiti Pueblo on the south, to the caldera on the west, and to the mesas overlooking the Rio Grande Valley to the east. LANL covers approximately 29,000 acres of land on this high mesa, ranging from about 1829 to 2438 m (6000 to 8000 ft) in elevation and covered with stands of piñon-juniper and ponderosa pine. The mesa has been incised with several deep canyons that drain from the mountain country down to the river valley. Balice (1998) has defined six basic vegetation and land cover types for LANL: unvegetated, grassland, juniper savanna, piñon-juniper, ponderosa pine and mixed conifer. Figure 83.1 illustrates the distribution of these vegetation types across LANL. Most of LANL is covered with piñon-juniper woodlands at the lower elevations and ponderosa pine at the higher elevations.

As of 2001, approximately 15,700 acres, or about 50 percent of LANL, had been intensively surveyed, with a total of 1025 archeological sites recorded. This reflects an average density of 1 site per 15 acres. The archaeological record of the plateau is rich and diverse, representing over 8000 years of human occupation. The recorded sites span a period from Archaic times to the Cold War era. However, the majority of these sites date to the Coalition period, ca. AD 1200–1325, with a large number of undetermined prehistoric sites (e.g., artifact scatters, fieldhouses, cavates, or rock art sites).

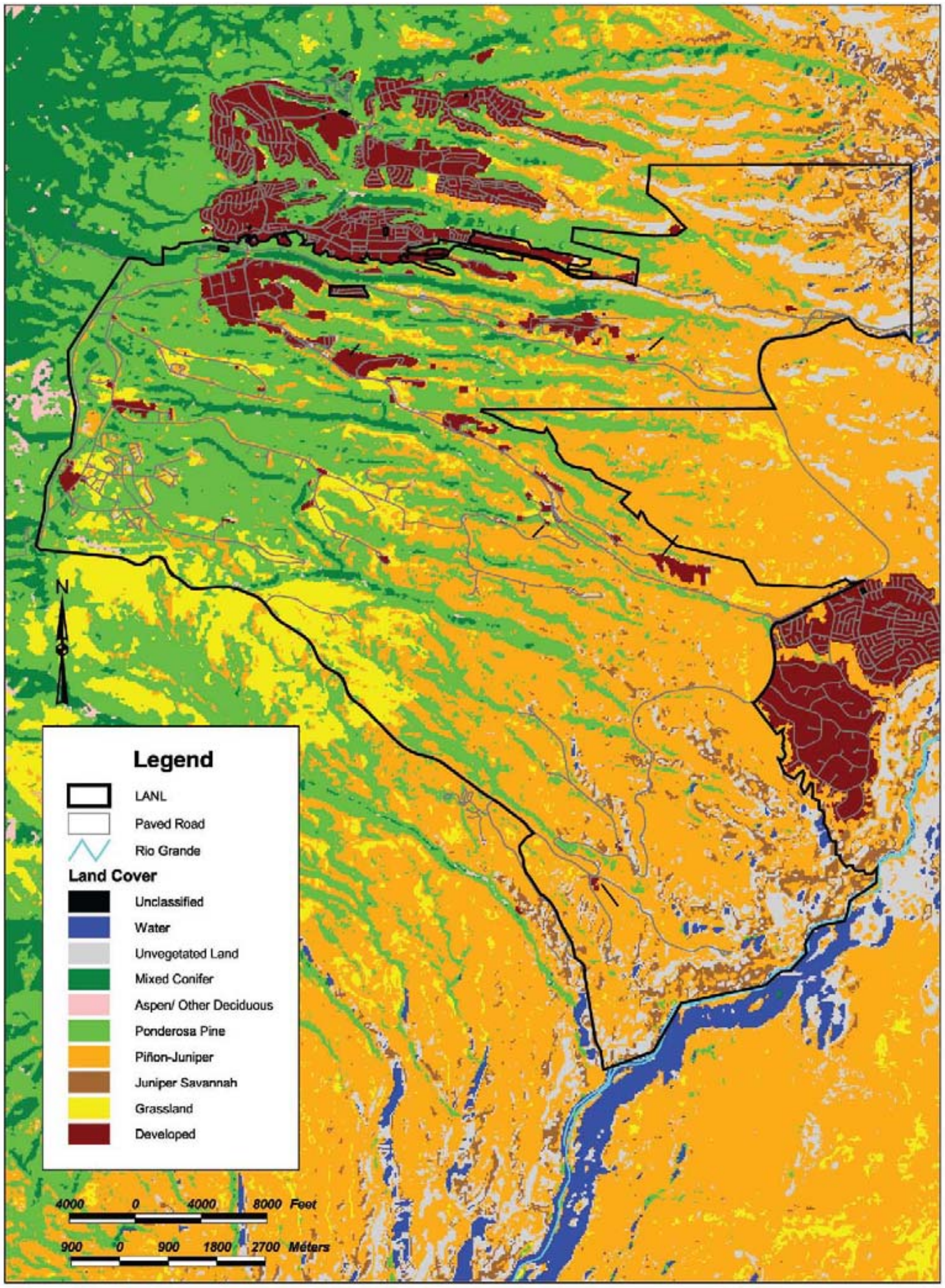


Figure 83.1. Vegetation types at Los Alamos National Laboratory.

Site distribution maps reveal obvious differences in the patterning of sites over time (see Vierra and Schmidt 2006). These differences presumably reflect important changes in past upland land-use strategies. For example, Archaic campsites are distributed across both piñon-juniper and ponderosa pine zones**.** Undetermined lithic scatter sites exhibit a similar distribution and presumably reflect Archaic campsites lacking diagnostic artifacts**.** However, these patterns stand in mark contrast to the distribution of Ceramic period habitation sites. Coalition period habitation sites are confined to the piñon-juniper zone**,** as are Classic period sites**.** Most of the

Coalition period fieldhouses are also located in the piñon-juniper zone, with a few situated at higher elevations in the ponderosa pine. This contrasts with the Classic period fieldhouses, which show a marked increase in the use of the ponderosa pine zone, most notably the area of Rendija Canyon.

Piñon-juniper and ponderosa pine cover the majority of the area surveyed. Table 83.1 presents the information on site density by vegetation type. Site densities range from a high of one site per 10 acres in the piñon-juniper woodlands, to a low of one site per 585 acres in mixed conifer forest. If we assume a 1000-acre survey was conducted in the piñon-juniper, ponderosa pine, and mixed conifer, we would see an inverse relationship between site density and elevation, with an expected 100 sites recorded in the piñon-juniper, 38 sites in the ponderosa pine, and only two sites in the mixed conifer. The latter may be an underestimation based on the small sample size.

Table 83.1. Density of archaeological sites by vegetation type.

Vegetation Type	Total Sites	Total Acres	Site per Acre
Unvegetated	88	2049	1:23
Grassland	14	1277	1:91
Juniper Savanna	2	442	1:221
Piñon-Juniper	556	6041	1:10
Ponderosa Pine	203	5373	1:26
Mixed Conifer	1	585	1:585

A chi-square analysis of archaeological sites by vegetation type for piñon-juniper and ponderosa pine (Table 83.2) indicates some significant differences (*chi-sq* = 10.9, *df* = 4, *p* = 0.27). Adjusted residuals were therefore calculated to determine which of the cells were contributing to the significant chi-square value. The results confirm the patterns observed in the distribution maps; there is no significant difference in the distribution of Archaic sites, lithic scatters, or Coalition period fieldhouses between the two vegetation types. However, there are significantly more Coalition period habitation sites in the piñon-juniper and Classic period fieldhouses in the ponderosa pine. Classic period habitation sites were excluded from the analysis because only four of these were represented.

Table 83.2. Archaeological site by vegetation type. Top number is the frequency and bottom number is adjusted residual. Adjusted residuals in bold are significant at the 0.05 level.

Site	Piñon-Juniper	Ponderosa Pine	Total
Archaic	36 -0.5	9 0.5	45
Lithic Scatter	7 -1.1	3 1.1	10
Coalition Habitation	102 **2.5**	12 -2.5	114
Coalition Fieldhouse	54 0.1	11 -0.1	65

Site	Piñon-Juniper	Ponderosa Pine	Total
Classic Fieldhouse	25 -2.6	12 **2.6**	37

Chi-square = 10.9, *df* = 4, *p* = 0.027

In summary, there is an inverse relationship between site density and elevation, with most sites being located in the piñon-juniper woodland. Overall, there are relatively more Archaic campsites with some Classic period fieldhouses situated in the ponderosa pine forest, versus more Coalition period habitation sites in the piñon-juniper woodland.

FUEL LOADING AT LOS ALAMOS NATIONAL LABORATORY

Information on fuel inventories conducted in 1997 has been adopted from Balice et al. (1999), as supported by additional data collected in 1998 and 1999 (Balice et al. 2000). The results of these analyses are presented in Table 83.3. The table presents information on fuels inventory summaries and the results of their multivariate analyses. Data are organized by the independent variables: vegetation type (Veg) and by topographic characteristic (Topo). The vegetation types are as follows: PJ = piñon-juniper woodland, Pipo = ponderosa pine forest, and MC = mixed conifer forest. The dependent variables in the top row include 1-hr fuels (0 to ¼"), 10-hr fuels (¼ to 1"), 100-hr fuels (1 to 3"), 1000-hr-sound fuels (>3"), 1000-hr-rotten fuels, duff (decomposed litter), litter (surface pine needles), herbaceous vegetation like shrubs and grasses (Veg), trees per acre that are less than 8" DBH (T/A<8), and trees per acre that are greater than or equal to 8" DBH (T/A≥8). The values for the down woody fuels and ground fuels are in tons per acre. Values in bold type are significantly different from other values in the same column ($p \leq 0.05$). As can be seen, the mixed conifer vegetation type consistently exhibits the highest fuel loads in both canyon and mountain settings. On the other hand, the ponderosa pine also exhibits significantly more 10 hr fuels (i.e., ¼ to 1" size) in both canyon and mesa settings, and a greater number of the larger trees per acre on mesa tops. These smaller fuels can act as ladder fuels to start crown fires in the higher-elevation forests. In contrast, the piñon-juniper woodlands contain significantly more fuel as ground shrubs, grasses, and forbs in both canyon and mesa settings. These fuels are less likely to create severe wildfires.

Table 83.3. Fuels inventory summaries and results of multivariate analyses. Significant values are in bold.

Veg-Topo Class	1 hr	10 hr	100 hr	1K hr S	1K hr R	Duff	Litter	Veg	T/A <8	T/A≥8
PJ-Canyon	0.3	1.2	0.7	0.5	2.9	3.4	0.8	**0.03**	46.4	25.9
PJ-Mesa	0.3	1.6	0.9	1.6	2.9	3.6	1.7	**0.03**	68.7	33.1
Pipo-Canyon	0.2	**1.9**	0.7	0.4	4.4	9.7	0.6	0.01	34.0	42.3
Pipo-Mesa	0.2	**2.3**	0.9	1.3	6.7	8.5	0.9	0.01	52.5	**91.0**
MC-Canyon	**0.9**	**3.1**	**2.5**	1.2	**14.2**	**12.5**	1.4	0.01	**227.9**	**78.7**
MC-Mountain	**0.6**	**2.0**	**3.4**	**3.2**	**28.6**	9.1	0.7	0.01	**222.1**	**121.8**

In summary, there are increasing fuel loads with elevation. We would therefore expect increasing levels of burn severity in these forests. As a consequence of this burn severity, steeper slopes and greater rainfall, we would also expect an increase in the potential for soil erosion at these higher elevations.

THE EFFECTS OF THE CERRO GRANDE FIRE ON ARCHAEOLOGICAL SITES AT LOS ALAMOS NATIONAL LABORATORY

Although the Cerro Grande fire burned a total of approximately 40,000 acres, only about 8000 acres were burned within LANL. This occurred under extreme weather conditions with excessively high winds. As previously discussed by Nisengard et al. (2002), a post-fire assessment was made on all the archaeological sites within the LANL burn area. A total of 384 sites were revisited during the field assessments. Of these, 369 were assessed for burn severity. Burn severity was defined as follows:

1. Low: duff partially consumed, none to little ladder fuels burned, no canopy burned.
2. Moderate: duff consumed, ladder fuel burned, isolated crown burn or torching.
3. High: duff, ladder, and crown completely burned.

Table 83.4 presents the information on burn severity by vegetation type for field-assessed archaeological sites. Overall, about 60 percent of the burned area at LANL is comprised of ponderosa pine. However, about 88 percent of the LANL area that burned did so with low severity, 11 percent with moderate severity, and about 1 percent with high severity. An additional 455 acres were burned in Rendija Canyon on Department of Energy lands. This area is situated within a ponderosa pine setting, with 355 acres of low-burn severity and 110 acres of high-burn severity. Archaeological data from this area are also included in our analysis.

Table 83.4. Burn severity by vegetation type for field-assessed archaeological sites within the Cerro Grande fire burn area at LANL.

Vegetation Type	Total Acres	*Total Archaeological Sites by Burn Severity*		
		Low	Moderate	High
Unvegetated	293	2	0	1
Grassland	814	80	18	2
Juniper Savanna	15	0	0	0
Piñon-Juniper	1394	85	8	11
Ponderosa Pine	4941	61	54	38
Mixed Conifer	624	3	2	2
Total	8081	231	82	54

Based on our previous discussion, we would expect significantly more severely burned sites in the ponderosa pine forest, and that relatively more temporary campsites and fieldhouses would be more severely burned.

So, are there significantly more severely burned sites located in the ponderosa pine forest versus the piñon-juniper woodland? The answer to this question is yes. An analysis of a contingency table of burn severity by vegetation type for field assessed archaeological sites indicates a significant difference in the distribution of sites across piñon-juniper and ponderosa pine zones (Table 83.5) (*chi-sq* = 4.25, *df* = 2, *p*≤001). A review of the adjusted residuals indicates that there are significantly more low severity sites in the piñon-juniper woodlands, and relatively more moderate- and high-severity burned sites in the ponderosa pine forest.

Table 83.5. Burn severity by vegetation type for field-assessed archaeological sites within the Cerro Grande fire burn area at LANL. Top number is the frequency and bottom number is the adjusted residual. Adjusted residuals in bold are significant at the 0.05 level.

Vegetation Type	***Total Archaeological Sites by Burn Severity***		
	Low	**Moderate**	**High**
Piñon-Juniper	85 **6.6**	8 -5.1	11 -2.9
Ponderosa Pine	61 -6.6	54 **5.1**	38 **2.9**
Total	146	62	49

Chi-square = 4.25, df = 2, p≤001

Second, are there significantly more severely burned temporary campsites and fieldhouses in the ponderosa pine versus the piñon-juniper? Table 83.6 presents the information on archaeological site type by burn severity. However, the sample sizes are too small to run a chi-square analysis. Nonetheless, 11 of the 15 (73%) severely burned sites are located in the ponderosa pine, with only four situated in the piñon-juniper. The sites in the ponderosa pine consist of temporary campsites and fieldhouses. Most of the moderately burned sites are also located in the ponderosa pine. That is, 13 of the 19 (68%) sites are situated in the ponderosa pine, with two in the piñon-juniper and four in grassland settings. Given the weather conditions associated with the Cerro Grande fire, patches of moderate- and high-severity burn areas are also present within the piñon-juniper woodlands.

Table 83.6. Archaeological site by field-assessed burn severity.

Site	***Burn Severity***		
	Low	**Moderate**	**High**
Archaic	14	4	3
Lithic Scatter	7	3	0
Coalition Habitation	43	7	1
Coalition Fieldhouse	21	3	2
Classic Fieldhouse	25	1	9

CONCLUSIONS

At the beginning of this chapter, we asked the question "what types of archaeological sites are at greatest risk to wildfires" at LANL. Our archaeological site distribution and fuel inventory studies indicate that those sites situated at higher elevations were potentially at greater risk for burn severity (Table 83.7). This mostly includes Archaic campsites and Ceramic period fieldhouses in the ponderosa pine forest. The evidence from the Cerro Grande Fire provides empirical support for these propositions.

Table 83.7. Burn severity by topographic setting for field-assessed archaeological sites within the Cerro Grande burn area at LANL. Top number is the frequency and bottom number is the adjusted residual. Adjusted residuals in bold are significant at the 0.05 level.

Topographic Setting	***Total Archaeological Sites by Burn Severity***		
	Low	**Moderate**	**High**
Canyon	43 -1.9	15 -0.7	21 **3.5**
Mesa	195 1.9	67 0.7	33 -3.5
Total	238	82	54

Chi-square = 11.95, *df* = 2, *p* = 0.003

CHAPTER 84
THE LAND CONVEYANCE AND TRANSFER PROJECT ARCHAEOLOGICAL SITE RESTORATION PROGRAM

Samuel Loftin

INTRODUCTION

Several archaeological sites were excavated in association with the Land Conveyance and Transfer (C&T) Project. The process of excavating a site removes much of the vegetation and disturbs the soils. Although the sites are relatively small, there is a risk of accelerated soil erosion, site degradation, and impacts to surface water quality. Once the excavation activities have been completed, we have a responsibility to stabilize and restore the integrity of these sites. Because the budget and staff available for site restoration were limited, we decided to use relatively low-tech treatments that could be implemented quickly and easily. Information gained from successful treatments can be used to design future restoration projects.

Following excavation activities, the sites were back filled and graded. Sites were then broadcast seeded by hand with a native grass seed mixture developed for the C&T Project. The seed mix included native grass species such as blue grama (*Bouteloua gracilis*), little bluestem (*Schizachyrium scoparium*), and dropseed (*Sporobolus cryptandrus*). Broadcast seeding alone can result in very low rates of seedling establishment due to inadequate conditions for germination, coupled with high seed predation by birds and insects. This is particularly true for arid and semiarid areas. Northern New Mexico has been experiencing drought conditions for the past eight to ten years. Annual precipitation has been alternating between average to above average one year to below average the next. These conditions can severely reduce the success of seed germination and establishment but are not uncommon for this region. For these reasons, it is beneficial to combine the seeding with some form of mulching treatment. The White Rock and Airport sites were seeded and mulched with straw. The Rendija Canyon sites were seeded and partially covered with piñon and juniper slash mulch to protect the seedbed and to improve establishment.

WHITE ROCK TRACT

The White Rock Tract is partially situated at the eastern tip of Mesita del Buey and within the Cañada del Buey floodplain (Figure 84.1). The area is covered by a piñon-juniper woodland at an elevation ranging from 2133 to 2186 m (6400 to 6560 ft).

LA 12587

The White Rock Tract rehab activities at this site were conducted in the winter of 2003. Seed and straw mulch was surface broadcast by hand. No slash mulch was used at this site. At the time the original photographs were taken, most of the straw mulch had blown off the site (Figure 84.2). By August 2007, the site was dominated by early successional species, primarily purple aster (*Machaeranthera bigelovii*), with scattered individuals of pale trumpet (*Ipomopsis longiflora*), snakeweed (*Gutierrezia sarothrae*), and Russian thistle (*Salsola kali*). Some seeded grasses are present but at low abundance. Although vegetation cover is relatively low (around 15%), there is no visible evidence of soil erosion.

Figure 84.1. Overview of the White Rock Tract showing important landmarks.

Figure 84.2. LA 12587 with extensive bare soils (top) with much of the straw mulch blown off the site. Bottom photo shows establishment of early successional weedy plant species two years later.

AIRPORT TRACT

The Airport Tract is located near the eastern end of the mesa, which is situated between Pueblo and DP canyons (Figure 84.3). It ranges in elevation from 2153 to 2196 m (7060 to 7200 ft) and is primarily covered by a piñon-juniper woodland with areas of ponderosa pine.

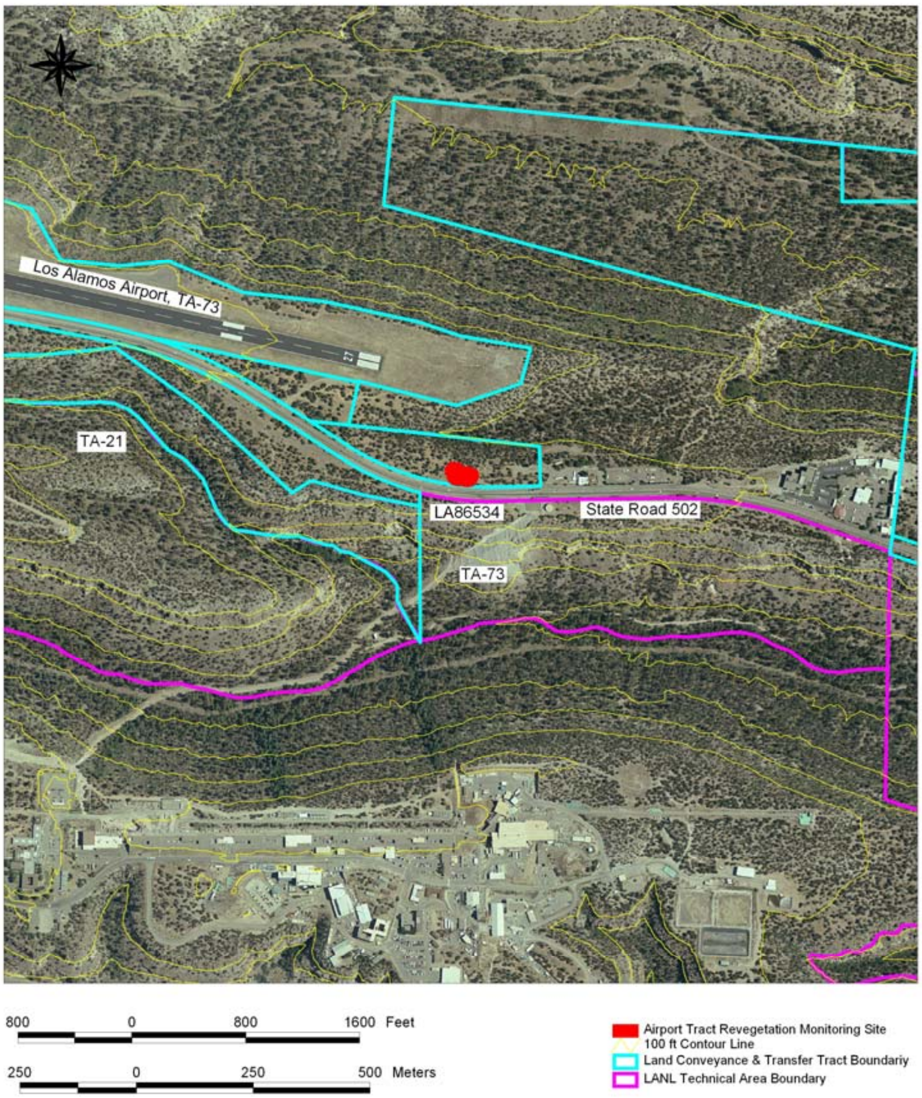


Figure 84.3. Overview of the Airport Tract showing important landmarks.

LA 86534

Archaeological activities at LA 86534 were completed in October 2002. The site was broadcast seeded by hand and then straw mulch was applied. No slash mulch was used at this site. The early photograph show that most of the straw mulch has blown off the site (Figures 84.4 and 84.5). The photos also show a nice stand of early successional plants, mostly lambsquarters (*Chenopodium album*). By August 2007 there had been a distinct change in vegetation. The site is dominated by grasses, mostly native perennials bottlebrush squirreltail (*Elymus elymoides*) and needle and thread grass (*Stipa comata*). There is also substantial cheatgrass (*Bromus techtorum*) cover, a non-native annual grass species. Other incidental plant species include blue aster and snakeweed. Average cover at the site is around 50 percent and there is no visible sign of soil erosion.

Figure 84.4. LA 86534 in the first growing season following seeding treatment; most of the understory plants are early successional weedy plant species.

Figure 84.5. LA 86534 in August of 2007 shows fewer weedy plants and more grasses. Note that the mature piñons have died and been removed from the site. A small piñon tree can be seen in foreground of both photos.

RENDIJA TRACT

The Rendija Tract contains portions of Rendija and Cabra canyons and ranges in elevation from 2293 to 4226 m (6880 to 7280 ft) (Figure 84.6). The lower canyon area is covered by a ponderosa pine forest, whereas, the mesa top areas are covered by a piñon-juniper woodland. The following sites were all located in these mesa top settings.

LA 85408

Rehab treatments on this site were conducted in summer 2005. The treatment included broadcast seeding by hand and then lightly covering with slash mulch that was scavenged from the trees that had been cut to clear the site. Figure 84.7 shows bare, loose, rocky soils with a light slash mulch, and how the same locale looked in August 2007 when grass cover averages around 50 percent. The vegetation is dominated by blue grama with some little bluestem. Another locale at the site (Figure 84.8) shows less vegetation cover (15% to 20%) but more surface rock to protect the soil from erosion. Neither locale at the site shows any visible evidence of soil erosion.

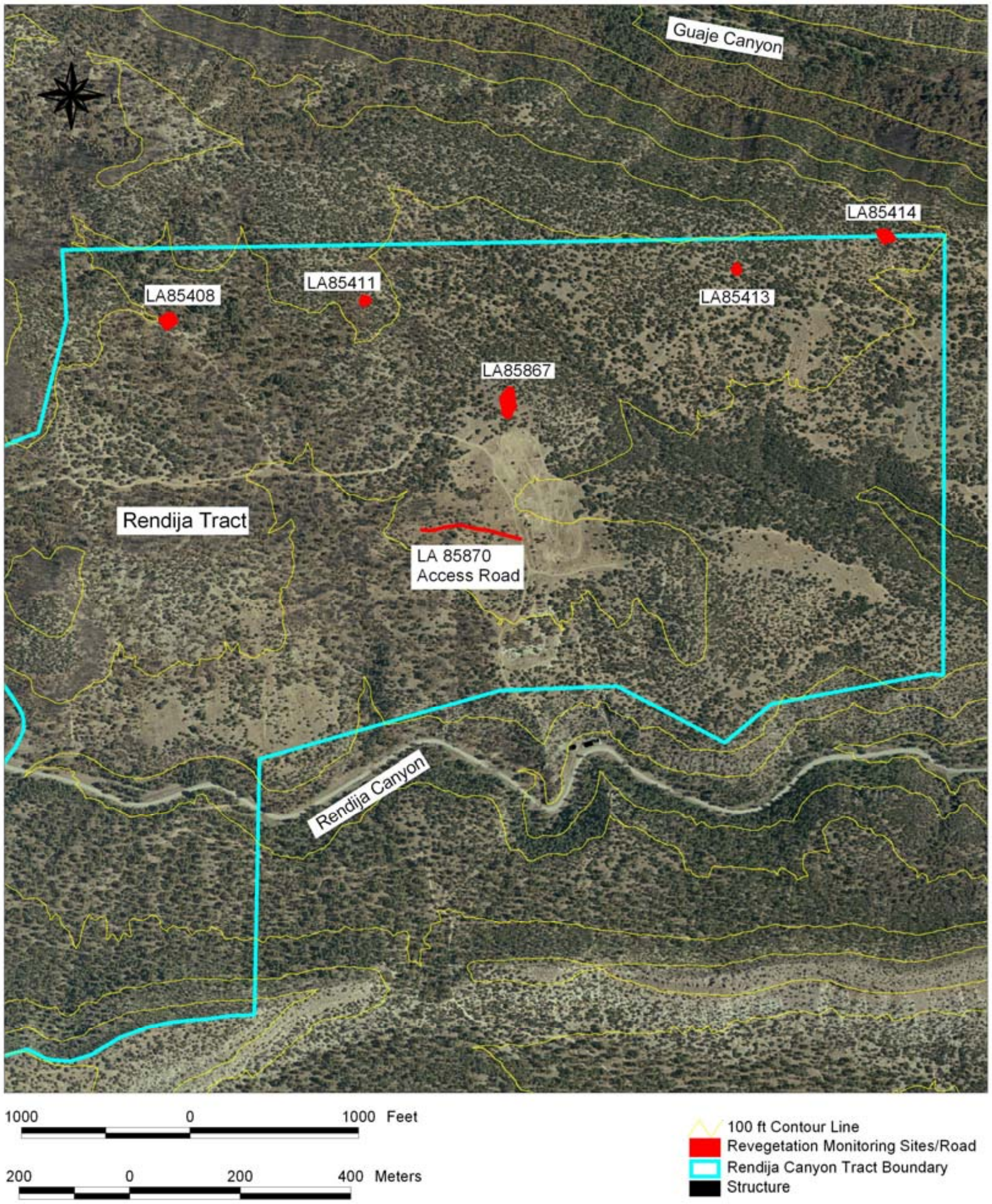


Figure 84.6. Overview of the Rendija Tract showing important landmarks.

Figure 84.7. Top photo shows one locale at LA 85408 shortly after seed and mulch were applied in the summer of 2005. The bottom photo shows the response after two years when the site is dominated by blue grama and soils are well stabilized.

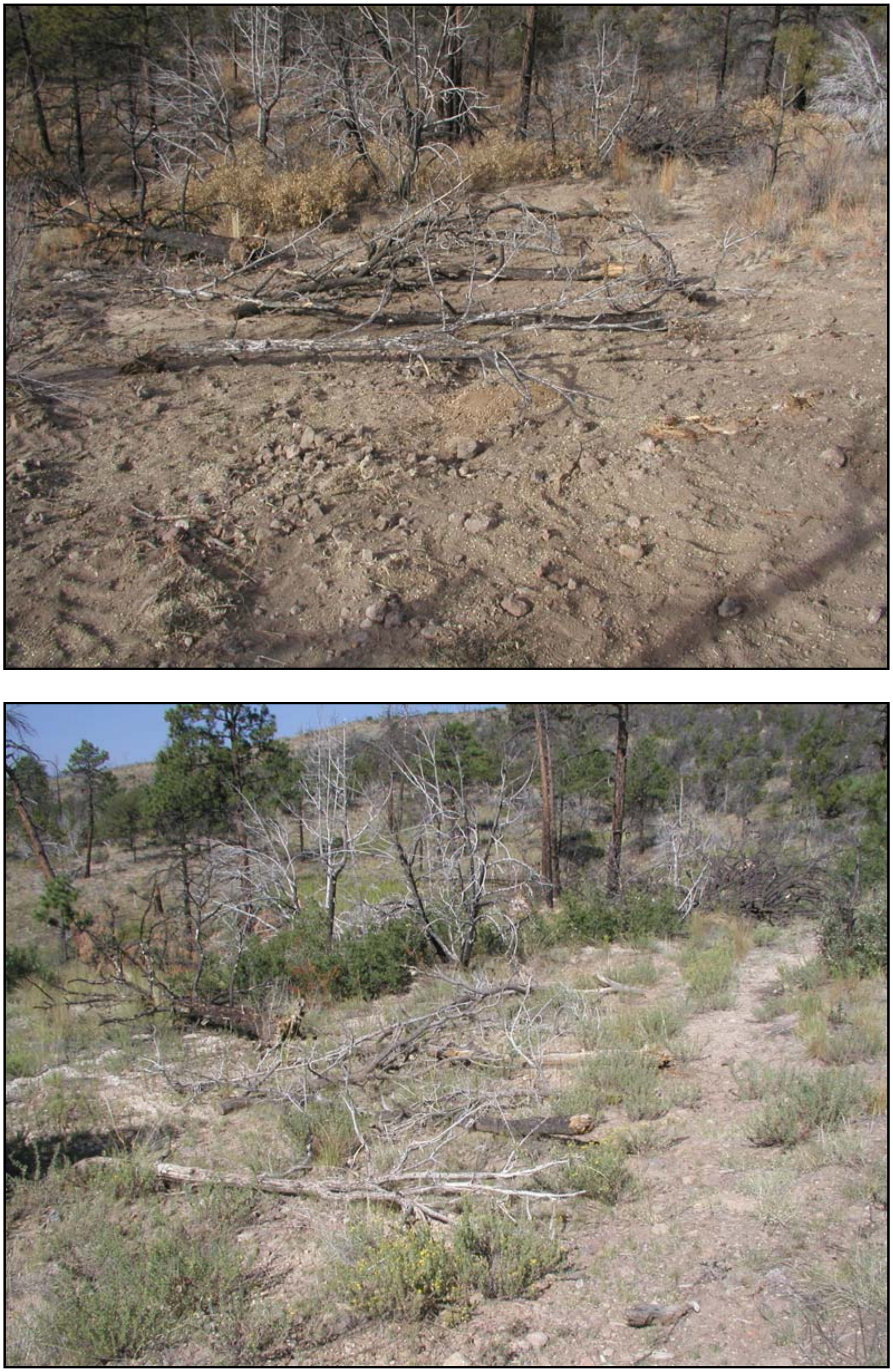


Figure 84.8. Adjacent to the locale shown in Figure 84.7, this locale has less establishment by seeded grass and better establishment from resident plants. Top is shown in summer of 2005 and bottom is summer of 2007.

LA 85411

Rehab treatments on this site were conducted in summer 2005. The treatment included broadcast seeding by hand and then lightly covering with slash mulch that was scavenged from the trees that had been cut to clear the site. The original photograph (top) shows loose bare soils with slash mulch (Figure 84.9). The later photo (bottom) shows substantial vegetation cover. There is good establishment of blue grama, particularly around the perimeter of the site. There appears to be some gopher activity in the center of the site, which is dominated by blue aster and other weedy species. There is a lot of dead plant litter on the site from past growing seasons and there are several resprouting oaks. There is no visible evidence of erosion on the site.

LA 85413

Rehab treatments on this site were conducted in summer 2005. The treatment included broadcast seeding by hand and then lightly covering with slash mulch that was scavenged from the trees that had been cut to clear the site. The original photograph shows loose bare soils with slash mulch. By August of 2007 there is a thick stand of blue grama on the site (see Figure 84.10), with few other plant species present. The blue grama cover averages 70 percent to 80 percent and is adequate to control soil erosion at the site.

LA 85867

Rehab treatments on this site were conducted in summer 2005. The treatment included broadcast seeding by hand and then lightly covering with slash mulch that was scavenged from the trees that had been cut to clear the site. The original photos show loose bare soils with slash mulch and some tracks left by the heavy equipment used to prep the site. The August 2007 photograph shows good vegetation cover on the site. Again, the blue grama has successfully established throughout the site, particularly under or around the slash (see Figure 84.11). The site appears stable with no visible evidence of erosion.

LA 85414

Rehab treatments on this site were conducted in summer 2005. The treatment included broadcast seeding by hand and then lightly covering with slash mulch that was scavenged from the trees that had been cut to clear the site. The original photograph shows loose bare soils with slash mulch (Figure 84.12). The August 2007 photo shows an excellent stand of blue grama (70 to 75% cover), substantially better than in surrounding undisturbed areas. Few other plant species are present on the site. Even with a slope of around 20 percent, there is no visible evidence of soil erosion at this site.

Figure 84.9. Top photo shows LA 85411 shortly after seed and mulch were applied in summer 2005. Bottom photo shows vegetation response after two years. This site still has a substantial weedy plant component along with some seeded blue grama. Judging by the amount of dead plant material on the site, there has been a substantial crop of weedy plants on the site over the past two years.

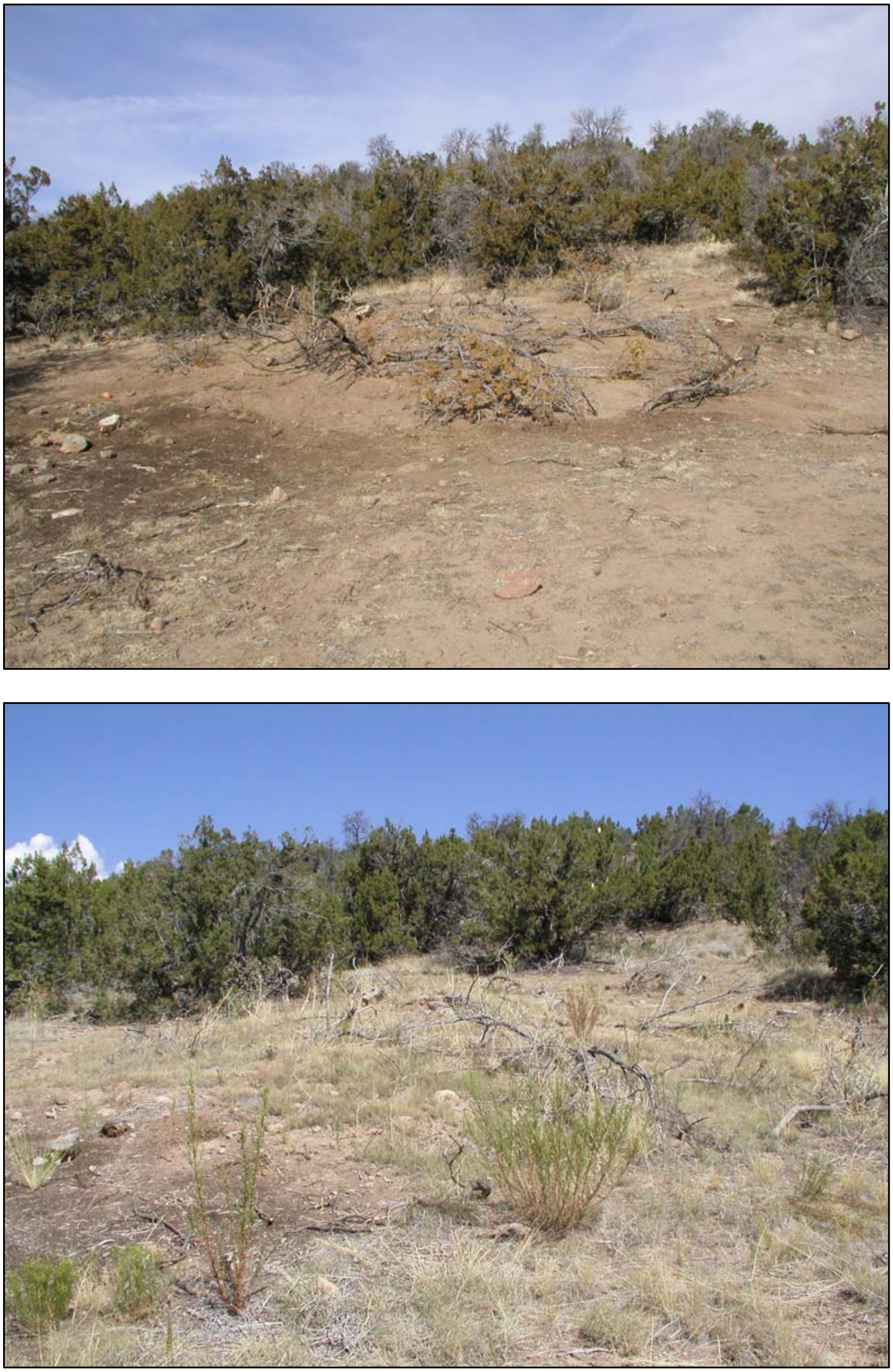


Figure 84.10. Top photo shows LA 85413 shortly after seed and mulch were applied in summer 2005. Bottom photo shows vegetation response after two years. Vegetation on this site is almost exclusively blue grama.

Figure 84.11. Top photo shows LA 85867 shortly after seed and mulch were applied in summer 2005. Bottom photo shows vegetation response after two years. Vegetation on this site is almost exclusively blue grama.

Figure 84.12. Top photo shows LA 85414 shortly after seed and mulch were applied in summer 2005. Bottom photo shows vegetation response after two years. Again, vegetation on this site is almost exclusively blue grama.

Road to LA 85417

This site is a road section that was constructed for access to LA 85417. Rehabilitation treatments were conducted in summer 2005. The treatment included broadcast seeding by hand with no mulch application. After two years, some vegetation (mostly blue grama) was re-established on site mostly in the tracks where water collects (Figure 84.13). The site has little slope and does not appear to be overly impacted by vehicular traffic. There is no visible evidence of erosion.

Figure 84.13. Top photo shows LA 85414 shortly after seed was applied in summer 2005. Bottom photo shows vegetation response after two years. Resident species have resprouted in the road median and there is some vegetation growing in the tracks.

CONCLUSIONS

Despite less than desirable precipitation during the project period, all the sites are stable with no evidence of soil erosion. The Airport and White Rock sites (LA 12587 and LA 86534) are dominated by weedy plants but this is a typical response for disturbed areas and native perennial plants should establish in time. The best seeded vegetation establishment was observed at the Rendija Canyon sites where we used a slash mulch to protect the seedbed (Figure 84.14). Interestingly, blue grama was the only grass from seed mix to successfully establish at these sites. For comparison, we photographed one of the Jicarilla tipi ring sites that received no rehabilitation treatments. The site is still bare with little vegetation cover (Figure 84.15).

Figure 84.14. Photo of juniper slash with blue grama established under and around the protective cover of the dead limbs. Slash improves microsite conditions for seed germination and establishment and provides some physical protection.

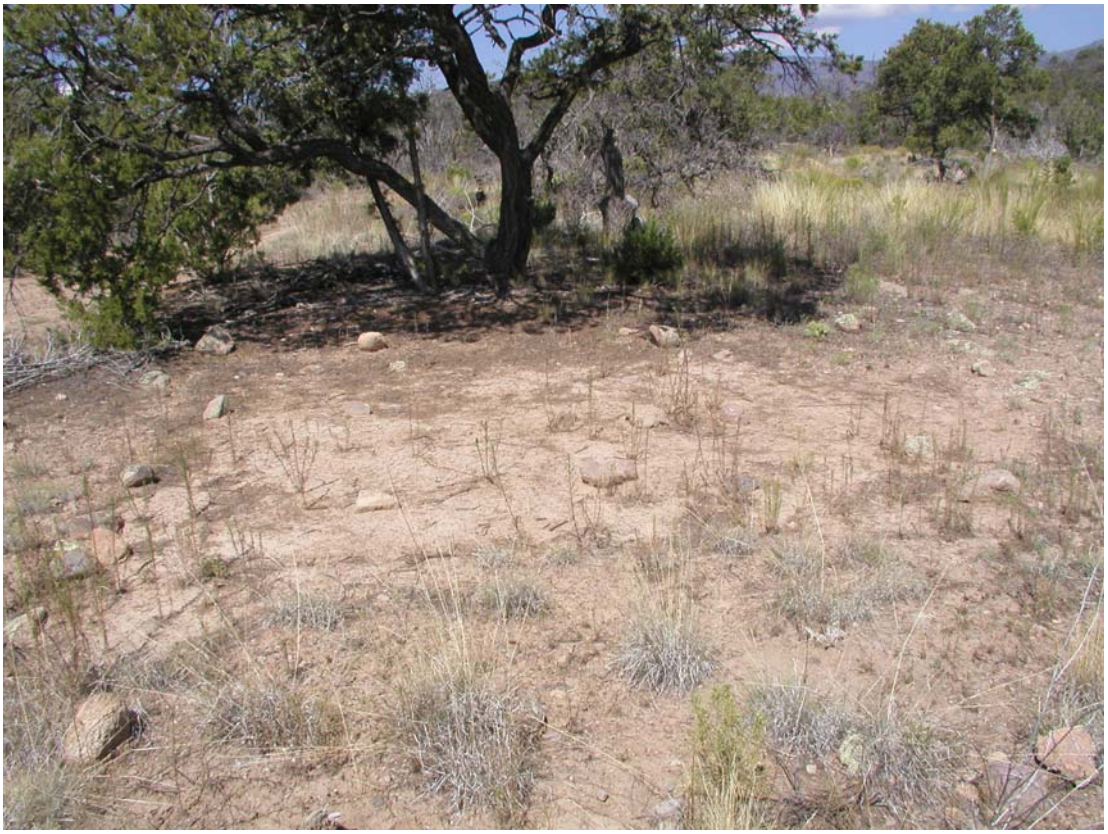


Figure 84.15. Photo of site with no rehab treatments. Although this site is relatively small, after two years the soils remain mostly bare with little vegetation reestablishment.

The results of this project suggest the importance of protective microsites for seed germination and seedling establishment. Broadcast seeding with a slash mulch performed better than other treatments. A surface straw mulch can be helpful, but if there is nothing holding it down it will often blow off the site. I would still recommend using a seed mix with several species. It may have been the case that the climatic factors following these treatments were optimal for blue grama grass. Other years may favor other grass species so it is best to hedge our bets when we can.

CHAPTER 85
PERSONAL PERSPECTIVES ON THE NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT TRIBAL MONITOR PROGRAM OF THE PUEBLOS OF SAN ILDEFONSO AND SANTA CLARA

Timothy Martinez, Jeremy Yepa, Aaron Gonzales

Los Alamos National Laboratory (LANL) is situated on lands considered to be affiliated with San Ildefonso and Santa Clara Pueblos. A Tribal Monitor Program was set up for the Conveyance and Transfer (C&T) Project archaeological excavations as part of the initial 2002 Intentional Excavation Agreement in compliance with NAGPRA—the Native American Graves Protection and Repatriation Act (see Chapter 72, Volume 3).

San Ildefonso and Santa Clara Pueblos provided tribal monitors who were responsible for observing the excavations, identifying any sacred objects, and supervising the treatment of human remains. During the first two field seasons, Aaron Gonzales and Timothy Martinez served as monitors for the Pueblo of San Ildefonso. Beginning in 2004, they were joined by a monitor from the Pueblo of Santa Clara for all work conducted in Rendija Canyon. Michael Chavarria, Sr., served as the Pueblo of Santa Clara monitor in Rendija Canyon for the 2004 field season. He was replaced in 2005 first by Paul Baca and then by Jeremy Yepa. This chapter presents the views of Martinez, Yepa, and Gonzales (Figure 85.1).

Figure 85.1. Tribal Monitors Aaron Gonzales, Jeremy Yepa, and Timothy Martinez.

STATEMENT OF TIMOTHY MARTINEZ – PUEBLO OF SAN ILDEFONSO

***Powhoge Oweenge* "Where the water cuts through"**

The Pajarito Plateau is the traditional setting of the Pueblo of San Ildefonso. These lands continue to be acknowledged in the songs and prayers of our Tewa people.

I was hired by Los Alamos National Laboratory as the Pueblo of San Ildefonso Tribal Monitor from 2002 through 2006 for the Intentional Archeological Excavation, pursuant to lands managed by the Los Alamos National Laboratory in the Northern New Mexico for the U.S. Department of Energy, in order to create a framework for effective compliance with the Conveyance and Transfer of Lands from Federal Ownership under P.L. 105.119, as well as the Native American Graves Protection and Repatriation Act (NAGPRA), enacted in 1990.

The Excavation and Repatriation Process

As a tribal monitor, I observed the conduct of the excavations as well as treatment of any human remains, funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony that were encountered during the excavations (Figure 85.2).

Figure 85.2. Tim Martinez observing artifact collecting at LA 86534.

Training

Training for the job of monitor included taking the annual CPR, First Aid, Defensive Driving, Substance Abuse Awareness, Computer Security, Annual Security Refresher, and Ordinance Training courses, as well as reading the Environmental Management Awareness System (EMS), Archaeology Excavation, and Lab Safety training manuals.

Excavation

Project work included excavations from four major periods: (1) Archaic, 6000 BC to AD 500; (2) Coalition, AD 1100 to 1325; (3) Classic, AD 1325 to 1600; and (4) Homestead, 1890 to 1943. Excavated site types included lithic scatters, artifact scatters, fieldhouses, roomblocks, garden plots, water control features, tipi/wickiup rings, a homestead, a corral, and a wagon road. Over 40 sites were excavated in three separate C&T parcels: the Airport Tract, the White Rock Tract, and the Rendija Tract.

Laboratory and Field Work

Laboratory and field work activities consisted of flotation, mapping, monitoring access gates, counting, cleaning, washing and re-bagging artifacts, organizing the lab, printing labels, labeling boxes, organizing equipment, and conducting inventory (Figures 85.3 and 85.4).

Figure 85.3. Timothy Martinez screening at one of the sites in the White Rock tract.

Figure 85.4. Bettina Kuru'es and Tim Martinez processing flotation samples.

Meetings

A wide variety of meetings touched upon the C&T archaeological excavations. These included monthly group meetings, weekly team meetings, Resource Council meetings, Tribal Consultation, LANL NAGPRA meetings, and the Trails Working Group meetings.

Repatriation

In December of 2005, I oversaw repatriation and interment of 34 remains from the Maxwell Museum in Albuquerque, one ceremonial object from the Laboratory of Anthropology, three remains from the White Rock site, and one inadvertent discovery from TA-72.

Recommendations

Consultation is the key requirement of any Intentional Archeological Excavation. Museum and Federal agencies must consult with Indian Tribes prior to making decisions. Consultation is a process involving open discussion and joint deliberation with respect to potential issues, changes, or actions. Consultations regarding activities that affect tribal trust resources or property must be carried out on a government-to-government basis.

Unclaimed Native American human remains and objects shall be disposed of in accordance with regulations. Native American groups and representatives of museums should be consulted. Initiate consultation on the inadvertent discovery if human remains must be excavated or removed. Enter into agreement with the consent of culturally affiliated tribe or organization as to the disposition of, or control of, specific items.

Consultation must seek to identify traditional religious leaders who would also be consulted to identify where applicable lineal descendents and Indian Tribes (Pueblo) affiliated with the human remains, funerary objects, sacred objects, or objects of cultural patrimony.

Conclusion

Archaeology is not only about digging up the past, it's about history and education. It's about learning how our ancestors lived, what plants they grew, what they ate, how they built their home. It's also about working with a group of people of various backgrounds, and personalities, and working as a team. The excavations of all the sites were done with the utmost respect by the field crew through communication, protocol, enforcement, and compliance (Figure 85.5).

Figure 85.5. Completion of excavations at LA 127635.

STATEMENT OF JEREMY YEPA – PUEBLO OF SANTA CLARA

My name is Jeremy Yepa. I worked as the tribal monitor for the Pueblo of Santa Clara from 2005 to the end of the C&T Project. Since coming to work with the Cultural Resources Team, I observed and participated in many of the excavations of sites in Cabra and Rendija canyons located north of Barranca Mesa. I monitored the excavations for human remains and burial and sacred artifacts to ensure that the NAGPRA guidelines were followed and proper repatriation to the respective pueblo would be assured. This experience was very educational as both a student and a tribal member. The C&T Project set up a framework for communication between DOE, LANL, and the four accord Pueblos and was a model for any relations between tribes and the government (Figure 85.6).

Figure 85.6. Tim Martinez and Jeremy Yepa discussing issues in Rendija Canyon.

I began working as a Santa Clara tribal monitor in the latter part of August 2005. I hired on as a full time undergraduate student. Employed through the UGS program, I came on board on June 5. At the start of my employment, Paul Baca was the Santa Clara Pueblo Monitor. Due to personal issues he was unable to continue his work with the Cultural Resources Team. With the agreement of Vicki Loucks, Brad Vierra, Bruce Masse, and Santa Clara Pueblo officials, I became the interim monitor until a replacement for Mr. Baca was found. At the end of August and not having found a suitable replacement, Santa Clara Pueblo and LANL selected me to continue as the Santa Clara tribal monitor for the duration of the C&T Project.

Through the course of my employment at LANL, I observed and excavated many sites throughout Cabra and Rendija canyons. These sites included prehistoric fieldhouses, artifact scatters, agricultural plots, water diversion formations, tipi/wikiup rings, traditional cultural properties (observed but not excavated), and the historic Serna Homestead (Figure 85.7). As an undergraduate student, I excavated at each site. It was a new and gratifying experience. I learned so much about archaeology through my employment at LANL. I learned about stratigraphic distinctions, recording excavation unit elevations, measurements, and artifacts, and sweeping the site for clues to its history and its inhabitants such as pollen samples, dendrochronology, charcoal/macrobotanical samples, flotation samples, and the condition of artifacts as they come out of the site. I definitely learned that there is more to archaeology than just digging. It taught me a lot more about my culture, my ancestors, and where we came from. Because one of my majors is computer science, I was given the opportunity to work with the GPS unit. For a project for Santa Clara Pueblo, Brian Harmon, a full time archaeological contractor with LANL, mentored me in plotting out a Traditional Cultural Property (TCP) and then I aided him in superimposing the GPS points onto a topographical map. The invaluable experience and knowledge that I have developed through my time working here will greatly help me to achieve my goals and to better help my people.

Figure 85.7. Jeremy Yepa excavating a fieldhouse in Rendija Canyon.

In addition to my duties as an undergraduate student employee, I was also the tribal monitor for Santa Clara Pueblo. I was trained on NAGPRA guidelines and other issues that are currently a concern for DOE, LANL, and Santa Clara and San Ildefonso Pueblos. I also obtained on the job training on excavating, recording data in the field, screening artifacts (Figure 85.8), and site profiling. As monitor, my duties were screening buckets excavated from the site and identifying NAGPRA defined funerary and sacred artifacts, as well as, non-NAGPRA related artifacts.

Figure 85.8. Jeremy Yepa screening excavation fill at a site in Rendija Canyon.

As a LANL liaison to Santa Clara and DOE, I coordinated negotiations between DOE, LANL, the Santa Clara Tribal Council, and the Santa Clara Environmental Department that resulted with the Santa Clara Pueblo being able to claim two sites located in Rendija Canyon as Traditional Cultural Properties (TCPs). By claiming a site a TCP, the site will be protected from development and Pueblo members will be able to access the site once the Los Alamos County takes over. I also advised the tribe to register the site for the New Mexico Historic Preservation Department's Cultural Properties Review. By being on the list, the tribe can receive assistance for protecting, restoring, and cleanup of the site. The negotiations happened over several meetings that occurred in Santa Clara Pueblo and at LANL with myself, Brad Vierra, Bruce Masse, Vicki Loucks, members of the Santa Clara Tribal Council, and the Santa Clara Environmental Department. In addition to the consultation meetings we had with the tribe, we also provided several tours for Tribal Council members, elders, and department administrators of the sites in the Rendija Canyon. I feel, in addition to the training I received with LANL, that I also have had beneficial experience dealing with my pueblo's Environmental Department, Office of Land Claims and the Tribal Council. It will set up a basis for future employment or consultation opportunities. This experience will directly help me achieve my goals of assisting my tribe to better ourselves.

Overall, the project, in my opinion, was successful. I think that it is a model for future relations between tribes and the government. This project sets precedence for future attempts at a working relationship between these two entities. The bond that was once nonexistent now extends strong from the accord pueblos to the lab, strengthening as we move forward. However, I think that involving the youth, in addition to the elders and tribal representatives of the tribes, may be even more beneficial to the tribes and their futures. Decisions cannot be made without knowing the past. It is imperative that the youth, our future leaders, learn where we come from and who we are so that they are better prepared to lead us in the right direction. It would also be more beneficial to the tribe to involve the whole community by offering presentations at centralized community centers of what is being done. In the end, it was a rewarding experience. I learned the various aspects of archaeology, more history of my people, and helped my pueblo.

STATEMENT OF AARON GONZALES – PUEBLO OF SAN ILDEFONSO

My name is Aaron Gonzales; I am one of two Tribal Monitors from San Ildefonso Pueblo for the Los Alamos National Laboratory's (LANL) Land Conveyance and Transfer Project (Figure 85.9). I am the San Ildefonso Tribal Sheriff's assistant and a member of the Tribal council as well. I was born and raised at the Pueblo. I have been working for LANL, monitoring the archaeological excavations that are part of the C&T Project since May 2002. It has been a great honor to participate in the consultation process with LANL. In addition to being a great learning experience, I feel that having tribal monitors work with archaeologists on their projects is something that is long overdue. Only recently has San Ildefonso been invited to participate actively with the DOE and LANL. We hope that the C&T Project will be a stepping stone to a better working relationship with the Pueblo of San Ildefonso as well as a model for future projects.

Traditionally, the people of San Ildefonso have not condoned excavations of any ancestral sites situated on tribal lands. However, we are excited to have an opportunity to share our perspectives about culturally significant sites situated on LANL lands with archaeologists and other LANL and DOE officials after all this time. Many sites, situated on LANL property, have been excavated since the inception of both entities. To my knowledge, some of these excavations have not been properly documented, thus presenting the Pueblo of San Ildefonso with many unanswered questions regarding where some cultural, ceremonial, and human remains originated.

I feel that this project has been a huge step for LANL in the sense that it is finally seeking the advice from the Native People who once called the Pajarito Plateau home. We no longer reside on the plateau, but our spiritual ties will be with us forever. I hope that this project is only a stepping-stone to a good working relationship with our tribe for the future. There are a lot of other archaeological sites on Laboratory property. As Tribal Monitors, I hope we will be asked to help or give guidance to LANL when the need arises. As long as there are sites being disturbed on LANL land, there will most likely be NAGPRA issues. I hope that DOE and LANL will work with San Ildefonso Pueblo to create a "NAGPRA Excavation/Testing Agreement" where monitors from the San Ildefonso Pueblo will observe and give advice during any future archeological excavations. As a monitor and tribal official, I feel that the tribe has much to learn from DOE/LANL, and vice versa, if only we are all given the opportunity.

Figure 85.9. Aaron Gonzales and Tim Martinez, San Ildefonso Tribal Monitors.

As a Tribal monitor for San Ildefonso Pueblo, I have come to realize that while we do not condone the excavations of any ancestral site, the C&T excavations had to occur in accordance with federal law. I feel that the project has opened a lot of doors for the Pueblo of San Ildefonso and is the first to be referred to the Pueblo. The Pueblo had a impact on "WHAT" was excavated, and most importantly "HOW" sites were excavated. Although LANL is one of our closest neighbors, the dialogue between our communities has been difficult and sometimes questionable. I feel that C&T marked the beginning of a great and positive relationship between our two entities.

I have expressed several concerns, questions, and comments regarding the Draft Comprehensive Agreement. Since then, we had several meetings about Tim Martinez's and my concerns to correct or adjust the 2002 Draft Comprehensive Agreement. I feel that this document should remain a draft so that it can be open to modification if the need arises. During the 2003 field season, we did not encounter any NAGPRA related items, so it was not necessary to consult the agreement or follow the protocol established in the 2002 document. Several Jicarilla Apache tribal elders visited the tipi ring sites. The tribal elders were able to see their ancestral site and provide us with some information about the kinds of things we might expect to find. We also had several site visits by members of San Ildefonso and Santa Clara Pueblos.

A monitor's job description is detailed in the Comprehensive Agreement between DOE/LANL and San Ildefonso Pueblo (see Chapter 72, Volume 3), and was a great learning experience. Not only was I a monitor, but I was also given the opportunity to be an active member of the field and laboratory crews and I am grateful for that (Figure 85.10). I helped with screening for artifacts, washed artifacts and processed flotation samples, and in early 2004 I began illustrating artifacts we found during the C&T Project. Examples of my illustrations are included in Volumes 2 and 3. These illustrations took a considerable amount of time and I took great pride in doing them.

Figure 85.10. Aaron Gonzales, processing flotation samples.

I have learned a lot about what is out there on our ancestral lands and from now on, I will look at things differently. I now know about rock alignments, one- to three-room structures/fieldhouses, grid gardens, artifact scatters, and other features and artifacts. Throughout this project, I have seen things and been a part of things I never would have known about otherwise. I wish that more of the people from San Ildefonso could be given the same opportunities as I have had.

There are three highlights from my time here at LANL with the Cultural Resources Team. One of the highlights was the trip the Trails Assessment Working group took to Mortandad Cave Kiva. I have lived in northern New Mexico all my life and have sat on the San Ildefonso side of the fence facing Mortandad Cave Kiva many times, but I had never been across the fence because of all the ‘No Trespassing’ signs. To some of the people who came to hike the Mortandad trail it was just a little trip we took, but to me it was something more and I will always remember it.

The second highlight was when I visited Nake'muu. Just to be there at the site and to know that it is still right there, smack in the middle of LANL is just amazing. There must be some strong spirits there. A lot of times when I see places like that, I contemplate things like, what is in store for the rest of us? What is our mission in life? Why did this place last for so long? My life is only a passing wind to a place like that. It was there before my time and it will be there long after I am gone. If only I can make such a lasting impression on this world.

The third highlight of my time here at LANL was the repatriation of the remains and sacred objects that had been removed from their original resting places. I am very proud to have been a part of the repatriation.

Finally, I am proud of the artifact illustrations and other designs I have done during the C&T Project. I feel that I have made a small, but lasting contribution to the project. I come from a long line of artists and I have them to thank for my talent.

I hope that the C&T project will just be the beginning of a long relationship between LANL/DOE and San Ildefonso. I also hope that if any other projects arise, then LANL would first consult with San Ildefonso and other affiliated Pueblos. I feel that too many years and too many decisions have been made without consulting with the Pueblo people who were on these lands first.

CHAPTER 86
RESEARCH QUESTIONS AND CONCLUSIONS

Bradley J. Vierra

INTRODUCTION

Approximately 10,000 years of human occupation are represented on the Pajarito Plateau. This includes the initial use of the area by Clovis hunter-gatherers and, more recently, the nuclear research conducted by the Manhattan Project. During this long history, the plateau has witnessed various periods of sporadic and intense occupation. Most notable of these are the Coalition and Classic periods (ca. AD 1200–1600), during which many of the archaeological sites on the plateau were constructed, occupied, and later abandoned. Nonetheless, the region was also visited on a seasonal basis by Archaic foragers, and groups of Navajos and Apaches. But it was not until the turn of the 20th century that the plateau would again witness a return to more permanent residences with Homestead cabins and the founding of Los Alamos National Laboratory (LANL).

Although the plateau has witnessed almost 100 years of archaeological research, very little of this work has been published in synthetic reports. Most notable of these is the work of Hewett and Wilson at the large Classic period sites of Otowi and Tsirege (Hewett 1906, 1938; Wilson 1916a, 1916b, 1918a, 1918b). Not until the 1950s to 1970s would there be a resurgence in the excavation of sites on the plateau by Worman, Steen, and the Los Alamos Archaeological Society; however, little of this work has been fully published (Fretwell 1954, 1959; Maxon 1969; Poore 1981; Steen 1974, 1977, 1982; Worman 1967; Worman and Steen 1978; Young 1954). More recently, three major survey projects have been conducted on the plateau. The Pajarito Archaeological Research Project (PARP) (Hill and Trierweiler 1986; Hill et al. 1996), the Bandelier Archaeological Survey (BAS) (Powers and Orcutt 1999a, 1999b), and the Land Conveyance and Transfer (C&T) Project (Hoagland et al. 2000). In the latter two cases, detailed reports presenting the results of these surveys were completed. Reports were also done for small-scale excavations conducted by Washington State University in conjunction with the BAS Project (Kohler 1989, 1990; Kohler and Linse 1993; Kohler and Root 1992b). However, only a series of theses and dissertations and a single summary article were ever written for the PARP. All of this underscores the general lack of data currently available on the archaeology of the Pajarito Plateau.

A total of 39 archaeological sites were excavated as part of the Data Recovery Program for the C&T Project. A series of research contexts have already been proposed in the Cultural Resource Management Plan for Los Alamos National Laboratory and provided in the project data recovery plan (Vierra et al. 2002; Vierra and Schmidt 2006). These contexts consist of chronometrics, geoarchaeology, paleoenvironment, land-use, community and site organization, subsistence and seasonality, and technology, production, and exchange. These research domains provide the framework for identifying specific research questions that can be used to help determine the potential eligibility of sites for inclusion to the National Register of Historic Places. Here, they provide a research design to guide the excavation and analysis of data obtained from the sites located within the C&T Project area. This chapter addresses the results of the project excavations in respect to a series of detailed research questions that were provided in the original data recovery plan (Vierra et al. 2002).

CHRONOMETRIC DATING RESEARCH QUESTIONS

1. **What period do the sites date to, and is there evidence of multiple occupational episodes?**

Harmon and Vierra (Chapter 69, Volume 3) reviewed the chronometric information on the excavated sites and presented a coherent sequence for these. Four sites were assigned to the Archaic period: LA 85859, LA 99396, LA 99397, and Area 8 at LA 12587. Three charcoal dates were submitted from the lower levels of LA 85859 providing a calibrated intercept range from 5300 to 4860 BC. This site presumably dates to the Early Archaic period. LA 99396 and LA 99397 can be tentatively assigned to the Middle to Late Archaic period. The Archaic component consists of a surface lithic scatter with possible Middle to Late Archaic points. Obsidian hydration dates indicate a possible Middle to Late Archaic period occupation. Lastly, LA 99397 is a surface scatter with subsurface deposits. Two charcoal dates from the upper levels provided calibrated intercepts of 380 and 160 BC, with obsidian hydration dates ranging from Middle- to-Late Archaic. A single possible Late Archaic site was identified in the White Rock Tract. LA 12587 (Area 8) contains Late Archaic projectile points. Late Archaic points were also recovered at several multi-component surface scatters: LA 86533, LA 86637, and LA 139418.

Table 86.1 summarizes the Ancestral Pueblo temporal sequence for the sites. It has been separated into nine categories: Indeterminate Pueblo, Indeterminate Coalition, Coalition 1, Coalition 2, Coalition2/Classic 1, Indeterminate Classic, and Classic 1, Classic 2, and Classic 3 based on the chronometric and ceramic dates. LA 4618 and LA 4619 were not excavated during the C&T Project, but are included since they are located near the White Rock Tract on Mesita del Buey (Hoagland 2007; Schmidt 2006). The Coalition period sequence includes both roomblocks and fieldhouses, whereas the Classic period sequence solely includes fieldhouses. The temporal sequence for the Coalition roomblock sites consists of LA 86534, LA 135290, LA 4618, LA 12587, and LA 4619.

Architectural remodeling was solely identified at the Coalition period roomblock site of LA 135290. At least three occupation episodes were identified, including multiple floors and features. One hearth was remodeled at LA 86534 and consisted of two use-events. However, three separate components were found at LA 12587. The first component consists of a Late Coalition roomblock, the second component is an unfinished linear roomblock that also dates to the Late Coalition period, and the third component is a Classic period fieldhouse with multiple agricultural features. In addition, at least one fieldhouse in Rendija Canyon may have been reused. The hearth at LA 127635 was radiocarbon dated to the 13th century, however, the ceramic assemblage appears to represent a later 14th century occupation.

Table 86.1. Ancestral Pueblo site temporal sequence from the C&T Project.

Ind. Pueblo	Ind. Coalition	Coalition 1	Coalition 2	Coalition/ Classic	Ind. Classic	Classic 1	Classic 2	Classic 3
86531	85404+?	85417	4618	4619	85861	85404	70025	15116
127633?	86606	86533-	12587		127625	85411	85411?	85403
	86607	86534	85861+		128803	85413	86637	85408
		99396			139418	85414		86605
		127635+			141505	85867		86606?
		135290				127631		87430
						127635		110126
						135291		110130
								127627?
								127634
								128804
								128805
								135292

In addition to the prehistoric sites, three historic sites were also excavated. LA 85864 and LA 85869 are turn-of-the-20th-century Jicarilla Apache tipi ring sites. Five radiocarbon samples were submitted from the latter site; however, only one returned a date that is clearly associated with the occupation. The 260±40 BP date has several calibrated two-sigma ranges, starting at AD 1520 and ending at AD 1950. A single micaceous sherd did yield a luminescence date of AD 1859±13. The historic bead, metal, and ceramic artifacts also indicate a late 19th or early 20th century occupation at the site.

LA 85407 is the Serna Homestead site in Rendija Canyon. Eight wood construction elements from the cabin and corral were submitted to the Dendrochronology Laboratory at the University of Arizona for tree-ring dating. All the samples were ponderosa pine, with five of the eight yielding dates. However, none provided cutting dates due to the poor preservation of the outside rings, leading to a couple of interpretations. The simplest is that the entire structure was built sometime after 1900, based on the 1900+vv date from Room 2. The historic metal and glass artifacts indicate a late 19th to early 20th century occupation and the ceramics a post-1913 date. This corresponds with oral interviews that indicate the homestead was occupied in the early 1900s.

2. **Do the recovered projectile points resemble types described for the Oshara Tradition? If so, do the associated chronometric dates place them within the time range as defined by Irwin-Williams?**

Very few Archaic projectile points were recovered during the C&T Project excavations. Most of these were found in surface contexts, with no clearly associated chronometric dates. They include Middle and Late Archaic points, with one San Jose point recovered from a Classic period fieldhouse (LA 85411). Figures 86.1 through 86.3 provide examples of Early, Middle and Late Archaic point types from the area.

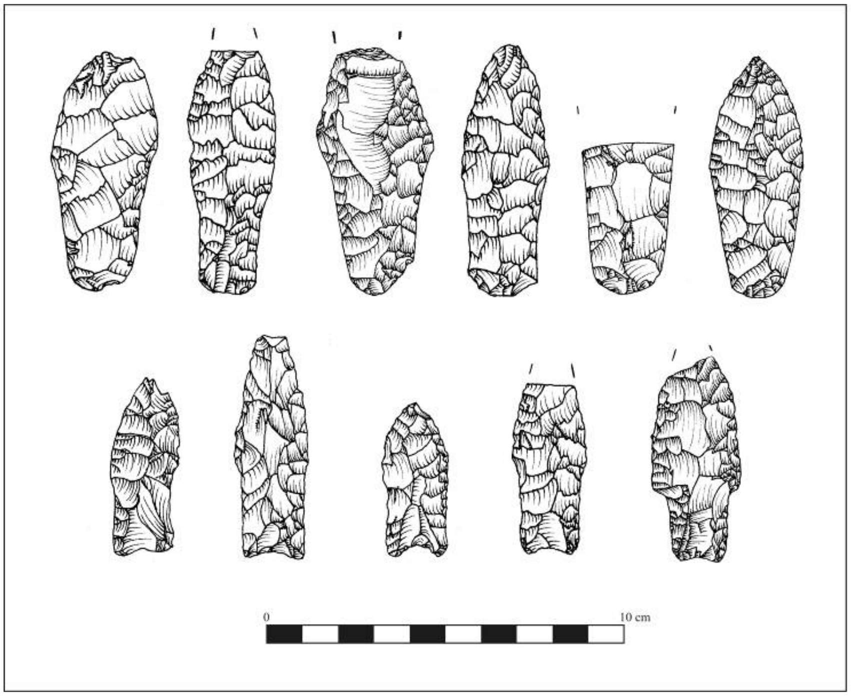


Figure 86.1. Early Archaic points (Jay: upper; Bajada: lower).

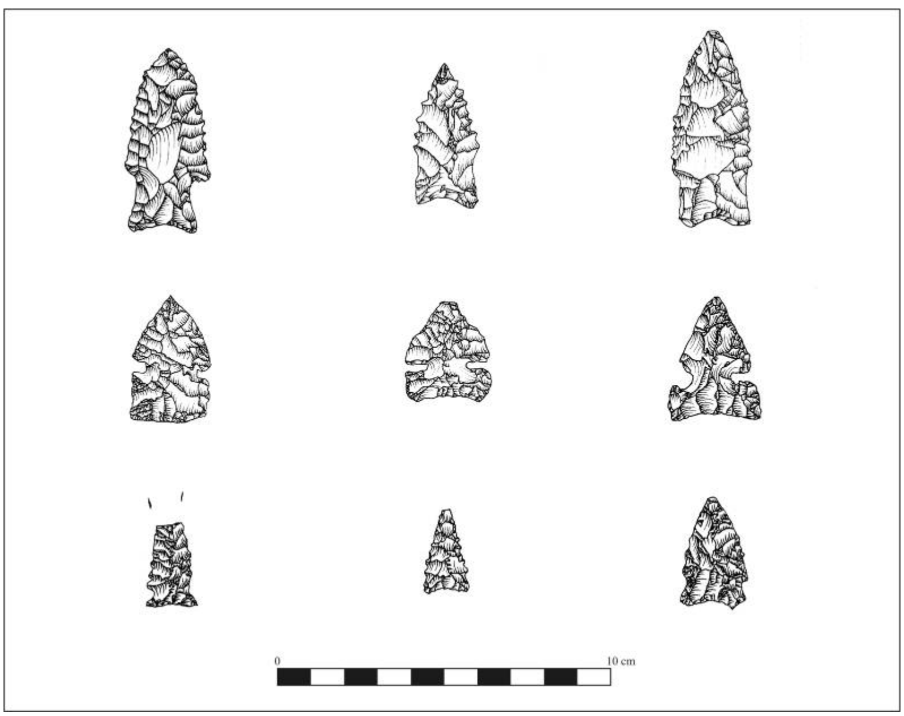


Figure 86.2. Middle and Late Archaic points (San Jose: upper; Large side-notched: middle; Armijo: lower).

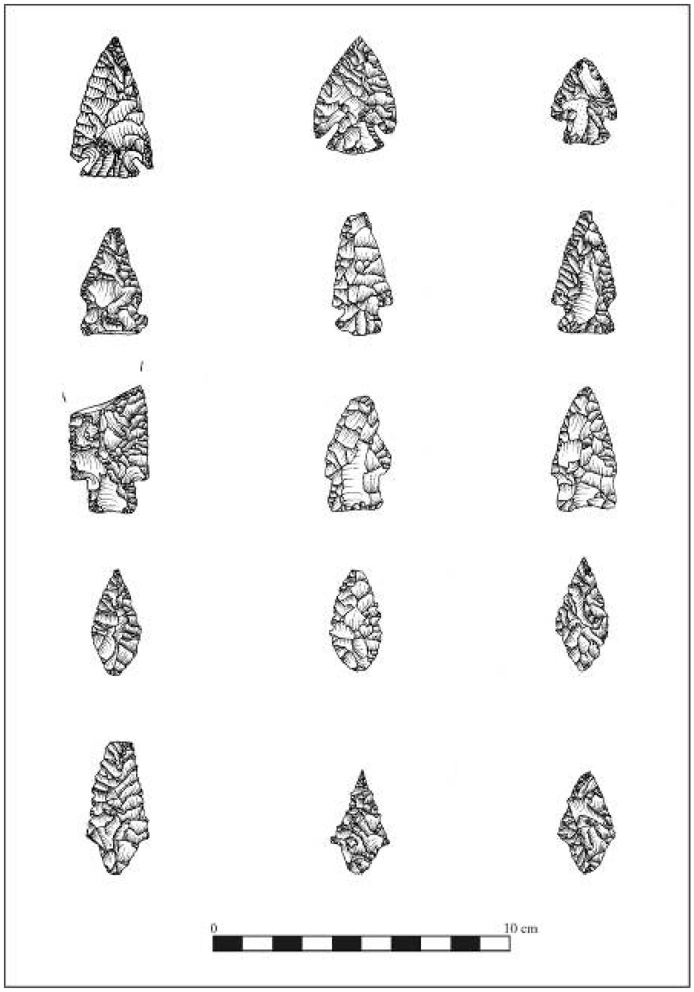


Figure 86.3. Late Archaic points (top to bottom: corner-notched, side-notched, stemmed, leaf-shaped, and contracting stem).

3. **How do the projectile points compare in morphology and temporal range to the sequence defined by Turnbow (1997)?**

There is no temporal information to clarify the relative ages of the projectile point sequence. However, the point types illustrated in Figures 86.1 through 86.3 do fit the variability described by Turnbow (1997). This includes Jay, Bajada, San Jose, large side-notched points (Sudden, Northern or San Rafael types), Armijo, and five other Late Archaic point types. The latter consists of corner-notched, side-notched, stemmed, leaf-shaped, and contracting stem points.

4. **Given the problems with the obsidian hydration dating of Early and Middle Archaic obsidian artifacts, do projectile points from LA 85859 and LA 99396 also follow the pattern of dating to the Late Archaic? Or, were some of these point types actually used (reused) during later times?**

Harmon et al. (Chapter 71, Volume 3) discussed the problems with obsidian hydration dating for this project. Most of the artifacts recovered from both Archaic and Ancestral Pueblo contexts actually dated to the Archaic period. It therefore seems likely that Archaic surface scatters were used as a source of raw materials by the later occupants of the plateau. There were no Early Archaic points recovered from LA 85859, and several possible Middle to Late Archaic point bases were found at LA 99396. Obsidian artifacts from LA 85859 provided a date range of circa 6000 to 2000 BC, with a later surface component dating to the AD period, whereas, LA 99396 provides an unbroken sequence of obsidian dates from about 6000 BC to the first few centuries AD. This indicates that the sites may represent multiple occupation episodes.

Given that obsidian debitage appears to have been scavenged and reused by the later Pueblo site occupants, the question is, did they also scavenge Archaic projectile points. Certainly, Archaic-style dart points were recovered from Ancestral Pueblo contexts. As previously noted, this included a San Jose point from a Classic period fieldhouse and other possible Late Archaic points from Coalition period contexts. However, it is unclear as to whether these latter points actually date to the Archaic or represent Pueblo lance or dart points. A pilot study was conducted on four arrow points and four lance/dart points recovered from a Late Coalition roomblock site (LA 4618) (Figure 86.4). The points were submitted for obsidian hydration dating and the results are presented in Table 86.2. One arrow point could not be dated (Field Specimen [FS] 348), but the remaining six points exhibit hydration rims ranging from 2 to 4 microns, with one outlier of about 7 microns. The larger points do exhibit slightly thicker rims (3.59 to 4.36) and the smaller points have thinner rims (1.94 to 2.13), however, the dates do overlap. Presumably these arrow and lance/dart points are roughly contemporaneous, versus the single dart point, which appears to be Archaic in age. This dart point also exhibits more resharpening than the other points. It therefore seems likely that at least some large points continued to be manufactured and used during the later Ceramic period.

Table 86.2. Obsidian hydration data for the projectile points from LA 4618.

FS #	Type	Rim (*um*)	Age	*sd*
8	Lance/dart	3.59	AD 1650	17
31	Lance/dart	4.36	AD 1431	24
179	Lance/dart	3.71	AD 1619	18
282	Arrow	2.07	AD 1447	50
443	Arrow	1.94	AD 1547	43
466	Arrow	2.13	AD 1828	12
781	Lance/Dart	6.91	3258 BC	152

5. **Can obsidian hydration analysis distinguish between Archaic and later Ceramic period occupations (i.e., Coalition and Classic periods)?**

As previously noted, most of the obsidian artifacts recovered from Ceramic period occupations dated to the Archaic. Therefore, it is presumed that most of these were in fact scavenged from these older sites. Obsidian hydration dating did not clearly distinguish between Coalition and Classic period occupations.

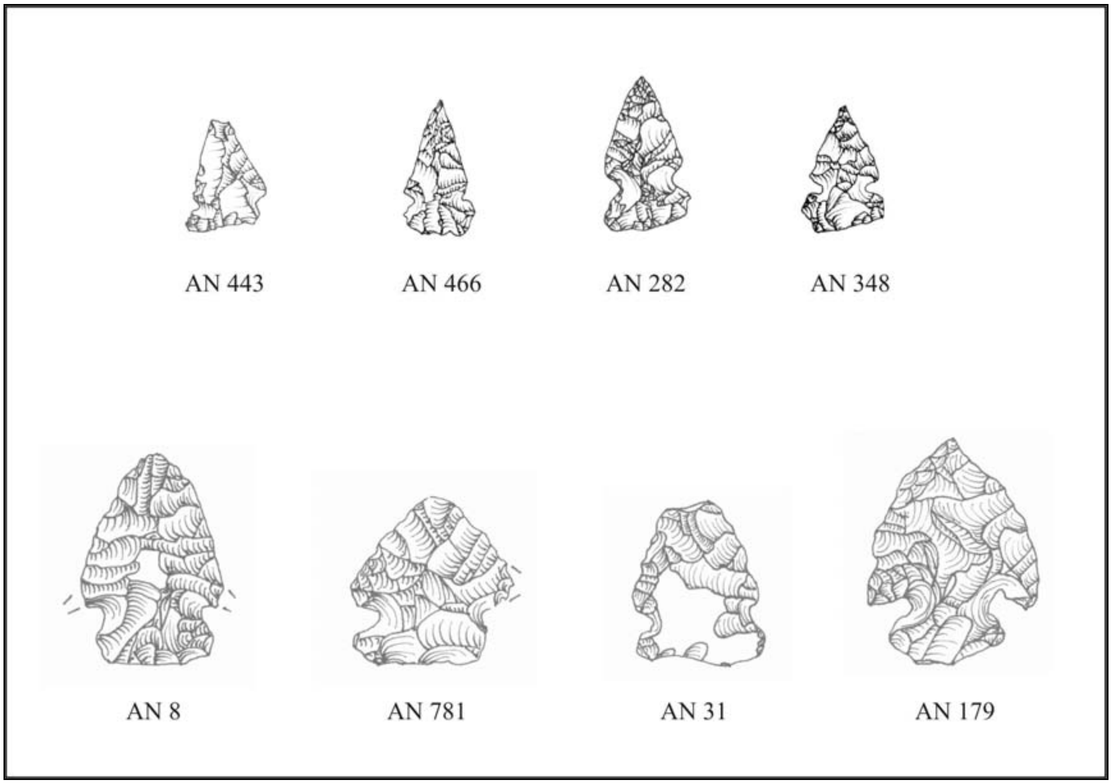


Figure 86.4. Arrow (top) and lance/dart (bottom) points from LA 4618.

6. **How do the ceramics compare with the type descriptions and date spans as provided by McKenna and Miles (1991)?**

Dean (Chapter 58, Volume 3) described Santa Fe Black-on-white as having relatively thin and straight vessel walls and being similar in shape and thickness to Kwahe'e Black-on-white. Pastes are often fairly dense, hard, and can be vitreous. They are usually very fine in texture and fracture along an even plane. Paste color is usually light gray to blue-gray. Surfaces are moderately to well polished, often slipped, and range from white, light-gray, greenish, to tan in color. Decorated surfaces are usually polished and often slipped. Bowls are by far the dominant vessel form in this type. Undecorated exterior bowl surfaces are often unslipped and unpolished and may occasionally display unobliterated coils, striation, or basket impressions. Tempering materials include finely crushed volcanic rock, fine sand, and, in some cases, sherd temper (Habicht-Mauche 1993; Stubbs and Stallings 1953).

Painted decorations are executed in organic pigment, which is sometimes faded and translucent. Paint color ranges from dark gray, bluish-black, to black. Rims are usually tapered and undecorated, while ticked rims, similar to those noted in contemporaneous pottery from regions on the Colorado Plateau, are extremely rare. In bowls, decoration is oriented in a band on the interior surfaces. Decoration consists of banded panels on bowl interiors and the upper portions of jars. These banded panels are often framed by a pair of single lines that are separated by very short spaces between the line and the top and bottom of the panels. Similar lines are also directly incorporated into the top and bottom edges of the panels. These designs are occasionally framed by a series of similar-sized parallel lines or a combination of thick and thin lines. Santa Fe Black-on-white is thought to have first been produced during the middle to late 1100s and continued to dominate assemblages until the middle 1300s and may occur as late as the early 1400s (Habicht-Mauche 1993; Stubbs and Stallings 1953; Sundt 1987). Indeed, a very small percentage of Santa Fe Black-on-white sherds are often represented at Early Classic period fieldhouse sites indicating that it could have been produced during the 14th century. In addition, although smeared-indented corrugated dominates the Coalition period utilityware assemblages, this pottery type also continues into the Early Classic period.

7. **What are the most temporally sensitive attributes for the ceramic types? Can Santa Fe Black-on-white be subdivided into earlier and later varieties?**

Dean's (Chapter 58, Volume 3) ceramic analysis indicates that Santa Fe Black-on-white does not appear to exhibit any significant stylistic changes during the Coalition period. However, there does appear to be some noteworthy long-term changes in temper and paste characteristics. Most of the Santa Fe Black-on-white ceramics appear to be tempered with a fine tuff, although LA 135290 exhibits more of a fine tuff with clay fragments. Nonetheless, this is a variable group that presumably reflects the use of multiple local sources. Miksa's (Chapter 59, Volume 3) petrographic analysis identified five temper groups: anthill sand, anthill/clay, granitic, Tuff 1, and Tuff 2. Anthill sand seems to be more prevalent in the earlier varieties of Santa Fe Black-on-white, while Tuff 2 is more prevalent in the later varieties. Tuff 2 is a natural occurring material that is highly variable and was probably used without alteration. In contrast, Tuff 1 has a more uniform grain sorting, with a finer grain size. It was used primarily for the production of biscuitwares and represents a more selective use of this tempering material. As Dean notes, these changes are first reflected in some of the pastes at the Late Coalition period site of LA 12587 and then are more dramatically represented at LA 4618. As a result, a shift to the use of crushed tuff temper, common during the Classic period, may have first occurred during the Late Coalition period. Therefore, changes in temper and paste appear to be more sensitive than stylistic changes for distinguishing earlier versus later varieties of Santa Fe Black-on-white.

8. **How do Santa Fe and Wiyo Black-on-white compare with similar types that were produced in the Rio Grande Valley (e.g., Pindi and Poge Black-on-white) and later biscuitware types from the plateau?**

Dean (Chapter 58, Volume 3) notes that the styles and manipulations noted in Santa Fe Black-on-white are similar to contemporary whitewares found on sites in other areas of the Rio Grande region including the Albuquerque area, Santa Domingo Basin, Puerco Valley, Pecos Valley, Santa Fe Valley, Tewa Basin, Chama Valley, and Galisteo Basin. Otherwise, any differences are primarily restricted to the use of local paste and tempering materials; however, unlike areas to the west, local Santa Fe Black-on-white ceramics are dominated by bowl vessel forms with the almost complete absence of kiva jars and ladles.

Some of the sherds classified as Santa Fe Black-on-white during the Early Classic period might actually be classified as Pindi Black-on-white. Dean (Chapter 58, Volume 3) states that this type may be distinguished from earlier varieties of Santa Fe Black-on-white by the presence of added vitric temper with distinctive paste and slip clays. Therefore, some of these sherds may have been imported from the nearby valley or represent a local variant of Santa Fe Black-on-white that was produced at the same time as the biscuitwares. In contrast to Santa Fe Black-on-white, the sample size for the later biscuitwares was too small for a detailed stylistic analysis.

9. How do the dated ceramic assemblages compare with Orcutt's seriation sequence?

Harmon and Vierra (Chapter 69, Volume 3) conducted a detailed chronological study of the project dating methods and associated ceramic types. A direct comparison with Orcutt's seriation sequence could not be conducted due to the small ceramic sample sizes. Nonetheless, their preliminary cluster analysis was able to distinguish six distinct ceramic type clusters: 1) Santa Fe Black-on-white and smeared-indented corrugated; 2) smeared plain corrugated; 3) undetermined biscuitware and plain gray; 4) mixed decorated wares and smeared-indented corrugated; 5) Biscuit B or Biscuit C and Sapawe Micaceous, and 6) Biscuit A and Sapawe Micaceous.

10. Is there a difference in accuracy between archaeomagnetic samples taken from tuff versus clay-lined features or burned soil?

All the archaeomagnetic samples were taken from burned adobe or clay-lined features. None were taken from burned tuff. However, a set of archaeomagnetic dates was obtained from two clay-lined features: Feature 20 at LA 12587 and Feature 2 at 127635. Neither of the samples from Feature 20 or Feature 2 returned exactly the same dates, although in both cases there is considerable overlap, particularly with the Wolfman Curve dates.

11. How do the results of the dendrochronology, radiocarbon, archaeomagnetic, obsidian hydration, and luminescence dating techniques compare with each other? Which are the more accurate techniques?

Harmon et al. (Chapter 71, Volume 3) conducted a detailed comparison of the chronometric methods used to date sites on the project. Since tree-ring samples were only obtained at the Serna Homestead, the other four dating techniques were contrasted in this study. In general, the obsidian hydration dates from Ancestral Pueblo sites are much earlier than expected, whereas, the Archaic site dates appear to be accurate, but very imprecise. As previously suggested, it may be that the later inhabitants were scavenging obsidian from these older surface sites.

The radiocarbon and archaeomagnetic dates are generally in agreement indicating that both methods are accurate. Of the two methods, archaeomagnetic dating is often more precise, with a resolution of 20 to 40 years possible for a given sample. Accelerator mass spectroscopy dating also appears to be more precise than the standard radiocarbon dating method. However, between about AD 1460 and AD 1640, the radiocarbon calibration curve flattens out. At two sigma, any radiocarbon date with an AD 1440 to 1600 intercept is almost indistinguishable from any other.

When luminescence dates are compared with other dating methods, they either agree with the other dates or are too early. A similar result was obtained by Dykeman et al. (2002), although late luminescence dates are not unknown (e.g., Ramenofsky and Feathers 2002). In summary, radiocarbon and archaeomagnetic dating techniques appear to be the most accurate and precise.

12. Which suite of historic artifacts provide the most accurate dating mechanism for the homestead site?

Haecker (Chapter 32, Volume 2) conducted the historic artifact analysis for the Serna Homestead. He considers that food cans appear to provide the most useful information for dating because they are more time sensitive due to changes in manufacturing techniques (i.e., lead solder to sanitary seal) and because of the encouragement of the Canning Trade Association to standardize can dimensions (i.e., height and diameter) during the circa 1900 to 1930 time period. In fact, this information could yield the year of introduction and sometimes the year of discontinuation for a particular can dimension. In addition, since canned foods are not curated items like tools, jewelry, or buttons, they can reflect the purchase, use, and discard sequence within a short period of time. Thus, an estimated date range of all cans found on a site would accurately reflect the time period of occupation.

GEOARCHAEOLOGY RESEARCH QUESTIONS

1. What is the geomorphic context of the sites?

Drakos and Reneau (Chapters 3 and 57, Volumes 1 and 3) provide a detailed description of the geomorphic context of each tract and excavated archaeological site. All the tracts are situated in differing topographic and geomorphic settings. Each context has a differing effect on the depositional history of the site area. The highest potential for site preservation exists along small drainage channels on mesas, on alluvial fans, and in canyon bottoms, where net deposition of alluvium and colluvium has occurred during the Holocene, and on the more stable parts of mesa tops where erosion has been minimal or where deposition of eolian sediment has occurred.

In canyon settings, early to middle Holocene deposits are less extensively preserved, except in some canyon bottoms, recording net erosion during the Holocene across most of the landscape. Late Pleistocene soils are truncated, indicating erosion some time during the Holocene, before deposition of the late Holocene colluvium. In Rendija Canyon, the development of shallow hillslope drainages and their subsequent filling is recorded by the ca 1 to 2 ka and ca 6 to 7 ka swale fill deposits. Valley bottoms preserve 1.5- to 2-m-thick mid to late Holocene colluvial deposits and an unknown thickness of underlying early Holocene and/or late Pleistocene deposits. Pre-Coalition period colluvial deposits are apparently preserved over a larger part of the Cañada del Buey landscape, but are apparently very poorly preserved in Pueblo Canyon within the TA-74 South Tract. Use of soil stratigraphic characteristics to differentiate between Coalition and Classic period sites in hillslope settings has not been as reliable as has been found for mesa top sites. This may indicate that the main pulse of recent colluvial deposition has occurred later than the AD 1250–1325 eolian event, likely after AD 1500.

2. Which sites have been affected by sediment deposition or erosion, and how have these processes affected the integrity of the sites?

Archaeological sites examined by Drakos and Reneau (Chapter 57, Volume 3) are situated on mesa top, colluvial slope, fluvial terrace, valley bottom, and ridge top settings. The record of eolian and colluvial deposition on mesa tops and within canyons indicates periods of widespread deposition during the latest Holocene (generally <1 ka deposits) and during the late Pleistocene to early Holocene. Middle Holocene (approximately 6 to 8 ka) and late Holocene (approximately 1 to 2 ka) colluvial deposits are less extensively preserved. Similarly, early Holocene (9 to 10 ka), middle Holocene (approximately 4 to 6 ka), and late Holocene (approximately 2 to 3 ka) eolian deposits are less extensively preserved than late Pleistocene and latest Holocene deposits.

Preliminary regional correlation of eolian stratigraphic units has been developed during investigation of sites located on mesa top settings in the Airport Tract and White Rock Tract, and by comparison with the stratigraphic record exposed in paleoseismic trenches on Pajarito Mesa. A post-Puebloan age eolian deposit is present in each of the mesa top locations; therefore Ancestral Pueblo sites are typically buried and are generally in good archaeological context. It is inferred that 15 to 20 cm of eolian deposition occurred some time after the Middle Coalition period but before the Classic period (i.e., ca AD 1250–1325), and in many cases Coalition and Classic period sites can be differentiated based on soil stratigraphic relationships. The timing of this eolian event corresponds to "The Great Drought" of AD 1276 to 1299 and a locally drier period from AD 1250 to 1255, inferred from tree ring data, and a major regional event associated with the abandonment of Mesa Verde (Rose et al. 1981; also see Chapter 7, Volume 1). A second, more recent eolian event occurred after abandonment of the Early Classic (?) period sites, resulting in deposition of an additional 5 to 10 cm of fine-grained sediment in mesa top settings since approximately AD 1500. Up to 4 cm of eolian deposition has occurred since the mid to late 1800s at one site.

The general processes of erosion versus deposition are best illustrated at the Rendija Canyon Archaic sites. Abandoned roomblock sites act as effective traps to catch soil. They are partially buried by colluvium that is in part derived by the erosion of the roomblock. In addition, the rubble mound acts to catch silty eolian sediment and short-distance colluvium. Whereas, the site area may have exhibited little deposition before the construction of the roomblock, soil deposition increases during the post-occupational period. This process provided an excellent niche for agriculture during the later Classic period.

In contrast, middle to late Holocene deposits are less extensively preserved. Therefore, the older Archaic sites in Rendija Canyon are primarily found in secondary context. For example, at LA 85859 the upper hillslope was eroded during the early to middle Holocene and then deposited in a concave part of the lower hillslope. Then, a second period of erosion likely occurred during the late Holocene, when the upper hillslope was stripped to bedrock and the middle Holocene soils on the lower slope were truncated. These soils were subsequently buried by a thin late Holocene colluvial deposit. Although artifacts were recovered from both the middle and late Holocene colluvium, the highest artifact concentration was located in the middle Holocene deposit, with artifacts present in the late Holocene deposit being supplied by bioturbation.

PALEOENVIRONMENTAL RESEARCH QUESTIONS

1. **What evidence do the tree-ring measurements, and the pollen and floral remains provide for past environmental conditions at the sites?**

Towner (Chapter 7, Volume 1) provides a detailed paleoclimate reconstruction based on the tree-ring sequence from the Jemez Mountains. This sequence is graphically illustrated in Figure 86.5. Agriculturalists colonized the plateau circa AD 1150 during a period of above average rainfall following the Chaco drought. This is followed by two droughts during the 13th century (including the Great Drought) and then a period of increased effective moisture during the 14th century. This period correlates with the Classic period occupation of the plateau. The 15th through 17th centuries are bounded by two droughts, with intervening above average rainfall. It is the megadrought of the 1580s that causes the eventual termination of year-round occupation of the Pajarito Plateau.

The two Middle Coalition period roomblocks (LA 86534 and LA 135290) date to circa AD 1160 to 1270. This time range is bounded by two periods of increased effective moisture with about 35 cm of rainfall, separated by a drought. The two Late Coalition period roomblocks (LA 4618 and 12587) were occupied circa AD 1275 to 1325, also during a period of above average rainfall with about 35 cm.

The 14th through 16th centuries were generally characterized by increased effective moisture (30-40 cm), with a drought circa AD 1420. The Classic period fieldhouses span this time period, although there does appear to be a bimodal distribution with most of the sites dating to earlier and later temporal segments. Smith's study (Chapter 63, Volume 3) does show a marked decrease in the amount of pollen present in the Early-Middle Classic period fieldhouses, which could reflect the early 15th century drought.

The Serna Homestead was occupied during a period of above average rainfall (35 to 40 cm) from circa AD 1910 to 1950. This would have been an excellent time for the rainfall farming of beans.

A pilot paleoenvironmental study was initiated by collecting pollen from geologic contexts, however, the study only met with limited success. That is, only 40 percent of the 41 total samples collected yielded sufficient pollen to describe the spectra. Smith (Chapter 6, Volume 1) identified four major trends in this dataset: 1) pollen concentrations drop dramatically from the A to B horizon and continue to decline with depth; 2) this decrease is in part due to increased amounts of degraded pollen that is unidentifiable; 3) pine pollen decreases with depth; and 4) cheno-am pollen tends to increase with depth. Otherwise, the archaeological pollen indicates an environment similar to today during the Ancestral Pueblo and Historic periods; however, these data do not provide sufficient detail to allow time-specific descriptions of potential changes in vegetation structure. For example, was it open or park-like with more grass, closed, or deforested?

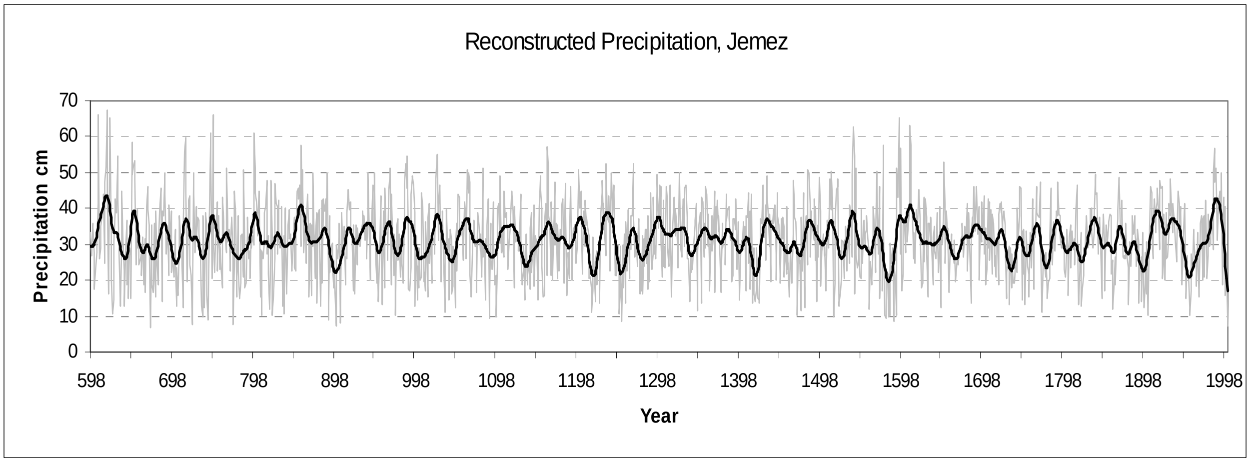


Figure 86.5. Reconstructed precipitation for the Jemez Mountains tree-ring chronology.

McBride's (Chapter 62, Volume 3) fuel wood study indicated that local materials were collected during the Coalition and Classic periods, consisting mostly of piñon, juniper, and ponderosa pine. Although the macrobotanical evidence does not support widespread deforestation, there are indications that some lower-elevation conifers (e.g., juniper) may have been depleted and subsequently replaced with the use of higher-elevation woods during the Late Coalition period.

2. **Are there differences between the Early and Late Archaic period sites versus the Ancestral Pueblo and Historic periods that could reflect changes in past vegetation communities?**

The pollen record provides some excellent baseline environmental data for understanding the changing vegetation setting during the Archaic. Recent studies by Scott Anderson and his students (Chapter 5, Volume 1; Anderson et al. 2007) of pollen cores in the Jemez Mountains indicate that the Late Paleoindian and Early Archaic transition is separated by a period of decreased effective moisture when the Chihuahueños bog had dried up from circa 8000 to 6500 BP. This obviously had a significant effect on the Early Archaic foragers in the area, with their settlement system shifting to a north-south pattern within the northern Rio Grande Valley (Vierra et al. 2005; Chapter 74, Volume 4).

Then during the subsequent Middle Archaic period (6000 to 4000 BP), there is evidence for moister conditions and the expansion of piñon-juniper woodlands in the northern Rio Grande Valley. This evidence is represented by increased percentages of piñon pollen at circa 4500 BP at Chihuahueños Bog, 4300 BP at Alamo Bog, and 4000 to 3500 at Alta Alamo Bog (Chapter 5, Volume 1; Anderson et al. 2007; Brunner-Jass 1999; Stearns 1981). It may be during the Middle Archaic that fall hunts in the Rio Grande Valley were becoming less successful, so these hunter-gatherers would have shifted their residence to the uplands where they could collect piñon nuts and hunt deer (Vierra 2005a; Chapter 75, Volume 4).

The initial use of maize agriculture is dated to about 3000 BP during a period of increased effective moisture (Smith and McFaul 1997; Vierra and Ford 2006). These moister conditions continue until about 2200 BP with the onset of drier conditions. The cyclical nature of the rainfall conditions during the subsequent time period has been described in the El Malpais data (Grissino-Mayer 1996). Late Archaic land-use appears to be characterized by a lowland/upland pattern within restricted areas of the Rio Grande Valley (Vierra 2003, Chapter 75, Volume 4; Vierra and Foxx 2002; Chapter 75, Volume 4).

As previously noted, the pollen record provides little detailed information on long-term structural changes in the local vegetation communities; however, the archaeobotanical evidence does indicate that the juniper population may have been depleted and replaced with the use of ponderosa pine from higher elevations during the Late Coalition period.

LAND-USE, COMMUNITY, AND SITE ORGANIZATION QUESTIONS

1. **Can site structure studies identify the internal organization of the Archaic campsites? If so, what evidence is there for identifying the occupying group size, structure, and site occupational history?**

The answer to this question appears to be no. Four sites were assigned to the Archaic period: LA 85859, LA 99396, LA 99397, and Area 8 at LA 12587. All of the Archaic sites are situated in secondary contexts. A spatial analysis of LA 99396 did identify two artifact clusters (Chapter 71, Volume 3); however, these appear to be the result of both natural and cultural factors. There is no difference in respect to lithic debitage between the two areas, but there are some minor differences in respect to chipped stone tools. That is, the northern cluster primarily contains bifaces and the southern cluster contains a variety of tools. This may in part reflect a mixture of Archaic and Ceramic period components in the northern cluster versus mostly Archaic material in the southern cluster.

2. **Is there any evidence of structures or features on the Archaic campsites?**

No Archaic age features were identified during the excavations.

3. **How do these Archaic campsites contrast with the Late Archaic winter habitation site excavated near San Ildefonso Pueblo?**

Vierra (2003, Chapter 75, Volume 4) did a comparative analysis of Late Archaic lithic assemblages across the various vegetation zones. These zones covered the elevational gradient from river valley to piñon-juniper to ponderosa pine to mixed conifer. In doing so, he determined that these debitage assemblages are all linked by reduction tactic and obsidian procurement patterns. That is, lowland habitation sites are characterized by an emphasis on core reduction while upland campsites are characterized by biface production. Otherwise, obsidian dominated all the lithic assemblages, with sites situated in the lowland juniper-savanna and nearby upland piñon-juniper communities also containing a small amount of material derived from local river gravels.

LA 85859 is an Early Archaic site that emphasizes the reduction of bifacial cores and biface blanks using obsidian derived from the nearby caldera. The Late Archaic site of LA 12587

(Area 8) is also dominated by the production/maintenance of bifacial tools. However, the Middle to Late Archaic sites of LA 99396 and LA 99397 are characterized by a mix of core reduction and biface production/maintenance activities. The implication of Vierra's (2003, Chapter 75, Volume 4) argument was that sites containing a mix of core and biface flakes presumably reflect habitation sites versus temporary campsites with mostly biface flakes. If so, LA 85859 and LA 12587 (Area 8) reflect temporary campsites, whereas LA 99396 and LA 99397 may be habitations. It is, however, unclear whether the Ceramic period component at LA 99396 is contributing to the increased amount of core reduction at this site.

4. **What is the general layout of the Coalition period habitation sites?**

Most Coalition period habitation sites are linear, north-south-oriented roomblocks that are two to three rooms deep, and have a single or multiple kivas located along the eastern side of the pueblo (Steen 1977, 1982; Worman 1967; Worman and Steen 1978) (Figure 86.6).

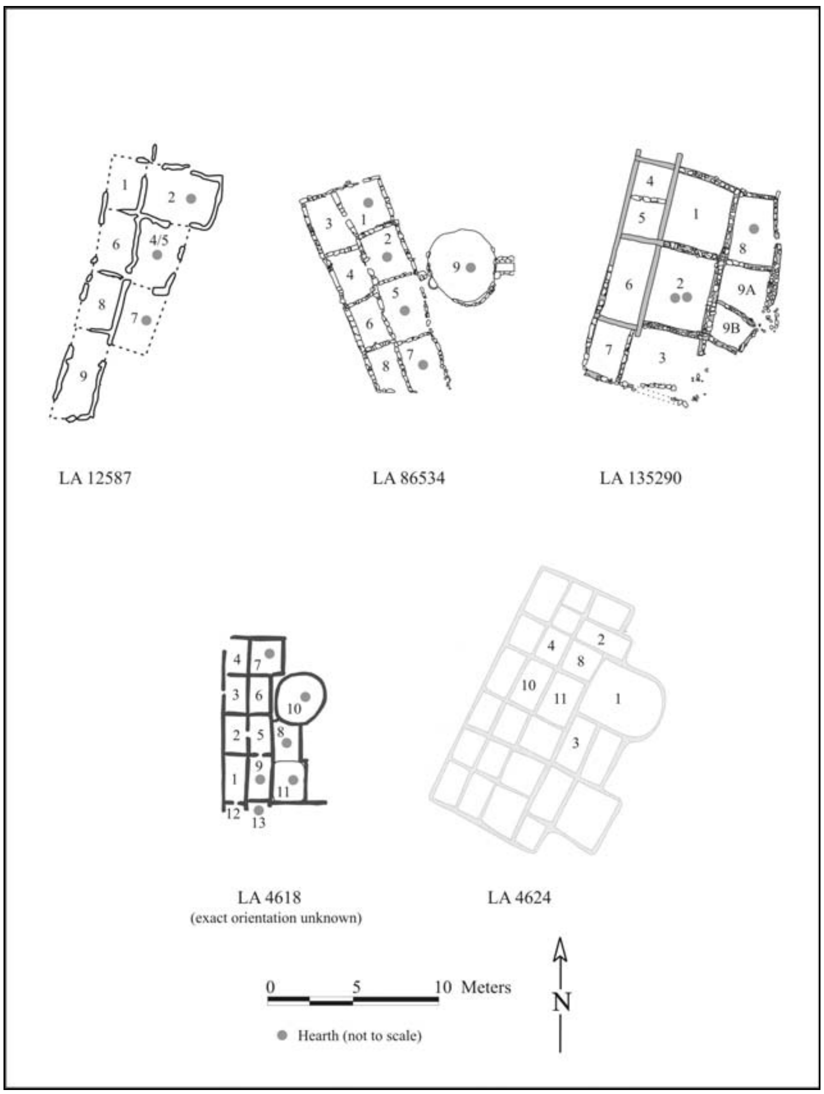


Figure 86.6. Roomblock ground plans.

The three Coalition roomblocks excavated during the C&T Project are quite similar (Figure 86.6). LA 12587, LA 86534, and LA 135290 are all composed of two linear sets of rooms (front and back); however, LA 135290 does contain three plaza-oriented rooms that could represent ramadas and not a fully enclosed space (Chapter 71, Volume 3). Of the three sites, only LA 86534 contains a kiva (Chapter 24, Volume 2). This makes it more similar to LA 4618 and LA 4624 where the roomblocks are three or more rows deep, including both circular and rectangular kivas (Schmidt 2006; Vierra et al. 2002). The roomblocks are generally oriented north-south, with three being slightly tilted towards the northeast and one to the northwest (LA 86534). The kivas are all situated along the east facing (front) of the roomblocks.

5. **Can habitation versus storage rooms be identified and are there kivas (or communal rooms) present?**

Coalition period habitation rooms typically contain hearths and are located along the eastern (front) side of the pueblo, while storage rooms are typically located on the west (rear) side of the pueblo and may contain storage or milling bins. Communal rooms (i.e., kivas) are generally larger in size than the habitation and storage rooms and can be round, square, or D-shaped. In addition, the habitation rooms also tend to be larger than the storage rooms.

Most of the front rooms at LA 12587, LA 86534, and LA 135290 contain hearths; whereas, only a single rear room at LA 86534 contained evidence of a milling bin. The architecture at LA 135290 did differ between front and back rooms, with the front rooms being constructed of masonry and the back rooms of adobe. The fact that the back rooms were consistently burned during the three occupations indicates that these were probably storage rooms that were being hardened to protect stored foods.

The pollen information as provided by Smith (Chapter 63, Volume 3) is variable by room location and site. For example, there is a greater diversity of plant pollen in the front rooms at LA 135290, with similar amounts of maize pollen in both front and back rooms. This would appear to support the contention of the front rooms being used as domestic space and the back rooms as storage. However, the pollen spectra are similar for both front and back rooms at LA 86534 and vary between front and back rooms at LA 12587. That is, the front rooms at LA 12587 contain relatively more maize and beeweed pollen while the back rooms contain more cheno-am, grass, sage, and pine pollen. Overall, cultigen abundance can be high in the front or back rooms; however, prickly pear pollen tends to be associated with the front rooms, with beeweed and cheno-am pollen usually being higher in back rooms.

The single kiva at LA 86534 is circular-shaped, with an east-oriented ventilator shaft, deflector, ash pit, hearth, and sipapu. It appears that the entrance was through the back wall into an adjacent room and not through the roof (Chapter 24, Volume 2). Maize, cholla, prickly pear, and sunflower pollen were all identified on the kiva floor.

A study by Harmon et al. (Chapter 71, Volume 3) indicates some important differences in room size and function for LA 4618, LA 86534, LA 12587, and LA 135290 (Figure 86.7). It appears that the sites without kivas tend to have larger rooms (both front and back); whereas, the sites with kivas have a large ceremonial room, but the other rooms tend to be smaller. Nonetheless, habitation rooms with hearths are generally larger than the rear storage rooms at all the sites. In addition, McBride (Chapter 62, Volume 3) notes that maize is more ubiquitous in samples from the non-kiva versus the sites with kivas. The occupation of these non-kiva sites may therefore have involved a greater emphasis on agriculture.

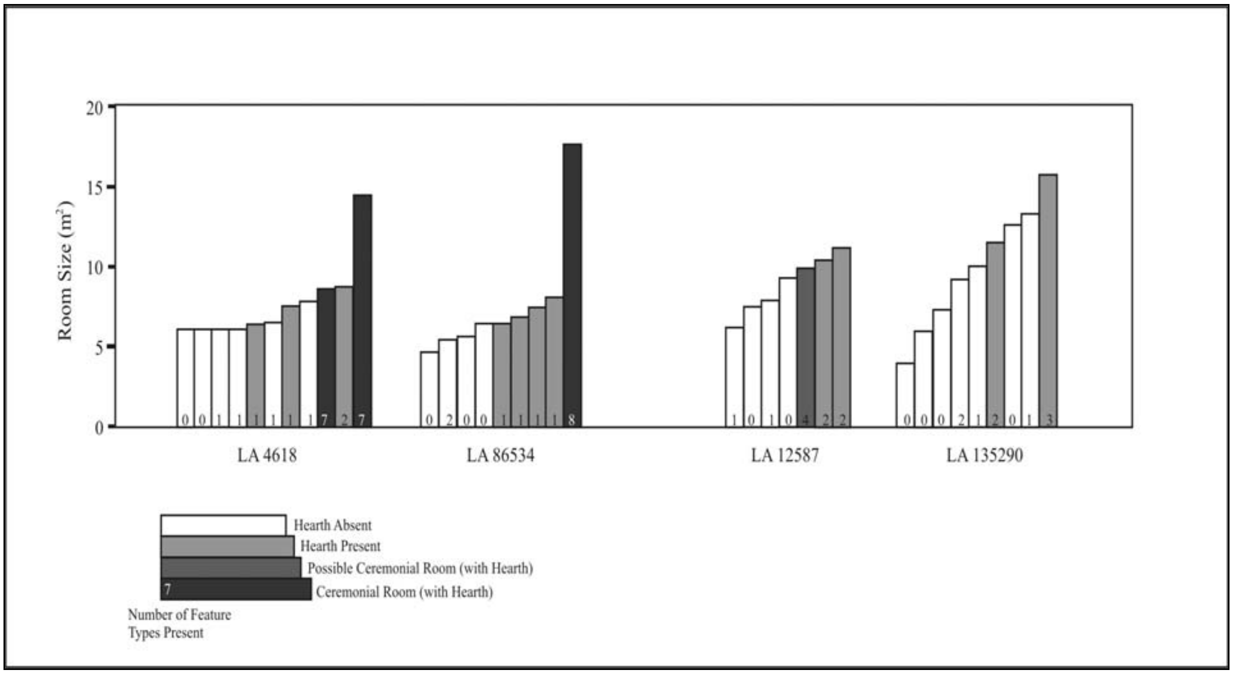


Figure 86.7. Room size at Coalition period roomblocks.

6. **Is there an outside midden area located to the east of the roomblocks?**

A light surface scatter of artifacts was identified to the east of the Middle Coalition roomblocks at LA 86534 and LA 135290, however, no clear evidence of a midden was identified. On the other hand, a 50-cm-thick midden deposit was exposed at the Late Coalition period site of LA 12587. It appears that this latter site was occupied for a longer period of time, with several burials being interred at this location.

7. **Are there exterior activity areas present adjacent to the roomblocks?**

There was no obvious evidence of an exterior activity area present adjacent to the roomblock at LA 86534. In contrast, the front rooms at LA 135290 may represent ramadas that could have been used for outside activities. In addition, there is a possible agricultural feature situated to the immediate east of the roomblock, but it is undetermined as to whether it is associated with the roomblock or a later occupation.

Although no clear activity areas were defined at LA 12587, an exterior cist was present along the east wall of the structure and a large tuff mortar was recovered from the back hoe excavations to the immediate east of the structure. The following charred botanical remains were identified from the contents of the cist: pigweed, sagebrush, saltbush/greasewood, goosefoot, cheno-ams, bugseed, unknown conifer, juniper, unidentified pine, piñon pine, ponderosa pine, prickly pear, cottonwood/willow, and maize.

8. What architectural style was used in the construction of the walls?

A variety of architectural styles were used in the construction of the walls at LA 12587, LA 86534, and LA 135290. As previously noted, the front rooms at LA 135290 were constructed of shaped and unshaped tuff block masonry and the back rooms of adobe. Given that the back room walls and floors were consistently burned, it appears that this area was used for storage. Nonetheless, the masonry walls also differed across the site. Some walls were multiple layers of tuff blocks with adobe mortar; whereas, other walls contain larger tuff blocks or upright blocks along the basal sections of the walls, with rows of smaller tuff blocks in the upper section. Lastly, it appears that the rear adobe walls were also capped with masonry.

A diversity of styles is also represented at LA 12587. These walls are built of shaped and unshaped tuff blocks, adobe mortar, and chinking stones. Additionally, dacite cobbles are occasionally used as masonry and one adobe block was encountered during excavation. Most basal courses consist of large tuff uprights set into adobe and/or sunk beneath the floor surface. In one wall these uprights are covered with multiple layers of adobe (turtlebacks) forming a thick platform upon which the overlying course is laid. In several walls the basal course consists of core and veneer segments separated by upright tuff blocks that are perpendicular to the length of the wall. The veneer consists of a thick layer of adobe set with small tuff stones, whereas, the core consists of sediment and rubble. The basal course of one wall consists of two parallel rows of upright tabular tuff blocks, with sediment and rubble probably filling the space between these uprights. The few upper courses still present consist of shaped and unshaped tuff blocks set in adobe and reinforced with chinking stones.

In contrast to the other two sites, the masonry at LA 86534 is consistently made of shaped and unshaped tuff blocks, which are a single course wide, and set into adobe mortar with chinking stones. The one difference is that the kiva was constructed by cutting a pit directly into the bedrock with some tuff block masonry being present at ground level.

9. What is the construction history of the roomblock? Is it similar to the plan used at Nake'muu?

Nake'muu is the only standing-walled pueblo at LANL. Although the final configuration of the site is a plaza-oriented pueblo, this was not the initial site layout. The initial site layout consisted of two separate sets of linear roomblocks with front and back rooms. In each case, the smaller back rooms were built as a single unit and then the larger front rooms bonded to this central wall. In this case, site construction was characterized by rows, rather than blocks of rooms (Nordby et al. 1998; 2003; Vierra and Foxx Chapter 75, Volume 4).

The construction history of LA 135290 follows a similar pattern. That is, the back rooms (Rooms 4 to 6) were constructed first and the front rooms (Rooms 1 and 2) bonded to the back room walls. Room 8 (plaza room) was also constructed during this time. This involved the initial construction of the north-south back wall, the addition of the east-west walls in the back rooms, followed by the central north-south wall and then the front rooms. Later, Room 3 (front) and Room 7 (back) were added on to the southern end of the roomblock and Room 9 as another plaza room. A similar pattern is represented at LA 86534. However, in this case it appears that the central north-south wall was built first, with the wall between back Rooms 6 and 8 built at the same time. The east-west walls in the back rooms were then built, followed by the back north-south wall. It then appears that the front rooms were abutted on to the central north-south wall. Again, a similar pattern is evident at LA 12587. Many of the room corners of the pueblo were in poor condition, thereby making bonding versus abutment determinations quite difficult. Nonetheless, it appears that the central north-south wall was built first and that the other front/back rooms added to it. It could not be determined whether the front or back rooms were the first to be added on to the central wall. Room 9 appears to represent a later back room addition to the south end of the pueblo.

10. Is there any evidence of remodeling in the roomblocks?

LA 135290 contains the greatest evidence of remodeling for the three excavated pueblos. At least three separate occupations are represented by multiple floors in the back rooms. In addition, the hearth in Room 8 was remodeled with two use-events, and there is a temporal sequence of three hearth features present in Room 2. Lastly, Rooms 3 (front), 7 (back), and 9 (plaza) reflect later additions to the southern end of pueblo. On the other hand, LA 86534 contains no evidence for the remodeling of any walls. The only evidence of remodeling is the hearth in Room 1 that represents two use-events. The nature of the standing architecture is difficult to determine given the poor condition of the walls at LA 12587; however, Room 9 (back) certainly represents a later addition to the southern end of the pueblo. Again, hearths in Rooms 4/5 and 7 appear to have been remodeled with two use-events.

11. Do the fieldhouses represent short-term residences, or is there any evidence that they might have been used as long-term habitations?

Harmon et al. (Chapter 71, Volume 3) describe the variability represented by the fieldhouses. In this chapter, Lockard notes that 20 of the Rendija Canyon fieldhouses consist of a single room, with only one having two rooms. Seventeen of the one-room fieldhouses are rectangular in form and one is circular. The form of the two remaining one-room fieldhouses could not be determined due to extensive disturbance of their wall foundations. The estimated masonry wall height for the fieldhouses ranges from 0.94 to 1.63 m, with an average of 1.17 m. Based on the burned remains from LA 85417, the upper structure was presumably built of wattle and daub. Only six of the fieldhouses contained hearths, whereas, both rooms at the two-room structure contained hearths. The number of artifacts recovered from the fieldhouses ranges from 9 to 772, with an average of 253. An above average number of artifacts were recovered from all six of the sites that contained hearths. On the other hand, sites without hearths contained fewer artifacts. This indicates that the sites with hearths were more intensively occupied than sites without hearths. The two-room structure (LA 85411) contains two rectangular-shaped rooms with hearths and an exterior wing wall that encloses a small plaza area. A total of about 430 artifacts were recovered during the site excavation, indicating that it represents one of the longer occupied structures.

12. How does the architecture at the fieldhouses compare to Coalition and Classic period roomblock sites?

Again, Lockard (Harmon et al., Chapter 71, Volume 3) provides information on fieldhouse architecture. The wall foundations of the Rendija Canyon fieldhouses are generally constructed of dacite cobbles and/or slabs. In the case of 17 of the fieldhouses, the entire wall masonry consists of only dacite cobbles. The remaining fieldhouses have masonry that consists of a mix of dacite cobbles, tuff cobbles, and/or shaped blocks. This generally depends on the availability of local building materials. As previously noted the estimated masonry wall height for the fieldhouses ranges from 0.94 to 1.63 m, with an average of 1.17 m. Based on the burned remains from LA 85417, the upper structure was presumably built of wattle and daub. Overall, the construction of these temporary structures is quite different from that exhibited at the Coalition and Classic period pueblos. The pueblos have full height masonry walls that are primarily composed of small to medium versus large tuff blocks at the Coalition and Classic period sites, respectively. Although a Classic period fieldhouse in the area of White Rock was observed with large shaped tuff block masonry, the other excavated Classic period fieldhouses in the White Rock Tract are composed of one to three courses of small- to medium-size tuff block masonry, including both shaped and unshaped pieces of building stone. This building material could have been scavenged from the nearby Coalition period site of LA 12587.

13. What construction techniques were used for agricultural features?

Three sets of Classic period grid gardens were excavated at LA 12587, LA 128803, and LA 139418 (Figure 86.8). Feature 22 at LA 12587 consists of three east-west-running berms of unshaped tuff blocks. The berms are 4 to 5 m long, 0.5 to 1.5 m wide, and 0.15 to 0.20 m high. A few rocks on the west side of the feature created a rough boundary that could form an "E" shape to the feature. If so, the feature is set at an oblique angle to the direction of the slope. The tuff blocks making up the feature are loosely placed together and stacked no more than three high. The A horizon (sandy loam) is somewhat deeper inside the feature, indicating that some of this dirt was intentionally placed inside the berms.

The grid garden at LA 128805 was constructed of local basalt cobbles. The feature consists of two U-shaped grids with a connecting wall that measures 4 by 6 m in size. The opening of each grid is perpendicular to the slope of the hill. Presumably the water drained over the side walls and was caught within the grid. It appears that the native clayey soil was removed from inside the grids and replaced with a more arable mixture of silty loam soil.

The grid garden at LA 139418 consists of a central grid with two partial grids on either side, measuring 3 by 7 m in size. The grids are situated parallel to the slope, allowing the water to flow into the open end of the northern grid. The basal portion of the north and south walls of the central grid were constructed with thin and wide pieces of tuff that were overlain with narrow and larger blocks. On the other hand, the east and west walls were built of a single course of tuff blocks that were mostly situated in an upright position. In contrast, the outside grids were constructed with a single course of shaped and unshaped tuff blocks. Again, the geomorphic study indicates that the grids were filled with a loose, unconsolidated silty loam with small rocks and gravel that appears to be culturally modified.

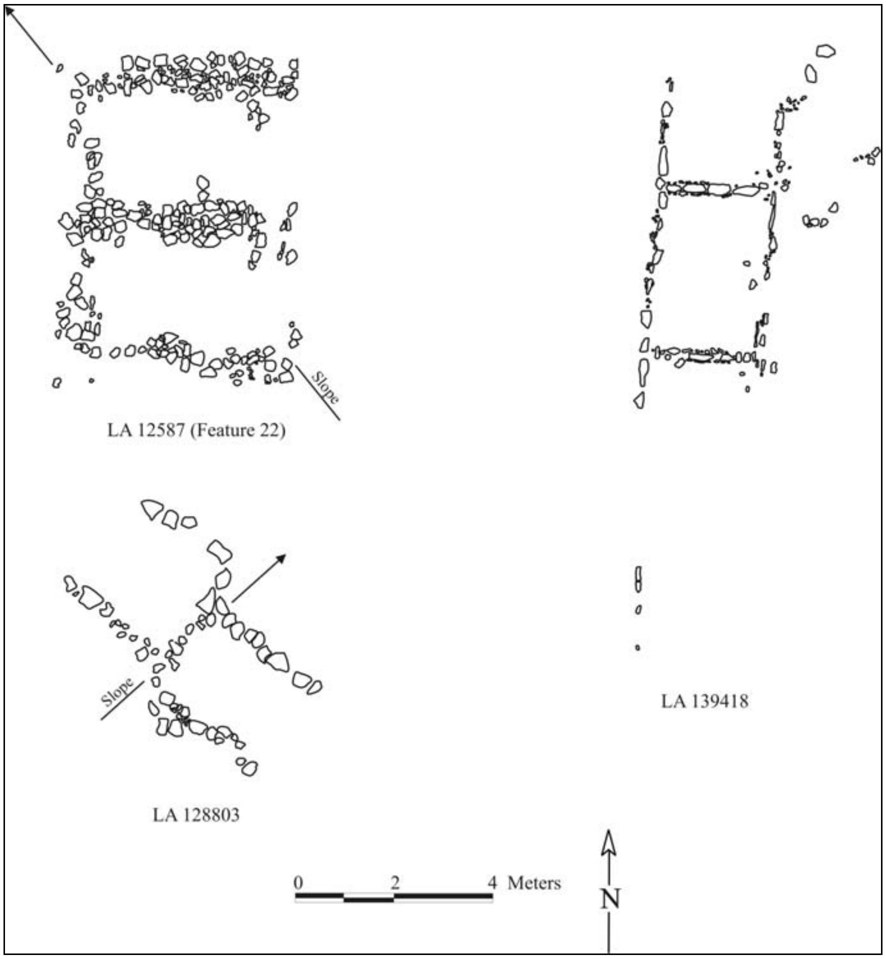


Figure 86.8. Grid gardens at LA 12587, LA 128803, and LA 139418.

14. Can site structure studies identify the internal organization of Ceramic period artifact scatters? If so, what evidence is there for identifying the occupying group size, structure, and site occupational history?

Multi-component lithic and ceramic scatters were present at LA 86637 and LA 127625 in the White Rock Tract. Both of these are situated in secondary context and contain potential Archaic and Ceramic period components. Therefore, the site lacks site structural integrity. LA 86533 and LA 139418 also contain Archaic and Ceramic period components on sites located in the Airport Tract. LA 86533 is a very diffuse artifact scatter; however, LA 139418 exhibited two primary surface artifact clusters in the eastern (Area 2) and southern (Area 3) sections of the site. Most of these artifacts included the by-products of lithic reduction activities, although a few ceramics were present. Nonetheless, the lithic assemblage was dominated by chalcedony core reduction activities, which are more likely to represent a Ceramic period versus Archaic period occupation. Detailed site structure information is lacking, but both Coalition and Classic period occupations appear to be represented.

15. Do LA 85864 and LA 85869 represent Athabaskan campsites?

Both sites appear to represent Jicarilla Apache tipi ring sites that were occupied circa the turn of the 20th century. LA 85864 contains a single rock ring and LA 85869 contains two rock rings. Small charcoal concentrations were present within both tipi rings at LA 85869, indicating the presence of a warming hearth, but no in situ fire. Artifacts recovered from LA 85869 include a .50-caliber unalloyed lead ball, *coscojos* fragments, possible cone tinkler fragments, a pony bead, and numerous seed beads. Seven micaceous sherds that represent two jars and one non-micaceous plainware sherd were also found. One of the vessels can be attributed to Taos, Picuris, or Jicarilla makers, whereas the other vessel was probably made by Jicarilla Apaches and is of the Cimarron Micaceous type. A single micaceous sherd was submitted for luminescence dating, providing a date of AD 1859±13. The lithic assemblage contains a mix of core reduction and tool production /maintenance activities, with an exterior lithic reduction area being located adjacent to one of the tipi rings. Otherwise, most of the worked obsidian appears to have been derived from the nearby Valle Grande caldera source.

16. Given that the Serna Homestead appears to have been sporadically occupied during the growing season, how does the organization of this site contrast with the Romero Homestead that was occupied continuously during the growing season?

Recent excavations were conducted at the McDougall Homestead site located adjacent to the Romero Homestead (McGehee et al. 2006). Comparisons will therefore be made between the McDougall and Serna Homesteads because both of the historic artifact collections were analyzed by Charles Haecker (Chapter 32, Volume 2; McGehee et al. 2006). Comparison of the Serna and McDougall homesteads indicate not-surprising idiosyncratic differences between the daily routines of the two households. As examples, the McDougall household indulged in alcoholic beverages and tobacco, whereas these indulgences were virtually absent at the Serna Homestead. Extensive food can refuse is present at the McDougall Homestead, but significantly fewer cans are present at the Serna Homestead. This difference is presumably due to the Sernas occupying their homestead on a seasonal basis, in contrast, to the McDougalls who lived on their homestead year-round. The McDougall residence also contains a basement where household items and food could have been stored. This too indicates a longer period of occupation. Otherwise, most of the artifact assemblage is similar between the two sites, with the exception of more canning jars being present at the McDougall Homestead. Again, this would stress the importance of stored foods and a longer period of site occupation. Nonetheless, an horno and a corral are present at the Serna Homestead, with a masonry-lined cistern being present at the McDougall Homestead.

SUBSISTENCE AND SEASONALITY RESEARCH QUESTIONS

1. What subsistence foods were exploited by Archaic peoples on the plateau?

No direct evidence of subsistence items were recovered from any of the Archaic sites. The presence of projectile points, bifaces, and ground stone indicate that hunting and gathering activities were occurring.

2. **During what season(s) of the year were Archaic peoples occupying the plateau?**

There is no direct evidence for season(s) of occupation from any of the Archaic sites.

3. **Are there differences in foods and season(s) of occupations between the Early and Late Archaic occupations?**

There is no direct evidence for subsistence or season(s) of occupation from any of the Archaic sites.

4. **Are there differences in foods and season(s) of occupations between Archaic sites in the piñon-juniper versus the ponderosa pine zone?**

There is no direct evidence for subsistence or season(s) of occupation from any of the Archaic sites.

5. **What subsistence foods are represented at the Coalition period habitation sites?**

A variety of botanical remains were recovered during the excavation of the Coalition period habitation sites. The potential economic species identified during McBride's (Chapter 62, Volume 3) analysis consist of maize, beans, squash, beeweed, cheno-am seeds, dropseed grass, four-wing saltbush, goosefoot, ground cherry, mint, pigweed, prickly pear, piñon nuts, purslane, ricegrass, sunflower, and tobacco. Maize cobs included 8- to 14-rowed varieties.

A diverse array of pollen remains were also identified during Smith's (Chapter 63, Volume 3) analysis of the soil samples from the Coalition period roomblocks. The potential economic species include maize, beeweed, cholla, prickly pear, squash, cotton, cheno-am, sunflower, lily family (e.g., yucca), purslane, and rose family.

The remains of various animal species identified at these sites includes turkey, jackrabbit, cottontail, rock squirrel, gray fox, coyote, domestic dog, pronghorn, mule deer, and several different birds (Chapter 64, Volume 3). Elk remains are absent from these assemblages, but they have been identified at other sites in the northern Rio Grande region (Chapter 80, Volume 4). There do, however, seem to be some differences in the relative abundance of certain species through time. For example, mule deer remains are more abundant at the Middle Coalition sites versus turkey and large bird remains at the Late Coalition sites. It appears that mule deer are actually more abundant than rabbit at each site, which is unusual for Southwestern archaeological faunal assemblages. This is presumably due to the upland setting of these sites versus the lowland setting for most Southwestern sites. At any rate, the increased abundance of turkey during the Late Coalition period corresponds with the increased abundance of maize at these sites. Both appear to be indicators of subsistence intensification during this later time period. Lastly, two varieties of turkey were identified. The smaller variety was recovered from midden contexts and the larger variety from room and kiva contexts. These differences in size and context could reflect wild versus domesticated turkeys.

6. Were the Coalition period habitation sites occupied seasonally or throughout the year?

LA 86534 contains a kiva and LA 12587 a midden, with both sites containing domestic and storage rooms. Indeed, burned maize cobs were stored in one of the rooms at LA 12587. Overall, the evidence would seem to indicate that these sites were occupied throughout the year. Nonetheless, as McBride (Chapter 62, Volume 3) points out, the habitation sites without kivas appear to exhibit a stronger focus on agricultural activities than those sites with kivas (including LA 4618). The pollen evidence also indicates a strong agricultural focus for LA 135290. This site contains back storage rooms that were built of adobe and then burned to harden the floor areas. This activity was repeated during the subsequent two periods of occupation. On the other hand, the lack of a midden deposit indicates that this site experienced a much lower occupational intensity than the non-kiva site at LA 12587, but a similar occupational intensity as the nearby kiva site at LA 86534. So, the variability exhibited by the excavated Coalition period roomblocks indicates a range in site function and occupational histories. Presumably LA 86534, LA 12587, and LA 4618 were all occupied throughout the year; however, it is unclear as to whether LA 135290 was occupied on a seasonal basis or throughout the year. It is possible that the site was occupied for part of the year, with the back rooms being used for storage without the occupants residing there; however, this would seem unlikely.

Smith (Chapter 63, Volume 3) discusses the issue of seasonality and notes that the pollen results cannot determine whether roomblocks were occupied year-round, but there are seasonal signals in the data. The overwhelming evidence for maize agriculture indicates spring through early fall occupation. The interpretation of the use of cholla as a cultigen at the pueblos supports an interpretation of late spring activities, as most cacti species flower between late April and June. Lily family encompasses both early spring plants (e.g., wild onion) and late spring and early summer resources, such as yucca. The prickly pear fruits or tunas are harvested later in the summer and into the early fall months. Beeweed, several cheno-am, and sunflower family taxa are late summer through early fall resources.

7. What subsistence foods are represented at fieldhouses?

Very few botanical remains were recovered from the Coalition period fieldhouses, with most of the evidence having been derived from the Classic period sites. These economic species include maize, beans, squash, beeweed, bugseed, cheno-am, goosefoot, pigweed, purslane, and tobacco (Chapter 62, Volume 3).

The fieldhouses also contained much less evidence of pollen remains when compared with the habitation sites (Chapter 63, Volume 3). A comparison of floor samples indicates lower pollen concentrations (2069 versus 4677) and a lower mean number of economic species (1.8 versus 3.1), respectively. Economic pollen present at the fieldhouse locations includes maize, squash, pea family, prickly pear, beeweed, sunflower, lily family, purslane, and cholla.

Very few faunal remains were recovered from the fieldhouses (Chapter 64, Volume 3). Taxa identified in the fieldhouses included mule deer, cottontail, pocket gopher, and elk (modern surface remain). Small-medium and medium-large sized mammal remains were also identified.

8. What season(s) were fieldhouses occupied?

Given the economic species identified in Question 7 and the seasonality data presented in Question 6, it would appear that the fieldhouses could have been occupied from spring to fall. Nonetheless, as previously noted, several of the fieldhouses did contain internal hearths. It is therefore possible that at least some of these structures were also occupied during the winter while hunting in the area. Grooved abraders were recovered from LA 85861 and LA 85414, however, an internal hearth was only present at LA 85861.

9. Are there differences in subsistence items and season(s) of occupation between Coalition and Classic period fieldhouses?

As McBride (Chapter 62, Volume 3) notes, the meager non-wood cultural plant material from Coalition period fieldhouses consists of burned cheno-am and purslane seeds, grass stems, and immature piñon nuts. Although lacking the diversity of taxa from Classic fieldhouses, the assemblage from one of the Coalition fieldhouses (LA 85861) resembles those of several Classic period fieldhouses in that beeweed seeds were recovered in two samples from the hearth. The increased plant species diversity represented at the Classic period fieldhouses may indicate an increase in the number of species being cultivated (or collected), that they were occupied for a longer part of the growing season, and/or that differential preservation is a factor.

Smith (Chapter 63, Volume 3) also identified a similar pattern with Classic period fieldhouses exhibiting a higher representation of maize than Coalition period fieldhouses. Of the 39 floor samples collected from 16 Classic period fieldhouses, 12 (33%) produced maize pollen as compared to 2 of 9 floor samples (22%) with maize pollen from five Coalition period sites. Only three Classic sites did not produce any maize pollen, but two of the Coalition sites lack maize. The pollen samples collected from LA 85413 produced the highest maize and beeweed concentrations of all the Rendija Tract fieldhouses.

10. What crops were grown in the agricultural features (e.g., grid gardens)?

As previously noted, three sets of Classic period grid gardens were excavated at LA 12587, LA 128803, and LA 139418. Very few botanical remains were recovered from the grid gardens, however, these include carbonized maize cupules, goosefoot, and cheno-am seeds and wood charcoal (Chapter 62, Volume 3). Otherwise, most of the botanical evidence was derived from the pollen remains (Chapter 63, Volume 3). Most of the pollen identified in the grid gardens consists of cheno-ams, sunflower, and piñon. However, pollen representation from these features is intermediate between fieldhouses and pueblos. That is, cheno-am percentages from gardens are moderate, and piñon and juniper values tend to be higher than observed within structures. This pattern makes sense, as gardens were open to atmospheric pollen deposition; thus tree pollen input drives the conifer percentages higher. The feature sampled at LA 12587 is an exception among the gardens, with pollen concentrations and cheno-am percentages comparable to the LA 12587 roomblock. Otherwise, maize is represented in all three features, with its abundance being greatest at LA 12587 (93%), with less at LA 128803 (44%), and the least at LA 139418 (15%). Cotton pollen was also documented at LA 12587 and LA 128803.

Lastly, although cholla and prickly pear pollen were identified in all of the features, their relative abundance is significantly greater at LA 12587, indicating that they may have been cultivated.

11. What subsistence foods were exploited at the possible Athabaskan campsites?

Very few botanical remains were recovered from the two Jicarilla Apache sites, however, charred goosefoot and a possible wheat seed were identified. Otherwise, beeweed and sunflower pollen were the only other potential economic plant species identified.

12. During what season(s) were the possible Athabaskan campsites occupied?

The presence of goosefoot and sunflower could indicate a late summer or early fall occupation. Given the presence of warming hearths within the tipi rings, it seems likely that the occupation was during the fall when the nights were becoming cooler.

13. What subsistence foods are represented at the Serna Homestead? What relative contribution did hunting, gathering, agricultural produce, herding, and store-bought foods provide for the diet?

The plant remains of several cultigens were recovered from the site including maize, bean, grape, and peach. On the other hand, maize pollen was the only domesticated plant pollen identified at the homestead. Prickly pear, beeweed, and sunflower pollen was also present, but it is not known whether these were environmentally or culturally introduced. The paucity of plant remains is surprising given that informants state that 40 acres of beans, corn, wheat, pumpkins, and various vegetables were cultivated at the homestead. In addition, only 27 pieces of bone were recovered from the site, including cow, goat, deer, elk, and blue grouse. The latter three species were presumably hunted in the area.

Haecker (Chapter 32, Volume 2) states that the measurable cans indicate that the homestead inhabitants depended on canned fruits, juices, vegetables, and baked beans. Sardine cans were also present, but represented less than 3 percent of the total number of food cans. In addition, coffee, condensed milk, and lard cans were also identified. Canned meats likely were not a regular item on the menu, and neither were home-canned foods. An informant recalled that his family regularly ate fresh beef (Peterson and Nightengale 1993:66), which would explain the virtual absence of meat cans and the presence of cow bone. Glass containers that once held food or condiments are also present, including canning jars. It is likely that, at least during the harvest season, the Sernas were consuming some of what they were harvesting (e.g., onions, beans, squash, chili, and corn).

14. What evidence for season(s) of occupation is represented at the Serna Homestead?

Informants state that the Serna Homestead was used as a seasonal farm, with the family traveling to the rancho three times during the year: in the spring for planting, the summer to weed and clean the fields, and in September/October to harvest the crops. They stayed about two weeks at a time and brought milk, cows, chickens, and all the supplies and tools they needed (Peterson and González-Peterson 1993). Even though 40 acres of beans, corn, wheat, pumpkins, and various vegetables were cultivated, the archaeological evidence is limited to corn and beans. The limited archaeobotanical evidence could be interpreted as reflecting an occupation during the spring to fall growing season, however, the oral history information refutes this interpretation.

15. How does the subsistence and seasonality information recovered from the Serna Homestead contrast with that recovered from the Romero and Vigil y Montoya Homesteads?

In contrast to the Serna Homestead, the Romero Homestead appears to have been occupied most or all the time from April to November. An informant stated that the Romero family moved to the homestead in "the first part of spring, usually in late April, and stayed until cold weather set in at about the middle of November" (Foxx and Tierney 1999:15). They also brought some chickens and pigs to the rancho in a horse-drawn wagon. Beans were the main crop, with some squash, pumpkins, peas, and corn; whereas, melons, watermelons, and chile were mainly grown in the Rio Grande Valley. A kitchen garden contained peas, pumpkins, sweet corn, and melons, and peach trees were also present on the homestead. Archaeological excavations at the Romero Homestead yielded evidence of cheno-ams, watermelon, squash, sunflower, piñon pine nuts, apricot, wild and domestic plum, domestic cherry, peach, chokecherry, acorn, and maize. Many of the seeds were obtained from deposits adjacent to the cabin where a lean-to had been attached (Foxx and Tierney 1999). Obviously, a much wider variety of plant remains were recovered from the excavations conducted at the Romero Homestead, including several structures and trash dumps. In contrast, very little was recovered from the excavations of the McDougall cabin, including amaranth, goosefoot, grape, and peach seeds (McBride 2006). This paucity could be due to the cabin having burned and the lack of trash deposits at the site. These deposits solely consisted of a surface concentration of cans.

16. How do these data on subsistence and seasonality reflect changes in the long-term use of the plateau from Archaic through Homestead Era times?

Vierra (2003, 2007; Vierra and Foxx 2002; Chapter 75, Volume 4) suggests a changing pattern of land-use from Early to Middle to Late Archaic times. These long-term patterns reflect the increasing use of upland areas like the Pajarito Plateau. However, this interpretation is based on a limited amount of subsistence information. In fact, direct subsistence information is lacking from the excavated Archaic sites on the plateau. Information is solely available from the excavation of two Late Archaic sites situated in the Rio Grande Valley near San Ildefonso Pueblo. The botanical remains recovered from these sites include chenopodium, prickly pear, and squawberry seeds. These sites have been interpreted as representing habitation sites (winter?) based on the lithic assemblages and the presence of a structure and storage facilities at one of the sites, whereby the upland sites are assumed to represent limited campsites (Vierra 2003; Vierra and Foxx Chapter 75, Volume 4). On the other hand, a variety of plant and animal species have been identified from the excavations conducted at Jemez Cave. The botanical remains include maize, yucca, pumpkins, prickly pear, piñon pine, and cotton. The faunal remains include turkey, grouse, crane, bison, ground squirrel, prairie dog, porcupine, black bear, mountain lion, jackrabbit, cottontail, bobcat, skunk, mountain sheep, mule deer, fox, and badger. Not all of these were necessarily introduced by the site occupants, and not all of these are associated with the Archaic occupation of the rockshelter (Alexander and Reiter 1935).

Nonetheless, Ford (1975) suggests that Late Archaic people occupied the rockshelter from late spring to summer based on the growing of maize near the site. Overall, the Late Archaic land-use pattern appears to be characterized by a lowland/upland pattern within restricted areas of the Rio Grande Valley. This may have involved movements from the juniper-savanna in the early summer (Indian ricegrass), to the ponderosa pine/mixed conifer in the mid to late summer (cheno-ams, wild onions, berries, and wild potatoes), and then down to the piñon-juniper woodlands in the fall (acorns, pine nuts, yucca, and cacti). As previously noted, the riverine settings also appear to have been used for winter campsites (Vierra 2003; Vierra and Foxx 2002, Chapter 75, Volume 4).

It seems likely that Archaic foragers continued to seasonally occupy the Pajarito Plateau until the 12th century when agriculturalists began to move into the area as full-time residents. Although a few Developmental period sites are present on the central plateau, these are mostly situated at lower elevations and presumably reflect the first attempt to occupy the plateau by agriculturalists; however, it was probably not productive to implement a year-round strategy until 12- to 14-rowed varieties of maize could be planted in these upland settings (Vierra and Ford 2006, 2007).

Not until the 12th century was the Pajarito Plateau occupied on a year-round basis as reflected by the immigration of Coalition period agriculturalists into the area. Most of these early sites consist of 10- to 20-room pueblos; however, excavations conducted by this project indicate that a variety of floor plans and architectural styles were used in the construction of these roomblocks. As previously noted, it seems likely that LA 12587, LA 86534, and LA 4618 were all occupied throughout the year; however, it is unclear as to whether LA 135290 was occupied seasonally and/or on a year-round basis. A variety of wild and domesticated plants and animals are represented at the sites, but a general lack of remodeling presumably indicates that these sites were occupied for 10 to 15 years and then abandoned once the local resources were exhausted. The roof beams appear to have been removed and subsequently integrated into the new structure. The presence of middens and evidence for subsistence intensification reflects that these Late Coalition period pueblos were occupied for longer periods of time than their Early-Middle Coalition period counterparts.

This evidence of subsistence intensification is also represented in the expansion of farming plots into higher elevation settings during the Late Coalition period. However, as pointed out by Gabler (Chapter 79, Volume 4), there does not appear to be significant difference in the distribution of Coalition versus Classic period fieldhouses in respect to elevation. Nonetheless, comparisons of Late Coalition versus Classic period fieldhouses in Rendija Canyon indicate that the latter were more intensively occupied. This is of course associated with a marked increase in the number of Classic period fieldhouses present in the Rendija Tract, but fieldhouses and grid gardens are also present in the Airport and White Rock tracts during this time period. Overall, these fieldhouses appear to have been occupied during the growing season, with some possibly being used for hunting during the winter months.

Eventually a series of droughts during the 1580s forced the Ancestral Pueblo occupants of the plateau down to the Rio Grande Valley for year-round habitation. Nonetheless, these peoples continued to seasonally use these upland settings for agriculture and hunting and gathering activities. Evidence from test excavations at the Otowi grid gardens indicates that the features continued to be used during the 18th century, with both squash and maize pollen being recovered (Chapter 55, Volume 2). In addition, Steen (1977) suggests that the various game pits situated along deer trails were used from the 17th through the early 19th centuries.

Eventually the plateau was occupied on a seasonal basis by Jicarilla Apaches at the turn of the 20th century. During this time, Apaches roamed this area of the northern Rio Grande prior to the designation of a reservation near Dulce. In addition, the Homestead Act opened up the plateau to mostly Hispanics who filed for patent claims during the 1890s to early 1900s. As previously noted, this was a period of above average rainfall that provided the moisture necessary for dry land farming. The rainfall farming of mostly beans provided a cash crop to the residents who seasonally occupied the plateau during the growing season. Otherwise, their primary residences were located in the nearby Rio Grande Valley. With the exception of the Los Alamos Boys Ranch, it was not until the arrival of the Manhattan Project during the 1940s that the plateau would again witness a year-round occupation.

TECHNOLOGY, PRODUCTION, AND EXCHANGE RESEARCH QUESTIONS

1. **Are the Archaic lithic assemblages dominated by the production and maintenance of bifacial tools?**

The answer to this question is obviously yes, however, it is much more complicated than that. Figure 86.9 illustrates the relationship between core flakes, biface flakes, and angular debris for Archaic (n = 3), Coalition period roomblocks (n = 5), Classic period fieldhouses (n = 2), and Jicarilla Apache (n = 1) sites. As can be seen, the Archaic sites form a cluster with a greater emphasis on bifacial cores and tools and the Coalition period roomblocks another cluster emphasizing core reduction. There are three sites situated between these two groups, including an Archaic site, a fieldhouse, and the Jicarilla Apache site. Nonetheless, significant changes in biface technology were occurring during the Archaic (Chapter 74, Volume 4). The lithic assemblage at LA 85859 indicates that the Early Archaic site occupants were gearing up with bifacial cores at the nearby caldera obsidian source. These cores were then being reduced and used to produce biface blanks for dart points. A similar situation is represented at the La Bajada site (LA 9500), except that the Early Archaic occupants of this site were using dacite instead of obsidian. Figure 86.10 presents an example of bifacial cores and biface blanks from the La Bajada site. This pattern of using bifacial cores and biface blanks for the production of dart points continues during the Middle Archaic period as is represented by the San Jose point technology; however, it changes during the Late Archaic period when flake blanks replace biface blanks for the production of dart points. Analyses of biface flake platform angles at LA 85859 and LA 99397 (Middle-Late Archaic) indicates that the early to middle stage bifacial cores and biface blanks were being reduced at LA 85859 versus early, middle, and late stage bifaces including bifacial knives and points at LA 99397. Therefore, the former site probably represents a temporary campsite and the latter a habitation site (e.g., see Vierra 2003)

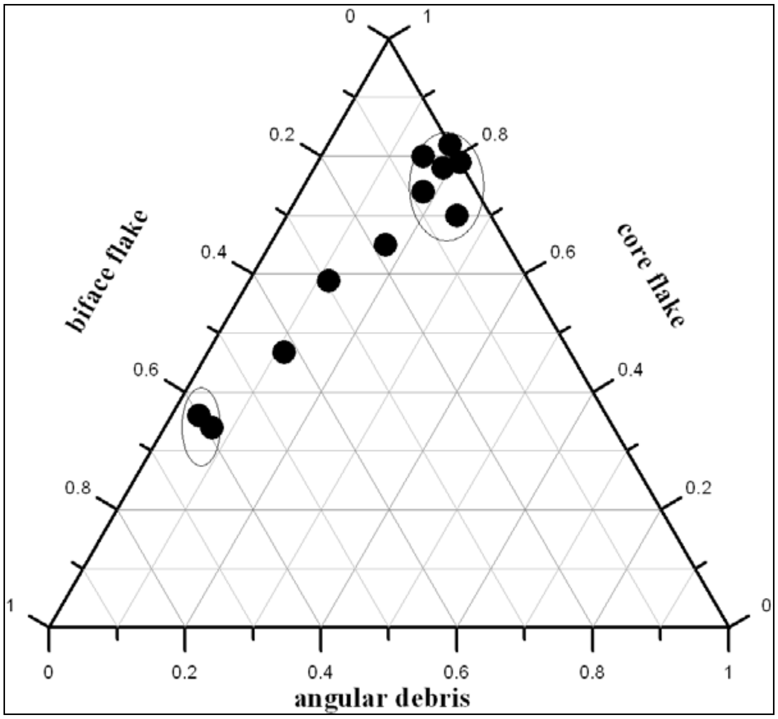


Figure 86.9. The relative distribution of debitage types for Archaic, Ancestral Pueblo, and Jicarilla Apache sites.

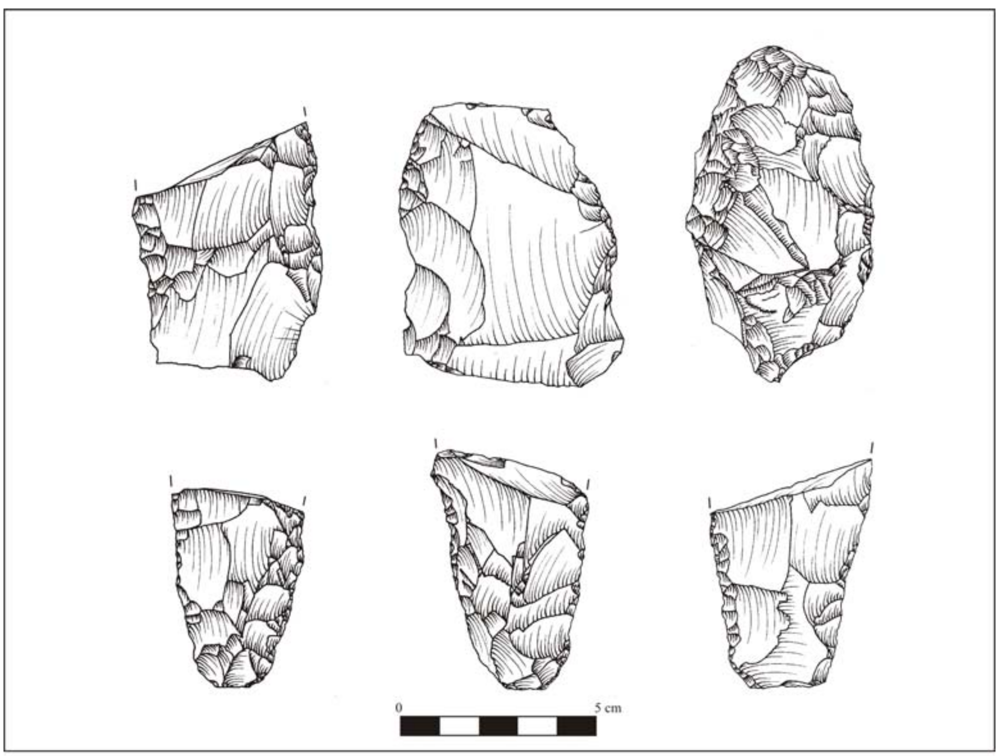


Figure 86.10. Early Archaic bifacial cores (upper) and biface blanks (lower) from the La Bajada site.

2. What nonlocal lithic materials are present on the Archaic sites, in what form were these items brought to the sites, and what artifacts were being produced on these materials?

Figure 86.11 illustrates the distribution of obsidian, chalcedony/chert, and basalt for Archaic, Ancestral Pueblo, and Jicarilla Apache sites. As can be seen, the Archaic and Jicarilla sites form a cluster that is dominated by obsidian, the Ancestral Pueblo sites by chalcedony/chert, and a single fieldhouse by both obsidian and chalcedony/chert. However, the obsidian was obtained from several different sources. Larger cobbles were available from the Valles Caldera (Valle Grande) and the Rabbit Mountain/Obsidian Ridge (Cerro Toledo) source areas; however, small nodules were also scattered in surface lag gravels on the mesa at Rendija Canyon (Cerro Toledo). Nonetheless, it appears that the primary sources were mostly used by the Archaic inhabitants. Larger nodule sizes would have been critical to the production of large biface and flake blanks for the production of dart points and bifacial knives. As previously noted, both bifacial cores and platform cores were being brought to campsites on the plateau for further reduction and tool production. At least some artifacts made of El Rechuelos obsidian were also identified. Given the lack (or paucity) of this material in nearby gravels, it is assumed that most of the material used for the production of these items was obtained to the north near the Abiquiu source area.

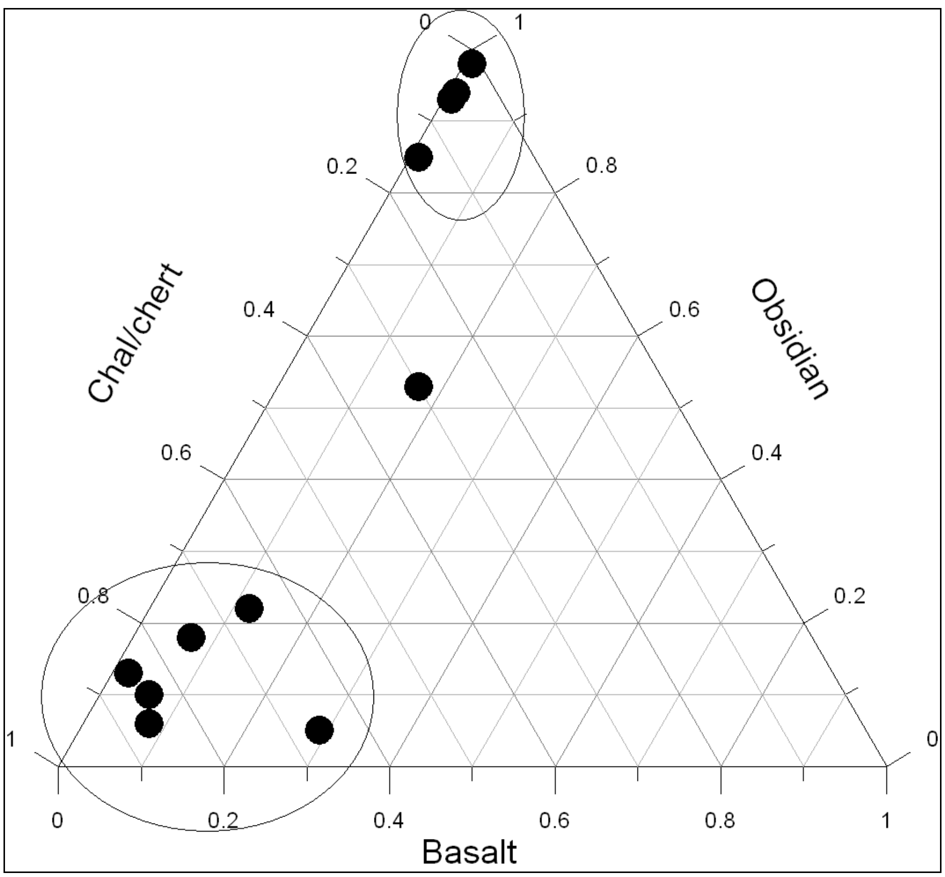


Figure 86.11. The relative distribution of debitage material types for Archaic, Ancestral Pueblo and Jicarilla Apache sites.

3. **What information do these nonlocal materials provide concerning possible Archaic mobility patterns?**

Vierra (2007, Chapter 75, Volume 4; Vierra et al. 2005) presents a potential model for long-term changes in Archaic mobility patterns. This study was based on the X-ray fluorescence (XRF) sourcing of projectile points made of both obsidian and dacite, which are available in the Jemez Mountains (Zone 1) and San Antonio Mountain (Zone 2) areas. It appears that the central Jemez Mountains sources dominate Zone 1 with mostly Cerro Toledo and Valle Grande obsidian; however, the Early Archaic and San Jose points are also represented by obsidian derived from the southern Bear Springs source and a few items from the northern El Rechuelos source. On the other hand, the San Jose points are dominated by the Valle Grande source. Since the Valle Grande obsidian source is restricted to the caldera, this pattern provides support for the contention that these Middle Archaic foragers were integrating these upland resource areas into their summer and fall seasonal rounds, and thereby collecting more of this obsidian. This contrasts with the Cerro Toledo source, which is present along the eastern periphery of the caldera and in secondary deposits along the nearby canyon and Rio Grande Valley.

In contrast, most of the Archaic points are made of El Rechuelos obsidian in Zone 2. However, the Early Archaic reflects a north-south pattern with all three central and northern obsidian sources being represented. San Jose points continue to reflect the importance of Valle Grande obsidian, but now with El Rechuelos. Together, the obsidian data seem to support a north-south seasonal pattern of movement during the Early Archaic period, with a more restricted north-south pattern during the Middle Archaic period. On the other hand, the Late Archaic points were made on flake blanks with shorter tool use-lives. In this case, these points are dominated by the most proximate obsidian source. That is, the central Jemez Mountains sources in Zone 1 and the El Rechuelos source in Zone 2.

The dacite sourcing study corroborates the obsidian study. That is, the Early Archaic points contain examples of dacite derived from all three southern and northern sources. In contrast, the later periods are mostly characterized by the increasing use of local dacite.

4. **Are there significant differences between Early and Late Archaic period stone tool technology, and, if so, what are the implications of these differences for understanding changes in past land-use strategies?**

As Vierra (2007, Chapter 75, Volume 4) points out, changes in Early and Middle Archaic period point technology may be associated with the expansion of piñon-juniper woodlands in the region and a shift from hunting large game in open settings to more medium to small game in wooded settings. This projectile point technology was characterized by low point diversity and low tool replacement rates. In contrast, the Late Archaic period point technology was characterized by high tool replacement rates and high point diversity. Overall, these changing patterns could reflect a "replacement when exhausted" versus a "replacement based on probability of failure" strategy (Kuhn 1989). That is, Early and Middle Archaic groups were residentially mobile, with a technology that was continuously used and maintained; whereas, Late Archaic groups were becoming more logistically organized, while focusing on specific target-species. Higher tool replacement rates would be used as a means of increasing tool reliability (also see Vierra 1992a:104). The changing emphasis on lowland versus upland resource use is reflected in the long-term pattern of using mostly dacite from lowland sources to obsidian derived from upland sources from the Early to Late Archaic period.

5. **Do Ceramic period lithic assemblages emphasize core reduction activities?**

The answer to this question is yes, as illustrated by the cluster of sites emphasizing core reduction in Figure 86.9. All of the Coalition period roomblocks and most of the fieldhouses emphasize core reduction activities; however, one Classic period fieldhouse does exhibit a mix of core reduction and biface production/maintenance activities (LA 128805). This fieldhouse is situated in the White Rock Tract and contains both a one-room structure and associated artifact scatter that dates to the Middle Classic period (15^{th} century). Most of the biface flakes are made of obsidian, with only two obsidian artifacts dating to the Classic period; whereas, the remaining eight artifacts date to the Archaic period. Therefore, at least some of the evidence for biface production could be associated with an older Archaic component.

6. **What nonlocal lithic materials are present on the Ceramic period sites, in what form were these items brought to the sites, and what artifacts were being produced on the materials?**

Obsidian is the only potential nonlocal lithic raw material that appears to have been brought onto the Ceramic period sites. Overall, about 11 percent to 15 percent of the total flake assemblages from roomblock and fieldhouse sites exhibit cortical platforms, indicating that cobble raw materials were being brought to the sites for reduction. On the other hand, most of the flakes exhibit single-faceted platforms (52% to 56%), indicating the reduction of platform (or flake) cores was also important. Obsidian comprises about 5 percent to 10 percent of the Early-Middle Coalition period roomblocks and increases to 17 percent to 22 percent at the Late Coalition and Classic period fieldhouses. Most of these fieldhouses are located in Rendija Canyon where small obsidian nodules were present in surface lag gravels situated on the mesa top. Bipolar reduction was one technique used to reduce these small pebbles. Nonetheless, some of the obsidian present at these sites was also derived from the Valle Grande source located in the nearby caldera. On the other hand, both Cerro Toledo and Valle Grande sources were exploited by the occupants of the Coalition period roomblocks. About 8 percent of the flakes on these sites exhibit cortical platforms, with 34 percent being single-faceted, and 33 percent being crushed. Therefore, both nodules and prepared cores (or flakes) appear to have been brought to the roomblock and fieldhouse sites for reduction.

A total of four prepared cores and a single tested obsidian nodule were identified at the Coalition roomblock sites, whereas, one prepared core and four tested obsidian nodules were recovered from the fieldhouses. The relative increase in tested nodules at the fieldhouses presumably reflects the use of local lag gravels. In contrast, the obsidian materials used at the roomblocks were probably obtained from the original source areas. For example, a large obsidian flake was observed at a Late Coalition period cavate site along Mesita del Buey near the White Rock Tract. The flake is 18.5 cm long and weighs 1274 g. The dorsal surface is covered with nodular cortex, indicating that it represents a large primary flake removed from a very large nodule. XRF analysis indicates that the item was obtained at the Valle Grande source. A similar procurement tactic was employed by Pueblo groups in the Flagstaff area while collecting obsidian from the Government Mountain source (Vierra 1993a).

7. What is the nature of the Ceramic period ground stone assemblages?

The Coalition roomblock sites contain mostly one-hand manos, but two-hand manos are represented as well (Figure 86.12). The percentage of two-hand manos actually increases slightly from the Early/Middle Coalition period to the Late Coalition period at the roomblock sites, but is highest at the Late Coalition period fieldhouses. Slab metates are also present at the roomblock sites, but no trough metates being identified. The fieldhouses contain both one- and two-hand manos, with some grinding slabs and undetermined metate fragments.

The sample sizes vary greatly when attempting to compare mean mano lengths; that is, Early/Middle Coalition roomblock (*n* = 11), Late Coalition roomblocks (*n* = 38), Late Coalition fieldhouses (*n* = 3), and Classic fieldhouses (*n* = 13). These comparisons are also difficult given that two-hand manos tend to be discarded when broken and cannot therefore provide overall length measurements. Nonetheless, there is a similar pattern with smaller mean lengths for Early/Middle Coalition (mean = 133 mm, *std* = 44.9) and Late Coalition roomblocks (mean = 120 mm, *std* = 48.2) versus larger lengths for Late Coalition period fieldhouses (mean = 176.6 mm, *std* = 52.5) and Classic period fieldhouses (mean = 151, *std* = 57.6). This again emphasizes the general importance of smaller-size manos at the roomblock sites.

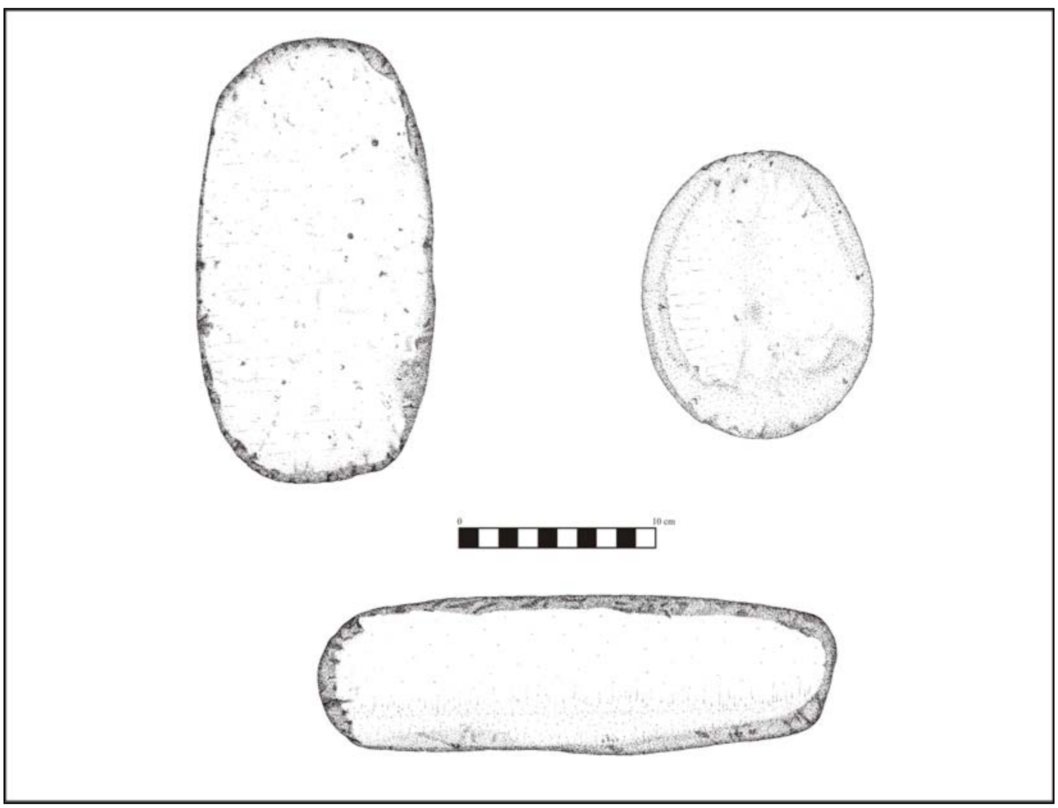


Figure 86.12. One- and two-hand manos.

8. How do the Ceramic period site types differ in respect to chipped and ground stone assemblage composition?

This question has partially been addressed by Questions 5, 6, and 7. That is, both roomblock sites and fieldhouses emphasize chalcedony core reduction activities. Although a single fieldhouse does deviate from this pattern, the increased proportion of biface flakes may actually represent an older Archaic component. Cortical:noncortical flake ratios do vary with somewhat lower ratios at the fieldhouses (0.24 and 0.29) versus higher ratios at the roomblocks (0.35 and 0.38). Given the small assemblage size at most of the fieldhouses, this probably indicates that prepared cores were often being brought to these sites for reduction. However, a closer inspection of cortical platforms by material types also reveals some subtle differences. Cortical platforms make up a minor portion of the flake platform types in all the assemblages, reflecting an emphasis on reducing platform cores at these sites. Nonetheless, the Classic period fieldhouses contain some obsidian (11%) and chalcedony (8%) cortical platforms, but no basalt cortical platforms. In contrast, the Early-Middle Coalition period roomblock assemblages contain obsidian (10%), chalcedony (13%), and basalt (9%) cortical platforms. Lastly, the Late Coalition period roomblock assemblages contain obsidian (9%), chalcedony (26%), and basalt (9%) cortical platforms. This indicates that some local obsidian pebbles and chalcedony cobbles were being brought to the fieldhouses for reduction, with a notable increase in the presence of basalt nodules at the roomblock sites and a marked increase in the reduction of chalcedony cobbles at the Late Coalition period roomblocks. Several cobble unifaces and tested nodules were recovered from the fieldhouses (n = 8). All of the latter are obsidian pebbles. In contrast, only two cobble bifaces and three tested nodules were actually found at the roomblocks. These consist of chalcedony, pedernal chert, basalt, and obsidian materials.

In respect to the ground stone assemblages, both roomblocks and fieldhouses contain mostly one-hand manos with fewer two-hand manos. The Late Coalition period roomblock manos tend to be more heavily used than either the Early-Middle Coalition period or fieldhouse sites; however, the large loaf-shaped two-hand manos were only identified at fieldhouse sites in Rendija Canyon. Lastly, formal slab metates were identified at the roomblock sites versus grinding slabs and undetermined metate fragments at the fieldhouses. Nonetheless, the presence of larger two-hand manos at some fieldhouses indicates that slab metates must have been present at some time.

9. What types of tools are present on Ceramic period agricultural sites?

A single hoe was the only agricultural tool recovered from the three grid garden sites at LA 12587, LA 128803, and LA 139418. It consists of a thin oval-shaped quartzite cobble with notches along either side (Figure 86.13) from LA 128803. Hoes that were presumably used for maintaining their agricultural fields and axes for construction or possibly clearing forested land for field plots were also recovered from fieldhouses.

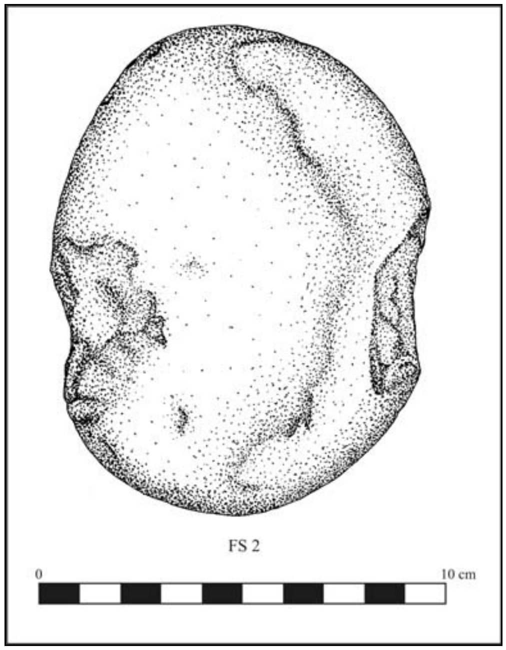


Figure 86.13. Hoe from LA 128803.

10. Can compositional studies of clay and temper sources identify distinctive signatures that can then be used to evaluate long-term changes in ceramic production and exchange on the plateau?

Miksa's (Chapter 59, Volume 3) petrographic study identified five basic temper groups. These groups consist of anthill sand, anthill sand with clay lumps, granitic, Tuff 1, and Tuff 2. Although source samples were taken from local alluvial sands, these were not sufficiently distinct to separate from the anthill. Santa Fe Black-on-white exhibits the greatest degree of variability including all but the granitic temper types. Overall, there appears to be a temporal trend with anthill tempers generally occurring earlier and tuff tempers later in time. This includes more Tuff 2 and less Tuff 1. The majority of the corrugated wares are tempered with anthill sand, although three sherds did contain granitic temper. All the biscuitware sherds are tempered with tuff, although there is more Tuff 1 represented than Tuff 2. Sapawe Micaceous is always tempered with granitic material, whereas most of the plainware pottery is tempered with anthill sand and a few with granitic temper.

11. Can compositional studies of paste and temper identify different sources for these materials? If so, which of these sources are local versus nonlocal?

Miksa's (Chapter 59, Volume 3) petrographic study identified five basic temper types. Four of these appear to be from local sources, consisting of anthill sand, anthill sand with clay lumps, Tuff 1, and Tuff 2; whereas, ceramics with granitic temper were presumably obtained from nearby villages in the Rio Grande Valley. The latter includes all of the Sapawe Micaceous, and a few of the plainware sherds. In addition, three corrugated sherds also exhibited granitic temper. These consist of two smeared-indented corrugated sherds that were recovered from Classic period fieldhouses and an indented corrugated sherd that was obtained from the Coalition period roomblock site at LA 4624. Otherwise, all the Santa Fe Black-on-white and biscuitware sherds appear to have been locally made. However, Curewitz and Harmon (2002) and Dean (2006) note the presence of igneous and sand, and granite and sand temper in several Santa Fe Black-on-white sherds from excavated Coalition period roomblocks on Mesita de Buey near the White Rock Tract. In addition, Dean (Chapter 58, Volume 3) also identified about 50 sherds with granite and sand temper from LA 12587, LA 86534, and LA 135290. These items presumably represent nonlocal trade wares.

12. Can refiring and tensile strength studies help us understand past ceramic production techniques?

Sam Duwe conducted a tensile strength study of Coalition and Classic period ceramics. In his preliminary test, it appears that ceramic strength, and hence durability, remained relatively consistent through the entire Pajarito whiteware chronology (Table 86.3). In fact, tensile strength may have actually *increased* with the advent of biscuitware technology. This is likely due to the average increased width of vessel walls, which likely compensated for the use of a softer and more porous paste.

From this analysis of tensile strength, it appears that although potters in the Classic period were changing the construction techniques and material sources of their pottery, these changes in ceramic technology allowed for the maintenance of vital performance characteristics, such as durability. This would have been important for the pottery to endure both domestic and ceremonial use and also long-distance exchange. Whatever the reasons for the transition to biscuitware technology, certain performance characteristics were inherent in all types of Pajarito whiteware through prehistoric occupation on the northern Pajarito Plateau.

Table 86.3. Results of the Pajarito whiteware ceramic tensile strength analysis.

Type	Date	Site	Unit	Thickness (mm)	Mean Thickness (mm)	Load (lbs)	Mean Load (lbs)
Santa Fe B/w	AD 1175–1475	LA 170	N	4.50	3.75	20	38
		LA 170	N	3.00		52	
Wiyo B/w	AD 1175–1425	LA 169	A	4.00	4.00	18	18
Abiquiu B/g	AD 1325–1450, 1540?	LA 169	A	7.00	7.50	33	42
		LA 169	A	8.00		51	
Bandelier B/g	AD 1550–1650	LA 169	A	7.00	6.75	56	42
		LA 169	A	6.50		27	

13. What nonlocal ceramics are present during the Coalition period? Besides the Red Mountain whitewares, is there evidence for the presence of nonlocal Santa Fe Black-on-white or other intra-regional painted wares? What are the implications of these data for understanding regional trade networks?

Nonlocal ceramics are very rare at Coalition period sites (Chapter 58, Volume 3). The Early-Middle Coalition sites of LA 86534 and LA 135290 contain eight Chupadero Black-on-white and three Reserve Smudged sherds, which indicate ties with the Jornada Mogollon to the south; whereas, a Gallup Black-on-white, a Socorro Black-on-white, and two Cibola whiteware sherds reflect ties to the west and to the San Juan Basin. Lastly, two White Mountain redwares also represent long-distance trade relationships to the west into east-central Arizona. The petrographic analysis indicates that all the sampled Santa Fe Black-on-white sherds were locally made (Chapter 59, Volume 3). The presence of Mogollon and Cibola ceramics may reflect ancestral ties by immigrants from the lower Rio Grande Valley and San Juan Basin to the Pajarito Plateau. In contrast, the White Mountain redwares reflect a region-wide Pueblo III exchange network that links many of these upland communities.

The Late Coalition site of LA 12587 contains a single Chupadero Black-on-white and three Reserve Smudged sherds, which indicate continuing ties to the south; however, the absence of any Jornada Mogollon ceramics at LA 4618 also reflects that these ties were more restricted (or terminated) near the latter part of the Coalition period. On the other hand, the presence of a Tularosa Black-on-white and six Cibola sherds reflects continuing ties to the San Juan Basin, and seven White Mountain redware, and four St. Johns Black-on-red and St. Johns Polychrome sherds to the regional Pueblo III trade network. On the other hand, two Gallina Black-on-white and four Mesa Verde Black-on-white sherds were also recovered from both sites, again reflecting subtle changes in regional contacts (recent immigrants?) during the latter part of the Coalition period. Gabler's (Chapter 79, Volume 4) study does identify peak population levels on the central plateau at about AD 1300 to 1350. This peak could reflect a second immigration into the area, this time from the four-corners region. Nonetheless, Duwe's (Chapter 77, Volume 4) analysis of the ceramic assemblage from Otowi, which includes Late Coalition and Early Classic period components, failed to identify any non-local Pueblo III ceramics (with the exception of three Red Mountain redware sherds). Two of these sherds were recovered from the older Late Coalition period component situated at Roomblock A. Overall, the ceramic evidence indicates that there was only a limited amount of regional interaction between the residents of the Pajarito Plateau and their neighbors during the Coalition period, although the effects of immigration into the area are still poorly understood.

14. What nonlocal ceramics are present during the Classic period? Besides the glazewares, is there evidence for the presence of nonlocal biscuitwares and utilitywares? What are the implications of these data for understanding regional trade networks?

The limited evidence of regional interaction that characterizes the Coalition period changed dramatically during the Classic period. There is a marked increase in the trade relationships between the occupants of the Pajarito Plateau and their Tewa neighbors in the nearby Rio Grande Valley. This is best illustrated by the presence of Sapawe Micaceous at the Classic period fieldhouses. Duwe's (Chapter 77, Volume 4) study at Otowi and Tsirege determined that micaceous ceramics composed 59 percent and 35 percent of the utilitywares, respectively. In addition, a locally produced micaceous slipped pottery was also identified at the Classic period fieldhouses, which appears to mimic the nonlocal type. Curewitz's (Chapter 76, Volume 4) study also identified that vessel size range, the proportion of large jars, and the degree of size standardization increases for utilitywares from the Coalition to the Classic period at sites on the Pajarito Plateau. The production of large jars requires a higher degree of skill, and these may have been made by fewer potters, resulting in a more standardized size range. However, it is unclear as to whether these Classic period jars were being exchanged with communities in the nearby valley.

Small amounts of nonlocal glazeware sherds are represented at the Classic period fieldhouses (3 to 8%). Otherwise, the petrographic analysis indicates that Sapawe Micaceous and a few plainware and corrugated sherds were obtained from villages in the nearby Rio Grande Valley. In contrast, all the sampled biscuitwares were produced using local tuff temper (Chapter 59, Volume 3).

Glazewares compose 5 percent to 12 percent of the decorated ware assemblages at Otowi and Tsirege, respectively (Chapter 77, Volume 4). Larson et al. (1986) determined that most of the glazewares in their sample from Tsirege were being produced on the Pajarito Plateau, with some from Cochiti and the Galisteo Basin. In addition, about 6 percent of the biscuitwares at Tsirege were obtained from the Chama Valley area. Larson et al. (1986) consider that there was more trade among the biscuitware sites than between the biscuitware and glazeware producing sites. On the other hand, Duwe (Chapter 77, Volume 4) suggests that the increase in glazewares at Tsirege may reflect increasing exchange relationships with Keres populations to the south.

Munson's (Chapter 82, Volume 4) rock art study could not identify a clear cut border between Tewa and Keres social boundaries. In fact, the majority of the conflict-related glyphs (e.g., shields) were observed in the area of Otowi and Tsankawi, which is north of the proposed Tewa-Keres boundary along Ancho Canyon. Snead's (Chapter 81, Volume 4) trail study denotes several major east-west trails from the Rio Grande Valley into the Jemez Mountains; however, he also defines an important north-south trail that spanned the entire Pajarito Plateau (the Old Pajarito Trail). This trail includes segments in the area between Tsirege and Mortandad Canyon and the Bayo Staircase near Otowi.

15. **Is there any evidence of ceramic production on the Ceramic period sites? Or, is there any evidence that a lithic and ceramic scatter site could reflect a kiln(s) used in pottery production?**

Petrographic analyses indicate that most of the decorated ceramics were produced using local tuff tempers, whereas, anthill sand was used for the utilitywares (Chapter 59, Volume 3). There seems little doubt that the majority of the Coalition period ceramics and much of the Classic period ceramics were produced by the residents of the Pajarito Plateau. However, no direct evidence of kilns or any other ceramic production features were identified during the excavations. The lithic and ceramic scatters appear to represent limited activity areas or temporary campsites, but not pottery production locales.

16. Is there evidence of ceramic craft specialists during the Classic period, and if so, what are they producing for exchange?

As previously noted, Curewitz's (Chapter 76, Volume 4) study identified that vessel size range, the proportion of large jars, and the degree of size standardization increases for utilitywares from the Coalition to the Classic period at sites on the Pajarito Plateau. The production of large jars requires a higher degree of skill, and these may have been made by fewer potters, resulting in a more standardized size range. However, it is unclear as to whether these Classic period jars were being exchanged with communities in the nearby valley. The biscuitwares are also represented by a marked increase in the proportion of jar forms when contrasted with decorated bowls during the Coalition period.

Duwe's (Chapter 77, Volume 4) study of biscuitwares from Otowi and Tsirege revealed that vessel size and standardization differed between the two sites. In general, the mean size of the Biscuit B bowls recovered from Otowi were smaller than those from Tsirege. Also, Tsirege had a much smaller standard deviation for bowl size than that from Otowi. If consistency of pottery is a sign of standardization, Tsirege is producing more standardized vessels, which could be interpreted as a higher degree of craft specialization. The same sort of relationships between Otowi and Tsirege was also identified when comparing the width of the interior framing line. That is, the standard deviation of framing line width was much smaller at Tsirege when compared with that of Otowi, also indicating increasing craft specialization in pottery production.

Lastly, Miksa (Chapter 59, Volume 3) suggests that the shift from sand and tuff temper sources for the production of Santa Fe Black-on-white to tuff temper sources for the production of biscuitwares represents a "much more controlled selection of materials and possibly much better control of production technology." This also presumably reflects a shift from household production to ceramic specialists.

17. What evidence is there for domestic versus agricultural activities at the Serna Homestead site?

A variety of domestic artifacts were identified at the Serna Homestead, including food cans, commercial food jars, canning jars, medicine bottles, whiteware and stoneware ceramics, kerosene lamp, lard pails, tools, and personal possessions. The latter consists of glass beads, a brooch fragment, a harmonica fragment, a clasp knife fragment, a pocket compass fragment, shirt and blouse fragments, jacket buttons, shoe and boot fragments, a comb, and a cold cream jar. In addition, various tools were also recovered including metal files, scissors, a wrench, and a hacksaw blade. Lastly, a Mexican-style slab metate and one-hand mano were also found near the cabin.

Four horseshoes and one horseshoe nail were identified in the collection, as were fragments of what is believed to be a leather harness. The presence of several fence staples in the collection indicates that the homestead included a wire fence. Strands of barbed wire were also present, with several fence posts still remaining around the periphery of the compound. With the exception of a shovel blade, no other agricultural implements were recovered from the site. Several large pieces of sheet metal with multiple holes punched in them may have been used to wash or clean the beans.

18. Were any manufactured items recycled into other tools?

The only example of a manufactured item being recycled into another tool appears to the use of sheet metal as bean sieves. Multiple holes were punched into large sheets of sheet metal and presumably used to wash or clean the beans.

19. Are there any historic Pueblo ceramics or other artifacts that would indicate interaction between Hispanic homesteaders and local Pueblos?

A total of 10 sherds representing nine historic Pueblo vessels were identified during Eiselt's (Chapter 78, Volume 4) analysis of the Serna Homestead. These consist of two Tewa Blackware sherds, four Tewa Micaceous slipped sherds, and four Hispanic/Tewa Buff sherds. Two of the Tewa Micaceous sherds could have been derived from a vessel produced at nearby San Ildefonso or Santa Clara Pueblos, while the other two sherds could have been derived from a vessel produced at Nambe, Tesuque, or Pojoaque. In addition, an isolated pot drop was recovered from near the Serna Homestead. It is an excellent example of a medium-sized Cimarron Micaceous long-necked olla or cook pot with an orifice diameter of around 26 cm. The 77 recovered fragments include five rim sherds, three neck sherds, and 69 body fragments. The vessel likely dates from around 1850 to 1880 or 1890 based on similarities with dated Jicarilla Apache types in the Río del Oso Valley (Eiselt 2006). In addition, a total of seven micaceous sherds were recovered during the excavations of the McDougall Homestead site west of the White Rock Tract. The ceramic assemblage is small, but relatively diverse with input from Jicarilla Apache, Hispanic, and Tewa or Picurís potters. These sherds were identified as Cimarron Micaceous (n = 4), Hispanic Blackware (n = 1), Peñasco/Tewa Micaceous (n = 1), and indeterminate micaceous (n = 1).

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APPENDICES

APPENDIX A
PROGRAMMATIC AGREEMENT

AMONG THE UNITED STATES DEPARTMENT OF ENERGY, THE ADVISORY COUNCIL ON HISTORIC PRESERVATION, THE NEW MEXICO STATE HISTORIC PRESERVATION OFFICER AND THE INCORPORATED COUNTY OF LOS ALAMOS, NEW MEXICO, CONCERNING THE CONVEYANCE OF CERTAIN PARCELS OF LAND TO LOS ALAMOS COUNTY, NEW MEXICO

WHEREAS:

1. Section 632 of Public Law 105-119 (Public Law 105-119) directs the Secretary of Energy to convey to the Incorporated County of Los Alamos, New Mexico (County), or its designee, and to transfer to the Secretary of the Interior in trust for the Pueblo of San Ildefonso (Pueblo), certain parcels of federal land under the administrative control of the Secretary of Energy in the vicinity of Los Alamos National Laboratory.

2. The Department of Energy (DOE) has determined that the conveyance of certain parcels pursuant to Public Law 105-119 to the County may have adverse effects on properties that are eligible for inclusion in the National Register of Historic Places (Historic Properties), and has entered into consultation with the New Mexico State Historic Preservation Officer (SHPO) and the Advisory Council on Historic. Preservation (Council) in accordance with Section 106 of the National Historic Preservation Act, 16 U.S.C.470 et. seq. (Act), its implementing regulations (36 CFR Part 800). DOE, the SHPO, the Council and the County may also be referred to in this Programmatic Agreement (PA) collectively as "the Parties" or "the Consulting Parties" and individually as a "Party."

3. The DOE has identified ten parcels of real property for conveyance, and has performed historic property identification surveys for the ten parcels. All potential historic properties have been evaluated for eligibility to the National Register of Historic Places (Register). SHPO has concurred with these eligibility determinations. It has been determined that historic properties are located in the following eight Parcels: TA-74, DP Road, White Rock Y, White Rock, Airport, LAAO, Manhattan Monument, and Rendija Canyon (Historic Parcels).

4. The *Final Environmental Impact Statement for the Conveyance and Transfer of Certain Land Parcels Administered by the U.* S. *Department of Energy and Located at Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico,* 1998, (DOE/EIS-0293) describes the contemplated land use by the County for the White Rock, Airport, LAAO, and Rendija parcels as economic development, and the contemplated land use for the TA-74 and White Rock Y parcels to include cultural preservation, natural areas, transportation, and utilities.

5. The Pueblo and the Bureau of Indian Affairs have participated in the consultation, and have been invited to concur in this PA.

6. The Consulting Parties have agreed that the schedule of the activities associated with the

conveyance of Parcels is set forth in the Conveyance Agreement (Attachment C [draft to be completed]). Environmental restoration and conveyance activities are likely to affect Historic Properties. It is appropriate for the DOE in this PA to set forth processes for the treatment and management of historic properties identified in the *Cultural Resources Assessment for the Department of Energy Conveyance and Transfer Project,* LA-CP-00-179, and the *Historic Building Assessment for the Department of Energy Conveyance and Transfer Project,* LA-UR-OO-I03.

7. The Consulting Parties have considered the applicable requirements of the Act, the American Indian Religious Freedom Act, 42 U.S.C. 1996 et. seq. (AIRFA), Executive Order 13007, Native American Sacred Sites (EO 13007), the Native American Graves Protection and Repatriation Act (NAGPRA), New Mexico Unmarked Burial Statute (18-6-11.2, NMSA 1978), the Archeological Resources Protection Act, 16 U.S.C. 470aa et. seq. (ARPA) and Public Law 105-119 in the course of consultation.

NOW, THEREFORE, the parties agree that they will act in accordance with the following stipulations in order to take into account the effect of the land conveyance activities and plan on Historic Properties in accordance with the Act, AIRFA, EO 13007, NAGPRA, the New Mexico Unmarked Burial Statute (18-6-11.2, NMSA 1978), and ARPA.

STIPULATIONS

I. Transfer to Other Federal Agencies

Notwithstanding any other provision of this PA, it is understood that should the DOE transfer any portion of the parcels to the Bureau of Indian Affairs in trust for the Pueblo, the DOE will implement such transfers through the development of a separate Memorandum of Understanding between the participating parties.

II. The Manhattan Monument, the Department of Energy Los Alamos Area Office buildings (TA-43-39, 41), LANL Archives (TA-21-1001, 1002), and the Incinerator Building (TA-73-2) located on the Airport Parcel.

1. The Manhattan Monument is a contributing element to the National Historic Landmark District (NHL) that includes the Fuller Lodge and the Bathtub Row residences. The Manhattan Monument will be transferred in accordance with the requirements of the NHL designation.

2. The SHPO has concurred with the Register eligibility under criteria A and C for the Department of Energy Los Alamos Area Office Buildings (TA-43-39, 41), the LANL Archives (TA-21-1001-1002), and the eligibility of the incinerator building (TA-73-2 located at the Los Alamos County Airport. The Parties understand that these properties may be demolished after transfer to the County. Therefore, the DOE will ensure that any adverse effects to these eligible historic buildings will be resolved by implementing the proposed treatment of effects presented below (see Attachment D for expanded version of treatment of

effects agreement):

a. Documentation will be carried out according to standards of the Historic American Building Survey/Historic American Engineering Record (HABS/HAER), Level Two, with original LANL construction drawings substituted for new drawings, and medium format black and white photographs substituted for large format photography.
b. Prior to demolition, the interiors and exteriors of the four buildings will be photographed. Archival quality, medium format black and white photographs will be produced in accordance with the standards set forth in the Secretary of the Interior's Guidelines for Architectural and Engineering Documentation.
c. A complete set of LANL drawings for each property will be compiled. Available drawings and technical schematic plans will be submitted depicting the significant instrumentation historically housed in each property. Additionally, at each technical area, the overall site will be documented so that there will be a permanent archival record of the history and appearance of the area. Documentation will include maps showing the location of the TA-21, TA-43, and TA-73 properties relative to the entire Laboratory. Site maps will also be generated depicting, at a sufficient scale, the footprint of each eligible and non-eligible building or structure as they appear today. Additional overlays will be produced depicting the historic properties at each technical area and any previously removed properties that would have been associated with significant missions during the Cold War.
d. A written history will be prepared and will include a use history of the properties supplemented with information from oral interviews. This use history will include a discussion of each property's role at LANL, its historical significance, and a comparison of the administrative, security, and support missions carried out at these technical areas with similar missions historically conducted at other DOE Cold War facilities. A description of any specialized instrumentation housed in the properties and an evaluation of how this instrumentation contributed to the Cold War effort at Los Alamos will also be included.
e. Decontamination and decommissioning activities will commence only after drawings have been compiled and medium format photographs have been produced. A final report will be submitted to the SHPO after the decontamination and decommissioning phase is complete.
f. Copies of all documentation, including historical and architectural information, will be provided to the New Mexico SHPO. The New Mexico Archaeological Records Repository (ARMS) will be the designated repository. Original negatives will be curated at LANL's photographic archives.

3. Implement the proposed treatment of effects, including completing the historic building documentation, prior to the transfer of TA-43-39, 41, TA-211001-1002, and TA-73-2 to the County. Any revision to this PA will be recorded in accordance with Stipulation VIII.

4. Should it not be feasible to transfer the properties subject to Stipulation 11.2., the DOE will take the lead in consultation with the SHPO, the Council, and the County to ensure appropriate historic preservation measures are taken with regard to TA-43-39, 41, TA-21-

11O-1002, and TA-73-2 to resolve the adverse effects of the transfer. Any revision to this PA will be recorded in accordance with Stipulation VIII.

III. Land Conveyance Parcels TA-74 and White Rock Y

1. The portions of Parcels TA-74 and White Rock Y that contain Historic Properties will be nominated by DOE to the New Mexico State Register of Cultural Properties before conveyance to the County or its designee.

2. In the portions of Parcels TA-74 and White Rock Y that are to be conveyed to the County, or its designee, the DOE will undertake such conveyance in consultation with the SHPO, the County, the Pueblo, and other interested parties as relating to the following issues:
    a. Archaeological sites in Parcel TA-74 associated with the Ancestral Puebloan culture and identified as Register-eligible in the *Cultural Resource Assessment for the Department of Energy Conveyance* and *Transfer Project,* LA-CP-OO179 and concurred with by the SHPO in July, 2000, will be identified in the transfer documents as three.(3) archaeological preservation districts. The three archeological preservation districts are defined by the distribution of large, complex Ancestral Puebloan sites and made the subject of three (3) preservation easements as set forth in the sample document, Attachment A, and Figure A-I. These preservation easements will be included in the conveyance instrument pertaining to the real property containing the sites, developed in consultation with the County, and recorded in the real estate records of Santa Fe County, State of New Mexico, for the conveyance of such real property.
    b. Other archaeological Historic Properties in the TA-74 and White Rock Y Parcels that are not included in the archaeological preservation districts will be subject to New Mexico State Historic Preservation Laws and Regulations. Any objection regarding the development of such districts raised by a party to the DOE decision shall be resolved as specified in Stipulation X.

3. Should any traditional cultural property or cultural landscape of value to an Indian tribe or other social group be determined eligible for inclusion in the Register, through the DOE ongoing Traditional Cultural Properties consultation, the DOE will consult further with the SHPO, the Council, and the Indian Tribe(s), the County and others who ascribe value to the property, in accordance with 36 CFR 800.5(e), the requirements of the AIRFA and EO 13007, if applicable. If through this consultation process, the property is determined not to be Register eligible, the DOE may convey such property without further consultation with the Council and SHPO, but will consult further with the applicable Indian Tribe in accordance with AIRFA.

4. The DOE will evaluate any archaeological site or other possible Historic Property that has not already been evaluated, prior to conveying such site or property to a non-federal entity. If after consultation with the SHPO, the property is determined eligible for inclusion in the Register, the DOE will comply with 36 CFR 800, with respect to such property. If the property is determined not eligible on its own merits and is not a contributing element of a National Register of Historic Places District or Landmark, the DOE may transfer such

property without further consideration.

IV. Land Conveyance Parcels: Airport, White Rock, Rendija

The County portions of the parcels designated the Airport Tract, the White Rock Tract, and the Rendija Tract, described in the *Final Environmental Impact Statement for the Conveyance and Transfer of Certain Land Parcels Administered by the U.* S. *Department of Energy and Located at Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico,* 1998 (DOE/EIS-0293), as having the intended use of economic development, will be treated in the following manner:

1. DOE shall propose a representative sample of Historic Properties that will be subjected to archaeological data recovery prior to conveyance, in accordance with a scope of work developed in consultation with the SHPO, the County, Indian Tribes, and other interested parties, in accordance with the schedule set forth in this PA, and meeting the standards set forth in Attachment B.

2. Should any traditional cultural property or cultural landscape of value to an Indian tribe or other social group be determined eligible for inclusion in the Register, as stated in Stipulation III.3 above, the DOE will consult further with the SHPO, the Council, the Indian Tribe(s), the County and others who ascribe value to the property, in accordance with 36 CFR 800.5(e), giving particular attention to the requirements of the AIRFA and EO 13007, if applicable and Public Law 105-119. If the property is determined not eligible, the DOE may transfer such property without further consultation with the Council and SHPO, but will consult further with the applicable Indian Tribe and take such actions as are feasible and prudent to advance the purpose of the AIRFA.

3. If the DOE proposes to convey to the County any archaeological site or other possible Historic Property that has not yet been evaluated, the DOE will ensure that it is so evaluated in consultation with the SHPO. If the property is determined eligible for inclusion in the Register, the DOE will comply with 36 CFR 800, with respect to such property. If the property is determined to not be eligible on its own merits and is not a contributing element of a National Register District or Landmark, the DOE may transfer such property without further consideration.

V. Interim Protection of Historic Properties

While the property remains in DOE ownership, the DOE will comply with 36 CFR 800 with respect to any undertaking it proposes to carry out on the parcels.

VI. Reporting

The DOE shall ensure that reports on all activities carried out pursuant to this PA are provided to the Parties, in so far as such disclosure is not in violation of the Archaeological Resources Protection Act (ARPA) of 1979, 16 D.S.C. Section 470 hh.

VII. Qualification of Personnel

The DOE shall ensure that all archaeological surveys and Historic Property data recovery work pursuant to this agreement are carried out by or under the direct supervision of a person or persons meeting, at a minimum, the requirements for Archaeologist set for that Appendix C-l of DOE Regulation 420-40; also that any studies of traditional cultural properties are carried out by or under the direct supervision of a person or persons trained in cultural anthropology at a minimum consistent with the requirements of Appendix C-6 of DOE Regulation 420-40.

VIII. Amendments

1. The Parties may amend this PA, and any attachment hereto by signing an amendment document.

2. The DOE will ask any of the concurring parties to this PA whose interests may be affected by an amendment, to concur in such amendment.

3. Upon execution of the amendment, each Party will attach a copy of the fully executed amendment document to that Party's copy of this PA, and will enter the amendment number and date on the upper-right-hand corner of the first page of this PA.

IX. Scheduled Consultation

1. Implementation plans developed in accordance with this PA that have received final approval, shall be final for all purposes and shall not be subject to further revision or consultation except in accordance with the express provisions of this PA. Upon completion of the activities and treatments required by this PA, the Parties shall have taken into account the effect of the land conveyance activities and plans on historic properties in accordance with applicable law. No further activity or treatment shall be required prior to the conveyance of the properties in accordance with the conveyance agreement between the DOE and the County.

2. Twelve (12) months after this PA and annually thereafter until the Historic Parcels have been transferred in accordance with this PA, the DOE will invite the Parties to review implementation of this PA and to determine whether revisions are needed. If revisions are needed, the Parties will consult in accordance with 36 CFR Part 800 to make such revisions.

X. Dispute Resolution

1. Should any party object within 30 days to any plans or other documents provided by the DOE or others for review pursuant to this agreement or to any actions proposed or initiated by the DOE that may pertain to the terms of this agreement, the DOE shall consult with the objecting party to resolve the objection. If the DOE determines that the objection cannot be resolved, the DOE shall forward all documents relevant to the dispute to the Council. Within 30 days after receipt of all pertinent documents, the Council will either:
    a. Provide the DOE with recommendations, which the DOE will take into account in

reaching a final decision regarding the dispute; or

b. Notify the DOE that it will comment pursuant to 36 CFR 800.6(b), and proceed to comment. Any council comment provided in response to such a request will be taken into account by the DOE in accordance with 36 CFR 800.6(C)(2) with reference to the subject of the dispute.

2. Any recommendation or comment provided by the Council pursuant to Stipulation X.l will be understood to pertain only to the subject of the dispute; the DOE's responsibility to carry out all actions under this PA that are not the subject of the dispute will remain unchanged.

3. At any time during development of implementation plans for measures stipulated in this PA, should an objection to any such measure or its manner of implementation be raised by a member of the public, the DOE shall take the objection into account and consult as needed with the objecting party, the SHPO, other pertinent parties, and the Council to resolve the objection.

Execution and implementation of this PA evidences that the DOE has afforded the Council a reasonable opportunity to comment on the disposal of the Parcels, and that DOE has taken into account the effect of the undertaking on historic properties.

ADVISORY COUNCIL ON HISTORIC PRESERVATION

By: ______________________ Date: 6/14/02
(Ser) Executive Director

DEPARTMENT OF ENERGY

By: ______________________ Date: 5/29/02

THE NEW MEXICO STATE HISTORIC PRESERVATION OFFICER

By: ______________________ Date: 5/28/02

INCORPORATED COUNTY OF LOS ALAMOS, NEW MEXICO

By: ______________________ Date: 5-22-02

PUEBLO OF SAN ILDEFONSO

By: ______________________ Date: 8-13-02

ATTACHMENT A:
STANDARD PRESERVATION EASEMENT FOR ARCHAEOLOGICAL SITES

Sample Document Subject to Change

In consideration of the conveyance of the real property that includes the [name of archaeological sites] located in the County of Santa Fe, State of New Mexico, which is more fully described as: [Insert legal description of Archaeological Districts.] [Name of property recipient] hereby agrees (?) on behalf of [himself/herself/itself], [his/her/its] heirs, successors, and assigns at all times to the [name of agency of organization] and the New Mexico State Historic Preservation Officer to maintain and preserve the [name of archaeological site] as follows:

1. No disturbance of the ground surface or any other thing shall be undertaken or permitted to be undertaken on [name or archaeological site] that would affect the physical integrity of the [name of archaeological site] without the express prior written permission of the [name of agency or organization], signed by a fully authorized representative thereof. The [name of agency or organization] may require, as a condition of the granting of such permission, that the [name of recipient] conduct archaeological data recovery operations or other activities designed to mitigate the adverse effect of the proposed activity on the [name of archaeological site]. In the event that such a requirement is made, the [name of recipient] shall at [his/her/its] own expense conduct such activities in accordance with the Secretary of the Interior's Standards and Guidelines for Archaeological Documentation (48 FR 44734-37) and such standards and guidelines as the [name of agency or organization] specify. Standards and guidelines may include but will not be limited to those with research design, conduct of field work, conduct of analysis, preparation and dissemination of reports, disposition of artifacts and other materials, consultation with Native American or other organizations, and reinterment of human remains.

2. [Name of recipient] shall make every reasonable effort to prohibit any person from vandalizing or otherwise disturbing the [name of archaeological site], and shall promptly report any such disturbance to the [name of agency or organization].

3. The [name of agency or organization] shall be permitted at all reasonable times to inspect [name of archaeological site] in order to ascertain if the above conditions are being observed.

4. In the event of a violation of this easement, and in addition to any remedy now or hereafter provided by law, the [name of agency or organization] will take all feasible steps to remedy the violation in a timely manner, and may, follow reasonable notice to [name of recipient], institute suit to enjoin said violation in a timely manner, and may, following reasonable notice to [name of recipient], institute suit to enjoin said violation or to require the restoration of [name of archaeological site]. The [name of agency or organization] if successful shall be entitled to recover all costs or expenses incurred in connection with such a suit, including all court costs and attorney's fees.

5. [Name of recipient] agrees that the [name of agency or organization] may at his discretion, without prior notice to [name of recipient], convey and assign all or part of its rights and responsibilities contained herein to a third party.

6. This easement is binding on [name of recipient], [his/her/its] heirs, successors, and assign in perpetuity. Restrictions, stipulations, and easements contained herein shall be inserted by [name of recipient] verbatim or by express reference in any deed or other legal instrument by which [he/she/it] divests [himself/herself/itself] of either the fee simple title or any other lesser estate in [name of archaeological site] or any part thereof.

7. The failure of [name of agency or organization] to exercise any right or remedy granted under this instrument shall not have the effect of waiving or limiting the exercise of any other right or remedy or the use of such right or remedy at any other time.

8. This easement is granted pursuant to the New Mexico Cultural Properties Preservation Easement Act, ss 47-12.A-l et seq., NMSA 1978

The easement shall be a binding servitude upon the real property that includes the [name of archaeological site] and shall be deemed to run with the land. Execution of this easement shall constitute conclusive evidence that [name of recipient] agrees to be bound by the foregoing conditions and restrictions and to perform to obligations herein set forth.

ATTACHMENT B: DATA RECOVERY STANDARDS

1. Archaeological data recovery shall be carried out in accordance with a data recovery plan developed in consultation with the New Mexico SHPO, the County, and any Indian tribe(s) that ascribe cultural value to the site. The data recovery plan shall be consistent with the Secretary of the Interior's Standards and Guidelines for Archaeological Documentation (48 FR 44734-37) and pertinent standards and guidelines of the New Mexico SHPO, and shall take into account the Council's publication, Treatment of Archaeological Properties, subject to any pertinent revisions the Council may make in the publications prior to completion of the data recovery plan. The plan shall specify, at a minimum:
    a. The property, properties, or portions where data recovery is to be carried out;
    b. Any property, properties, or portions of properties that will be transferred without data recovery, and the rationale for doing so;
    c. The research questions to be addressed through the data recovery, with an explanation of their relevance and importance;
    d. The field work methods to be used, with an explanation of their relevance to the research questions;
    e. The methods to be used in analysis, with an explanation of their relevance to the research questions;
    f. The methods to be used in data management and dissemination of data. including a schedule;
    g. The manner in which recovered materials will be disposed of. shall be in a manner consistent with Federal law regarding disposition of archeological materials and recovered human remains;
    h. The manner in which field notes and other records of field work and analysis will be preserved and disposed of;
    i. The methods to be used to involve the interested public in the data recovery;
    j. The methods to be used in disseminating results of the work to the interested public;
    k. The methods by which any Indian tribe that ascribes cultural value to the site, the County, and other parties with special interests in the property, if any, will be kept informed of the work and afforded the opportunity to participate; and
    l. The schedule for the submission of progress reports and final reports to the New Mexico SHPO, the County and others.

2. Records of data recovery field work and analysis shall be retained in an archive or other curatorial facility approved by the New Mexico SHPO and disseminated as appropriate to facilitate research and management without unduly endangering historic properties.

3. Material recovered from data recovery projects shall be curated in accordance with 36 CFR Part 79, except that human remains and artifacts associated with graves shall be treated in conformance with the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990.

ATTACHMENT C
Schedule of Transfers
Conveyance Agreement

Designator	Description	Recipient	Transfer Date
A-1	Manhattan Monument (0 ac.)	County	3/31/02
A-2	Site 22 (0 c.)	County	3/31/02
B-1	White Rock-2	Pueblo	3/31/02
A-12	LAAO-1 (East)	County	6/30/02
A-17	TA-74-1 (West) (3 ac.)	County	6/30/02
B-4	White Rock "Y"-3 (N. of Hwy)	Pueblo	6/30/02
A-3	Airport-1 (East) (8 ac.)	County	9/30/02
A-6	Airport-4 (West)	County	9/30/02
A-9	DP Road-2 (North) (Tank Farm) (4 ac.)	County	9/30/02
A-19	White Rock-1	County	9/30/02
B-2	TA-74-3 (North)	Pueblo	9/30/02
C-1	White Rock	Highway	9/30/02
C-2	White Rock "Y"-1	Highway	9/30/02
A-18	TA-74-2 (South)	County	3/31/03
B-3	TA-74-4 (Middle) (Little Otowi)	Pueblo	3/31/03
A-7	Airport-5 (Central) (7 ac.)	County	9/30/03
A-8	DP Road-1 (South) (25 ac.)	County	9/30/03
A-15	TA-21-1 (West)	County	9/30/03
A-13	LAAO-2 (West) (LAAO Bldg)	County	9/30/04
A-4	Airport-2 (North) (90 ac.)	County	9/30/05
A-10	DP Road-3 (East)	County	9/30/05
A-11	DP Road-4 (West) (Archives)	County	9/30/06
A-14	Rendija	County	9/30/07
A-5	Airport-3 (South) (withheld)	County	None
A-16	TA-21-2 (East) (withheld)	County	None
A-20	White Rock "Y"-2 (withheld)	County	None
C-3	White Rock "Y"-3 (withheld)	Highway	None
C-4	White Rock "Y"-4 (withheld)	Highway	None

ATTACHMENT D

Memorandum of Agreement Between The Department of Energy and The New Mexico Historic Preservation Division Regarding the Transfer of Buildings 1001 and 1002, Technical Area 21; Buildings 39 and 41, Technical Area 43; and Building 2, Technical Area 73, Los Alamos National Laboratory

WHEREAS, the U.S. Department of Energy, Office of Los Alamos Site Operations (DOE/OLASO), proposes to transfer four early Cold War era properties at Technical Areas (TAs) 21, 43, and 73, Los Alamos National Laboratory, Los Alamos, New Mexico, to the County of Los Alamos; and

WHEREAS, the DOE/OLASO has determined that the proposal constitutes an undertaking, as described in Section 106 of the National Historic Preservation Act (16 V.S.C. 4701); and

WHEREAS, the DOE/OLASO has determined that the undertaking will have an adverse effect upon properties that are eligible for inclusion in the National Register of Historic Places; and

WHEREAS, in accordance with Section V.G. of the Programmatic Agreement for the Management of Historic Properties at Los Alamos National Laboratory, (MOD DEGM32-00AL 77152), the DOE/OLASO has consulted with the New Mexico Historic Preservation Division and its representative, the State Historic Preservation Officer (SHPO), concerning this undertaking; and

WHEREAS, the DOE/OLASO intends to use the provisions of this Memorandum of Agreement to address applicable requirements of Section 110(b) of the National Historic Preservation Act.

NOW, THEREFORE, DOE/OLASO and the SHPO agree that, upon DOE/OLASO's decision to proceed with the property transfer, the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on historic properties.

Stipulations

DOE/OLASO will ensure that any adverse effects to these eligible historic buildings will be resolved by implementing the proposed treatment of effects presented below. Documentation conducted under stipulations 1 and 2 will be carried out according to standards of the Historic American Building Survey/Historic American Engineering Record (HABS/HAER), Level Two, with original LANL construction drawings substituted for new drawings, and medium format black and white photographs substituted for large format, when appropriate.

1. Prior to demolition, the interiors and exteriors of the four buildings will be photographed. Archival quality, medium format black and white photographs will be produced in accordance with the standards set forth in the Secretary of the Interior's Guidelines for Architectural and Engineering Documentation.

2. A complete set of LANL drawings for each property will be compiled. Available drawings

and technical schematic plans will be submitted depicting the significant instrumentation historically housed in each property. Additionally, at each technical area, the overall site will be documented so that there will be a permanent archival record of the history and appearance of the area. Documentation will include maps showing the location of the TA-21, TA-43, and TA-73 properties relative to the entire Laboratory. Site maps will also be generated depicting, at a sufficient scale, the footprint of each eligible and non-eligible building or structure as they appear today. Additional overlays will be produced depicting the historic properties at each technical area and any previously removed properties that would have been associated with significant missions during the Cold War.

3. A written history will be prepared and will include a use history of the properties supplemented with information from oral interviews. This use history will include a discussion of each property's role at LANL, its historical significance, and a comparison of the administrative, security, and support missions carried out at these technical areas with similar missions historically conducted at other DOE Cold War facilities. A description of any specialized instrumentation housed in the properties and an evaluation of how this instrumentation contributed to the Cold War effort at Los Alamos will also be included.

4. Decontamination and decommissioning activities will commence only after drawings have been compiled and medium format photographs have been produced. A final report will be submitted to the SHPO after the decontamination and decommissioning phase is complete.

5. Copies of all documentation, including historical and architectural information, will be provided to the New Mexico SHPO. The New Mexico Archaeological Records Repository (ARMS) will be the designated repository. Original negatives will be curated at LANL's photographic archives.

Execution of this Memorandum of Agreement between DOE/OLASO and the New Mexico SHPO will verify that DOE/OLASO has considered the effects of the property transfer on these historic properties and implemented the proposed treatment of effects.

U.S. Department of Energy/Office of Los Alamos Site Operations

By:______________________________ date ____________________

Corey Cruz, Area Manager

New Mexico State Historic Preservation Officer

By:______________________________ date ____________________

Elmo Baca, SHPO

Amendment 1 to Stipulation IV.1 of the Programmatic Agreement among the United States Department of Energy, the Advisory Council on Historic Preservation, the New Mexico State Historic Preservation Officer and the Incorporated County of Los Alamos, New Mexico, concerning the conveyance of certain parcels of land to Los Alamos County, New Mexico.

It is agreed by the undersigned parties that in the event that the archaeological data recovery (excavation) activities being conducted by DOE/NNSA cannot be completed by the proposed transfer dates for the Airport, White Rock, and Rendija Parcels, the parcels shall be transferred to the Incorporated County of Los Alamos and DOE/NNSA will continue the data recovery activities to completion. DOE/NNSA shall provide written notice to the parties of completion of the excavations which is anticipated by the end of calendar 2002. During this time period, all archaeological sites under investigation shall be subject to the full protection of Section 106 of the Act.

Ralph E. Erickson, Director
DOE/NNSA Los Alamos Site Office

10/11/02
Date

Mary McInerny, County Administrator
Incorporated County of Los Alamos

10/9/02
Date

Jan Biella, Interim New Mexico State
Historic Preservation Officer

10/15/02
Date

APPENDIX B

MODERN POLLEN ANALOG STUDY: PLANT SPECIES LISTS AND SITE DESCRIPTION NOTES

Teralene Foxx

All visits were made on June 12, 2002. Field personnel included Susie Smith, Brad Vierra, David Barsanti, and Teralene Foxx. The purpose for the site visits was to collect elevation gradient pollen samples.

SITE 1

Plant Community: Piñon-Juniper

Location: Off State Route 4 to the east side of the road, south of White Rock and Pajarito Acres

GPS: RO 612 16A

General Characteristics: The site is about 50 percent juniper (*Juniperus monosperma*) and Colorado Piñon (*Pinus edulis*). After months of drought plants are showing a great deal of stress: shrubs have not leafed. Cover is approximately 5 percent grass with bare ground 80 percent. Only about 15 percent cover of tree canopy.

Soils: Shallow soils, sandy, with exposed Bandelier tuff.

Plants

Trees
One-seed Juniper (*Juniperus monosperma*)
Colorado piñon (*Pinus edulis*)
Forbs:
Prickly pear cactus (*Opuntia spp*.)
Golden weed *(Heterotheca sp*p.)
Scarlet gilia (*Ipomopsis aggregata*)
Antelope sage (*Eriogonum jamesii*)
Thymeleaf spurge (*Euphorbia seryllifolia*)
Wormwood *Artemisia ludoviciana*
False terragon *(Artemisia dracunculus)*

Grass
Little bluestem (*Schizachyrium scoparius*)
Blue grama (*Bouteloua gracilis*)

Shrubs
Mountain mahogany (*Cercocarpus montanus*)
Apache plume (*Fallugia paradoxa*)
Lemonadeberry (*Rhus trilobata*)
Broadleaf yucca (*Yucca baccata*)
Scrub oak (*Quercus* spp.)

SITE 2: PL2

Plant Community: Disturbance: old fields, old road, other activities

Location: Off State Route 4 to the east side of the road, across from TA-39

GPS: RO 612 17A

General Characteristics: This site is part of a canyon bottom floodplain with the perimeter of ponderosa pine and some juniper. North facing slope. Gophers.

Soils: Sandy soils

Plants

Trees
Ponderosa pine
One-seed juniper

Forbs
Sweetclover (*Melilotus* spp.)
Summercyperus (*Kochia scoparia*)
Blazingstar (*Mentzelia* spp.)
Lupine (*Lupinus caudatus*)
False terragon
Wormwood (*Artemisia carruthii*)
Mullein (*Verbascum thapsus*)
Penstemon (*Penstemon* spp.)
Ponymint (*Monarda pectinata*)
Wild buckwheat (*Eriogonum cernuum*)
Wild buckwheat (*Eriogonum racemosum*)

Grass
Sand dropseed (*Sporobolus* spp.)

Shrubs
Chamisa (*Chrysothamnus nauseosus*)

SITE 3: PL3

Plant Community: Piñon-juniper west of the Bandelier entrance and south of the road.

Location: West of the Bandelier entrance and south of the road

GPS: RO 612 17b

General Characteristics: Deep soils, Juniper 10 percent and Piñon 80 percent; Cover 65 percent trees, grasses are 25 percent of the understory

Soils: Deep soils

Plants:

Trees
One seed juniper
Colorado piñon

Forbs
False terragon
Wormwood
Purple owlclover (*Orthocarpus purpureo-albus*)
Bitterweed (*Hymenoxys richardsoni*)
Snake weed (*Gutierrezia sarothrae*)

Grass
Bluegrass (*Poa fendleriana*)
Bluegramma

Shrubs
Lemonadeberry

SITE 4: PL4

Plant Community: Ponderosa Pine

Location: Pond outside of fence at TA-16

GPS: RO 612 18A

General Characteristics: This pond was associated with the ice house. It presently is dry and was affected by a flood after the Cerro Grande Fire. The pond is filled with wheatgrass and rimmed by Ponderosa pine.

Cerro Grande Fire took place May 5-15, 2000. There were floods from the watershed in July after the monsoon rains.

Soils: Deep soils

Plants

Trees
Ponderosa pine
Aspen (*Populus tremuloides* sprout)

Forbs
wild onion (*Allium cernuum*)
Mullein
Cinquefoil (*Potentilla* spp.)
Bitterweed
Groundsel (*Senecio* spp.)
Yarrow (*Achillea lanulosa*)
Horseweed (*Conyza canadensis*)
Domestic iris
Fleabane daisy (*Erigeron divergens*)
Cinquefoil (*Potentilla* spp.)

Grass
Little bluestem
June grass (*Koleria cristata*)
Mountain muhly (*Muhlenbergia montanus*)
Squirreltail (*Sitanion hystrix*)
Western wheatgrass (*Agropyron smithii*)
Brome (*Bromus* spp.)
Fendler barberry (*Berberis fendleri*)

Shrubs
New Mexico locust (*Robinia neomexicana*)
Gambel oak (*Quercus gambelii*)
Wild rose (*Rosa* spp.)
Common juniper (*Juniperus communis*)

SITE 5: PL5

Plant Community: Ponderosa Pine

Location: Near Pond outside of fence at TA-16

GPS: RO 612 18b

General Characteristics: The area has both rotten low cut and high cut stumps. The low cut stumps may stem from thinning done after the 1977 La Mesa Fire. High cut stumps for homestead days. There is a thick layer of needs on the ground. The ponderosa pine cover is approximately 70 percent.

Cerro Grande Fire took place May 5-15, 2000. There were floods from the watershed in July after the monsoon rains.

Soils: Deep soils, thick layer of needles on ground.

Plants

Trees
Ponderosa pine

Forbs:
Pussytoes (*Antennaria parviflora*)

Grass
Junegrass
Mountain muhly
Squirreltail

Shrubs
Gambel oak
Fendler barberry
Buckbrush (*Ceaonothus fendleri*)

SITE 6: PL6

Plant Community: Ponderosa Pine, burned

Location: Intersection of St R. 502 and Ski hill road

GPS: RO 612 19a

General Characteristics. Area previously thinned.

Cerro Grande Fire took place May 5-15, 2000. There were floods from the watershed in July after the monsoon rains.

Soils: Deep soils, thick layer of needles on ground.

Plants

Trees
Ponderosa Pine (cover 50%)
Russian olive is about ¼ mile upslope

Forbs
Summer cypress
Aster spp.
Goldenrod (*Solidago* spp.)
Pussytoes
Bitterweed

Grass
June grass
Little bluestem
Mountain muhly

Shrub
New Mexico locust
Lemonade berry
Gambel oak

SITE 7: PL 7

Plant Community: Limber pine site

Location: Up ski hill road

GPS: RO 612 20 A

General Characteristics. Rocky south facing slope with 30 percent Limber pine, 40 percent Ponderosa pine, 10 percent Douglas fir

Soils: Rocky with tuff bedrock, sandy grus-like soils

Plants

Trees
Limber pine (*Pinus flexlis*)
Ponderosa pine
Douglas fir (*Psuedotsuga menzieii*)

Forbs
Penstemon spp.

Wild geranium (*Geranium* spp. Probably Caespitosum)

Grass
Mountain muhly
June grass
Pinedropseed (*Blepharoneuron tricholepis*)

Shrubs
Gambel oak
New Mexico locust
Mountain's lover (*Pachystima myrsinites*)
Bearberry (*Archtostaphylos uva-ursi*)

SITE 8: PL8

Plant Community: Mixed Conifer

Location: Up ski hill road

GPS: RO 612

General Characteristics: Just above the ski lodge off road to the left, before going up road to Camp May. Dense stand of aspen, Douglas fir and white fir: Douglas fir 75 percent, White fir 1 percent, Aspen 10 percent.

Plants

Trees
Aspen (*Populus tremuloides*)
Douglas fir
White fir (*Abies concolor*)
Rocky Mountain maple (*Acer glabrum*)

Forbs
Geranium spp.
American vetch (*Vicia americana*)
Wild strawberry (*Fragaria americana*)
Wild onion
Canadian violet (*Viola canadensis*)
Violet (*Viola* (blue) spp.
Cinquefoil (*Potentilla* spp.)
Meadowrue (*Thalictrum fendleri*)
Yarrow
Dandelion (*Taraxicum officinale*)
Shooting star (*Dodecatheon* spp.)

Bedstraw (*Galium* spp.)
Bluntseed sweet cicely (*Osmorhiza obtuse*)
Golden pea (*Thermopsis pinetorum*)

Grass
Brome (*Bromus* spp.)
Sedges

Shrubs
Baneberry (*Actaea arguta*)

SITE 9: PL9

Plant Community: High elevation meadows

Location: Up ski hill road, Camp May

GPS: RO 612 20 c

General Characteristics: Open meadow overgrown by meadow grasses

Plants

Trees
Blue spruce (*Picea engelmanni*)
Douglas fir
Aspen

Forbs
Potentilla spp.
Louisiana wormwood (*Artemisia ludoviciana*)
Mountain parsley (*Psuedocymoptris montanus*)
Dandelion
Thistle (*Cirsium* spp.)
Blue flag *(Iris missouriensis*)
Bracken fern

Grass
Timber oatgrass (*Danthonia intermedia*)

Shrubs
Elderberry (*Sambucus microbothrys*)
Raspberry (*Rubus strigosus*)

SITE 10: PL 10

Plant Community: Pueblo Canyon Sewage Effluent area

Location: Pueblo Canyon road

GPS: RO 612 21A

General Characteristics: Sewage effluent area was dry and no cattails although historically there had been cattails along the area.

Plants

Trees
Ponderosa pine
Piñon
Juniper
Russian Olive

Forbs
Mullein
False terragon

Grass
Orchard grass (*Dactylis glomerulata*)

Shrubs
Lemonade berry
Big sagebrush (*Artemisia tridentata*)
New Mexico olive (*Forestierra neomexicana*)
Chamisa

Site 11: PL11

Plant Community: Piñon juniper, ponderosa pine

Location: Pueblo Canyon

GPS: RO 612

General Characteristics: Open meadow overgrown by meadow grasses. 40 percent juniper, 20 percent piñon, 10 percent Ponderosa pine

Plants

Trees
Piñon
Juniper
Ponderosa pine

Forbs
Prickly pear cactus (*Opuntia* spp.)
False terragon

Grass
Blue grama
Littleseed ricegrass (*Oryzopsis micrantha*)
Ring muhly (*Muhlenbergia torreyi*)

Shrubs
Lemonade berry
Big sagebrush

SITE 12: PL12

Plant Community: Riparian zone

Location: Los Alamos Canyon upstream from the Ice Skating Rink

GPS: RO 612

General: Dense stand of mixed conifer next to stream. Stream is dry at this time but usually flows in wetter years.

Plants

Trees
Douglas Fir
Birch (*Betula*) or Alder (*Alnus*)
Ponderosa pine
Narrowleaf cottonwood (*Populus angustifolia*)
New Mexico Maple

Forbs
Dandelion
Thistle

Grass
Mountain muhly
Brome (*Bromus* spp.)
Sand dropseed

Vines
Virginia creeper (*Parthenocissus inserta*)
Clematis (*Clematis pseudoalpina*)

Shrubs
Wild rose (*Rosa* spp.)
Gambel oak
Fendler barberry
Jamesia Americana
Wax currant (*Ribes cernuum*)
Mock orange (*Philadelphus microphyllus*)
Willow (*Salix* spp.)
New Mexico locust

APPENDIX C
LOS ALAMOS MODERN POLLEN ANALOG STUDY

Susan J. Smith

Table C.1. Raw Pollen Counts from 20 Stations (x notes scan identified taxa).

Pollen Station Number		1	2	3	4	5	6	7	8	9
Sample Number		1C	2B	3A	4B	5C	6C	7B	8B	9A
Pollen Sum		343	346	328	261	318	316	319	302	357
Tracers		7	7	10	12	8	3	1	7	86
Sample Volume		20	20	20	20	20	20	20	20	20
Sample Weight grams		26.1	23.9	23.8	13.4	14.5	21.6	18.0	9.2	18.0
Pollen Concentration gr/gm		47092.6	51877.3	34569.5	40714.7	68764.8	122323.2	444544.2	117629.9	5784.9
Pollen Concentration gr/cc		61455.8	61993.3	41137.8	27278.9	49854.5	132109.1	400089.8	54109.8	5206.4
Pollen Taxa Richness		14	20	13	11	15	15	16	20	15
Charcoal as % of slide matrix		<10	<10	<10	20-30	10-20	<10	<10	<10	10-20
Common Name	**Taxa Name**									
Degraded	Degraded	12	10	9	6	6	3	11	8	30
Unknown	Unknown	5	4	2	1	5	1	1	0	6
Douglas Fir	Pseudotsuga	0	X	0	0	0	0	1	2	0
Spruce	Picea	X	0	0	0	0	2	1	17	0
Fir	Abies	1	6	2	20	12	17	22	32	13
Pine	Pinus	74	63	93	110	188	213	163	133	95
Piñon	Piñon	63	22	37	86	43	21	62	40	17
Juniper	Juniperus	122	46	106	4	6	7	12	9	40
Oak	Quercus	15	3	2	5	8	3	8	9	6
Large Haploxylon Pine	Pinus Haploxylon >70 µm	0	0	0	1	0	0	0	1	1
Caprifoliaceae	Caprifoliaceae, cf. Symphoricarpos	0	0	0	0	0	0	0	1	0
Cliffrose, Mtn. Mahogany type	Rosaceae, Cercocarpus/Purshia type	3	4	2	0	4	3	1	1	13
Buckthorn Family	Rhamnaceae	0	0	0	0	0	0	0	0	0
Other Rose Family	Roseaceae	0	0	0	0	0	0	0	3	0
Lemonadeberry	Rhus	0	0	0	0	1	0	1	0	0
Mormon Tea	Ephedra	2	2	0	0	0	0	0	1	6
Sagebrush	Artemisia	4	5	3	4	9	5	1	9	10
Mistletoe	Loranthaceae	0	0	0	0	0	3	2	0	0

Pollen Station Number		1	2	3	4	5	6	7	8	9
Sample Number		1C	2B	3A	4B	5C	6C	7B	8B	9A
Pollen Sum		343	346	328	261	318	316	319	302	357
Tracers		7	7	10	12	8	3	1	7	86
Sample Volume		20	20	20	20	20	20	20	20	20
Sample Weight grams		26.1	23.9	23.8	13.4	14.5	21.6	18.0	9.2	18.0
Pollen Concentration gr/gm		47092.6	51877.3	34569.5	40714.7	68764.8	122323.2	444544.2	117629.9	5784.9
Pollen Concentration gr/cc		61455.8	61993.3	41137.8	27278.9	49854.5	132109.1	400089.8	54109.8	5206.4
Pollen Taxa Richness		14	20	13	11	15	15	16	20	15
Charcoal as % of slide matrix		<10	<10	<10	20-30	10-20	<10	<10	<10	10-20
Common Name	**Taxa Name**									
Maple	Acer	0	0	0	0	0	0	0	1	0
Walnut	Juglans	0	0	0	0	0	0	0	0	0
Birch	Betula	0	0	0	0	0	0	0	0	0
Willow	Salix	0	0	0	0	2	0	0	0	0
Yucca	Lily Family	0	0	0	0	0	1	0	0	0
Prickly Pear	Opuntia	0	0	0	0	0	0	0	0	0
Greasewood	Sarcobatus	0	0	0	0	0	0	0	0	0
Cheno-Am	Cheno-Am	16	75	27	8	15	18	14	12	32
Sunflower Family	Asteraceae	13	64	29	6	7	12	2	6	23
Chicory Tribe	Liguliflorae	0	0	0	0	0	0	0	1	22
Bursage/Ragweed type	Ambrosia	5	12	3	2	4	2	5	7	2
Thistle	Cirsium	0	5	4	0	0	3	0	0	0
Long Spine type	cf. Helianthus	0	8	0	0	0	0	0	0	0
Broad Spine type	Unknown Sunflower Family cf. Dicoria type	0	0	0	0	0	0	0	0	0
Grass Family	Poaceae	5	6	5	8	5	1	10	8	38
Large Grass type	Large Poaceae	0	0	0	0	0	0	0	0	0
Buckwheat	Eriogonum	0	1	0	0	0	0	0	0	0
Purslane	Portulaca	0	X	0	0	0	0	0	0	0
Spurge Family	Euphorbiaceae	1	2	1	0	2	0	1	0	2
Mustard Family	Brassicaceae	0	6	0	0	1	0	0	1	0
Globemallow	Sphaeralcea	0	0	0	0	0	0	0	0	0
Evening Primrose	Onagraceae	0	0	0	0	0	0	0	0	0

Pollen Station Number		1	2	3	4	5	6	7	8	9
Sample Number		1C	2B	3A	4B	5C	6C	7B	8B	9A
Pollen Sum		343	346	328	261	318	316	319	302	357
Tracers		7	7	10	12	8	3	1	7	86
Sample Volume		20	20	20	20	20	20	20	20	20
Sample Weight grams		26.1	23.9	23.8	13.4	14.5	21.6	18.0	9.2	18.0
Pollen Concentration gr/gm		47092.6	51877.3	34569.5	40714.7	68764.8	122323.2	444544.2	117629.9	5784.9
Pollen Concentration gr/cc		61455.8	61993.3	41137.8	27278.9	49854.5	132109.1	400089.8	54109.8	5206.4
Pollen Taxa Richness		14	20	13	11	15	15	16	20	15
Charcoal as % of slide matrix		<10	<10	<10	20-30	10-20	<10	<10	<10	10-20
Common Name	**Taxa Name**									
Pea Family	Fabaceae	0	1	0	0	0	0	0	0	0
Figwort Family	Scrophulariaceae	0	0	0	0	0	0	0	0	0
Knotweed	Polygonum viva?	0	0	0	0	0	0	0	0	0
Four O'Clock Family	Nyctaginaceae	0	0	0	0	0	0	0	0	0
Cattail	Typha latifolia	0	0	0	0	0	0	0	0	0
Russian Olive	Elaeagnaceae	0	0	0	0	0	0	0	0	0
Total Aggregates		2	1	3	0	0	1	1	0	1
Pine Aggregates		1(20+)	0	2(8+)	0	0	1(20+)	X(8)	0	1(10)
Piñon Aggregates		1(6)	0	0	0	0	0	0	0	0
Grass Aggregates		0	0	1(4)	0	0	0	1(6)	0	0
Juniper Aggregates		0	1(15+)	0	0	0	0	0	0	0
Oak Aggregates		0	0	0	0	0	0	0	0	0
Sunflower Family Aggregates		0	0	0	0	0	0	0	0	0
Cheno-Am Aggregates		0	0	0	0	0	0	0	0	0

* Pollen Aggregate data shown as number of aggregates, and in parentheses, the number of grains in the largest aggregate

Table C.1 (continued). Raw Pollen Counts from 20 Stations (x notes scan identified taxa).

Pollen Station Number		10	11	12	17	18	19	25	26	27
Sample Number		10C	11A	12C	17B	18	19A	25	26	27
Pollen Sum		355	348	321	364	323	300	332	319	383
Tracers		16	4	1	5	2	13	14	26	3
Sample Volume		20	20	20	20	20	20	20	20	20
Sample Weight grams		17.6	23.6	25.7	27.4	26.3	26.6	12.3	27.0	14.9
Pollen Concentration gr/gm		3162 2.2	92470 .7	2410 0.5	6664 6.5	15403 2.9	2176 1.7	4807 0.4	1139 8.6	21492 5.5
Pollen Concentration gr/cc		2782 7.6	10911 5.4	3096 9.1	9130 5.8	20255 3.3	2894 3.1	2956 3.3	1538 8.1	16011 9.5
Pollen Taxa Richness		13	13	15	15	22	16	17	17	16
Charcoal as % of slide matrix		30-40	<10	<10	<10	10-20	<10	20-30	<10	20-30
Common Name	**Taxa Name**									
Degraded	Degraded	13	8	5	7	6	3	7	26	3
Unknown	Unknown	1	1	3	6	3	0	1	14	0
Douglas Fir	Pseudotsuga	0	0	2	0	X	0	0	0	0
Spruce	Picea	0	2	2	0	1	X	5	0	1
Fir	Abies	6	8	109	10	6	6	16	2	7
Pine	Pinus	182	184	139	127	137	151	172	67	232
Piñon	Piñon	47	36	23	80	46	48	59	24	64
Juniper	Juniperus	9	46	11	36	12	52	8	34	12
Oak	Quercus	6	6	4	29	39	7	19	5	16
Large Haploxylon Pine	Pinus Haploxylon >70 µm	0	0	2	0	1	1	0	0	0
Caprifoliaceae	Caprifoliaceae, cf. Symphoricarpos	0	0	0	0	0	0	0	0	0
Cliffrose, Mtn. Mahogany type	Rosaceae, Cercocarpus/Purshia type	5	0	0	3	0	2	0	3	3
Buckthorn Family	Rhamnaceae	0	0	0	0	1	0	0	0	0
Other Rose Family	Roseaceae	0	0	0	0	3	0	0	0	0

Pollen Station Number		10	11	12	17	18	19	25	26	27
Sample Number		10C	11A	12C	17B	18	19A	25	26	27
Pollen Sum		355	348	321	364	323	300	332	319	383
Tracers		16	4	1	5	2	13	14	26	3
Sample Volume		20	20	20	20	20	20	20	20	20
Sample Weight grams		17.6	23.6	25.7	27.4	26.3	26.6	12.3	27.0	14.9
Pollen Concentration gr/gm		3162 2.2	92470 .7	2410 0.5	6664 6.5	15403 2.9	2176 1.7	4807 0.4	1139 8.6	21492 5.5
Pollen Concentration gr/cc		2782 7.6	10911 5.4	3096 9.1	9130 5.8	20255 3.3	2894 3.1	2956 3.3	1538 8.1	16011 9.5
Pollen Taxa Richness		13	13	15	15	22	16	17	17	16
Charcoal as % of slide matrix		30-40	<10	<10	<10	10-20	<10	20-30	<10	20-30
Common Name	**Taxa Name**									
Lemonadeberry	Rhus	0	0	0	0	0	0	0	0	0
Mormon Tea	Ephedra	0	0	1	2	0	0	1	0	0
Sagebrush	Artemisia	5	20	2	6	13	3	11	16	12
Mistletoe	Loranthaceae	0	0	1	0	0	0	0	0	0
Maple	Acer	0	0	0	0	0	0	0	0	0
Walnut	Juglans	0	0	0	0	0	1	0	0	0
Birch	Betula	0	0	3	0	0	0	0	0	2
Willow	Salix	0	0	0	0	0	0	1	0	0
Yucca	Lily Family	0	0	0	0	0	0	0	0	0
Prickly Pear	Opuntia	0	X	0	X	0	X	0	0	0
Greasewood	Sarcobatus	0	0	0	0	0	0	1	0	2
Cheno-Am	Cheno-Am	20	15	4	11	9	7	3	50	9
Sunflower Family	Asteraceae	17	14	0	33	19	11	11	50	9
Chicory Tribe	Liguliflorae	0	0	0	0	0	0	1	0	0
Bursage/Ragweed type	Ambrosia	18	2	6	4	9	2	5	0	4
Thistle	Cirsium	0	0	0	0	1	0	0	2	0
Long Spine type	cf. Helianthus	0	0	0	1	2	0	0	3	0
Broad Spine type	Unknown Sunflower Family cf. Dicoria type	0	0	0	1	2	3	2	2	2

Pollen Station Number		10	11	12	17	18	19	25	26	27
Sample Number		10C	11A	12C	17B	18	19A	25	26	27
Pollen Sum		355	348	321	364	323	300	332	319	383
Tracers		16	4	1	5	2	13	14	26	3
Sample Volume		20	20	20	20	20	20	20	20	20
Sample Weight grams		17.6	23.6	25.7	27.4	26.3	26.6	12.3	27.0	14.9
Pollen Concentration gr/gm		31622.2	92470.7	24100.5	66646.5	154032.9	21761.7	48070.4	11398.6	214925.5
Pollen Concentration gr/cc		27827.6	109115.4	30969.1	91305.8	202553.3	28943.1	29563.3	15388.1	160119.5
Pollen Taxa Richness		13	13	15	15	22	16	17	17	16
Charcoal as % of slide matrix		30-40	<10	<10	<10	10-20	<10	20-30	<10	20-30
Common Name	**Taxa Name**									
Grass Family	Poaceae	24	6	4	7	5	0	6	16	0
Large Grass type	Large Poaceae	0	0	0	0	2	0	0	0	1
Buckwheat	Eriogonum	0	0	0	0	1	0	0	0	1
Purslane	Portulaca	0	0	0	0	0	0	0	0	0
Spurge Family	Euphorbiaceae	0	0	0	0	0	0	0	0	0
Mustard Family	Brassicaceae	1	0	0	0	0	0	0	3	0
Globemallow	Sphaeralcea	0	0	0	0	0	0	0	1	0
Evening Primrose	Onagraceae	0	0	0	0	0	0	0	X	0
Pea Family	Fabaceae	0	0	0	0	0	0	0	0	0
Figwort Family	Scrophulariaceae	1	0	0	0	0	0	0	1	0
Knotweed	Polygonum viva?	0	0	0	0	0	1	0	0	0
Four O'Clock Family	Nyctaginaceae	0	X	0	0	0	0	0	0	0
Cattail	Typha latifolia	0	0	0	0	0	0	2	0	0
Russian Olive	Elaeagnaceae	0	0	0	0	1	0	0	0	0
Total Aggregates		0	0	0	1	4	2	1	0	3
Pine Aggregates		0	0	0	1(20+)	1(10+)	1(20+)	1(20+)	0	3(50+)
Piñon Aggregates		0	0	0	0	0	1(30+)	0	0	0

Pollen Station Number		10	11	12	17	18	19	25	26	27
Sample Number		10C	11A	12C	17B	18	19A	25	26	27
Pollen Sum		355	348	321	364	323	300	332	319	383
Tracers		16	4	1	5	2	13	14	26	3
Sample Volume		20	20	20	20	20	20	20	20	20
Sample Weight grams		17.6	23.6	25.7	27.4	26.3	26.6	12.3	27.0	14.9
Pollen Concentration gr/gm		3162 2.2	92470 .7	2410 0.5	6664 6.5	15403 2.9	2176 1.7	4807 0.4	1139 8.6	21492 5.5
Pollen Concentration gr/cc		2782 7.6	10911 5.4	3096 9.1	9130 5.8	20255 3.3	2894 3.1	2956 3.3	1538 8.1	16011 9.5
Pollen Taxa Richness		13	13	15	15	22	16	17	17	16
Charcoal as % of slide matrix		30-40	<10	<10	<10	10-20	<10	20-30	<10	20-30
Common Name	**Taxa Name**									
Grass Aggregates		0	0	0	0	0	X(40 +)	0	0	0
Juniper Aggregates		0	0	0	0	1(20+)	0	0	0	0
Oak Aggregates		0	0	0	0	1(30+)	X(20 +)	0	0	0
Sunflower Family Aggregates		0	0	0	X(6)	0	0	0	0	0
Cheno-Am Aggregates		0	0	0	0	1(12+)	0	0	0	0

* Pollen Aggregate data shown as number of aggregates, and in parentheses, the number of grains in the largest aggregate

Table C.1 (continued). Raw Pollen Counts from 20 Stations (x notes scan identified taxa).

Pollen Station Number		28	29
Sample Number		28	29B
Pollen Sum		329	335
Tracers		4	42
Sample Volume		20	20
Sample Weight grams		22.6	21.4
Pollen Concentration gr/gm		91290.2	9349.3
Pollen Concentration gr/cc		103158.0	10003.7
Pollen Taxa Richness		13	19
Charcoal as % of slide matrix		20-30	10-20
Common Name	**Taxa Name**		
Degraded	Degraded	4	20
Unknown	Unknown	2	2
Douglas Fir	Pseudotsuga	0	0
Spruce	Picea	1	0
Fir	Abies	3	7
Pine	Pinus	238	74
Piñon	Piñon	24	19
Juniper	Juniperus	4	26
Oak	Quercus	8	13
Large Haploxylon Pine	Pinus Haploxylon >70 µm	0	0
Caprifoliaceae	Caprifoliaceae, cf. Symphoricarpos	0	0
Cliffrose, Mtn. Mahogany type	Rosaceae, Cercocarpus/Purshia type	1	0
Buckthorn Family	Rhamnaceae	0	0
Other Rose Family	Roseaceae	0	0
Lemonadeberry	Rhus	0	0
Mormon Tea	Ephedra	1	X
Sagebrush	Artemisia	3	100
Mistletoe	Loranthaceae	0	0
Maple	Acer	0	0

Pollen Station Number		28	29
Sample Number		28	29B
Pollen Sum		329	335
Tracers		4	42
Sample Volume		20	20
Sample Weight grams		22.6	21.4
Pollen Concentration gr/gm		91290.2	9349.3
Pollen Concentration gr/cc		103158.0	10003.7
Pollen Taxa Richness		13	19
Charcoal as % of slide matrix		20-30	10-20
Common Name	**Taxa Name**		
Walnut	Juglans	0	0
Birch	Betula	0	0
Willow	Salix	0	0
Yucca	Lily Family	0	0
Prickly Pear	Opuntia	0	0
Greasewood	Sarcobatus	0	1
Cheno-Am	Cheno-Am	14	36
Sunflower Family	Asteraceae	12	24
Chicory Tribe	Liguliflorae	0	0
Bursage/Ragweed type	Ambrosia	7	0
Thistle	Cirsium	0	X
Long Spine type	cf. Helianthus	0	1
Broad Spine type	Unknown Sunflower Family cf. Dicoria type	0	1
Grass Family	Poaceae	6	7
Large Grass type	Large Poaceae	0	0
Buckwheat	Eriogonum	0	2
Purslane	Portulaca	0	0
Spurge Family	Euphorbiaceae	0	0
Mustard Family	Brassicaceae	0	1
Globemallow	Sphaeralcea	0	0
Evening Primrose	Onagraceae	0	X

Pollen Station Number		28	29
Sample Number		28	29B
Pollen Sum		329	335
Tracers		4	42
Sample Volume		20	20
Sample Weight grams		22.6	21.4
Pollen Concentration gr/gm		91290.2	9349.3
Pollen Concentration gr/cc		103158.0	10003.7
Pollen Taxa Richness		13	19
Charcoal as % of slide matrix		20-30	10-20
Common Name	**Taxa Name**		
Pea Family	Fabaceae	0	1
Figwort Family	Scrophulariaceae	0	0
Knotweed	Polygonum viva?	0	0
Four O'Clock Family	Nyctaginaceae	0	0
Cattail	Typha latifolia	0	0
Russian Olive	Elaeagnaceae	0	0
Total Aggregates		1	0
Pine Aggregates		1(40+)	0
Piñon Aggregates		0	0
Grass Aggregates		0	0
Juniper Aggregates		0	0
Oak Aggregates		0	0
Sunflower Family Aggregates		0	0
Cheno-Am Aggregates		0	0

* Pollen Aggregate data shown as number of aggregates, and in parentheses, the number of grains in the largest aggregate

APPENDIX D
DENDROCHRONOLOGICAL SAMPLES FROM THE PAJARITO PLATEAU

Ronald H. Towner

Table D.1. All dendrochronological samples from Pajarito Plateau, including duplicates.

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
Puye (LA 47)	RG-327-12	char frag	E,S, & W sides of ruin	DF	1476fp	1498vv	comp	
	RG-327-2	char frag	E,S, & W sides of ruin	PP	1498fp	1525vv		
	RG-327-4	char frag	E,S, & W sides of ruin	PP	1492fp	1526vv		
	RG-327-15	char frag	E,S, & W sides of ruin	DF	1488fp	1536+r	comp	
	RG-327-11	char frag	E,S, & W sides of ruin	PP	1486fp	1537vv		
	RG-327-9	char frag	E,S, & W sides of ruin	PP	1519fp	1548vv		
	RG-327-10	char frag	E,S, & W sides of ruin	PP	1440	1554++vv		
	RG-327-1	char frag	E,S, & W sides of ruin	PP	1504fp	1572vv		
	RG-327-13	char frag	E,S, & W sides of ruin	DF	1546p	1577r	comp	
	RG-327-3	char frag	E,S, & W sides of ruin	PP	no date			
	RG-327-5	char frag	E,S, & W sides of ruin	PP	no date			
	RG-327-6	char frag	E,S, & W sides of ruin	PP	no date			
	RG-327-7	char frag	E,S, & W sides of ruin	PP	no date			
	RG-327-8	char frag	E,S, & W sides of ruin	PP	no date			
	RG-327-14	char frag	E,S, & W sides of ruin	DF	no date			
	RG-327-16	char frag	E,S, & W sides of ruin	PP	no date			
	RG-545	wd frag	S house, 5th N-s Line of Rooms from W	PP	1388np	1452vv		
	RG-546-22	char frag	Fill of Deric's room	PP	1373	1416vv		
	RG-547-1	char frag	Fill of Deric's room	PP	1395np	1437vv		
	RG-547-2	char frag	Fill of Deric's room	PP	no date			
	RG-546-23	char frag	Fill of Deric's room	PP	1357p	1454vv		
	RG-546-15	char frag	Fill of Deric's room	Pnn	1450fp	1488vv		
	RG-546-3	char frag	Fill of Deric's room	PP	1444p	1498vv		
	RG-546-4	char frag	Fill of Deric's room	PP	1467fp	1521vv		
	RG-546-5	char frag	Fill of Deric's room	PP	1501np	1526vv		
	RG-546-19	char frag	Fill of Deric's room	PP	1489fp	1528vv		
	RG-546-18	char frag	Fill of Deric's room	PP	1473fp	1534vv		
	RG-546-14	char frag	Fill of Deric's room	Pnn	1519fp	1546vv		
	RG-546-1	char frag	Fill of Deric's room	PP	1508fp	1572vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-546-2	char frag	Fill of Deric's room	PP	no date			
	RG-546-3	char frag	Fill of Deric's room	PP	no date			
	RG-546-4	char frag	Fill of Deric's room	PP	no date			
	RG-546-6	char frag	Fill of Deric's room	PP	no date			
	RG-546-7	char frag	Fill of Deric's room	PP	no date			
	RG-546-8	char frag	Fill of Deric's room	PP	no date			
	RG-546-9	char frag	Fill of Deric's room	PP	no date			
	RG-546-10	char frag	Fill of Deric's room	PP	no date			
	RG-546-11	char frag	Fill of Deric's room	PP	no date			
	RG-546-12	char frag	Fill of Deric's room	PP	no date			
	RG-546-13	char frag	Fill of Deric's room	PP	no date			
	RG-546-14	char frag	Fill of Deric's room	PP	no date			
	RG-546-16	char frag	Fill of Deric's room	PP	no date			
	RG-546-17	char frag	Fill of Deric's room	PP	no date			
	RG-546-20	char frag	Fill of Deric's room	Pnn	no date			
	RG-546-21	char frag	Fill of Deric's room	PP	no date			
	RG-551	wd sect	8th N-S line of rooms from W, 2nd from W	DF	1449p	1526v	inc	
	RG-624	wd frag	stump out of wall	PP	1430p	1539+vv		
	RG-550-6	char frag	dump	DF	1490fp	1543r	comp	
	RG-550-2	char frag	dump	PP	1502fp	1543v	inc	
	RG-550-1	char 1/2 sect	dump	PP	1512p	1544r	inc	
	RG-550-5	char frag	dump	DF	1509fp	1547vv		
	RG-550-3	char frag	dump	PP	1447fp	1574r	comp	
	RG-550-7	char frag	dump	PP	1525fp	1575+v	inc	
	RG-550-4	char frag	dump	PP	no date			
	RG-550-8	char frag	dump	PP	no date			
	RG-625	char sect	No provenience	PP	1329p	1413vv		
	RG-626	char frag	No provenience	PP	1376np	1432vv		
	RG-49	wd sect	No provenience	PP	1414p	1445vv		
	RG-627	char frag	No provenience	Pnn	1346p	1466++v v		
	RG-328	wd frag	No provenience	PP	1441p	1474+vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-546-4	char frag	No provenience	PP	1467fp	1521vv		
	RG-546-5	char frag	No provenience	PP	1501np	1526vv		
	RG-5306	char frag	No provenience	DF	1478fp	1516+vv		
	RG-48	char frag	No provenience	DF	1485p	1529v	inc	
	RG-329	char frag	No provenience	DF	1486np	1531v	inc	
	RG-353	char frag	No provenience	PP	1458p	1526vv		
	RG-333	char frag	No provenience	PP	1520fp	1562+v	inc	
	RG-548-1	char frag	Fill of WSS room	PP	no date			
	RG-548-2	char frag	Fill of WSS room	PP	no date			
	RG-548-3	char frag	Fill of WSS room	PP	no date			
	RG-549	char branch	Fill of Room 2	PP	no date			
Tsirege (LA 170)	RG-51-1	char frag	E & N sides of court	PP	1382fp	1412vv		
	RG-51-2	char frag	E & N sides of court	PP	no date			
	RG-51-3	char frag	E & N sides of court	PP	1350fp	1422++vv		
	RG-51-4	char frag	E & N sides of court	DF	no date			
	RG-51-5	char frag	E & N sides of court	PP	no date			
	RG-51-6	char frag						missing from collection
	RG-51-7	char frag	E & N sides of court	PP	1488fp	1574v		
	RG-51-8	char frag	E & N sides of court	PP				same as RG-51-7
	RG-51-9	char frag	E & N sides of court	PP				same as RG-51-7
	RG-51-10	char frag	E & N sides of court	PP				same as RG-51-7
	RG-51-11	char frag	E & N sides of court	PP	1520fp	1581v	inc	
	RG-51-12	char frag	E & N sides of court	PP				same as RG-51-7
	RG-51-13	char frag	E & N sides of court	PP				same as RG-51-7
	RG-51-14	char frag	E & N sides of court	PP	1361fp	1416vv		
	RG-51-15	char frag	E & N sides of court	PP	1541fp	1581vv		
	RG-51-16	char frag	E & N sides of court	PP				same as RG-51-11

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-51-17	char frag	E & N sides of court	DF	1384fp	1514vv		
	RG-51-18	char frag	E & N sides of court	PP	1430fp	1515vv		
	RG-51-19	char frag	E & N sides of court	PP	1392	1442vv		
	RG-51-20	char frag	E & N sides of court	PP	1523fp	1578vv		
	RG-51-21	char frag	E & N sides of court	PP	1344fp	1411+vv		
	RG-51-22	char frag	E & N sides of court	DF	1483p	1516vv		
	RG-51-23	char frag	E & N sides of court	PP	1467fp	1540vv		
	RG-51-24	char frag	E & N sides of court	PP	1482fp	1504vv		
	RG-51-25	char frag	E & N sides of court	DF	no date			
	RG-51-26	char frag	E & N sides of court	DF	no date			
	RG-51-27	char frag	E & N sides of court	PP	1464fp	1496vv		
	RG-51-28	char frag	E & N sides of court	DF	no date			
	RG-51-29	char frag	E & N sides of court	PP	1374fp	1421vv		
	RG-51-30	char frag	E & N sides of court	PP				same as RG-51-11
	RG-51-31	char frag	E & N sides of court	PP	1474fp	1502vv		
	RG-51-32	char frag	E & N sides of court	PP	1391fp	1440vv		
	RG-51-33	char frag	E & N sides of court	DF	1487fp	1515vv		
	RG-51-34	char frag	E & N sides of court	DF	1386fp	1479+vv		
	RG-51-35	char frag	E & N sides of court	PP	1537fp	1581vv		
	RG-51-36	char frag	E & N sides of court	PP	1380fp	1426vv		
	RG-51-37	char frag	E & N sides of court	PP	no date			
	RG-51-38	char frag	E & N sides of court	DF	no date			
	RG-51-39	char frag	E & N sides of court	DF	no date			
	RG-51-40	char frag	E & N sides of court	DF	no date			
	RG-52-1	wd frag	misc	DF	1397	1423vv		
	RG-52-2	wd frag	misc	DF	1427fp	1492vv		
	RG-52-3	wd frag	misc	DF	1530p	1578vv		
	RG-52-4	wd frag	misc	DF	no date			
	RG-52-5	wd frag	misc	DF	no date			
	RG-53	char frag	E side of pueblo	DF	1515p	1559r	comp	
	RG-54	wd sect	E Room beam in wall	DF	1395p	1457+vv		
	RG-404	wd sect	E side	WF	1449p	1492vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-405	wd frag	plank	PP	1345fp	1477vv		
	RG-406	wd frag	E part quadrangle	PP	no date			
	RG-407	wd frag	E part quadrangle	WF	no date			
	RG-408	wd frag	none	PP	1328fp	1435vv		
Fulton's 190 (LA 8681)	FU-1	char frag	Rm 2 fill	PNN	no date			short
	FU-2	char frag	Rm 2 fill	PNN	no date			
	FU-3	char frag	Rm 2 fill	PNN	no date			
	FU-4	char frag	Rm 2 floor	PNN	no date			
	FU-5	char frag	Rm 2 floor	JUN	no date			short
	FU-6	char frag	Rm 2 subfloor	PNN	1030p	1081vv		
	FU-8	char frag	Rm 1 subfloor	DF	no date			
	FU-9	char frag	Rm 3 fill	PNN	1130fp	1182+vv		
	FU-9-1	char frag	Rm 3 fill	PNN	no date			
	FU-10	char frag	Rm 3 firepit	PNN	1120	1162vv		
	FU-10-1	char frag	Rm 3 firepit	PNN	1143fp	1204vv		
	FU-10-2	char frag	Rm 3 firepit	PP	no date			
	FU-11	char frag	Rm 3 subfloor	DF	no date			short
	FU-12	char frag	Rm 3 firepit	PNN	no date			short
	FU-14	char frag	Rm 4 fill	PNN	no date			
	FU-14-1	char frag	Rm 4 fill	PNN	1137fp	1168vv		
	FU-14-2	char frag	Rm 4 fill	PNN	no date			
	FU-14-3	char frag	Rm 4 fill	PNN	1169fp	1218+vv		
	FU-14-4	char frag	Rm 4 fill	PNN	no date			
	FU-15	char frag	Rm 4 fill	PNN	no date			
	FU-16	char frag	Rm 4 fill	PNN	no date			
	FU-17	char frag	Rm 4 floor	PNN	1152fp	1197vv		
	FU-17-1	char frag	Rm 4 floor	PNN	1126fp	1183vv		
	FU-18	char frag	Rm 4 fill	PNN	no date			
	FU-19	char frag	Rm 4 floor	PNN	no date			
	FU-19-1	char frag	Rm 4 floor	PNN	no date			
	FU-20	char frag	Rm 4 firepit	PNN	1088	1124vv		
	FU-20-1	char frag	Rm 4 firepit	PNN	1150fp	1205vv		
	FU-20-2	char frag	Rm 4 firepit	PNN	no date			

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	FU-20-3	char frag	Rm 4 firepit	PNN	1053	1095vv		
	FU-20-4	char frag	Rm 4 firepit	PNN	1026fp	1060vv		
	FU-20-5	char frag	Rm 4 firepit	PNN	1042fp	1097vv		
	FU-20-6	char frag	Rm 4 firepit	PNN	no date			
	FU-20-7	char frag	Rm 4 firepit	PNN	1076fp	1106vv		
	FU-21	char frag	Rm 5	PNN	1129	1190vv		
	FU-21-1	char frag	Rm 5	PNN	1116np	1149vv		
	FU-21-2	char frag	Rm 5	PNN	no date			
	FU-21-3	char frag	Rm 5	PNN	no date			
	FU-22	char frag	Rm 5 fill	PNN	1168fp	1191vv		
	FU-22-1	char frag	Rm 5 fill	PNN	1152	1191vv		
	FU-22-2	char frag	Rm 5 fill	PNN	no date			
	FU-23	char frag	Rm 5 floor	PNN	no date			
	FU-23-1	char frag	Rm 5 floor	PNN	1123	1153vv		
	FU-24	char frag	Rm 6	JUN	no date			short
	FU-25	char frag	Rm 6 subfloor	PNN	no date			
	FU-26	char frag	Rm 8	JUN	no date			
	FU-27	char frag	Trench 2	JUN	no date			short
	FU-28	char frag	Trench 3	JUN	no date			short
	FU-29	char frag	Trench 4	PNN	1140	1164vv		
San Ildefonso	BE-81	wd x-sect	old kiva central beam	PP	1661p	1787vv		
	BE-82	wd x-sect	old kiva west end	PP	no date			
Cochiti Church (LA 295)	RG-714	1"core	Sacristy	PP	1677p	1745vv		adzed
	RG-715	1" core	Sacristy, E door lintel	PP	1662np	1697vv		adzed
Kotyiti (LA 84/295)	RG-55-1	char frag	none	PP	1662p	1689r	inc	
	RG-55-2	char frag	none	PP	1658p	1691vv		
	RG-55-3	char frag	none	PP	1487fp	1547vv		
	RG-55-4	char frag	none	PP	1614fp	1659vv		
	RG-55-5	char frag	none	PP	no date			short
	RG-55-6	char frag	none	PP	1587fp	1616vv		
	RG-55-7	char frag	none	PP				same as RG-55-4
	RG-55-8	char frag	none	PP	1538fp	1605vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-55-9	char frag	none	PP	1660	1685+vv		
	RG-55-10	char frag	none	PP	no date			
	RG-55-11	char frag	none	DF	no date			
	RG-55-12	char frag	none	DF	no date			short
	RG-55-13	char frag	none	PP	no date			short
	RG-55-14	char frag	none	PP	1640fp	1685+vv		
	RG-55-15	char frag	none	DF	1612fp	1654vv		
	RG-55-16	char frag	none	PP	1612fp	1681+vv		
	RG-55-17	char frag	none	PP	no date			
	RG-55-18	char frag	none	DF	1658	1688vv		
	RG-55-19	char frag	none	PP	1582fp	1666vv		
	RG-55-20	char frag	none	PP	1627fp	1685+v	inc	
	RG-55-21	char frag	none	PP	1632p	1690rB	inc	
	RG-55-22	char frag	none	PP	1627fp	1684vv		
	RG-55-23	char frag	none	PP	1622fp	1684r	comp	
	RG-55-24	char frag	none	PP	1617fp	1657vv		
	RG-55-25	char frag	none	PP	1619fp	1680vv		
	RG-55-26	char frag	none	PP	1618fp	1680vv		
	RG-55-27	char frag	none	PP	1571fp	1661vv		
	RG-55-28	char frag	none	PP	1536fp	1599vv		
	RG-55-29	char frag	none	PP	1646	1691vv		
	RG-55-30	char frag	none	PP	no date			
	RG-55-31	char frag	none	PP	1636fp	1683vv		
	RG-55-32	char frag	none	PP	no date			
	RG-55-33	char frag	none	PP	1648	1683vv		
	RG-55-34	char frag	none	PP	1637fp	1682vv		
	RG-55-35	char frag	none	PP	1629fp	1683vv		
	RG-55-36	char frag	none	PP	1606fp	1651vv		
	RG-55-37	char frag	none	PP	1622fp	1688vv		
	RG-55-38	char frag	none	PP	1652fp	1685+vv		
	RG-55-39	char frag	none	PP	1612fp	1642vv		
	RG-55-40	char frag	none	PP	1627fp	1680vv		
	RG-55-41	char frag	none	PP	1619p	1652vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-55-42	char frag	none	PP	no date			
	RG-56	wd frag	none	JUN	no date			short
Water Canyon Pueblo (LA 545)	PD-1	char frag	NW side of court	PP	1359	1429vv		
	PD-2	char frag	NW side of court	PP	no date			
	PD-3	char frag	NW side of court	PP				same as PD-17
	PD-4	char frag	NW side of court	PP				same as PD-17
	PD-5	char frag	NW side of court	PP				same as PD-17
	PD-6	char frag	NW side of court	PP				same as PD-17
	PD-7	char frag	NW side of court	DF	1123p	1165vv		
	PD-8	char frag	NW side of court	PP				same as PD-17
	PD-9	char frag	NW side of court	PP	no date			
	PD-10	char frag	NW side of court	PP	1391fp	1447v	inc	
	PD-11	char frag	NW side of court	PP	1201fp	1270vv		
	PD-12	char frag	NW side of court	PP	no date			
	PD-13	char frag	NW side of court	PP	1249fp	1281vv		
	PD-14	char frag	SW corner of court	PP	1255fp	1301vv		
	PD-15	char frag	SW corner of court	PP	1242fp	1291vv		
	PD-16	char frag	NW side of court	PP	1211fp	1302v	comp	
	PD-17	char frag	NW side of court	PP	1111fp	1302rB	comp	
	PD-18	char frag	NW side of court	PP	1260fp	1303v	comp	
	PD-19	char frag	NW side of court	DF				same as PD-7
	PD-20	char frag	NW side of court	DF				same as PD-11
	PD-21	char frag	NW side of court	PP				same as PD-17
	PD-22	char frag	NW side of court	PP	no date			
	PD-23	char frag	NW side of court	DF	no date			
	PD-24	char frag	NW side of court	PP	1333fp	1419+vv		
	PD-25	char frag	NW side of court	PP	1212fp	1265+vv		
	PD-26	char frag	NW side of court	DF	1261fp	1302vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	PD-27	char frag	NW side of court	PP	1268fp	1303r	inc	
	PD-28	char frag	NW side of court	PP	no date			
Navawi (LA 257)	RG-50	char frag	none	PP				short
Los Alamos School (LA 708)	RG-552-1	char frag	none	PP	no date			short
	RG-552-2	char frag	none	PP	no date			short
	RG-552-3	char frag	none	PP	no date			short
	RG-552-4	char frag	none	DF	no date			short
	RG-552-5	char frag	none	PP	no date			short
	RG-552-6	char frag	none	PP	no date			short
	RG-552-7	char frag	none	PP	no date			short
	RG-552-8	char frag	none	PP	no date			short
	RG-552-9	char frag	none	PP	no date			short
	RG-552-10	char frag	none	PP	no date			short
	RG-552-11	char frag	none	PP	no date			short
	RG-552-12	char frag	none	PP	no date			short
	RG-552-13	char frag	none	PP	no date			short
	RG-552-14	char frag	none	PP	no date			short
	RG-552-15	char frag	none	PP	no date			short
	RG-552-16	char frag	none	PP	no date			short
Bandelier Group M	BNM-1	wd frag	Rooms 1 & 2	PP	1352fp	1494rG	comp	
	BNM-1-1	wd frag	Room 5	PP	no date			
	BNM-1-2	wd frag	Room 2	PP	no date			
	BNM-1-3	wd frag	Room 2	PP	no date			
	BNM-1-4	wd frag	Room 2	PP	no date			
Tyuonyi (LA 82)	TYU-1A	char frag	Tier 10 Rm B	PP	1370fp	1421v	inc	
	TYU-1B	char frag	Tier 10 Rm B	PP	no date			
	TYU-2-1	char frag	Tier 9-10, Rm A	PP	1416fp	1451vv		
	TYU-2-1	char frag	Tier 9-10, Rm A	PP	1388p	1422vv		
	TYU-2-2	char frag	Tier 9-10, Rm A	PP	1396np	1427vv		
	TYU-3	char frag	Tier 1 Rm A Lv 3	PNN	no date			
	TYU-4	char frag	Tier 16 Rm F subfloor	PP	1417fp	1469vv		
	TYU-5	char frag	Tier 8 Rm A	PP	1382fp	1427+r	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	TYU-6	char frag	Tier 16 Rm F subfloor	PP	1412fp	1466v	inc	
	TYU-7	char frag	Tier 7 Rm B subfloor	PP	no date			
	TYU-8	char frag	Tier 3 Rm B	PP	1403fp	1442r	comp	
	TYU-9	char frag	Tier 8 Rm A	PP	1388p	1431v	inc	
	TYU-10	char frag	Tier 16 Rm A subfloor	PP	1364np	1407+vv		
	TYU-11	char frag	Tier 7 Rm A	PP	1331p	1385vv		
	TYU-11-1	char frag	Tier 7 Rm A	PP	no date			
	TYU-12	char frag	Tier 16 Rm G subfloor	PP	1362fp	1423+vv		
	TYU-13-1	char frag	Tier 16 Rm A subfloor	PP	1352fp	1421++v	inc	
	TYU-13-2	char frag	Tier 16 Rm A subfloor	PP	1360fp	1427v	comp	
	TYU-14	char frag	Tier 3 Rm 8 top floor	PP	1395np	1458vv		
	TYU-15	char frag	Tier 1 Rm B	PP	no date			short
	TYU-16	char frag	Tier 2 Rm E	PP	no date			short
	TYU-17	char frag	Tier 3 Rm A subfloor	PP	no date			
	TYU-17-1	char frag	Tier 3 Rm A subfloor	DF	no date			
	TYU-17-2	char frag	Tier 3 Rm A subfloor	PP	no date			
	TYU-18	char frag	Tier 17 Rm F	PP	1361fp	1422+r	comp	
	TYU-19	char frag	Tier 18 Rm G subfloor	PP	1353fp	1389vv		
	TYU-19-1	char frag	Tier 18 Rm G subfloor	DF	1390p	1422+r	comp	
	TYU-19-2	char frag	Tier 18 Rm G subfloor	PP	1368fp	1421+v	inc	
	TYU-20-1	char frag	Tier 17 Rm B	PP	1370fp	1401vv		
	TYU-20-2	char frag	Tier 17 Rm B	PP	no date			
	TYU-21	char frag	Tier 14 Rm E subfloor	PP	1417fp	1457vv		
	TYU-22	char frag	Tier 15 Rm A	PP	no date			
	TYU-22-1	char frag	Tier 15 Rm A	PP	no date			
	TYU-23	char frag	Tier 14 Rm A subfloor	PP	1367fp	1395vv		
	TYU-24	char frag	Tier 8 Rm A subfloor	PP	no date			
	TYU-25	char frag	Tier 15 Rm A subfloor	PP	1383fp	1408vv		
	TYU-26	char frag	Tier 17 Rm 6	PP	no date			short
	TYU-27	char frag	Tier 15 Rm B subfloor	PP	no date			short
	TYU-28	char frag	Tier 3 Rm D subfloor	PP	no date			short
	TYU-29	char frag	Tier 4 Rm B subfloor	JUN	no date			false
	TYU-30	char frag	Tier 16 Rm G	PP	1359fp	1387vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	TYU-31	char frag	Tier 18 Rm F subfloor	PP	no date			short
	TYU-32	char frag	Tier 16 Rm F	PP	no date			short
	TYU-33	char frag	B-1 (?)	PP	no date			short
	TYU-34	char frag	Tier 1 Rm A Lv 3	PP	no date			
	TYU-35	char frag	Tier 16 Rm G	QUER	no date			
	TYU-36	char frag	Tier 8 Rm A subfloor	JUN	1350fp	1400++v v		
	TYU-37	char frag	Tier 8 Rm A subfloor	JUN	no date			compressed
	TYU-38	char frag	Tier 3 Rm A sub 3	PP	no date			short
	TYU-39	char frag	Tier 2 Rm A	PP	no date			short
	TYU-40	char frag	Sector B	DF	no date			
	TYU-40-1	char frag	Sector B	POP	no date			
	TYU-41	char frag	Tier 5 Rm A	PP	no date			short
	TYU-42	char frag	Tier 3 Rm A subsurface	PP	no date			short
	TYU-43-1	char frag	Tier 12 Rm B sub	PP	1363p	1415+vv		
	TYU-43-2	char frag	Tier 12 Rm B sub	PP	no date			
	TYU-44-1	char frag	Tier 15 Rm F	PP	no date			
	TYU-44-2	char frag	Tier 15 Rm F	PP	1391fp	1509v	inc	
	TYU-45-1	char frag	Tier 14 Rm G SB	PP	1353np	1415+rB	inc	
	TYU-45-2	char frag	Tier 14 Rm G SB	PP	1366p	1398vv		
	TYU-46-1	char frag	Tier 10 Rm A SB	PP	no date			
	TYU-46-2	char frag	Tier 10 Rm A SB	PP	1454np	1496vv		
	TYU-46-3	char frag	Tier 10 Rm A SB	PP				same as TYU-46-1
	TYU-47	char frag	Tier 1 Rm C	JUN	no date			short
	TYU-48	char frag	Tier 16 Rm E	PP	1436fp	1467r	comp	
	TYU-49	char frag	Tier 9 Rm A	PP	1385fp	1427r	inc	
	TYU-50	char frag	Tier 9 Rm A	PP	no date			short
	TYU-51	char frag	Tier 3 Rm A SB	PP	no date			short
	TYU-52	char frag	Tier 14 Rm E subfloor	PP	no date			short
	TYU-53	char frag	Tier 16 Rm E	PP	no date			short
	TYU-54	char frag	Tier 17 Rm B SB	DF	no date			short
	TYU-55-1	char frag	Sector C	PP	1392fp	1466r	comp	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	TYU-55-2	char frag	Sector C	PP	1487fp	1521vv		
	TYU-56	char frag	Tier 8 Rm A	PP	1387np	1426r	inc	
	TYU-57	char frag	Tier 8 Rm A	JUN	same as TYU-36			
	TYU-57-1	char frag	Tier 8 Rm A	DF	1332	1383vv		
	TYU-58	char frag	Trench 1	DF	no date			short
	TYU-59	char frag	Tier 18 Rm F SB	PP	no date			short
	TYU-60	char frag	Tier 16 Rm H SB	PP	1389np	1422+r	inc	
	TYU-61	char frag	Tier 8 Rm A SB	JUN	no date			short
	TYU-62	char frag	Sector B	DF	no date			
	TYU-63	char frag	Trench 1	PP	no date			short
	TYU-64	char frag	Trench 1	DF	no date			short
	TYU-65	char frag	Tier 15 Rm A SB	DF	no date			short
	TYU-66	char frag	Sector B	DF	1459p	1521r	comp	
	TYU-67	char frag	Trench 1	PP	no date			short
	TYU-68	char frag	Tier 16 Rm A	PP	1353fp	1419+r	comp	
	TYU-69	char frag	Trench 1	DF	no date			
	TYU-70	char frag	Tier 18 Rm A SB	POP	no date			short
	TYU-71	char frag	Tier 6 Rm A	PP	no date			short
	TYU-72	char frag	Tier 16 Rm B	PP	1392fp	1447r	inc	
	TYU-73	char frag	Tier 1 Rm B	PP	1390fp	1443vv		
	TYU-73-1	char frag	Tier 1 Rm B	PP	1306fp	1366vv		
	TYU-74	char frag	Tier 15 Rm E SB	DF	no date			
	TYU-75	char frag	Tier 12 Rm B SB	PP	no date			
	TYU-76	char frag	Tier 2 Rm B	PP	1384fp	1442+v		
	TYU-77	char frag	Tier 2 Rm B SB	PP	no date			short
	TYU-78	char frag	Tier 16 Rm E betw floors	PP	no date			
	TYU-79	char frag	Tier 16 Rm G strat test	PP	1435	1517vv		
	TYU-80	char frag	Tier 14 Rm G SB	PP				missing from collection
	TYU-81	char frag	Tier 4 Rm A	DF	no date			short
	TYU-82	char frag	Tier 13 Rm D	PP	1240np	1340vv		
	TYU-82-1	char frag	Tier 13 Rm D	PP	1280fp	1327vv		
	TYU-82-2	char frag	Tier 13 Rm D	PP	1328fp	1369+r	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	TYU-83	char frag	Tier 9 Rm A trench	PP	no date			short
	TYU-84	char frag	Tier 11 Rm A trench	PP	1318p	1388vv		
	TYU-84-1	char frag	Tier 11 Rm A trench	PP	1332np	1386r	inc	
	TYU-84-2	char frag	Tier 11 Rm A trench	DF	no date			
	RG-8-1	char frag	Misc from Surface	PP	1407fp	1462+vv		
	RG-8-2	char frag	Misc from Surface	PP	1368fp	1421+vv		
	RG-24-1	char frag	Misc from Surface	DF	no date			short
	RG-24-2	char frag	Misc from Surface	PP	no date			
	RG-24-3	char frag	Misc from Surface	PP	no date			short
	RG-24-4	char frag	Misc from Surface	PP	no date			short
	RG-24-5	char frag	Misc from Surface	PP	no date			
	RG-24-6	char frag	Misc from Surface	PP	no date			short
	RG-24-7	char frag	Misc from Surface	PP				same as RG-24-5
	RG-24-8	char frag	Misc from Surface	PP	no date			
	RG-24-9	char frag	Misc from Surface	PP	1368p	1439vv		
	RG-24-10	char frag	Misc from Surface	DF	1394fp	1442vv		
	RG-24-11	char frag	Misc from Surface	PP	no date			
	RG-24-12	char frag	Misc from Surface	PP	1353fp	1394vv		
	RG-24-13	char frag	Misc from Surface	PP	1449fp	1494vv		
	RG-24-14	char frag	Misc from Surface	PP	no date			
	RG-24-15	char frag	Misc from Surface	PP	no date			
Rainbow House (LA 217)	BNM-6	char frag	Kiva 1 Level 4	DF	no date			short
	RBH-1-1A	char frag	Room 1-18	PP	1389fp	1451r	inc	
	RBH-1-1B	char frag	Room 1-18	PP	1377fp	1451r	comp	
	RBH-1-2	char frag	Room 1-18	PP				Same as RBH-1-1B
	RBH-2	char frag	Room 1-18	PP				Same as RBH-1-1A
	RBH-3	char frag	Kiva 1 Level 2	PP	1389np	1458v	inc	
	RBH-4	char frag	Room 1-18	PP	1389np	1422+v	inc	
	RBH-5	char frag	Room 1-18	PP	1404np	1451r	comp	
	RBH-5-1	char frag	Room 1-18	PP				Same as RBH-1-1B

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RBH-5-2	char frag	Room 1-18	PP	1382p	1412vv		
	RBH-5-3	char frag	Room 1-18	PP				Same as RBH-1-1A
	RBH-6-1	char frag	Room 1-18	PP				Same as RBH-1-1A
	RBH-6-2	char frag	Room 1-18	PP	1395np	1449v	inc	
	RBH-7A	char frag	Room 1-18	PP				Same as RBH-1-1B
	RBH-7B	char frag	Room 1-18	PP	1393fp	1435vv		
	RBH-8	char frag	Room 1-18	PP	1377p	1439vv		
	RBH-9	char frag	Room 1-18	PP				Same as RBH-8
	RBH-10	char frag	Room 1-18	PP	1381	1427vv		
	RBH-11	char frag	Room 1-18	PP	1387fp	1451r	comp	
	RBH-12	char frag	Room 1-18	PP	1412fp	1453vv		
	RBH-13	char frag	Room 1-18	PP				Same as RBH-1-1B
	RBH-14	char frag	Room 1-18	PP				Same as RBH-1-1B
	RBH-15	char frag	Room 1-18	PP	1393fp	1454vv		
	RBH-16	char frag	Room 1-18	PP	1389np	1427+v	inc	
	RBH-17	char frag	Room 1-18	PP	1415np	1451v	inc	
	RBH-18	char frag	Room 1-18	PP	1379fp	1408vv		
	RBH-19	char frag	Room 1-18	PP	1405np	1446vv		
	RBH-20	char frag	Room 1-18	PP				Same as RBH-1-1A
	RBH-21	char frag	Room 1-18	PP				Same as RBH-1-1A
	RBH-22	char frag	Room 1-18	PP				Same as RBH-1-1A
	RBH-23	char frag	Room 1-18	PP	1404fp	1451r	comp	
	RBH-24	char frag	Room 1-18	PP				Same as RBH-1-1B
	RBH-25	char frag	Room 1-18	PP				Same as RBH-10

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-9	char frag	none	PP	no date			short
Frijolito (LA 78)	RG-13-1	char frag	Room N side	PP	1343p	1460r	comp	
	RG-13-2	char frag	Room N side	PP	no date			short
	RG-13-3	char frag	Room N side	PP	1367fp	1447v	inc	
	RG-13-4	char frag	Room N side	PP	1384p	1431vv		
	RG-13-5	char frag	Room N side	PP	1412fp	1447vv		
	RG-13-6	char frag	none	PP	1414p	1447r	inc	
	RG-13-7	char frag	none	PP	1315	1437vv		
	RG-13-8	char frag	none	PP	1357fp	1426r	comp	
	RG-13-9	char frag	none	PP	1396p	1454r	comp	
	RG-13-10	char frag	none	PP	1389fp	1447vv		
	RG-13-11	char frag	none	PP	1394fp	1441vv		
	RG-13-12	char frag	none	PP	1386np	1452r	comp	
	RG-13-13	char frag	none	PP	1328np	1385vv		
Otowi (LA 169)	RG-28-1	char frag	No provenience	PP	1378fp	1431vv		
	RG-28-2	char frag	No provenience	PP	1375fp	1409vv		
	RG-28-3	char frag	No provenience	PP	no date			
	OTO-1	rot wd frag	RM 5 fill	PP	1381p	1414r	comp	
	OTO-2	rot wd frag	RM 5&6 Fill	DF	1434fp	1491vv		
	OTO-2C	rot wd frag	RM 5&6 Fill	PP				same as OTO-1
	OTO-3	rot wd frag	No provenience	PP				same as OTO-1
	OTO-4	rot wd frag	No provenience	PP				same as OTO-1
	OTO-4-1	rot wd frag	No provenience	PP	no date			
	OTO-5	rot wd frag	No provenience	PP				same as OTO-1
	OTO-6	rot wd frag	No provenience	PP				same as OTO-1
Hewitt's Ruin 12 (LA 42)	RG-26-1	char frag	Blumenthal modern house?	PP	1804fp	1867v	inc	
	RG-26-2	char frag		PP	1793fp	1837vv		
	RG-26-3	char frag		PP	1830fp	1871vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-26-4	char frag		PP	1786fp	1832vv		
	RG-26-5	char frag		PP	no date			
	RG-26-6	char frag		PP	no date			
	RG-26-7	char frag		PP	1796fp	1830vv		
Tsankawi (LA 211)	RG-25-1	char frag	none	PP	1373fp	1436vv		
	RG-25-2	char frag	none	PP	1395fp	1439vv		
	RG-25-3	char frag	none	PP	no date			
	RG-25-4	char frag	none	PP	no date			
LA 3852	BNM-84	char frag	Pit structure area 4	Pnn	1006	1085+vv		
	BNM-85	char frag	Rm 6 area 1	PP	no date			
	BNM-86	char frag	Rm 6 area 1	Pnn	no date			
Burnt Mesa Pueblo (LA 60372)	BNM-63	char frag	Rm 1	PP	no date			
	BNM-64	char frag	Rm 1	PP	no date			
	BNM-65	char frag	Rm 1	PP	no date			
	BNM-66	wd frag	Rm 1	DF	1221p	1275vv		
	BNM-67	char frag	Rm 1	PNN	no date			
	BNM-68	char frag	Rm 1	DF	1231p	1268vv		
	BNM-69	wd frag	Rm 1	DF	1222p	1275vv		
	BNM-70	wd frag	Rm 1	PP	no date			
	BNM-72	wd frag	Rm 1	DF	1230	1267vv		
	BNM-73	char frag	Rm 2	PP	no date			
	BNM-74	char frag	Rm 2	PP	1194	1250B	inc	
	BNM-75	char frag	Rm 4	PP	no date			
	BNM-76	char frag	Rm 4	PP	1098	1204vv		
	BNM-77	char frag	Rm 4	PP	1134	1193vv		
	BNM-78	char frag	Rm 4	PP	1120	1207+vv		
	BNM-79	char frag	Rm 2	PP	no date			
	BNM-80	char frag	Rm 10	PP	1206	1272vv		
	BNM-81	char frag	2 x 2 unit	DF	1132p	1189vv		
	BNM-82	char frag	2 x 2 unit	DF	no date			
	BNM-83	char frag	2 x 2 unit	DF	1230p	1271vv		
	BNM-87	char frag	Rm 1	PP	no date			
	BNM-88	char frag	Pitstr 1	PNN	1244+-	1317B	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	BNM-89	char frag	Pitstr 1	PP	1249	1316B	inc	
	BNM-90	char frag	Rm 11	PP	no date			
	BNM-91	char frag	2 x 2 unit	PP	no date			
LA 53148	BNM-92	wd x-sect	Cavate 1 surf	PP	no date			
	BNM-93	wd x-sect	Cavate 1 surf	PP	no date			
	BNM-94	wd x-sect	Cavate 1 surf	PP	no date			
LA 71155	BNM-95	wd x-sect	Rockshelter surf	PP	no date			
LA 71090	BNM-96	wd frag	Camp 2 Roof post NE	JUN	no date			
	BNM-97	wd frag	Cavate Str 1	PP	no date			
	BNM-98	wd frag	Camp 2 Roof post SE	JUN	no date			
LA 84067	BNM-99	wd frag	Bedrock Pit 1	PP	no date			
LA 71081	BNM-100	wd char frag	small str 1 surf	PP	no date			
Saltbush Pueblo (LA 4497)	BNM-7	char frag	trash	PNN	no date			
	BNM-8	char frag	gen fill	PNN	1166p	1241vv		
	BNM-9	char frag	Kiva	PNN	1159p	1194vv		
	BNM-10	char frag	Kiva floor fill	PNN	1151p	1215vv		
LA 2987	BNM-2	char frag	gen site	PNN	no date			
LA 2990	BNM-5	wd sect	Navajo midden?	POP	no date			
LA 2994	BNM-4	char frag	Level 4	JUN	no date			erratic
LA 2998	BNM-3	char sect	below floor	POP	no date			
LA 3852	BNM-84	char frag	Pit structure area 4	Pnn	1006	1085+vv		
	BNM-85	char frag	Rm 6 area 1	PP	no date			
	BNM-86	char frag	Rm 6 area 1	Pnn	no date			
LA 50972	BNM-71	char frag	Cavate	PNN	no date			
Pueblo del Encierro (LA 70)	CDP-32	char frag	FE 2	PNN	1359fp	1458vv		
	CDP-33	char frag	FE 25	PNN	1322np	1381vv		
	CDP-34	char frag	FE 25 ash pit	PNN	1362p	1416v	inc	
	CDP-35	char frag	FE 29 gen fill	PNN	1331fp	1364vv		
	CDP-36	char frag	FE 29 pit	PNN	no date			short
	CDP-37	char frag	FE 33 subfloor pit	PP	no date			
	CDP-38	char frag	FE 42 gen fill	PNN	no date			
	CDP-39	char frag	FE 42 gen fill	PNN	no date			

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	CDP-40	char frag	FE 62 floor fill	PNN	no date			
	CDP-41	char frag	FE 69 gen fill	PNN	1387fp	1427r	comp	
	CDP-42	char frag	FE 69 gen fill	PNN	1297fp	1423r	comp	
	CDP-43	char frag	FE 69 gen fill	PNN	1356p	1411r	comp	
	CDP-44	char frag	FE 69 gen fill	PP	no date			
	CDP-45	char frag	FE 78 gen fill	PNN	no date			
	CDP-46	char frag	FE 79 floor fill	DF	no date			short
	CDP-47	char frag	FE 80 gen fill	DF	1432p	1469r	inc	
	CDP-48	char frag	FE 80 gen fill	DF	1331p	1374vv		
	CDP-49	char frag	FE 80 gen fill	PP	1385p	1428r	comp	
	CDP-50	char frag	FE 80 gen fill	PP	1368	1439r	inc	
	CDP-51	char frag	FE 83 gen fill	JUN	no date			short
	CDP-52	char frag	FE 83 gen fill	DF	no date			short
	CDP-53	char frag	FE 83 gen fill	PP	1365+-p	1412r	inc	
	CDP-54	char frag	FE 83 gen fill	PP	no date			
	CDP-55	char frag	FE 83 gen fill	PNN	1309p	1406+r	inc	
	CDP-56	char frag	FE 83 gen fill	JUN	no date			
	CDP-57	char frag	FE 83 floor fill	PNN	same as CDP-55			
	CDP-58	char frag	FE 83 floor fill	DF	1414+-p	1415r	comp	
	CDP-59	char frag	FE 83 floor fill	PP	1360fp	1388vv		
	CDP-60	char frag	FE 83 floor fill	PP	no date			
	CDP-61	char frag	FE 83 floor fill	DF	1464p	1494r	comp	
	CDP-62	char frag	FE 83 floor contact	PP	same as CDP-60			
	CDP-63	char frag	FE 87 gen fill	PNN	1258fp	1345vv		
	CDP-64	char frag	FE 90 gen fill	NON-CON	no date			short
	CDP-65	char frag	FE 92 post hole	PNN	1271np	1341vv		
	CDP-66	char frag	FE 93	PP	no date			short
	CDP-67	char frag	FE 100 gen fill	PNN	no date			short
	CDP-68	char frag	FE 101 trench	PNN	1357	1381vv		
	CDP-69	char frag	FE 107 trench	PNN	no date			short
	CDP-70	char frag	FE 107 trench	PP	no date			short
	CDP-71	char frag	FE 123 floor fill	PP	no date			
	CDP-72	char frag	FE 124 roof fall	DF	1479p	1515rB	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	CDP-73	char frag	FE 124 roof fall	PP	no date			
	CDP-74	char frag	FE 128 fill	PP	no date			
	CDP-75	char frag	FE 128 Gen fill	NON-CON	no date			
	CDP-76	char frag	FE128 Roof fall	DF	1323p	1413+r	inc	
	CDP-77	char frag	FE128 Roof fall	DF	1339p	1423+r	inc	
	CDP-78	char frag	FE128 Roof fall	DF	1431p	1469r	inc	
	CDP-79	char frag	FE128 Roof fall	PP	1326np	1454v	inc	
	CDP-80	char frag	FE128 Roof fall	PP	no date			
	CDP-81	char frag	FE128 Roof fall	DF	no date			
	CDP-82	char frag	FE128 Roof fall	DF	1412p	1447vv		
	CDP-83	char frag	FE128 Roof fall	PNN	1352np	1508vv		
	CDP-84	char frag	FE128 Roof fall	PP	1400	1467r	inc	
	CDP-85	char frag	FE128 Roof fall	DF	1359p	1422+r	inc	
	CDP-86	char frag	FE128 Roof fall	DF	1420p	1463rB	inc	
	CDP-87	char frag	FE128 Roof fall	PNN	1184	1368++v v		
	CDP-88	char frag	FE128 Roof fall	PP	1440p	1468r	inc	
	CDP-89	char frag	FE128 Roof fall	DF	1327p	1420+rB	inc	
	CDP-90	char frag	FE128 Roof fall	PNN	1349np	1520vv		
	CDP-91	char frag	FE128 Roof fall	PP	1325np	1424+r	inc	
	CDP-92	char frag	FE128 Roof fall	DF	1432p	1469rB	comp	
	CDP-93	char frag	FE128 Roof fall	PP	1405p	1455r	inc	
	CDP-94	char frag	FE128 Roof fall	DF	1418p	1464r	inc	
	CDP-95	char frag	FE128 Roof fall	DF	1385p	1424r	inc	
	CDP-96	char frag	FE128 Roof fall	DF	1372p	1421r	inc	
	CDP-97	char frag	FE128 Roof fall	PP	no date			
	CDP-98	char frag	FE128 Roof fall	DF	1442p	1468r	comp	
	CDP-99	char frag	FE128 Roof fall	DF	1364p	1435v	inc	
	CDP-100	char frag	FE128 Roof fall	PP	no date			
	CDP-101	char frag	FE128 Roof fall	PP	no date			
	CDP-102	char frag	FE128 Roof fall	DF	1377p	1428r	inc	
	CDP-103	char frag	FE128 Roof fall	DF	1377p	1424+r	inc	
	CDP-104	char frag	FE128 Roof fall	DF	1433p	1468r	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	CDP-105	char frag	FE128 Roof fall	DF	1418p	1462v	inc	
	CDP-106	char frag	FE128 Roof fall	PNN	1274p	1409v	inc	
	CDP-107	char frag	FE128 Roof fall	PP	no date			
	CDP-108	char frag	FE128 Roof fall	PP	1384p	1428r	inc	
	CDP-109	char frag	FE128 Roof fall	DF	1413p	1467r	inc	
	CDP-110	char frag	FE128 Roof fall	PP	1424	1466r	inc	
	CDP-111	char frag	FE128 Roof fall	PP	1363	1401r	inc	
	CDP-112	char frag	FE128 Roof fall	PNN	1482p	1513v	inc	
	CDP-113	char frag	FE 129 gen fill	PP	1597	1766++v v		
	CDP-114	char frag	FE 129 gen fill	PP	1645fp	1742vv		
	CDP-115	char frag	FE 129 gen fill	PP	1716	1790vv		
	CDP-116	char frag	FE 129 gen fill	PP	1596fp	1724vv		
	CDP-117	char frag	FE 129 floor fill	PP	1527fp	1702vv		
	CDP-118	char frag	FE 129 floor fill	PP				same as CDP-116
	CDP-119	char frag	FE 129 floor fill	PP	1561p	1691vv		
	CDP-120	char frag	FE 129 floor contact	PP				same as CDP-119
	CDP-121	char frag	FE 129 floor contact	PP	1687fp	1770vv		
	CDP-122	char frag	FE 129 floor contact	PP	1701fp	1771vv		
	CDP-123	char frag	door betw Fe 129/123	PP	1701fp	1787vv		
	CDP-124	char frag	door betw Fe 129/123	PP	no date			
	CDP-125	char frag	door betw Fe 129/123	PP	1746fp	1786vv		
	CDP-126	char frag	FE 130 gen fill	PP	no date			short
	CDP-127	char frag	FE 130 gen fill	PNN	1362np	1441r	inc	
	CDP-128	char frag	FE 130 gen fill	PNN	1334fp	1388vv		
	CDP-129	char frag	FE 130 gen fill	PP	1374fp	1422+vv		
	CDP-130	char frag	FE 132 gen fill	PNN	1371p	1427r	inc	
	CDP-131	char frag	FE 132 floor fill	PNN	1362+-p	1426+r	inc	
	CDP-132	char frag	FE 132 floor fill	PNN				same as CDP-130
	CDP-133	char frag	FE 132 floor contact	PNN				same as CDP-131

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	CDP-134	char frag	FE 132 floor contact	PNN				same as CDP-130
	CDP-135	char frag	FE 132 betw floors 1/2	JUN	no date			false
	CDP-136	char frag	FE 132 betw floors 1/2	PNN	no date			
	CDP-137	char frag	FE 136 floor fill	PP	1376p	1425+r	inc	
	CDP-138	char frag	FE 136 floor fill	PP	1389fp	1425+v	inc	
	CDP-139	char frag	FE 136 floor fill	PP	1385p	1421vv		
	CDP-140	char frag	FE 140 gen fill	JUN	no date			false
	CDP-141	char frag	FE 152 roof fall	DF	1404p	1444rB	comp	
	CDP-142	char frag	FE 152 roof fall	PP	1330p	1388vv		
	CDP-143	char frag	FE 152 roof fall	DF	1403p	1438+vv		
	CDP-144	char frag	FE 152 roof fall	PP	1344fp	1426vv		
	CDP-145	char frag	FE 152 roof fall	PP	1305fp	1357vv		
	CDP-146	char frag	FE 152 roof fall	DF	1405p	1451rB	inc	
	CDP-147	char frag	FE 152 roof fall	PP	no date			
	CDP-148	char frag	FE 152 roof fall	PP	no date			
	CDP-149	char frag	FE 152 roof fall	POP	no date			short
	CDP-150	char frag	FE 152 roof fall	PP	no date			
	CDP-151	char frag	FE 152 roof fall	DF	1415p	1451rB	inc	
	CDP-152	char frag	FE 152 roof fall	PP	1273np	1406vv		
	CDP-153	char frag	FE 152 roof fall	PP	no date			
	CDP-154	char frag	FE 152 roof fall	PP	1390p	1422r	inc	
	CDP-155	char frag	FE 152 roof fall	DF	1413p	1446vv		
	CDP-156	char frag	FE 152 roof fall	DF	1403np	1450rB	inc	
	CDP-157	char frag	FE 152 roof fall	DF	1385p	1434vv		
	CDP-158	char frag	FE 152 roof fall	DF	1414p	1441r	inc	
	CDP-159	char frag	FE 152 roof fall	DF	1384p	1443r	inc	
	CDP-160	char frag	FE 152 roof fall	DF	1413p	1441v	inc	
	CDP-161	char frag	FE 152 roof fall	DF	1421p	1450+r	inc	
	CDP-162	char frag	FE 152 roof fall	PP	1401p	1451r	inc	
	CDP-163	char frag	FE 152 roof fall	PP	no date			
	CDP-164	char frag	FE 152 roof fall	DF	1334p	1414r	inc	
	CDP-165	char frag	FE 152 roof fall	DF	1400p	1445r	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	CDP-166	char frag	FE 152 floor contact	POP	no date			short
	CDP-167	char frag	FE 152	JUN	no date			short
	CDP-168	char frag	FE 152	PP	same as CDP-152			
	CDP-169	char frag	FE 167 gen fill	DF	no date			
	CDP-170	char frag	FE 169 gen fill	DF	1404p	1428vv		
	CDP-171	char frag	FE 179 gen fill	POP	no date			short
	CDP-172	char frag	FE 179 floor fill	DF	no date			short
	CDP-173	char frag	FE 181 fill	JUN	no date			false
	CDP-174	char frag	FE 183 gen fill	PP	1473	1518+r	inc	
	CDP-175	char frag	FE 186 roof fall	DF	1385p	1449vv		
	CDP-176	char frag	FE 186 roof fall	DF	1447p	1479rB	inc	
	CDP-177	char frag	FE 186 roof fall	DF	1435p	1479rB	inc	
	CDP-178	char frag	FE 186 roof fall	DF	1456p	1479rB	inc	
	CDP-179	char frag	FE 186 roof fall	PP	1442p	1486rG	inc	
	CDP-180	char frag	FE 186 roof fall	PP	1458p	1486rG	inc	
	CDP-181	char frag	FE 186 roof fall	DF	1449p	1486rG	inc	
	CDP-182	char frag	FE 186 roof fall	DF	1458p	1479rB	inc	
	CDP-183	char frag	FE 186 roof fall	PP	1440p	1479rB	inc	
	CDP-184	char frag	FE 186 roof fall	DF	1449p	1479rB	inc	
	CDP-185	char frag	FE 186 roof fall	DF	1446p	1474vv		
	CDP-186	char frag	FE 186 roof fall	DF	1462p	1480r	inc	
	CDP-187	char frag	FE 186 roof fall	DF	1454p	1479rB	inc	
	CDP-188	char frag	FE 186 roof fall	DF	1457	1480r	inc	
	CDP-189	char frag	FE 186 roof fall	DF	1331p	1476+r	inc	
	CDP-190	char frag	FE 186 roof fall	PP	1370p	1455v	inc	
	CDP-191	char frag	FE 186 roof fall	PP	no date			
	CDP-192	char frag	FE 186 roof fall	PP	1311fp	1348vv		
	CDP-193	char frag	FE 186 roof fall	PP	1435p	1463vv		
	CDP-194	char frag	FE 200 vent fill	PNN	1241np	1292vv		
	CDP-195	char frag	FE 200 inside pot	PNN	1235np	1402+vv		
	CDP-196	char frag	FE 200 inside pot	PNN	1263fp	1367vv		
	CDP-197	char frag	FE 200 inside pot	PNN	1233p	1368vv		
	CDP-198	char frag	FE 213 ash pit A	PNN	1289	1346vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	CDP-199	char frag	FE 223 level 4	PNN	1282fp	1350vv		
	CDP-200	char frag	FE 223 level 6	PNN	1157fp	1327++v v		
	CDP-201	char frag	FE 223 level 6	JUN	no date			short
	CDP-202	char frag	FE 229 roof fall	PNN	no date			short
	CDP-203	char frag	FE 279 roof fall	DF	1487p	1515r	inc	
	CDP-204	char frag	FE 279 roof fall	DF	1491p	1515r	inc	
	CDP-205	char frag	FE 279 roof fall	DF	1474p	1516r	inc	
	CDP-206	char frag	FE 279 roof fall	DF	1468p	1516r	inc	
	CDP-207	char frag	FE 279 roof fall	PP	1498p	1520c	inc	
	CDP-208	char frag	FE 279 roof fall	PP	1482p	1520r	inc	
	CDP-209	char frag	FE 279 roof fall	DF	1487p	1515r	inc	
	CDP-210	char frag	FE 279 roof fall	DF	1490p	1516r	inc	
	CDP-211	char frag	FE 279 roof fall	DF	1479p	1516r	inc	
	CDP-212	char frag	FE 279 roof fall	DF	1470p	1515r	inc	
	CDP-213	char frag	FE 279 roof fall	DF	1479p	1515r	inc	
	CDP-214	char frag	FE 279 roof fall	DF	1485p	1518r	inc	
	CDP-215	char frag	FE 279 roof fall	DF	1490p	1514vv		
	CDP-216	char frag	FE 279 roof fall	DF	1485	1515r	inc	
	CDP-217	char frag	FE 279 roof fall	DF	1488p	1513vv		
	CDP-218	char frag	FE 279 roof fall	PP	1480p	1520r	inc	
	CDP-219	char frag	FE 279 roof fall	DF	1480p	1515rB	inc	
	CDP-220	char frag	FE 279 roof fall	PP	1493p	1520c	inc	
	CDP-221	char frag	FE 279 roof fall	DF	1491p	1519rB	inc	
	CDP-222	char frag	FE 279 roof fall	DF	1494p	1516r	inc	
	CDP-223	char frag	FE 279 roof fall	DF	1473p	1516+c	inc	
	CDP-224	char frag	FE 279 roof fall	DF	1463p	1507r	inc	
	CDP-225	char frag	FE 279 roof fall	DF	1481p	1515r	inc	
	CDP-226	char frag	FE 279 roof fall	PP	1498p	1520c	inc	
	CDP-227	char frag	FE 279 roof fall	DF	1492p	1515r	inc	
	CDP-228	char frag	FE 279 roof fall	DF	1484p	1515+r	inc	
	CDP-229	char frag	FE 279 roof fall	DF	1476p	1515r	inc	
	CDP-230	char frag	FE 279 roof fall	DF	1481p	1515r	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	CDP-231	char frag	FE 279 roof fall	DF	no date			
	CDP-232	char frag	FE 279 roof fall	DF	1468p	1515r	inc	
	CDP-233	char frag	FE 279 roof fall	DF	1482p	1515r	inc	
	CDP-234	char frag	FE 279 roof fall	DF	1488p	1514vv		
	CDP-235	char frag	FE 279 roof fall	DF	1459p	1515r	inc	
	CDP-236	char frag	FE 279 roof fall	DF	1485p	1515r	inc	
	CDP-237	char frag	FE 279 roof fall	DF	1476p	1515r	inc	
	CDP-238	char frag	FE 279 roof fall	PP	1486p	1520r	inc	
	CDP-239	char frag	FE 279 roof fall	PNN	1488p	1515r	inc	
	CDP-240	char frag	FE 279 roof fall	DF	1492p	1515r	inc	
	CDP-241	char frag	FE 279 roof fall	DF	1481p	1515r	inc	
	CDP-242	char frag	FE 279 roof fall	DF	1475p	1515r	inc	
	CDP-243	char frag	FE 279 roof fall	DF	1487p	1515rB	inc	
	CDP-244	char frag	FE 279 roof fall	DF				same as CDP-231
	CDP-245	char frag	FE 279 roof fall	DF	1475p	1515r	inc	
	CDP-246	char frag	FE 279 roof fall	PP	1487p	1520r	inc	
	CDP-247	char frag	FE 279 roof fall	DF	1484p	1515r	inc	
	CDP-248	char frag	FE 279 roof fall	DF	1481p	1515r	inc	
	CDP-249	char frag	FE 279 roof fall	DF	1482p	1515r	inc	
	CDP-250	char frag	FE 279 roof fall	DF	1476p	1513vv		
	CDP-251	char frag	FE 279 roof fall	DF	1467p	1515r	inc	
	CDP-252	char frag	FE 280 fill	PNN	no date			
	CDP-253	char frag	FE 292 hearth	PNN	1393fp	1446vv		
LA 34	CDP-1	char frag	FE 13	DF	no date			
LA 272	CDP-2	char frag	FE 1 gen fill	POP	no date			short
	CDP-3	char frag	FE 2 roof fall	PP	no date			short
	CDP-4	char frag	FE 2 roof fall	POP	no date			short
	CDP-5	char frag	FE 2 floor contact	POP	no date			short
	CDP-6	char frag	FE 2 floor contact	POP	no date			short
	CDP-7	char frag	FE 2 floor contact	PP	no date			short
LA 3446	CDP-8	char frag	square 7	JUN	no date			short
	CDP-9	char frag	square 8	JUN	no date			

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	CDP-10	char frag	square 9	JUN	no date			short
	CDP-11	char frag	square 10 or 11	PP	no date			short
	CDP-12	char frag	square 13	JUN	no date			false
LA 6178	CDP-13	wd frag	FE 21	JUN	no date			short
Alfred Herrera Site (LA 6455)	CDP-14	char frag	FE 251 top fill	PNN	1311fp	1370vv		
	CDP-15	char frag	FE 251 top fill	PNN	no date			
	CDP-16	char frag	FE 251 top fill	PNN	1308np	1349vv		
	CDP-17	char frag	FE 251 top fill	PNN	1197p	1281vv		
	CDP-18	char frag	FE 251 top fill	PNN	no date			
	CDP-19	char frag	FE 251 top fill	PNN	no date			
	CDP-20	char frag	FE 251 top fill	PNN	no date			
	CDP-21	char frag	FE 251 middle fill	PNN	1300	1382vv		
	CDP-22	char frag	FE 251 middle fill	PNN	1244	1380++vv		
	CDP-23	char frag	FE 251 middle fill	PNN	no date			
	CDP-24	char frag	FE 251 middle fill	PNN	no date			
	CDP-25	char frag	FE 251 floor fill	PNN	1240fp	1348+vv		
	RG-4714	char frag	FE 1 plaza area	PNN	no date			
	RG-4715	char frag	FE 10 top fill	PNN	1243p	1318vv		
	RG-4716	char frag	FE 10 top fill	PNN	no date			
	RG-4717	char frag	FE 10 top fill	JUN	no date			
	RG-4718	char frag	FE 14 lower fill	PP	no date			
	RG-4719	char frag	FE 14 floor fill	PNN	no date			
	RG-4720	char frag	FE 17 floor fill	PNN	1264np	1318vv		
	RG-4721	char frag	FE 23 floor fill	PP	no date			
	RG-4722	char frag	FE 24 floor fill	PNN	no date			
	RG-4723	char frag	FE 24 floor fill	PNN	1281	1342vv		
	RG-4724	char frag	FE 28 gen fill	PP	no date			
	RG-4725	char frag	FE 33 gen fill	JUN	no date			
	RG-4726	char frag	FE 52 gen fill	PP	1283np	1320vv		
	RG-4727	char frag	FE 52 floor fill	PP	no date			
	RG-4728	char frag	FE 52 floor fill	DF	no date			
	RG-4729	char frag	FE 52 floor fill	PP	1265fp	1302vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-4720	char frag	FE 52 floor fill	PNN	1385fp	1457v	inc	
	RG-4731	char frag	FE 52 floor fill	PP	1275fp	1381vv		
	RG-4732	char frag	FE 52 floor fill	PP	1333fp	1372vv		
	RG-4733	char frag	FE 52 floor fill	PP	1330fp	1357vv		
	RG-4734	char frag	FE 52 roof fall	PP	1360fp	1469rB	inc	
	RG-4735	char frag	FE 52 roof fall	PP	1325	1384vv		
	RG-4736	char frag	FE 52 roof fall	PP				same as RG-4731
	RG-4737	char frag	FE 52 roof fall	DF	no date			
	RG-4738	char frag	FE 52 roof fall	PP				same as RG-4731
	RG-4739	char frag	FE 52 roof fall	PP	1307fp	1344vv		
	RG-4740	char frag	FE 52 roof fall	PP				same as RG-4731
	RG-4741	char frag	FE 52 roof fall	PP	1318fp	1346vv		
	RG-4742	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4743	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4744	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4745	char frag	FE 52 floor contact	PP				same as RG-4731
	RG-4746	char frag	FE 52 floor contact	PP				same as RG-4734
	RG-4747	char frag	FE 52 floor contact	PP				same as RG-4734
	RG-4748	char frag	FE 52 floor contact	PP				same as RG-4734
	RG-4749	char frag	FE 52 floor contact	PP				same as RG-4734
	RG-4750	char frag	FE 52 floor contact	PP				same as RG-4734
	RG-4751	char frag	FE 52 floor contact	PP	no date			
	RG-4752	char frag	FE 52 floor contact	DF	no date			
	RG-4753	char frag	FE 52 roof fall	DF	1460p	1496v	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-4754	char frag	FE 52 roof fall	DF	1473p	1497r	inc	
	RG-4755	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4756	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4757	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4758	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4759	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4760	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4761	char frag	FE 52 roof fall	PP				same as RG-4731
	RG-4762	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4763	char frag	FE 52 roof fall	PP	1257p	1410vv		
	RG-4764	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4765	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4766	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4767	char frag	FE 52 roof fall	PP	no date			
	RG-4768	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4769	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4770	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4771	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4772	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4773	char frag	FE 52 roof fall	PP				same as RG-4763

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-4774	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4775	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4776	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4777	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4778	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4779	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4780	char frag	FE 52 roof fall	PP	1283p	1314vv		
	RG-4781	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4782	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4783	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4784	char frag	FE 52 roof fall	PP	no date			
	RG-4785	char frag	FE 52 floor contact	PP	no date			
	RG-4786	char frag	FE 52 floor contact	PP				same as RG-4734
	RG-4787	char frag	FE 52 floor contact	?	no date			vitrified knot
	RG-4788	char frag	FE 52 floor contact	?				short
	RG-4789	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4790	char frag	FE 52 roof fall	DF	no date			
	RG-4791	char frag	FE 52 roof fall	PP				same as RG-4734
	RG-4792	char frag	FE 52 roof fall	PP				same as RG-4763
	RG-4793	char frag	FE 52 roof fall	PP	1386fp	1470r	inc	
	RG-4794	char frag	FE 54 gen fill	PP	1399fp	1457vv		
	RG-4795	char frag	FE 54 gen fill	PP				same as RG-4763

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-4796	char frag	FE 54 gen fill	PP				same as RG-4794
	RG-4797	char frag	FE 54 gen fill	PP	1378np	1439vv		
	RG-4798	char frag	FE 54 gen fill	PP				same as RG-4794
	RG-4799	char frag	FE 54 gen fill	PNN	no date			short
	RG-4800	char frag	FE 54 gen fill	POP	no date			short
	RG-4801	char frag	FE 54 gen fill	PP	1414fp	1478vv		
	RG-4802	char frag	FE 54 gen fill	PP				same as RG-4763
	RG-4803	char frag	FE 59 S wall	PP	no date			
	RG-4804	char frag	FE 59 floor fill	DF	no date			short
	RG-4805	char frag	FE 59 floor fill	POP	no date			short
	RG-4806	char frag	FE 68	PP				same as RG-4734
	RG-4807	char frag	FE 68	PP				same as RG-4734
	RG-4808	char frag	FE 68	DF	no date			short
	RG-4809	char frag	FE 68 floor fill	DF	no date			short
	RG-4810	char frag	FE 68 floor fill	PP	no date			
	RG-4811	char frag	FE 68 floor fill	DF	no date			short
	RG-4812	char frag	FE 68 floor fill	DF	no date			short
	RG-4813	char frag	FE 68 floor fill	DF	no date			short
	RG-4814	char frag	FE 68 floor fill	DF				missing from collection
	RG-4815	char frag	FE 68 floor fill	DF				same as RG-4812
	RG-4816	char frag	FE 68 floor fill	PP				same as RG-4734
	RG-4817	char frag	FE 68 floor fill	PP				same as RG-4734
	RG-4818	char frag	FE 68 floor fill	PP	no date			short
	RG-4819	char frag	no provenience	PP	1359fp	1404vv		
	RG-4820	char frag	no provenience	PP				same as RG-4734

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-4821	char frag	no provenience	PP				same as RG-4734
	RG-4822	char frag	no provenience	PP				same as RG-4734
	RG-4823	char frag	no provenience	PP				same as RG-4734
	RG-4824	char frag	no provenience	PP				same as RG-4734
	RG-4825	char frag	no provenience	PP				same as RG-4763
	RG-4826	char frag	no provenience	PP				same as RG-4763
	RG-4827	char frag	no provenience	PP				same as RG-4763
	RG-4828	char frag	no provenience	PP				same as RG-4763
	RG-4829	char frag	no provenience	PP				same as RG-4763
	RG-4830	char frag	no provenience	PP				same as RG-4763
	RG-4831	char frag	no provenience	PP				same as RG-4731
	RG-4832	char frag	no provenience	PP				short
	RG-4833	char frag	no provenience	PP				same as RG-4763
	RG-4834	char frag	no provenience	PP				same as RG-4734
	RG-4835	char frag	no provenience	PP				same as RG-4734
	RG-4936	char frag	no provenience	PP				same as RG-4734
	RG-4837	char frag	no provenience	PP				same as RG-4734
	RG-4838	wd frag	no provenience	PP				short
Red Snake Hill (LA 6461)	RG-4890	char frag	FE 3 gen fill	JUN	no date			erratic
	RG-4891	char frag	FE 3 gen fill	JUN	no date			erratic
	RG-4892	char frag	FE 3 gen fill	JUN	no date			short

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-4893	char frag	FE 3 gen fill	JUN	no date			erratic
	RG-4894	char frag	FE 3 gen fill	JUN	no date			erratic
North Bank Site (LA 6462)	RG-4895	char frag	FE 1	PNN	1116np	1152vv		
	RG-4896	char frag	FE 1	PP	1188fp	1239vv		
	RG-4897	char frag	FE 1	POP	no date			short
	RG-4898	char frag	FE 1	JUN	no date			FALSE
	RG-4899	char frag	FE 1	JUN	no date			erratic
	RG-4900	char frag	FE 1	PNN	no date			
	RG-4901	char frag	FE 1	POP	no date			
	RG-4902	char frag	FE 10 FILL	PNN	1208p	1246r	inc	
	RG-4903	char frag	FE 10 FILL	PNN	no date			short
	RG-4904	char frag	FE 10 FILL	PNN	no date			
	RG-4905	char frag	FE 12 FLOOR FILL	PNN	1248p	1280r	comp	
	RG-4906	char frag	FE 12 FLOOR FILL	PP	1157p	1191vv		
	RG-4907-1	char frag	FE 20 HEARTH	PNN	1200p	1229vv		
	RG-4908	char frag	FE 20 HEARTH	POP	no date			short
	RG-4909	char frag	FE 21 FIRE PIT	PNN	no date			
	RG-4910	char frag	FE 27 HEARTH	JUN	no date			short
	RG-4911	char frag	FE 30 FILL	JUN	no date			erratic
	RG-4912	char frag	FE 30 FILL	JUN	no date			short
	RG-4913	char frag	FE 30 ASH PIT	JUN	no date			false
	RG-4914	char frag	FE 33 FLOOR	JUN	no date			erratic
	RG-4915	char frag	FE 34 COOKING PIT	PNN	no date			short
	RG-4916	char frag	FE 34 FILL	PNN	no date			short
	RG-4917	char frag	FE 34 FILL	PNN	1205p	1244rB	inc	
	RG-4918	char frag	FE 34 FILL	PNN	no date			
	RG-4919	char frag	FE 37 FILL	PNN	1025p	1117++vv		
	RG-4920	char frag	FE 37 FILL	PNN	no date			same as RG-4919
	RG-4921	char frag	FE 37 FILL	PNN	no date			
	RG-4922	char frag	FE 37 FILL	POP	no date			short
	RG-4923	char frag	FE 37 FILL	PNN	1073np	1124vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-4924	char frag	FE 37 FILL	PNN				same as RG-4919
	RG-4925	char frag	FE 37 FILL	PNN				same as RG-4919
	RG-4926	char frag	FE 37 FILL	PNN	1212p	1246r	comp	
	RG-4927	char frag	FE 37 FILL	PNN	1095p	1128vv		
	RG-4928	char frag	FE 37 FLOOR CONTACT	PNN	1071p	1130v	inc	
	RG-4929	char frag	FE 37 FLOOR CONTACT	PNN	1202p	1247r	comp	
	RG-4930	char frag	FE 38	PNN	1024p	1118vv		
	RG-4931	char frag	FE 38	PNN	1032p	1128r	comp	
	RG-4932	char frag	FE 38 FILL	JUN	1036fp	1130rB	comp	
	RG-4933	char frag	FE 38 FILL	PNN	1050np	1129vv		
	RG-4934	char frag	FE 38 FILL	PNN	no date			
	RG-4935	char frag	FE 38 FILL	PNN				same as RG-4933
	RG-4936	char frag	FE 38 FILL	PNN	1083np	1130vv		
	RG-4937	char frag	FE 41	JUN	no date			
	RG-4938	char frag	FE 43 HEARTH	JUN	no date			
	RG-4939	char frag	FE 45 FLOOR FILL	POP	no date			
	RG-4940	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-4941	char frag	FE 45 FLOOR FILL	PNN	1187+-p	1267+vv		
	RG-4942	char frag	FE 45 FLOOR FILL	DF	no date			
	RG-4943	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-4944	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-4945	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-4946	char frag	FE 45 FLOOR FILL	PNN	1180p	1278+r	inc	
	RG-4947	char frag	FE 45 FLOOR FILL	PNN	1229p	1280+r	inc	
	RG-4948	char frag	FE 45 FLOOR FILL	PNN	1233p	1280r	comp	
	RG-4949	char frag	FE 45 FLOOR FILL	PNN				same as RG-4946
	RG-4950	char frag	FE 45 FLOOR FILL	DF				same as RG-4942
	RG-4951	char frag	FE 45 FLOOR FILL	PNN				same as RG-

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
								4946
	RG-4952	char frag	FE 45 FLOOR FILL	PNN	1235np	1280rB	inc	
	RG-4953	char frag	FE 45 FLOOR FILL	DF				same as RG-4942
	RG-4954	char frag	FE 45 FLOOR FILL	PP	1244+-p	1278rB	inc	
	RG-4955	char frag	FE 45 FLOOR FILL	PNN				same as RG-4952
	RG-4956	char frag	FE 45 FLOOR FILL	PNN	1241	1279vv		
	RG-4957	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-4958	char frag	FE 45 FLOOR FILL	PNN	1201fp	1280r	comp	
	RG-4959	char frag	FE 45 FLOOR FILL	PP				same as RG-4954
	RG-4960	char frag	FE 45 FLOOR FILL	PNN				same as RG-4952
	RG-4961	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-4962	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-4963	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-4964	char frag	FE 45 FLOOR FILL	PP	1249p	1280r	comp	
	RG-4965	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-4966	char frag	FE 45 FLOOR FILL	PP				same as RG-4965
	RG-4967	char frag	FE 45 FLOOR FILL	PP				same as RG-4965
	RG-4968	char frag	FE 45 FLOOR FILL	PNN	1204p	1280rB	inc	
	RG-4969	char frag	FE 45 FLOOR FILL	PP	1248p	1280r	inc	
	RG-4970	char frag	FE 45 FLOOR FILL	PP	no date			short
	RG-4971	char frag	FE 45 FLOOR FILL	PP	1249p	1280r	inc	
	RG-4972	char frag	FE 45 FLOOR FILL	PNN	1205p	1232vv		
	RG-4973	char frag	FE 45 FLOOR FILL	PP				same as RG-4965
	RG-4974	char frag	FE 45 FLOOR FILL	PNN	1253p	1280r	inc	
	RG-4975	char frag	FE 45 FLOOR FILL	PP				same as RG-4965
	RG-4976	char frag	FE 45 FLOOR FILL	PP	1205p	1241vv		
	RG-4977	char frag	FE 45 FLOOR	PP	1251p	1280r	comp	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
			CONTACT					
	RG-4978	char frag	FE 45 FLOOR CONTACT	PP				same as RG-4954
	RG-4979	char frag	FE 45 FLOOR CONTACT	PNN	1220p	1280rB	inc	
	RG-4980	char frag	FE 45 FLOOR CONTACT	PP	no date			
	RG-4981	char frag	FE 45 FLOOR CONTACT	PNN	1191p	1280r	comp	
	RG-4982	char frag	FE 45 FLOOR CONTACT	PP	no date			
	RG-4983	char frag	FE 45 FLOOR CONTACT	PP	1253p	1280r	inc	
	RG-4984	char frag	FE 45 FLOOR CONTACT	PNN	1235np	1280r	inc	
	RG-4985	char frag	FE 45 FLOOR CONTACT	PNN				same as RG-4979
	RG-4986	char frag	FE 45 FLOOR FILL	PP	1243p	1278+r	inc	
	RG-4987	char frag	FE 45 FLOOR FILL	PNN	1241p	1280r	comp	
	RG-4988	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-4989	char frag	FE 45 FLOOR FILL	PP	1236p	1280r	inc	
	RG-4990	char frag	FE 45 FLOOR FILL	PP				same as RG-4954
	RG-4991	char frag	FE 45 FLOOR FILL	PNN	1194p	1278+rB	inc	
	RG-4992	char frag	FE 45 FLOOR FILL	PNN	1235p	1280r	comp	
	RG-4993	char frag	FE 45 FLOOR FILL	PP				same as RG-4954
	RG-4994	char frag	FE 45 FLOOR FILL	PP				same as RG-4989
	RG-4995	char frag	FE 45 FLOOR FILL	PNN				same as RG-4968
	RG-4996	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-4997	char frag	FE 45 FLOOR CONTACT	PP	no date			short
	RG-4998	char frag	FE 45 FLOOR CONTACT	PNN	1245p	1280r	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-4999	char frag	FE 45 FLOOR CONTACT	PP	no date			short
	RG-5000	char frag	FE 45 FLOOR CONTACT	PP				same as RG-4982
	RG-5001	char frag	FE 45 FLOOR CONTACT	PP	1243np	1280rB	inc	
	RG-5002	char frag	FE 45 FLOOR CONTACT	PNN	1249p	1280r	inc	
	RG-5003	char frag	FE 45 FLOOR CONTACT	PP	no date			short
	RG-5004	char frag	FE 45 FLOOR FILL	DF	no date			short
	RG-5005	char frag	FE 45 FLOOR FILL	PP	no date			short
	RG-5006	char frag	FE 45 FLOOR FILL	PP	1258p	1280rB	inc	
	RG-5007	char frag	FE 45 FLOOR FILL	PP				same as RG-4988
	RG-5008	char frag	FE 45 FLOOR FILL	PNN	1135p	1255++v v		
	RG-5009	char frag	FE 45 FLOOR FILL	PP	no date			short
	RG-5010	char frag	FE 45 FLOOR FILL	PP	no date			short
	RG-5011	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-5012	char frag	FE 45 FLOOR FILL	PP				same as RG-4988
	RG-5013	char frag	FE 45 FLOOR FILL	PNN	1222p	1280r	inc	
	RG-5014	char frag	FE 45 FLOOR FILL	PNN	1254p	1280r	comp	
	RG-5015	char frag	FE 45 FLOOR FILL	PNN				same as RG-5013
	RG-5016	char frag	FE 45 FLOOR FILL	PNN	1165p	1277+r	inc	
	RG-5017	char frag	FE 45 FLOOR FILL	PNN				same as RG-5016
	RG-5018	char frag	FE 45 FLOOR FILL	PP	1245p	1277rB	inc	
	RG-5019	char frag	FE 45 FLOOR FILL	PNN	1242p	1280r	inc	
	RG-5020	char frag	FE 45 FLOOR FILL	PNN	1220p	1280rB	inc	
	RG-5021	char frag	FE 45 FLOOR FILL	PP	1231p	1278rB	inc	
	RG-5022	char frag	FE 45 FLOOR FILL	PNN	1193p	1272+r	inc	
	RG-5023	char frag	FE 45 FLOOR FILL	PP	no date			short

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-5024	char frag	FE 45 FLOOR FILL	PNN	1211p	1280rB	inc	
	RG-5025	char frag	FE 45 FLOOR FILL	PP	no date			short
	RG-5026	char frag	FE 45 FLOOR FILL	PNN				same as RG-5016
	RG-5027	char frag	FE 45 FLOOR FILL	PNN	1256p	1280rB	inc	
	RG-5028	char frag	FE 45 FLOOR FILL	PNN	1240p	1280r	inc	
	RG-5029	char frag	FE 45 FLOOR FILL	PP				same as RG-5021
	RG-5030	char frag	FE 45 FLOOR FILL	PP	no date			short
	RG-5031	char frag	FE 45 FLOOR FILL	PP				same as RG-5021
	RG-5032	char frag	FE 45 FLOOR FILL	PNN	1231p	1269vv		
	RG-5033	char frag	FE 45 FLOOR FILL	PNN	1243p	1280rB	inc	
	RG-5034	char frag	FE 45 FLOOR FILL	PP	1217p	1276vv		
	RG-5035	char frag	FE 45 FLOOR FILL	DF	no date			short
	RG-5036	char frag	FE 45 FLOOR FILL	PP	no date			short
	RG-5037	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-5038	char frag	FE 45 FLOOR FILL	PNN	1104p	1264++vv		
	RG-5039	char frag	FE 45 FLOOR FILL	PNN	1234p	1280rB	inc	
	RG-5040	char frag	FE 45 FLOOR FILL	PP	no date			
	RG-5041	char frag	FE 45 FLOOR FILL	PP				same as RG-4954
	RG-5042	char frag	FE 45 FLOOR FILL	PP	1245p	1280vv		
	RG-5043	char frag	FE 45 FLOOR FILL	PNN	no date			
	RG-5044	char frag	FE 45 FLOOR FILL	PNN				same as RG-4981
	RG-5045	char frag	FE 45 FLOOR FILL	PNN	1209p	1280r	inc	
	RG-5046	char frag	FE 45 FLOOR FILL	PNN				same as RG-5038
	RG-5047	char frag	FE 45 FLOOR FILL	PNN	1214p	1280rB	inc	
	RG-5048	char frag	FE 45 FLOOR FILL	PNN				same as RG-4981
	RG-5049	char frag	FE 45 FLOOR FILL	PP	no date			short
	RG-5050	char frag	FE 45 FLOOR FILL	PNN	1110p	1222+vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-5051	char frag	FE 45 FLOOR FILL	PNN	1152fp	1215vv		
	RG-5052	char frag	FE 45 FLOOR FILL	PNN				same as RG-5047
	RG-5053	char frag	FE 45 ROOF FALL	PP	no date			short
	RG-5054	char frag	FE 45 ROOF FALL	PP	1243p	1280r	inc	
	RG-5055	char frag	FE 45 ROOF FALL	PNN	1236	1280r	inc	
	RG-5056	char frag	FE 45 ROOF FALL	PNN	1244p	1280r	inc	
	RG-5-57	char frag	FE 45 ROOF FALL	PNN	1224p	1280rB	inc	
	RG-5058	char frag	FE 45 ROOF FALL	PNN	1228p	1275vv		
	RG-5059	char frag	FE 45 ROOF FALL	PNN				same as RG-5058
	RG-5060	char frag	FE 45 ROOF FALL	PNN	1204p	1278v		
	RG-5061	char frag	FE 45 ROOF FALL	PNN	1193np	1279+r	inc	
	RG-5062	char frag	FE 45 ROOF FALL	PP	no date			short
	RG-5063	char frag	FE 65 GEN FILL	PNN	1227p	1275vv		
	RG-5064	char frag	FE 65 GEN FILL	POP	no date			
	RG-5065	char frag	FE 84 GEN FILL	JUN	no date			false
	RG-5066	char frag	FE 84 GEN FILL	JUN	no date			false
	RG-5067	char frag	FE 84 GEN FILL	JUN	no date			false
	RG-5068	char frag	FE 84 GEN FILL	PNN	no date			
	RG-5069	char frag	FE 84 GEN FILL	PNN	1022p	1118vv		
	RG-5070	char frag	FE 84 GEN FILL	JUN	no date			erratic
	RG-5071	char frag	FE 84 GEN FILL	JUN	no date			false
	RG-5072	char frag	FE 85 FILL	JUN	no date			
	RG-5073	char frag	FE 85 FILL	JUN	no date			
	RG-5074	char frag	FE 85 FILL	JUN	no date			
	RG-5075	char frag	FE 85 FILL	POP	no date			
	RG-5076	char frag	FE 85 FILL	PNN	1116p	1165v	inc	
	RG-5077	char frag	FE 85 FILL	POP	no date			
	RG-5078	char frag	FE 85 FILL	JUN	no date			short
	RG-5079	char frag	FE 85 FLOOR CONTACT	PNN	111p	1163vv		
	RG-5080	char frag	FE 85 FLOOR CONTACT	JUN	no date			false

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-5081	char frag	FE 87 FILL	POP	no date			
	RG-5082	char frag	FE 87 FILL	POP	no date			
	RG-5083	char frag	FE 87 FILL	PP	no date			short
	RG-5084	char frag	FE 87 FILL	JUN	no date			short
	RG-5085	char frag	FE 87 FILL	PNN	no date			
	RG-5086	char frag	FE 87 FILL	POP	no date			
	RG-5087	char frag	FE 87 FILL	JUN	no date			erratic
	RG-5088	char frag	FE 87 FILL	POP	no date			
	RG-5089	char frag	FE 87 FILL	JUN	no date			false
	RG-5090	char frag	FE 87 FILL	POP	no date			
	RG-5091	char frag	FE 87 FLOOR FILL	JUN	no date			short
	RG-5092	char frag	FE 87 W BIN IN N WALL	POP	no date			
	RG-5093	char frag	FE 87 W BIN IN N WALL	JUN	no date			short
	RG-5094	char frag	FE 87 W BIN IN N WALL	JUN	no date			erratic
	RG-5095	char frag	FE 87 FILL	JUN	no date			
	RG-5096	char frag	FE 87 FILL	JUN	no date			false
	RG-5097	char frag	FE 88 FILL	JUN	no date			false
	RG-5098	char frag	FE 88 FILL	JUN	no date			
	RG-5099	char frag	FE 88 FILL	JUN	no date			false
	RG-5100	char frag	FE 88 FILL	PP	no date			
	RG-5101	char frag	FE 88 FILL	POP	no date			
	RG-5102	char frag	FE 88 FILL	POP	no date			
	RG-5103	char frag	FE 96 HEARTH	JUN	no date			short
	RG-5104	char frag	FE 96 HEARTH	JUN	no date			false
	RG-5105	char frag	FE 96 HEARTH	JUN	no date			false
	RG-5106	char frag	FE 99 GEN FILL	PNN	1198p	1262vv		
	RG-5107	char frag	FE 99 GEN FILL	JUN	no date			erratic
	RG-5108	char frag	FE 99 FLOOR FILL	JUN	no date			false
	RG-5109	char frag	FE 99 FLOOR FILL	PNN	1143p	1182vv		
	RG-5110	char frag	FE 99 FLOOR FILL	JUN	no date			short
	RG-5111	char frag	FE 99 FLOOR FILL	PNN	1203p	1266r	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-5112	char frag	FE 99 FLOOR FILL	PNN	no date			
	RG-5113	char frag	FE 99 FLOOR CONTACT	JUN	no date			false
	RG-5114	char frag	FE 99 FLOOR CONTACT	PNN	1203p	1261+r	inc	
	RG-5115	char frag	FE 99 FLOOR CONTACT	PNN				same as RG-5114
	RG-5116	char frag	FE 103 FILL	PNN	1046p	1109vv		
	RG-5117	char frag	FE 103 FILL	PP	no date			short
	RG-5118	char frag	FE 103 FILL	PNN	no date			
	RG-5119	char frag	FE 103 FLOOR CONTACT	POP	no date			
	RG-5120	char frag	FE 103 FLOOR CONTACT	POP	no date			
	RG-5121	char frag	FE 103 FLOOR CONTACT	PP	1128p	1174r	inc	
	RG-5122	char frag	FE 103 FLOOR CONTACT	JUN	no date			false
	RG-5123	char frag	FE 103 FLOOR CONTACT	JUN	no date			
	RG-5124	char frag	FE 103 FLOOR CONTACT	POP	no date			
	RG-5125	char frag	FE 103 FLOOR CONTACT	PNN	1094np	1152vv		
	RG-5126	char frag	FE 103 FLOOR CONTACT	PNN	1086p	1148r	inc	
	RG-5127	char frag	FE 103 FLOOR CONTACT	POP	no date			
	RG-5128	char frag	FE 103 FLOOR CONTACT	POP	no date			
	RG-5129	char frag	FE 103 FLOOR CONTACT	ATTR?	no date			
	RG-5130	char frag	FE 103 FLOOR CONTACT	PNN	1074p	1140rB	inc	
	RG-5131	char frag	FE 103 FLOOR CONTACT	PP				
	RG-5132	char frag	FE 103 FIRE PIT	PNN	1133fp	1168vv		

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-5133	char frag	FE 103 FIRE PIT	PNN				same as RG-5132
	RG-5134	char frag	FE 103 FIRE PIT	POP	no date			
	RG-5135	char frag	FE 106	PNN	1133p	1206r	comp	
	RG-5136	char frag	FE 106	PNN	1172	1206r	inc	
	RG-5137	char frag	FE 106	PNN	1160p	1206r	comp	
	RG-5138	char frag	FE 108 GEN FILL	DF	no date			
	RG-5139	char frag	FE 108 GEN FILL	JUN	no date			short
	RG-5140	char frag	FE 108 GEN FILL	PNN	1162p	1223+vv		
	RG-5141	char frag	FE 108 GEN FILL	PNN	1155fp	1209vv		
	RG-5142	char frag	FE 108 GEN FILL	?	no date			short
	RG-5143	char frag	FE 108 GEN FILL	?	no date			
	RG-5144	char frag	FE 108 GEN FILL	JUN	no date			short
	RG-5145	char frag	FE 108 GEN FILL	PNN	1152fp	1209vv		
	RG-5146	char frag	FE 108 GEN FILL	POP	no date			
	RG-5147	char frag	FE 108 GEN FILL	POP	no date			
	RG-5148	char frag	FE 109 FILL	PP	no date			
	RG-5149	char frag	FE 109 FILL	PP	no date			
	RG-5150	bark	FE 109 FILL	PP	no date			
	RG-4907-2	char frag	FE 20 HEARTH	PNN	1200p	1248vv		
	RG-4907-3	char frag	FE 20 HEARTH	PNN	1202p	1244vv		
LA 9139	CDP-27	char frag	FE 1	PP	1534fp	1675vv		
	CDP-28	char frag	FE 1	PP	1724	1767vv		
	CDP-29	char frag	FE 1	PNN	no date			
	CDP-30	char frag	FE 1 roof fall	PP				same as CDP-27
	CDP-31	char frag	FE 1 roof fall	PP	no date			
Bandelier Big Kiva	RG-5156	char frag	Frijoles Canyon	PP	1343fp	1504vv		
	RG-5157	char frag	Frijoles Canyon	PP	1362np	1426vv		
	RG-5158	char frag	Frijoles Canyon	PP				same as RG-5156
	RG-5159	char frag	Frijoles Canyon	PP				same as RG-5156
	RG-5160	char frag	Frijoles Canyon	PP				same as RG-

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
								5156
	RG-5161	char frag	Frijoles Canyon	PP				same as RG-5156
	RG-5162	char frag	Frijoles Canyon	PP				same as RG-5156
	RG-5163	char frag	Frijoles Canyon	PP				same as RG-5157
	RG-5164	char frag	no provenience	PP	no date			
	RG-5165	char frag	west entrance	PP	1322fp	1505+r	inc	
	RG-5166	char frag	west entrance	PP				same as RG-5165
	RG-5167	char frag	west entrance	PP				same as RG-5165
	RG-5168	char frag	west entrance	PP				same as RG-5165
	RG-5169	char frag	west entrance	PP				same as RG-5156
	RG-5170	char frag	west entrance	PP				same as RG-5165
	RG-5171	char frag	south fill of kiva	PP	1320	1383vv		
	RG-5172	char frag	south fill of kiva	PP?	no date			
	RG-5173	char frag	south fill of kiva	DF	1489p	1523v	comp	
	RG-5174	char frag	south fill of kiva	DF	no date			
	RG-5175	char frag	south fill of kiva	?	no date			
	RG-5176	char frag	south fill of kiva	PP	no date			
	RG-5177	char frag	south fill of kiva	DF				same as RG-5173
	RG-5178	char frag	south fill of kiva	DF	1470p	1522r	comp	
	RG-5179	char frag	south fill of kiva	DF				same as RG-5178
	RG-5180	char frag	south fill of kiva	PP	no date			
	RG-5181	char frag	south fill of kiva	DF	no date			
	RG-5182	char frag	south fill of kiva	PP	no date			
	RG-5183	char frag	south fill of kiva	DF	no date			
	RG-5184	char frag	south fill of kiva	PP	no date			

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-5185	char frag	south fill of kiva	PP	1473fp	1521vv		
	RG-5186	char frag	south fill of kiva	?				same as RG-5175
	RG-5187	char frag	south fill of kiva	PP	1433fp	1470vv		
	RG-5188	char frag	south fill of kiva	PP				same as RG-5185
	RG-5189	char frag	south fill of kiva	PP				same as RG-5171
	RG-5190	char frag	south fill of kiva	?				same as RG-5175
	RG-5191	char frag	south fill of kiva	DF	1493p	1525r	comp	
	RG-5192	char frag	south fill of kiva	DF				same as RG-5173
	RG-5193	char frag	south fill of kiva	DF	1484np	1524v	inc	
	RG-5194	char frag	south fill of kiva	PP	no date			
	RG-5195	char frag	south fill of kiva	PP	no date			
	RG-5196	char frag	south fill of kiva	DF				same as RG-5191
	RG-5197	char frag	south fill of kiva	DF	1497p	1518vv		
	RG-5198	char frag	south fill of kiva	PP	no date			
	RG-5199	char frag	south fill of kiva	DF				same as RG-5191
	RG-5200	char frag	south fill of kiva	PP				same as RG-5171
	RG-5201	char frag	south fill of kiva	PP	no date			
	RG-5202	char frag	south fill of kiva	PP				same as RG-5182
	RG-5203	char frag	south fill of kiva	PP				same as RG-5171
	RG-5204	char frag	south fill of kiva	PP	1329fp	1410vv		
	RG-5205	char frag	south fill of kiva	PP	no date			
	RG-5206	char frag	south fill of kiva	DF	1509fp	1523r	inc	
	RG-5207	char frag	south fill of kiva	DF	no date			
	RG-5208	char frag	south fill of kiva	PP	no date			
	RG-5209	char frag	south fill of kiva	PP				same as RG-5204

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-5210	char frag	south fill of kiva	DF	1473p	1525+vv		
	RG-5211	char frag	south fill of kiva	?				same as RG-5175
	RG-5212	char frag	south fill of kiva	DF				same as RG-5206
	RG-5213	char frag	south fill of kiva	PP				same as RG-5171
	RG-5214	char frag	south fill of kiva	DF				same as RG-5178
	RG-5215	char frag	south fill of kiva	DF	no date			
	RG-5216	char frag	south fill of kiva	DF	no date			
	RG-5217	char frag	south fill of kiva	DF				same as RG-5206
	RG-5218	char frag	south fill of kiva	DF				same as RG-5178
	RG-5219	char frag	south fill of kiva	PP				same as RG-5182
	RG-5220	char frag	south fill of kiva	PP				same as RG-5171
	RG-5221	char frag	south fill of kiva	DF	no date			
	RG-5222	char frag	south fill of kiva	PP	no date			
	RG-5223	char frag	south fill of kiva	?				same as RG-5165
	RG-5224	char frag	south fill of kiva	DF				same as RG-5165
	RG-5225	char frag	south fill of kiva	PP				same as RG-5165
	RG-5226	char frag	Project I west entrance	PP				same as RG-5165
	RG-5227	char frag	Project I west entrance	PP				same as RG-5165
	RG-5228	char frag	Project I west entrance	PP				same as RG-5165
	RG-5229	char frag	Project I west entrance	PP				same as RG-5165
	RG-5230	char frag	Project I west entrance	PP				same as RG-5165

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	RG-5231	char frag	Project I west entrance	PP				same as RG-5165
	RG-5232	char frag	Project I west entrance	PP				same as RG-5165
	RG-5233	char frag	Project I west entrance	PP				same as RG-5165
	RG-5234	char frag	Project I west entrance	PP				same as RG-5165
	RG-5235	char frag	Project I west entrance	PP	no date			
	RG-5236	char frag	Project I west entrance	PP				same as RG-5165
	RG-5237	char frag	Project I west entrance	PP				same as RG-5165
	RG-5238	char frag	Project I west entrance	PP				same as RG-5165
	RG-5239	char frag	Project I west entrance	PP	1447p	1494vv		
	RG-5240	char frag	Project I west entrance	PP				same as RG-5165
	RG-5241	char frag	Project I west entrance	PP				same as RG-5165
	RG-5242	char frag	Project I west entrance	PP				same as RG-5165
	RG-5243	char frag	Project I west entrance	PP				same as RG-5165
	RG-5244	char frag	Project I west entrance	PP				same as RG-5165
	RG-5245	char frag	Project I west entrance	PP				same as RG-5165
	RG-5246	char frag	Project I west entrance	PP				same as RG-5165
	RG-5247	char frag	Project I west entrance	PP				same as RG-5165
	RG-5248	char frag	Project I west entrance	PP				same as RG-5165
	RG-5249	char frag	Project I west entrance	PP				same as RG-5165
	RG-5250	char frag	Project I west entrance	PP				same as RG-

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
								5165
	RG-5251	char frag	Project I west entrance	PP				same as RG-5165
	RG-5252	char frag	Project I west entrance	PP				same as RG-5165
	RG-5253	char frag	Project I west entrance	PP				same as RG-5165
	RG-5254	char frag	Project I west entrance	PP				same as RG-5165
	RG-5255	char frag	Project I west entrance	PP				same as RG-5165
	RG-5256	char frag	Project I west entrance	PP				same as RG-5165
	RG-5257	char frag	Project I west entrance	PP				same as RG-5165
	RG-5258	char frag	Project I west entrance	PP				same as RG-5165
	RG-5259	char frag	Project I west entrance	PP				same as RG-5165
	RG-5260	char frag	Project I west entrance	PP				same as RG-5165
LA 12121	BNM-33	char frag	Rm 3	PNN	1108p	1154vv		
	BNM-34	wd x-sect	Rm 3	PNN	no date			
	BNM-35	wd x-sect	Rm 3	PNN	1187p	1149vv		
	BNM-36	char frag	Rm 3	PNN	1109np	1149vv		
	BNM-37	char frag	Rm 3	PNN	no date			
	BNM-38	char frag	Rm 3	PNN	1120p	1150+v	inc	short
	BNM-39	wd x-sect	Rm 3	PNN	1117p	1149vv		
	BNM-40	wd x-sect	Rm 3	PNN	no date			
	BNM-41	char frag	Rm 4	PNN	1122p	1177v	inc	
	BNM-42	char frag	Rm 4	PNN	1133p	1177v	inc	
	BNM-43	char frag	Rm 4	PNN	1117p	1177v	inc	
	BNM-44	char frag	Rm 4	PNN	1136p	1177r	inc	
	BNM-45	char frag	Rm 4	PNN	1125p	1177r	inc	
	BNM-46	char frag	Rm 4	PNN	1114p	1162r	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	BNM-47	wd frag	Rm 2	PNN	1111p	1148vv		
	CDP-268	char frag	RM 4 fill	PNN	1118p	1180vv		
	CDP-269	char frag	Rm 3 fill	PNN	1101p	1152vv		
LA 13659	BNM-50	char frag	Str 2	PP	no date			short
	BNM-51	char frag	Str 2	PP	no date			short
LA 12119	BNM-11	char frag	Kiva 1	JUN	no date			
	BNM-12	char frag	Kiva 1	PNN	no date			
	BNM-13	char frag	Kiva 1	PNN	1146	1191+vv		
	BNM-14	char frag	Kiva 1	JUN	no date			
	BNM-15	char frag	Kiva 1	PNN	no date			
	BNM-16	char frag	Kiva 1	PNN	1302+-p	1396vv		
	BNM-17	char frag	Kiva 1	PNN	1221p	1278+vv		
	BNM-18	char frag	Kiva 2	PP	1326	1419vv		
	BNM-19	char frag	Kiva 2	PP	no date			
	BNM-20	char frag	Kiva 2	JUN	no date			
	BNM-21	char frag	Kiva 2	PNN	no date			
	BNM-22	char frag	Kiva 3	PNN	no date			
	BNM-23	char frag	Rm 1	PNN	no date			short
	BNM-24	char frag	Rm 2	PNN	no date			short
	BNM-25	char frag	Rm 5	PNN	no date			
	BNM-26	char frag	Rm 5	JUN	no date			
	BNM-27	char frag	Rm 14	JUN	no date			
	BNM-28	char frag	Rm 14	PNN	1162	1203vv		short
	BNM-29	char frag	Rm 16	JUN	no date			
	BNM-30	char frag	Rm 18	JUN	no date			
	BNM-31	char frag	Rm 21	JUN	no date			
	BNM-32	char frag	Rm 21	JUN	no date			
	CDP-254	char frag	N13 E16	PNN	no date			
	CDP-255	char frag	N14 W18	JUN	no date			
	CDP-256	char frag	Rm 1	PNN	no date			
	CDP-257	char frag	Kiva 1	PNN	no date			
	CDP-258	char frag	Kiva 1	PNN	no date			same as CDP=267

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	CDP-259	char frag	Kiva 1	PNN	no date			
	CDP-260	char frag	Kiva 1	JUN	no date			
	CDP-261	char frag	Kiva 1	DF	no date			
	DCP-262	char frag	Kiva 1	PNN	no date			
	CDP-263	char frag	Kiva 1	PNN	no date			
	CDP-264	char frag	Kiva 1	PNN	no date			same as CDP-265
	CDP-265	char frag	Kiva 1	PNN				same as CDP-264
	CDP-266	char frag	Kiva 1	PNN	no date			
	CDP-267	char frag	Kiva 1	PNN				same as CDP-258
LA 12578	BNM-49	wd frag	surface	PNN	no date			
LA 12567	none	char frag	unknown	Quer	no date			oak discarded
LA 12581	BNM-48	char frag	Rm 1	JUN	no date			short
Cavate E Mesa	PAJ-1	wd sect	gen site	PP	1628p	1674vv		
Kiva 1 Site 118	PAJ-2	wd sect	gen site	PP	1792	1830r	inc	
Cavate Site 127	PAJ-3	char frag	gen site	PP	no date			
	PAJ-4	char frag	gen site	PP	no date			
Cavate 128	PAJ-5	wd sect	gen site	PNN	no date			
Site 252	PAJ-6	char frag	potted Rm 3	fir	no date			short
	PAJ-7	char frag	potted Rm 3	fir	no date			short
	PAJ-8	wd frag	potted Rm 3	JUN	no date			short
	PAJ-9	wd frag	potted Rm 4	JUN	no date			
	PAJ-10	wd frag	potted Rm 4	JUN	no date			erratic
	PAJ-11	wd frag	potted Rm 4	JUN	no date			erratic
	PAJ-12	char frag	potted Rm 4	PP	no date			erratic
	PAJ-13	wd sect	?	PP	1797p	1844+vv		
	PAJ-14	wd sect	?	JUN	no date			
	PAJ-15	wd sect	?	POP	no date			
	PAJ-16	wd sect	?	POP	no date			
	PAJ-17	wd sect	?	POP	no date			
LA Mesa Fire	BNM-52	char frag	N of Rm 1	PP	1356p	1401+vv	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
Site	BNM-53	char frag	W of Rm 1	PP				short
	BNM-54	char frag	N of Rm 1& 2	PP	1347	1412+vv	inc	
LA 3824	BNM-55	char frag	none	DF	no date			
	BNM-56	char frag	none	DF	no date			
	BNM-57	char frag	none	DF	no date			
	BNM-58	char frag	none	DF	no date			
	BNM-59	char frag	none	PP	no date			
	BNM-60	char frag	none	PP	no date			
	BNM-61	char frag	none	PP	no date			
Gomez Homestead (LA 86643)	LAC-14	wd x-sect	top log E wall	JUN	no date			
	LAC-25	wd BE	sample 1	JUN	no date			metal ax-cut
	LAC-26	wd x-sect	sample 2	JUN	no date			
	LAC-27	wd x-sect	sample 3	JUN	no date			
	LAC-28	wd x-sect	sample 4	JUN	no date			
	LAC-29	wd x-sect	sample 5	JUN	no date			
	LAC-30	wd x-sect	sample 6	JUN	no date			
	LAC-31	wd x-sect	fence post	JUN	no date			
Anchor Ranch (LA 16808)	LAC-10	wd x-sect	Str 1	PP	no date			
	LAC-11	wd x-sect	Str 1	PP	no date			
	LAC-12	wd x-sect	Str 1	PP	no date			
	LAC-13	wd x-sect	Str 1	PP	1806p	1929GB	comp	
	LAC-52	wd x-sect	Ice house main roof beam	PP	no date			
	LAC-53	wd x-sect	Ice house E door lintel	PP				same as LAC-34
	LAC-54	wd x-sect	Ice house W side	PP	1822p	1933rGB	comp	
	LAC-55	wd x-sect	Ice house W side	PP	1798p	1933rLGB	comp	
	LAC-56	wd x-sect	Ice house S side	PP	1878p	1933rLGB	comp	
	LAC-57	wd x-sect	Ice house S side	PP	1790p	1896++rlGB	comp	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
Vigil Y Montoya Homestead (LA 70028)	LAC-62	wd x-sect	sw corner FE 1	PP	no date			
	LAC-63	wd x-sect	sw corner FE 1	PP	no date			
	LAC-64	wd x-sect	near loaf pan	PP	1836p	1963++G		
	LAC-65	wd x-sect	FE 7 surface	PP	no date			short
	LAC-66	wd x-sect	FE 7 surface	PP	no date			short
	LAC-67	wd x-sect	FE 7 surface	JUN	no date			false
	LAC-68	wd BE	FE 7 surface	PNN	1562	1720vv		
	LAC-69	wd BE	FE 7 surface	PP	no date			complacent
	LAC-70	wd x-sect	FE 7 surface	PP	no date			short
	LAC-71	wd x-sect	FE 6 privy	PP	no date			complacent
	LAC-72	wd x-sect	FE 4	PP	no date			
	LAC-73	wd BE	FE 4 s log	PP	1836p	1911++G		
	LAC-74	wd x-sect	Fe 4 W log	PP	no date			short
	LAC-75	wd x-sect	FE 4 lower log	DF	no date			short
	LAC-76	wd x-sect	FE 4 N log	PP	no date			
	LAC-77	wd x-sect	FE 4 SS log	PP	no date			short
	LAC-78	wd BE	FE 4 E log	PP	no date			
	LAC-79	wd BE	NW of FE 3	PP				same as LAC-80
	LAC-80	wd BE	Horno Fe 3	PP	1650p	1855+vv		
	LAC-81	wd BE	N of Fe 6	PP	1790p	1833vv		
Homestead bridge (LA 89826)	LAC-32	wd x-sect	w log S side	PP				short
	LAC-33	wd x-sect	E log S side	PP				erratic
	LAC-34	wd x-sect	C	PP	1783p	1899+rlg B		same as LAC-53
Montoya	LAC-35	wd BE	garden NE corner	PP	no date			short

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
Homestead (LA 21334)	LAC-36	wd BE	garden NE corner	PP	no date			short
	LAC-37	wd BE	garden NE corner	PP				same as LAC-36
	LAC-38	wd x-sect	garden center	PP	1794	1915++v v		
	LAC-39	wd x-sect	canyon fence	PP	1709p	1777vv		
	LAC-40	wd x-sect	canyon fence	PP	1687p	1746vv		
	LAC-41	wd x-sect	canyon fence	PP	1687p	1791vv		
	LAC-42	wd x-sect	canyon fence	pnn	1749p	1840vv		
Homestead fence (LA 89770)	LAC-43	wd BE	boundary fence	PP	1793p	1831vv		
	LAC-44	wd BE	boundary fence	PP	1777p	1820+vv		
	LAC-45	wd BE	boundary fence	PP	1796p	1834+vv		
	LAC-46	wd BE	boundary fence	PP	1767p	1848+vv		
	LAC-47	wd BE	boundary fence	PP	no date			complacent
	LAC-48	wd BE	boundary fence	PP	no date			short
	LAC-49	wd BE	boundary fence	PP	1775p	1737vv		
	LAC-50	wd BE	boundary fence	PP	no date			short
	LAC-51	wwd sect	boundary fence	PP	1809p	1890vv		
Serna Homestead (LA 85407)	LAC-58	char BE	wood pile SE	PP	1769	1815vv		no sapwood
	LAC-59	wd x-sect	wood pile SE	PP	1754p	1819vv		no sapwood
	LAC-60	BE frag	wd struct W	PP	1685	1792vv		no sapwood
	LAC-61	wd BE	fence	PP	1780p	1826vv		no sapwood
Romero Cabin (LA 16806)	ROM-1	wd x-sect	Cabin Structure 1	PP	1784p	1908++v	inc	
	ROM-2	wd x-sect	Cabin Structure 1	PP	1792p	1961+v	inc	
	ROM-3	wd x-sect	Cabin Structure 1	PP	1924p	1966rLB	comp	
	ROM-4	wd x-sect	Cabin Structure 1	PP	1936p	1966rLB	comp	
	ROM-5	wd x-sect	Cabin Structure 1	PP	1789p	1934rB	inc	
	ROM-6	wd x-sect	Cabin Structure 1	PP	1851p	1934r	inc	
	ROM-7	wd x-sect	Cabin Structure 1	PP	1832p	1934r	inc	
	ROM-8	wd x-sect	Cabin Structure 1	PP	1788p	1934G	inc	
	ROM-9	wd x-sect	Cabin Structure 1	PP	1823p	1934r	inc	
	ROM-10	wd x-sect	Cabin Structure 1	PP	1783p	1933v	comp	
	ROM-11	wd x-sect	Cabin Structure 1	PP	1829p	1960+v	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	ROM-12	wd x-sect	Cabin Structure 1	PP	1795p	1934v	inc	
	ROM-13	wd x-sect	Cabin Structure 1	PP	1830p	1934r	inc	
	ROM-14	wd x-sect	Cabin Structure 1	PP	1833p	1934rB	inc	
	ROM-15	wd x-sect	Cabin Structure 1	PP	1863p	1934rB	inc	
	ROM-16	wd x-sect	Cabin Structure 1	PP	1822p	1960+rB	inc	
	ROM-17	wd x-sect	Cabin Structure 1	PP	1796p	1934r	inc	
	ROM-18	wd x-sect	Cabin Structure 1	PP	1793p	1934v	inc	
	ROM-19	wd x-sect	Cabin Structure 1	PP	no date			
	ROM-20	wd x-sect	Cabin Structure 1	PP	no date			
	ROM-21	wd x-sect	Cabin Structure 1	PP	1935p	1966r	comp	
	ROM-22	wd x-sect	Cabin Structure 1	PP	1787p	1934r	inc	
	ROM-23	wd x-sect	Cabin Structure 1	PP	1833p	1934v	inc	
	ROM-24	wd x-sect	Cabin Structure 1	PP	1923p	1966rB	comp	
	ROM-25	wd x-sect	Cabin Structure 1	PP	1822p	1913G	inc	
	ROM-26	wd x-sect	Cabin Structure 1	PP	1872p	1934r	inc	
	ROM-27	wd x-sect	Cabin Structure 1	PP	1797p	1934v	inc	
	ROM-28	wd x-sect	Cabin Structure 1	PP	1798p	1934r	inc	
	ROM-29	wd x-sect	Cabin Structure 1	PP	1825p	1934r	inc	
	ROM-30	wd x-sect	Cabin Structure 1	PP	1821p	1934r	inc	
	ROM-31	wd x-sect	Cabin Structure 1	PP	1885p	1934r	inc	
	ROM-32	wd x-sect	Cabin Structure 1	PP	1827p	1934r	inc	
	RPM-33	wd x-sect	Cabin Structure 1	PP	1832p	1934rB	inc	
	ROM-34	wd x-sect	Cabin Structure 1	PP	1832p	1934rB	inc	
	ROM-35	wd x-sect	Cabin Structure 1	PP	1931p	1966LB	comp	
	ROM-36	wd x-sect	Cabin Structure 1	PP	1812p	1934rB	inc	
	ROM-37	wd x-sect	Cabin Structure 1	PP	1834p	1935rG	inc	
	ROM-38	wd x-sect	Cabin Structure 1	PP	1855p	1937+G	inc	
	ROM-39	wd x-sect	Cabin Structure 1	PP	1934p	1966LGB	comp	
	ROM-40	wd x-sect	Cabin Structure 1	PP	1844p	1938G	inc	
	ROM-41	wd x-sect	Cabin Structure 1	PP	1839p	1960+v	inc	
	ROM-42	wd x-sect	Cabin Structure 1	PP	1923p	1966rLB	comp	
	ROM-43	wd x-sect	Cabin Structure 1	PP	1934p	1966rB	comp	
	ROM-44	wd x-sect	Cabin Structure 1	PP	1909p	1934rG	inc	

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	ROM-45	wd x-sect	Cabin Structure 1	PP	1803p	1934r	inc	
	ROM-46	wd x-sect	Cabin Structure 1	PP	1829p	1934v	inc	
	ROM-47	wd x-sect	Cabin Structure 1	PP	1818p	1934v	inc	
	ROM-48	wd x-sect	Cabin Structure 1	PP	1812p	1934v	inc	
	ROM-49	wd x-sect	Cabin Structure 1	PP	1869p	1937+rG	comp	
	ROM-50	wd x-sect	Cabin Structure 1	PP	no date			
	ROM-51	wd x-sect	Cabin Structure 1	PP	1921p	1966r	comp	
	ROM-52	wd x-sect	Cabin Structure 1	PP	1822p	1961+rL B	inc	
	ROM-53	wd x-sect	Cabin Structure 1	PP				same as ROM-45
	ROM-54	wd x-sect	Cabin Structure 1	PP	1814p	1934r	inc	
	ROM-55	wd x-sect	FE 2 Hog Pen	PP	no date			
	ROM-56	wd x-sect	FE 2 Hog Pen	PP	1855p	1907vv		
	ROM-57	wd x-sect	FE 2 Hog Pen	PP	1809p	1912B	inc	
	ROM-58	wd x-sect	FE 2 Hog Pen	PP	1835p	1931vv		
	ROM-59	wd x-sect	FE 2 Hog Pen	PP	no date			
	ROM-60	wd x-sect	FE 2 Hog Pen	PP	1855p	1912G	inc	
	ROM-61	wd x-sect	FE 2 Hog Pen	PP	1799p	1895rG	inc	
	ROM-62	wd x-sect	FE 2 Hog Pen	PP				same as ROM-63
	ROM-63	wd x-sect	FE 2 Hog Pen	DF	1829p	1910r	inc	
	ROM-64	wd x-sect	FE 2 Hog Pen	DF	1877p	1912G	inc	
	ROM-65	wd x-sect	FE 2 Hog Pen	PP	1848p	1906+rG	inc	
	ROM-66	wd x-sect	FE 2 Hog Pen	PP	1783p	1912LB	inc	
	ROM-67	wd x-sect	FE 2 Hog Pen	PP	1885p	1912G	comp	
	ROM-68	wd x-sect	FE 2 Hog Pen	PP	1859p	1912G	comp	
	ROM-69	wd x-sect	FE 2 Hog Pen	PP	1850p	1912G	inc	
	ROM-70	wd x-sect	FE 2 Hog Pen	PP	1859p	1912G	inc	
	ROM-71	wd x-sect	FE 2 Hog Pen	PP	1763p	1912G	inc	
	ROM-72	wd x-sect	FE 2 Hog Pen	PP	1813p	1894r	inc	
	ROM-73	wd x-sect	FE 2 Hog Pen	PP	1793p	1912GB	comp	
	ROM-74	wd x-sect	FE 2 Hog Pen	PP	1868p	1908G	inc	
	ROM-75	wd x-sect	FE 2 Hog Pen	PP	no date			

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
	ROM-76	wd x-sect	FE 2 Hog Pen	PP	1874p	1912rG	inc	
	ROM-77	wd x-sect	FE 2 Hog Pen	PP	1845p	1912rG	inc	
	ROM-78	wd x-sect	FE 2 Hog Pen	PP	1777p	1898++v v		
	ROM-79	wd x-sect	FE 2 Hog Pen	PP	1644p	1922++v v		
	ROM-80	wd x-sect	FE 2 Hog Pen	PP	1789p	1912rG	inc	
	ROM-81	wd x-sect	FE 2 Hog Pen	PP	1839p	1912GB	inc	
	ROM-82	wd x-sect	FE 2 Hog Pen	PP	1818p	1912GB	inc	
	ROM-83	wd x-sect	FE 2 Hog Pen	PP	1775p	1912G	inc	
	ROM-84	wd x-sect	FE 2 Hog Pen	PP	1859p	1912rG	inc	
	ROM-85	wd x-sect	FE 2 Hog Pen	PP	1856p	1912G	inc	
	ROM-86	wd x-sect	FE 2 Hog Pen	DF	1787p	1910vv		
	LAC-1	wd x-sect	Cabin Structure 1	PP	1788p	1908vv		
	LAC-2	wd x-sect	Cabin Structure 1	PP	no date			
	LAC-3	wd x-sect	Cabin Structure 1	PP	1829p	1933rGB	comp	
	LAC-4	wd x-sect	Cabin Structure 1	PP	1776+-p	1892vv		
	LAC-5	1/2" core	Cabin Structure 1	PP	1863	1926vv		
	LAC-6	1/2" core	Cabin Structure 1	PP	1816	1932vv		
	LAC-7	1/2" core	Cabin Structure 1	PP	1873	1934vv		
	LAC-8	1/2" core	Cabin Structure 1	PP	no date			
	LAC-9	wd frag	E fence post	JUN	no date			
D. Romero Homestead (LA 16808B)	LAC-15	char frag	Post E of corral	PP	1798p	1884vv		
	LAC-16	char frag	FE 4	PP	1797p	1906vv		
	LAC-17	char frag	Corral Misc N 1	PP	1835p	1906vv		
	LAC-18	char frag	Corral Upper N wall	PP	1787p	1883vv		
	LAC-19	wd frag	Corral lower N wall	PP	1792p	1853vv		
	LAC-20	char frag	Corral middle N wall	PP	1809p	1898vv		
	LAC-21	char frag	Corral lower W wall	PP	1837p	1908rG	inc	
	LAC-22	char frag	Corral Upper S wall	PP	1841p	1898vv		
	LAC-23	char frag	Corral middle S wall	PP	1804p	1908vv		
	LAC-24	char frag	Corral lower S wall	PP	1810p	1908v	inc	
Archaic Site	Oto-7	char frag	FE 1	Jun	no date			Not plotted

Site	Sample Numbers	Sample Type	Provenience	Species	Inside Date	Outside Date	Terminal Ring	Comments
(LA 51912)	Oto-8	char frag	FE 1	Pnn	no date			plotted
	Oto-9	char frag	FE 1	Jun	no date			Not plotted
	Oto-10	char frag	FE 1	Jun	no date			Not plotted
	Oto-11	char frag	FE 12	Pnn	no date			plotted
	Oto-12	char frag	FE 14	Jun	no date			Not plotted
	Oto-13	char frag	FE 18	Jun	no date			Not plotted
	Oto-14	char frag	FE 18	Jun	no date			Not plotted
Kuapa (LA 3444)	SAR-85	char frag	D/5/4	PP	no date			
	SAR-86	char frag	A/6/4	PP	no date			false
Shohakka Pueblo (LA 3840)	BNM-101	char frag	FE 3 Area 1	PP	1387	1441vv		
	FS303	char frag		PP	no date			short
LA 118345	FS482	char frag	FE 1 Area 1	PP	no date			short
	FS487	char frag	FE 1 Area 1	PP	no date			short

APPENDIX E
STANDARDIZED DECADAL DEPARTURES IN MEAN RING-WIDTH FOR THE JEMEZ MOUNTAINS

Ronald H. Towner

Table E.1. Standardized decadal departures in mean ring-width for the Jemez Mountains (Dean and Robinson 1977).

Decade	Departure	Decade	Departure	Decade	Departure
680	0.70	1100	0.90	1560	-0.80
690	0.10	1110	1.30	1570	0.10
700	-1.70	1120	0.60	1580	-3.10
710	1.40	1130	-2.40	1590	1.40
720	-0.30	1140	-0.60	1600	0.20
730	-1.20	1150	-0.60	1610	2.40
740	1.70	1160	1.30	1620	0.20
750	-0.40	1170	0.10	1630	-0.50
760	0.80	1180	-0.20	1640	0.20
770	-1.40	1190	-0.20	1650	1.20
780	-1.00	1200	1.90	1660	-0.80
790	-0.70	1210	-1.6	1670	-0.70
800	1.50	1220	-1.6	1680	-0.40
810	-0.20	1230	2.00	1690	0.60
820	-0.10	1240	0.80	1700	0.10
830	-0.10	1250	-2.6	1710	-0.50
840	-0.30	1260	0.60	1720	1.10
850	2.10	1270	-1.2	1730	-2.10
860	0.70	1280	-1	1740	1.00
870	-0.20	1290	1.00	1750	-0.80
880	0.80	1300	0.90	1760	1.00
890	-0.30	1310	0.60	1770	-1.30
900	-2.30	1320	0.40	1780	-0.10
910	0.90	1330	0.20	1790	2.20
920	-0.60	1340	-0.70	1800	-0.40
930	0.60	1350	1.20	1810	0.80
940	1.90	1360	-0.60	1820	-0.90
950	-1.50	1370	0.10	1830	3.10
960	1.30	1380	1.00	1840	2.10
970	-0.60	1390	-0.70	1850	0.00
980	1.20	1400	-0.50	1860	0.30
990	0.50	1410	-1.40	1870	1.30
1000	-1.50	1420	-1.20	1880	0.10
1010	-1.20	1430	1.10	1890	-1.80
1020	2.20	1440	0.70	1900	-1.60
1030	-0.60	1450	-0.60	1910	-0.60
1040	-2.00	1460	-0.10	1920	-2.90
1050	0.70	1470	-1.60	1930	0.90
1060	1.40	1480	1.10	1940	1.00
1070	0.00	1490	0.70	1950	-4.10

Decade	Departure	Decade	Departure	Decade	Departure
1080	0.00	1500	-0.90	1960	-0.60
1090	-2.30	1510	1.40		
		1520	-1.20		
		1530	0.70		
		1540	0.60		
		1550	1.00		

APPENDIX F
RECONSTRUCTED ANNUAL PRECIPITATION IN INCHES FOR ARROYO HONDO

Ronald H. Towner

Table F.1 Reconstructed annual (prior August-current July) precipitation in inches for Arroyo Hondo (from Rose et al. 1981).

Decade	Year									
	0	1	2	3	4	5	6	7	8	9
980						11.4	15.1	16.3	16.9	16.5
990	12.4	10.0	11.2	9.8	15.9	15.8	15.2	17.0	13.7	8.4
1000	13.3	12.6	12.4	11.0	15.3	12.1	10.8	15.8	15.1	11.0
1010	9.8	11.2	15.4	14.5	9.9	12.8	17.4	13.1	12.0	10.0
1020	14.0	14.8	12.5	12.5	14.4	15.3	18.1	8.7	11.7	17.3
1030	12.4	11.5	12.8	14.6	13.4	10.0	14.6	14.0	14.9	11.9
1040	12.2	9.0	19.7	16.9	11.2	9.5	13.5	15.1	9.1	13.6
1050	17.7	11.1	18.6	15.9	11.7	13.4	14.0	15.7	12.0	12.1
1060	16.1	13.1	10.7	13.7	13.6	16.9	15.3	10.9	9.2	12.7
1070	15.5	13.8	14.3	12.9	15.8	11.4	13.9	14.2	12.7	11.9
1080	14.0	10.6	16.7	12.9	14.4	10.3	14.1	13.2	12.1	17.1
1090	11.1	11.5	14.1	13.7	10.7	15.6	17.5	12.3	9.8	10.5
1100	13.7	14.9	15.3	11.7	14.6	12.5	16.1	13.6	11.7	13.9
1110	14.4	13.9	14.4	14.7	11.5	11.9	14.8	16.9	14.4	13.9
1120	13.7	8.0	16.7	13.3	15.2	14.0	12.1	11.8	12.0	17.8
1130	13.9	10.4	10.4	15.5	11.5	9.9	14.5	13.8	11.5	14.2
1140	10.5	15.2	14.7	10.9	12.0	16.5	11.5	11.3	11.4	15.7
1150	11.8	10.6	17.6	14.3	13.7	13.6	11.3	10.4	10.3	16.6
1160	15.0	9.4	16.0	16.2	15.7	13.4	8.9	14.7	13.2	9.5
1170	12.4	19.0	14.0	13.2	9.9	16.0	12.6	11.8	14.2	14.1
1180	11.4	13.3	14.1	12.7	15.8	16.3	9.6	11.4	12.8	10.8
1190	14.1	18.4	13.3	11.5	11.8	14.7	14.8	14.1	13.1	11.9
1200	14.7	15.9	13.6	15.3	14.4	10.6	10.6	15.5	13.2	15.1
1210	13.4	13.7	13.5	15.2	13.5	12.7	10.9	9.8	12.4	16.8
1220	14.0	10.5	13.1	13.9	13.2	14.5	14.4	10.8	12.4	14.4
1230	16.3	14.6	14.0	11.9	10.8	14.7	12.7	13.7	14.1	14.7
1240	12.4	14.7	13.8	13.2	13.1	15.8	11.6	12.4	11.9	14.8
1250	13.4	10.1	11.0	16.2	11.2	13.3	13.0	14.5	11.6	14.2
1260	13.1	11.8	14.1	12.0	12.2	13.8	13.7	14.9	15.9	11.3
1270	13.2	14.1	13.4	11.8	12.9	15.4	11.7	13.8	11.8	14.7
1280	10.9	13.7	12.5	15.6	13.1	13.3	10.4	16.6	10.5	13.0
1290	18.5	11.0	11.5	14.0	12.2	14.6	11.6	13.3	15.6	14.5
1300	14.0	14.6	14.9	12.1	11.0	14.5	14.3	13.9	11.3	13.9
1310	14.9	14.1	10.0	15.3	16.5	12.9	9.7	14.8	15.8	13.5
1320	13.3	13.9	13.6	12.5	11.1	17.7	15.4	12.2	10.8	13.0
1330	14.1	13.3	14.7	14.7	14.1	11.1	13.2	12.9	11.7	13.7
1340	13.1	13.2	11.9	14.5	14.3	15.1	15.1	9.5	11.6	14.6
1350	14.0	15.2	10.1	14.2	15.5	14.0	13.1	12.3	15.0	15.2
1360	10.2	13.8	13.0	11.3	12.0	16.3	14.7	11.8	13.9	10.7
1370	14.7	14.1	15.7	13.3	13.7	11.4	12.0	11.9	14.8	14.3

Decade	Year									
	0	1	2	3	4	5	6	7	8	9
1380	13.6	13.3	10.8	15.7	12.5	12.8	13.9	13.2	13.2	15.8
1390	11.4	10.9	13.0	13.2	13.7	16.7	13.2	9.4	15.2	11.6
1400	11.7	13.9	14.4	12.9	16.2	13.4	14.4	10.8	14.0	14.5
1410	14.4	11.1	14.8	12.9	16.8	11.7	11.5	13.0	12.9	13.0
1420	12.4	15.5	13.3	10.6	10.4	14.0	14.3	14.9	17.3	12.2
1430	11.8	13.7	12.0	14.2	14.6	15.0	12.7	12.7	11.8	14.8
1440	14.0	14.2	13.9	15.3	13.0	9.7	13.9	15.4	14.2	12.1
1450	11.1	13.6	13.2	13.6	14.5	12.3	11.3	13.3	15.0	13.3
1460	12.9	11.2	14.0	13.1	12.5	13.6	15.1	14.7	14.0	14.7
1470	12.1	9.8	14.2	14.6	12.7	10.6	13.7	12.2	14.8	15.1
1480	11.1	12.1	13.7	13.2	14.8	14.6	16.8	11.6	11.3	13.7
1490	15.2	13.7	14.0	12.0	14.4	10.4	11.9	12.5	14.4	15.7
1500	12.3	12.4	15.1	13.9	11.9	15.0	10.8	13.3	13.5	12.9
1510	13.5	14.6	12.3	13.7	15.3	15.6	9.4	10.7	14.1	14.6
1520	13.9	16.3	13.4	12.2	10.2	13.6	13.5	13.2	13.5	15.4
1530	14.2	13.9	11.9	12.7	14.6	11.5	14.3	14.2	13.1	13.0
1540	15.8	15.1	9.9	13.8	14.9	12.1	10.7	13.5	14.1	12.4
1550	14.7	12.0	12.3	15.5	15.0	14.6	13.8	13.1	12.0	14.5
1560	11.8	13.0	10.9	13.4	13.6	14.8	13.0	12.6	13.3	14.6
1570	13.8	12.6	13.9	11.0	12.2	13.5	13.8	15.4	14.6	11.6
1580	10.3	13.0	14.1	12.2	12.7	11.5	14.6	13.5	13.8	15.1
1590	12.3	12.3	14.2	12.4	15.0	14.8	15.2	16.2	11.7	12.5
1600	12.2	10.6	12.7	15.3	14.8	14.3	12.2	13.1	12.3	13.0
1610	15.0	15.0	14.4	13.7	12.9	14.0	11.3	12.8	15.7	13.0
1620	13.6	15.4	13.7	15.1	11.7	10.5	12.7	14.4	11.4	15.0
1630	14.5	13.1	13.0	13.2	14.1	14.8	14.1	15.1	11.0	13.5
1640	15.0	11.8	12.1	14.1	13.7	11.3	14.1	14.4	12.1	13.2
1650	12.4	14.4	14.6	13.1	11.9	13.7	13.6	13.3	12.6	11.8
1660	13.3	14.6	16.0	14.2	10.8	13.3	12.5	12.1	12.7	13.0
1670	12.8	13.5	13.4	13.8	14.5	13.6	11.6	13.5	12.5	13.5
1680	15.6	13.4	12.7	14.7	12.7	9.4	12.8	14.7	14.0	15.9
1690	13.6	11.5	15.2	13.6	13.6	14.2	11.3	13.3	12.2	14.2
1700	13.5	14.3	12.1	14.1	13.4	11.2	14.4	13.3	14.1	12.6
1710	14.6	12.7	13.4	15.1	12.7	11.3	10.9	14.3	15.1	11.7
1720	14.5	14.5	12.8	13.6	13.7	12.6	14.6	14.9	13.9	9.8
1730	11.1	13.7	14.9	13.3	14.6	12.7	13.3	11.4	12.9	11.0
1740	12.6	13.6	13.6	14.8	13.0	13.5	15.8	17.6	10.0	13.3
1750	12.4	15.7	11.7	13.3	16.0	15.5	13.3	10.0	12.6	14.0
1760	11.7	14.7	16.3	10.9	14.1	12.3	13.9	13.9	14.6	14.1
1770	13.8	15.8	14.8	9.6	11.6	13.7	14.5	13.5	13.7	13.1
1780	11.1	13.2	12.7	14.3	16.0	12.8	10.9	15.6	13.3	11.4
1790	11.8	14.3	15.1	16.3	13.8	11.6	12.0	11.4	13.5	14.2
1800	14.4	11.6	13.0	13.4	14.8	13.2	11.3	13.9	14.1	12.7

Decade	**Year**									
	0	1	2	3	4	5	6	7	8	9
1810	13.0	13.7	12.8	13.5	11.4	13.4	16.3	14.4	12.2	9.8
1820	12.6	15.4	12.0	11.7	13.3	14.5	12.0	14.0	15.0	15.2
1830	12.7	12.3	12.2	14.1	15.9	12.7	9.5	13.3	14.5	15.5
1840	16.0	15.3	9.9	12.3	14.9	12.9	14.4	11.2	11.1	17.6
1850	15.2	10.1	11.2	13.5	14.7	13.9	14.3	15.0	15.5	11.8
1860	11.9	11.2	12.9	13.1	13.1	13.3	15.7	15.4	14.6	14.4
1870	11.9	11.6	14.0	12.0	13.5	12.5	13.8	15.5	12.9	13.5
1880	10.9	12.7	14.9	12.2	13.0	14.6	13.7	15.1	15.3	11.1
1890	9.3	14.2	14.8	10.3	13.4	13.7	11.6	15.9	13.8	9.7
1900	12.9	14.1	14.4	13.8	9.0	14.2	15.5	16.0	13.7	11.6
1910	10.3	13.0	15.6	15.1	13.7	13.2	15.7	11.5	10.8	15.6
1920	17.2	16.0	12.0	13.2	11.8	9.3	15.5	14.0	14.0	14.4
1930	13.7	13.1	17.1	14.9	9.5	12.7	11.7	15.4	11.7	12.2
1940	14.6	15.1	14.1	14.7	13.7	12.5	13.4	11.3	13.3	16.9
1950	11.9	10.0	12.6	11.6	13.0	12.9	13.3	12.0	15.3	14.6
1960	16.3	11.7	11.9	12.9	13.3	14.1	12.6	11.2	12.6	14.6
1970	14.2									

APPENDIX G
RECONSTRUCTED SPRING PRECIPITATION FROM ARROYO HONDO

Ronald H. Towner

Table G.1. Reconstructed spring (March-June) precipitation in inches for Arroyo Hondo (from Rose et al. 1981).

Decade	Year									
	0	1	2	3	4	5	6	7	8	9
980						3.5	5.8	6.3	6.8	5.8
990	3.0	2.3	2.3	2.6	6.3	5.4	6.0	6.5	3.2	1.7
1000	4.3	3.4	3.3	3.3	5.3	2.7	3.4	6.0	4.5	2.4
1010	1.9	3.3	5.7	4.0	2.1	5.0	6.2	3.8	3.1	2.3
1020	5.1	4.7	3.5	4.1	4.9	6.4	6.0	0.9	4.7	5.9
1030	3.1	3.5	4.0	5.1	3.4	2.7	5.2	4.6	4.9	3.3
1040	2.7	2.9	8.8	5.2	2.6	2.2	4.8	4.3	1.7	5.8
1050	5.7	3.8	8.2	4.6	3.7	4.4	4.9	5.5	3.0	4.3
1060	5.8	3.3	3.2	4.4	4.8	6.7	4.7	2.2	2.0	4.4
1070	5.3	4.7	4.6	4.4	5.3	3.0	5.0	4.4	3.5	3.8
1080	3.9	3.3	6.1	3.9	4.5	2.5	5.0	3.4	4.5	5.9
1090	2.2	3.8	4.6	3.7	3.1	6.4	6.0	3.0	2.0	2.7
1100	4.6	5.5	4.9	3.6	4.8	4.0	6.1	3.8	3.6	4.8
1110	4.7	4.7	5.2	4.6	2.9	3.8	5.7	6.3	4.7	5.0
1120	3.1	2.0	6.4	3.9	5.8	4.1	3.4	3.0	4.3	6.9
1130	3.7	2.2	3.1	5.2	2.2	2.8	5.0	3.7	3.7	4.1
1140	2.7	5.9	4.2	2.5	4.3	5.5	2.7	2.9	3.5	5.4
1150	2.4	3.8	6.8	4.3	4.8	3.9	2.7	2.0	3.1	6.6
1160	3.9	2.7	6.4	5.7	5.9	3.2	2.1	5.4	3.1	1.9
1170	5.0	7.2	4.4	3.7	2.7	5.9	3.1	3.8	4.9	4.1
1180	3.2	4.5	4.3	4.2	6.4	4.9	1.7	3.5	3.2	2.8
1190	5.8	6.8	3.7	3.2	3.6	5.2	5.0	4.7	3.8	3.7
1200	5.6	5.4	4.7	5.7	4.2	2.1	3.4	5.3	4.3	5.4
1210	4.1	4.5	4.6	5.3	4.1	3.6	2.3	2.0	4.4	6.2
1220	3.8	2.7	4.3	4.3	4.4	5.2	4.2	2.6	4.0	5.2
1230	6.0	5.0	4.5	2.8	3.3	4.9	3.7	4.7	4.8	4.7
1240	3.9	5.2	4.3	4.0	4.6	5.2	3.0	3.7	3.5	5.2
1250	3.6	1.9	3.8	5.2	2.8	4.4	4.0	4.5	3.3	4.9
1260	3.5	3.7	4.4	3.0	3.9	4.5	4.5	5.8	5.1	3.0
1270	4.5	4.5	4.0	3.2	4.5	4.9	3.4	4.3	3.5	4.6
1280	2.8	4.4	4.0	5.5	4.0	3.6	3.3	5.7	1.9	5.6
1290	6.4	2.2	4.0	4.0	3.9	4.8	2.9	4.9	5.5	4.9
1300	4.9	5.2	4.9	3.0	3.3	5.0	4.8	4.2	3.2	4.9
1310	5.2	3.9	2.7	6.2	5.7	3.3	2.6	5.6	5.3	4.3
1320	4.4	4.5	4.4	3.2	3.8	7.2	4.8	3.3	2.8	4.3
1330	4.5	4.4	5.2	5.1	4.2	3.0	4.3	3.4	3.5	4.4
1340	4.0	3.9	3.6	5.1	4.8	5.7	4.4	1.7	3.9	4.7
1350	5.0	4.6	2.3	5.5	5.2	4.6	4.0	3.8	5.7	4.4
1360	2.6	4.8	3.4	2.9	4.0	6.1	4.4	3.7	4.0	2.9
1370	5.3	4.8	5.6	4.2	4.2	2.9	3.3	3.6	5.2	4.6

Decade	Year									
	0	1	2	3	4	5	6	7	8	9
1380	4.6	3.6	3.3	5.5	3.3	4.3	4.4	3.9	4.8	5.3
1390	2.5	3.1	4.0	4.0	5.1	6.2	3.0	2.7	5.1	2.5
1400	3.6	4.8	4.4	4.6	5.8	4.4	4.5	2.8	5.0	5.0
1410	4.3	3.3	5.0	4.4	6.1	2.6	3.5	3.8	3.9	3.8
1420	4.1	5.5	3.5	2.3	2.8	4.8	4.7	6.0	6.2	3.1
1430	3.9	4.0	3.6	5.0	5.1	5.0	3.8	3.6	3.6	5.2
1440	4.6	4.9	4.8	5.4	3.2	2.4	5.1	5.2	4.5	3.1
1450	3.1	4.4	4.0	4.7	4.7	3.1	3.1	4.6	5.0	4.1
1460	3.6	3.1	4.7	3.7	3.8	4.7	5.4	5.0	4.9	4.9
1470	2.7	2.6	5.0	4.7	3.3	2.9	4.3	3.6	5.6	4.5
1480	2.7	3.8	4.2	4.4	5.2	5.6	5.9	2.7	3.5	4.7
1490	5.1	4.6	4.3	3.7	4.4	2.2	3.5	3.7	5.3	5.2
1500	2.8	3.2	3.3	3.8	4.2	4.3	2.0	3.9	3.4	3.2
1510	4.7	4.6	3.6	4.8	5.8	4.7	1.5	3.2	4.7	4.8
1520	5.1	5.9	3.9	3.1	2.5	4.5	4.1	4.1	4.7	5.4
1530	4.7	4.4	3.2	4.3	4.5	3.3	5.2	4.4	4.0	4.4
1540	6.0	4.4	2.4	5.1	4.6	3.0	2.9	4.5	4.2	4.0
1550	4.8	3.0	4.2	5.6	5.2	5.1	4.4	3.8	3.8	4.6
1560	3.2	3.7	2.7	4.4	4.5	5.0	3.8	3.9	4.4	5.0
1570	4.2	4.0	4.1	2.6	3.9	4.2	4.8	5.6	4.4	2.4
1580	2.5	4.3	4.2	3.5	3.6	3.4	5.1	4.1	5.0	5.0
1590	3.3	4.1	4.4	3.9	5.6	5.0	6.0	5.4	3.0	3.9
1600	2.9	2.6	4.3	5.4	5.2	4.5	3.5	4.0	3.4	4.4
1610	5.4	5.2	4.9	4.3	4.2	4.3	2.8	4.6	5.4	3.9
1620	5.0	5.2	4.7	5.1	2.6	2.7	4.2	4.2	3.4	5.6
1630	4.5	4.1	4.0	4.2	5.0	5.0	5.1	4.8	2.8	5.0
1640	4.7	3.1	3.9	4.7	3.9	3.3	5.0	4.3	3.6	4.0
1650	3.7	5.2	4.8	3.8	3.6	4.5	4.2	4.1	3.5	3.4
1660	4.4	5.3	5.9	4.1	2.9	4.2	3.3	3.6	3.8	3.8
1670	4.0	4.3	4.3	4.7	4.9	4.0	3.4	4.3	3.6	4.9
1680	5.4	3.9	4.3	5.0	3.0	2.1	4.4	4.7	5.0	5.9
1690	3.8	3.8	5.4	4.1	4.8	4.2	3.1	4.2	3.6	4.8
1700	4.4	4.6	3.6	4.9	3.6	3.4	4.8	4.1	4.6	4.0
1710	4.9	3.6	4.8	5.0	3.4	2.7	3.0	5.3	4.6	3.5
1720	5.3	4.5	4.0	4.6	4.1	4.0	5.2	5.1	3.9	1.8
1730	3.2	4.6	4.9	4.5	4.8	3.8	3.9	3.0	3.7	2.6
1740	4.0	4.2	4.6	5.0	3.9	4.7	6.6	5.8	2.3	4.3
1750	3.9	5.5	3.0	5.0	5.9	5.4	3.7	2.2	4.2	4.0
1760	3.4	5.8	5.0	3.0	4.7	3.4	4.9	4.6	5.1	4.6
1770	4.9	6.0	4.2	1.8	3.6	4.5	4.9	4.3	4.5	3.6
1780	3.0	4.1	3.8	5.3	5.6	3.2	3.5	5.6	3.6	3.1
1790	3.5	5.0	5.7	6.0	4.0	3.2	3.1	3.1	4.5	4.8
1800	4.5	3.2	4.1	4.4	5.1	3.6	3.3	4.8	4.3	3.8

Decade	**Year**									
	0	1	2	3	4	5	6	7	8	9
1810	4.2	4.2	4.0	4.0	3.0	5.0	5.9	4.5	3.0	2.1
1820	4.4	5.0	3.0	3.4	4.4	4.5	3.5	5.0	5.3	5.1
1830	3.7	3.5	3.6	5.2	5.6	3.0	2.3	4.5	5.0	5.8
1840	6.1	4.6	2.0	4.3	4.7	4.2	4.7	2.3	4.0	7.0
1850	4.2	2.3	3.2	4.4	5.0	4.6	5.0	5.6	5.1	3.1
1860	3.2	2.9	4.0	4.0	4.0	4.6	5.9	5.4	5.2	4.6
1870	3.0	3.6	4.3	3.4	4.3	3.6	5.0	5.2	4.0	4.0
1880	2.6	4.4	4.8	3.4	4.5	4.8	4.6	5.7	4.9	2.1
1890	2.3	5.1	4.1	2.5	4.6	3.7	3.8	6.0	3.4	2.3
1900	4.2	4.5	5.1	3.5	1.9	5.3	5.5	5.8	4.1	2.8
1910	2.5	4.5	5.7	5.2	4.3	4.7	5.3	2.5	3.5	6.1
1920	6.7	5.4	3.4	4.2	2.3	2.5	5.7	4.2	5.0	4.9
1930	4.2	4.8	6.8	4.1	2.3	3.7	3.5	5.3	2.8	4.1
1940	5.2	5.2	4.9	5.1	4.1	3.9	3.9	2.8	5.1	5.9
1950	2.5	2.6	3.4	3.0	4.0	3.9	3.9	3.8	5.5	5.3
1960	5.7	2.9	3.6	3.9	4.3	4.6	3.4	2.9	4.1	5.0
1970	4.4									

APPENDIX H
RECONSTRUCTED VALUES FOR THE JEMEZ CHRONOLOGY

Ronald H. Towner

Table H.1. Reconstructed Values for the Jemez Chronology.

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
598	33.26	29.64
599	26.92	29.63
600	35.95	29.66
601	34.73	29.73
602	27.65	29.93
603	17.65	30.35
604	22.77	31.09
605	27.65	32.11
606	31.55	33.32
607	41.31	34.57
608	66.20	35.70
609	25.94	36.66
610	28.87	37.55
611	34.97	38.49
612	37.90	39.48
613	39.12	40.49
614	43.75	41.49
615	24.97	42.41
616	47.41	43.19
617	51.81	43.66
618	67.42	43.67
619	43.27	43.14
620	16.43	42.19
621	63.27	40.92
622	65.47	39.31
623	32.29	37.47
624	20.57	35.73
625	10.81	34.39
626	14.72	33.59
627	30.58	33.30
628	38.63	33.30
629	42.53	33.32
630	38.63	33.16
631	54.49	32.68
632	42.78	31.84
633	26.67	30.75
634	12.77	29.64
635	12.77	28.69
636	30.82	27.93
637	44.73	27.30
638	30.82	26.72
639	22.77	26.25

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
640	12.77	26.02
641	28.87	26.08
642	36.68	26.43
643	18.87	27.07
644	28.87	28.04
645	14.96	29.39
646	28.87	31.09
647	26.92	33.04
648	14.96	35.09
649	58.64	37.01
650	49.37	38.46
651	52.05	39.23
652	53.27	39.25
653	48.15	38.55
654	24.23	37.30
655	39.61	35.74
656	28.87	34.03
657	31.31	32.35
658	24.48	30.82
659	25.45	29.55
660	27.16	28.62
661	21.55	28.03
662	32.04	27.79
663	18.87	27.86
664	25.21	28.19
665	31.80	28.69
666	16.67	29.23
667	40.34	29.69
668	45.95	29.87
669	39.85	29.66
670	35.21	29.09
671	30.58	28.27
672	6.91	27.41
673	35.46	26.67
674	18.87	26.11
675	16.67	25.82
676	35.70	25.82
677	22.28	26.09
678	15.21	26.63
679	39.36	27.43
680	24.48	28.43
681	18.87	29.60
682	28.87	30.90
683	39.12	32.20

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
684	45.46	33.36
685	40.58	34.30
686	13.99	35.05
687	39.36	35.63
688	37.90	35.98
689	50.10	36.01
690	43.75	35.69
691	28.38	35.07
692	27.16	34.30
693	34.48	33.45
694	21.31	32.56
695	40.83	31.65
696	31.55	30.66
697	39.36	29.59
698	22.04	28.48
699	28.38	27.41
700	25.21	26.44
701	20.82	25.63
702	34.24	25.03
703	24.48	24.65
704	13.01	24.58
705	23.50	24.88
706	15.69	25.55
707	28.63	26.54
708	37.90	27.73
709	32.04	29.03
710	27.89	30.40
711	24.48	31.87
712	12.52	33.40
713	35.46	34.91
714	55.95	36.14
715	59.61	36.83
716	44.49	36.93
717	19.60	36.52
718	40.09	35.79
719	42.29	34.82
720	43.51	33.69
721	24.23	32.58
722	21.31	31.70
723	7.89	31.23
724	11.79	31.22
725	49.85	31.52
726	45.22	31.85
727	27.65	32.04

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
728	40.58	32.02
729	31.07	31.75
730	37.41	31.20
731	36.68	30.39
732	32.77	29.38
733	28.63	28.28
734	29.85	27.26
735	12.77	26.46
736	9.84	26.04
737	38.14	26.05
738	12.28	26.42
739	32.77	27.13
740	38.87	28.08
741	34.97	29.20
742	15.94	30.51
743	9.11	32.08
744	34.97	33.83
745	37.90	35.52
746	60.83	36.89
747	52.54	37.73
748	20.33	38.02
749	65.96	37.84
750	30.82	37.22
751	22.28	36.35
752	35.46	35.38
753	34.97	34.37
754	41.80	33.36
755	22.77	32.41
756	37.90	31.62
757	23.01	31.03
758	29.36	30.72
759	23.01	30.71
760	17.89	30.99
761	43.27	31.49
762	36.19	32.04
763	32.04	32.53
764	32.04	32.93
765	27.65	33.16
766	51.07	33.18
767	36.19	32.90
768	30.82	32.35
769	34.24	31.63
770	22.53	30.82
771	29.36	30.00

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
772	37.65	29.21
773	26.19	28.48
774	7.89	27.90
775	23.75	27.50
776	44.97	27.20
777	38.63	26.87
778	15.21	26.53
779	20.33	26.27
780	38.14	26.12
781	22.53	26.07
782	14.96	26.18
783	19.35	26.48
784	32.29	26.92
785	33.02	27.39
786	21.06	27.81
787	50.83	28.12
788	30.58	28.30
789	17.89	28.44
790	19.35	28.66
791	33.02	29.02
792	37.65	29.51
793	26.19	30.12
794	28.14	30.92
795	20.33	31.95
796	32.77	33.20
797	28.87	34.59
798	32.53	36.01
799	30.09	37.30
800	61.08	38.26
801	51.07	38.67
802	44.24	38.48
803	41.80	37.75
804	32.29	36.62
805	37.41	35.23
806	44.97	33.74
807	15.45	32.32
808	28.63	31.17
809	10.33	30.43
810	28.14	30.12
811	25.94	30.17
812	30.58	30.43
813	38.63	30.72
814	40.58	30.86
815	47.66	30.77

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
816	27.41	30.43
817	32.53	29.98
818	21.79	29.54
819	12.03	29.26
820	30.58	29.18
821	47.66	29.24
822	33.02	29.40
823	10.08	29.72
824	15.94	30.31
825	26.19	31.12
826	46.93	31.96
827	41.31	32.63
828	40.58	33.01
829	27.16	33.09
830	42.29	32.90
831	31.80	32.48
832	29.11	31.90
833	32.04	31.23
834	40.58	30.56
835	12.77	29.95
836	32.53	29.54
837	10.81	29.34
838	40.09	29.36
839	36.92	29.48
840	16.43	29.66
841	34.97	29.87
842	35.46	30.05
843	39.61	30.13
844	31.55	30.13
845	33.02	30.11
846	22.77	30.19
847	23.01	30.47
848	29.85	31.02
849	37.65	31.83
850	23.50	32.89
851	22.53	34.20
852	32.77	35.71
853	44.73	37.24
854	45.71	38.62
855	42.78	39.71
856	46.68	40.45
857	29.36	40.82
858	57.66	40.81
859	38.87	40.39

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
860	50.59	39.61
861	27.89	38.56
862	36.43	37.38
863	38.39	36.16
864	24.97	34.96
865	34.73	33.84
866	43.75	32.82
867	32.29	31.90
868	15.21	31.17
869	35.70	30.71
870	15.69	30.49
871	35.46	30.48
872	29.36	30.58
873	50.10	30.67
874	31.80	30.68
875	20.33	30.65
876	32.29	30.67
877	38.63	30.73
878	13.50	30.86
879	38.39	31.10
880	39.61	31.40
881	31.07	31.74
882	13.01	32.18
883	42.05	32.75
884	19.35	33.36
885	36.92	33.94
886	42.78	34.34
887	39.12	34.42
888	42.78	34.11
889	33.26	33.41
890	49.85	32.37
891	21.79	31.07
892	9.11	29.72
893	37.90	28.44
894	22.04	27.22
895	29.60	26.07
896	30.33	25.00
897	23.99	24.03
898	18.13	23.23
899	25.45	22.65
900	16.43	22.33
901	7.15	22.32
902	30.09	22.58
903	25.94	23.00

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
904	32.53	23.49
905	35.95	24.00
906	10.57	24.58
907	8.13	25.33
908	38.87	26.26
909	28.38	27.27
910	30.33	28.32
911	34.97	29.37
912	18.62	30.44
913	26.43	31.55
914	25.94	32.66
915	38.87	33.65
916	45.22	34.37
917	39.61	34.69
918	41.56	34.60
919	41.80	34.13
920	33.26	33.36
921	31.31	32.47
922	16.91	31.61
923	35.46	30.94
924	16.43	30.48
925	35.21	30.28
926	33.26	30.29
927	24.48	30.47
928	34.48	30.81
929	31.31	31.27
930	30.82	31.82
931	29.36	32.44
932	33.75	33.09
933	35.95	33.71
934	39.12	34.26
935	34.97	34.70
936	37.90	35.04
937	31.31	35.30
938	36.43	35.52
939	25.94	35.70
940	38.39	35.85
941	49.85	35.90
942	35.21	35.82
943	20.09	35.66
944	33.02	35.47
945	36.68	35.20
946	46.68	34.74
947	33.75	34.04

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
948	35.95	33.10
949	50.10	31.95
950	25.94	30.67
951	19.35	29.45
952	30.82	28.48
953	15.69	27.85
954	13.99	27.65
955	26.43	27.87
956	43.51	28.39
957	33.26	29.08
958	13.25	29.92
959	38.63	30.89
960	39.12	31.91
961	17.89	32.93
962	45.46	33.92
963	33.02	34.79
964	33.26	35.51
965	25.45	36.03
966	45.22	36.29
967	49.61	36.16
968	51.07	35.56
969	18.87	34.56
970	43.75	33.31
971	32.53	31.92
972	21.31	30.52
973	33.02	29.27
974	20.57	28.25
975	10.08	27.55
976	34.97	27.20
977	36.92	27.09
978	25.70	27.18
979	32.77	27.48
980	20.82	28.02
981	22.53	28.86
982	29.85	30.00
983	24.72	31.40
984	19.11	32.97
985	38.14	34.59
986	46.93	36.01
987	52.54	37.04
988	45.71	37.55
989	54.73	37.57
990	33.75	37.22
991	17.40	36.75

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
992	17.16	36.37
993	23.50	36.14
994	43.75	35.94
995	48.15	35.55
996	48.88	34.80
997	46.68	33.63
998	38.63	32.13
999	13.01	30.50
1000	32.29	28.96
1001	14.72	27.65
1002	23.99	26.69
1003	18.13	26.09
1004	28.87	25.83
1005	20.09	25.83
1006	20.82	26.01
1007	44.24	26.25
1008	40.34	26.42
1009	19.60	26.51
1010	22.04	26.62
1011	16.91	26.84
1012	36.43	27.17
1013	28.14	27.58
1014	15.21	28.08
1015	37.41	28.66
1016	41.31	29.27
1017	24.72	29.90
1018	31.31	30.61
1019	19.35	31.47
1020	31.55	32.52
1021	31.80	33.72
1022	29.85	34.99
1023	27.16	36.26
1024	47.41	37.36
1025	48.39	38.10
1026	54.98	38.37
1027	31.31	38.14
1028	40.58	37.50
1029	46.44	36.54
1030	19.60	35.38
1031	31.55	34.15
1032	36.19	32.93
1033	39.36	31.73
1034	25.21	30.62
1035	11.06	29.68

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1036	29.36	28.97
1037	30.58	28.41
1038	39.85	27.89
1039	28.87	27.34
1040	31.80	26.76
1041	14.72	26.21
1042	33.99	25.76
1043	31.31	25.41
1044	16.18	25.22
1045	18.38	25.29
1046	29.36	25.64
1047	26.67	26.27
1048	12.28	27.15
1049	29.85	28.28
1050	35.95	29.53
1051	22.53	30.79
1052	43.75	31.97
1053	43.02	32.95
1054	33.51	33.71
1055	32.53	34.29
1056	35.70	34.76
1057	36.19	35.17
1058	25.45	35.58
1059	27.89	36.04
1060	41.80	36.52
1061	36.92	36.94
1062	25.94	37.22
1063	50.83	37.30
1064	44.24	37.03
1065	50.10	36.39
1066	47.41	35.40
1067	21.79	34.24
1068	15.45	33.15
1069	27.65	32.28
1070	32.77	31.64
1071	31.80	31.20
1072	36.68	30.90
1073	29.36	30.71
1074	29.60	30.66
1075	16.67	30.73
1076	38.87	30.90
1077	35.46	31.07
1078	35.46	31.17
1079	28.14	31.17

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1080	32.77	31.09
1081	20.82	30.93
1082	51.07	30.66
1083	26.43	30.26
1084	30.09	29.78
1085	14.72	29.31
1086	31.80	28.89
1087	29.60	28.49
1088	35.46	28.06
1089	42.53	27.58
1090	9.59	27.11
1091	14.72	26.78
1092	35.70	26.62
1093	25.45	26.57
1094	23.26	26.58
1095	41.80	26.65
1096	32.53	26.73
1097	18.87	26.92
1098	21.55	27.34
1099	9.84	28.06
1100	23.99	29.07
1101	39.61	30.24
1102	41.31	31.38
1103	30.33	32.36
1104	48.88	33.14
1105	27.65	33.70
1106	34.24	34.13
1107	28.63	34.47
1108	26.43	34.77
1109	44.97	35.02
1110	37.41	35.17
1111	38.87	35.20
1112	34.73	35.16
1113	35.21	35.11
1114	23.26	35.10
1115	31.31	35.19
1116	35.46	35.33
1117	37.65	35.44
1118	44.97	35.45
1119	39.12	35.29
1120	38.87	34.98
1121	17.89	34.59
1122	40.58	34.18
1123	30.82	33.73

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1124	33.26	33.24
1125	33.75	32.66
1126	33.51	31.99
1127	28.14	31.21
1128	33.51	30.30
1129	43.75	29.25
1130	27.89	28.07
1131	18.62	26.89
1132	23.26	25.82
1133	29.60	24.94
1134	14.72	24.30
1135	17.89	23.95
1136	32.77	23.87
1137	18.87	24.04
1138	20.82	24.42
1139	25.45	25.00
1140	17.65	25.71
1141	34.48	26.46
1142	38.87	27.14
1143	22.28	27.68
1144	28.63	28.11
1145	41.07	28.42
1146	18.38	28.64
1147	29.36	28.86
1148	32.29	29.11
1149	30.33	29.42
1150	15.21	29.85
1151	14.72	30.44
1152	40.34	31.12
1153	48.88	31.69
1154	45.22	32.04
1155	39.61	32.18
1156	23.75	32.26
1157	15.21	32.48
1158	15.94	32.98
1159	36.19	33.74
1160	41.56	34.60
1161	21.31	35.40
1162	57.17	36.01
1163	51.56	36.27
1164	38.39	36.12
1165	35.95	35.68
1166	21.31	35.08
1167	41.80	34.44

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1168	29.85	33.82
1169	20.09	33.28
1170	33.02	32.85
1171	47.41	32.46
1172	29.85	32.07
1173	35.95	31.70
1174	20.33	31.41
1175	35.21	31.25
1176	26.43	31.24
1177	22.53	31.37
1178	34.24	31.59
1179	32.53	31.81
1180	40.34	31.94
1181	42.53	31.90
1182	19.11	31.69
1183	28.87	31.37
1184	46.93	30.94
1185	39.61	30.38
1186	15.94	29.78
1187	23.99	29.32
1188	27.89	29.05
1189	20.33	29.01
1190	31.07	29.18
1191	46.19	29.49
1192	20.09	29.90
1193	23.01	30.47
1194	34.48	31.20
1195	33.99	32.04
1196	35.46	32.94
1197	30.58	33.88
1198	24.72	34.87
1199	29.11	35.85
1200	46.93	36.72
1201	50.83	37.29
1202	40.09	37.50
1203	44.97	37.35
1204	37.17	36.92
1205	21.79	36.34
1206	26.67	35.72
1207	39.12	35.08
1208	29.60	34.33
1209	42.29	33.43
1210	35.21	32.28
1211	37.65	30.89

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1212	34.48	29.27
1213	32.29	27.49
1214	20.57	25.71
1215	21.06	24.09
1216	17.65	22.75
1217	11.06	21.80
1218	16.91	21.29
1219	32.04	21.18
1220	21.31	21.38
1221	13.99	21.90
1222	25.94	22.74
1223	28.38	23.85
1224	18.62	25.19
1225	27.16	26.76
1226	27.65	28.51
1227	13.50	30.39
1228	38.87	32.31
1229	44.49	34.09
1230	47.66	35.58
1231	36.43	36.72
1232	41.31	37.54
1233	32.29	38.12
1234	26.92	38.53
1235	52.29	38.79
1236	37.41	38.88
1237	36.19	38.81
1238	43.51	38.64
1239	27.89	38.38
1240	22.77	38.07
1241	50.10	37.67
1242	41.07	37.03
1243	37.65	36.07
1244	45.95	34.76
1245	46.44	33.10
1246	21.55	31.19
1247	26.19	29.22
1248	21.55	27.33
1249	30.09	25.62
1250	25.70	24.16
1251	10.57	23.02
1252	18.13	22.29
1253	29.60	21.97
1254	8.62	22.02
1255	30.09	22.42

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1256	17.89	23.10
1257	33.02	23.98
1258	13.74	25.02
1259	36.43	26.17
1260	28.14	27.35
1261	22.53	28.55
1262	39.61	29.74
1263	20.33	30.89
1264	29.11	32.00
1265	28.63	33.02
1266	38.14	33.84
1267	38.14	34.34
1268	52.54	34.42
1269	37.65	34.04
1270	26.43	33.30
1271	33.02	32.32
1272	31.31	31.20
1273	23.99	30.04
1274	29.36	28.92
1275	36.92	27.87
1276	16.18	26.96
1277	26.67	26.26
1278	16.91	25.83
1279	32.29	25.66
1280	16.43	25.73
1281	31.55	26.01
1282	23.75	26.43
1283	34.24	26.94
1284	24.97	27.51
1285	34.24	28.12
1286	17.40	28.78
1287	38.14	29.49
1288	19.84	30.24
1289	37.41	31.00
1290	44.49	31.72
1291	23.01	32.40
1292	27.16	33.09
1293	43.02	33.82
1294	27.16	34.56
1295	30.33	35.34
1296	26.19	36.13
1297	44.73	36.85
1298	49.37	37.35
1299	34.48	37.54

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1300	46.44	37.42
1301	36.92	37.00
1302	46.19	36.34
1303	30.58	35.53
1304	21.06	34.74
1305	42.29	34.06
1306	23.75	33.53
1307	29.36	33.18
1308	23.50	33.02
1309	46.19	32.96
1310	41.80	32.90
1311	29.11	32.79
1312	23.75	32.70
1313	46.44	32.62
1314	41.80	32.55
1315	15.45	32.54
1316	15.45	32.73
1317	35.95	33.10
1318	43.02	33.52
1319	42.29	33.86
1320	32.29	34.07
1321	39.61	34.17
1322	35.95	34.17
1323	26.67	34.14
1324	23.50	34.16
1325	50.10	34.23
1326	28.87	34.30
1327	29.11	34.40
1328	26.67	34.54
1329	34.48	34.68
1330	42.53	34.70
1331	29.60	34.51
1332	45.46	34.04
1333	46.44	33.23
1334	37.65	32.09
1335	25.94	30.77
1336	25.94	29.44
1337	25.94	28.28
1338	13.99	27.39
1339	28.38	26.87
1340	22.28	26.71
1341	23.75	26.87
1342	23.26	27.31
1343	30.33	27.93

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1344	35.21	28.60
1345	36.68	29.24
1346	41.56	29.80
1347	11.55	30.31
1348	28.38	30.88
1349	34.97	31.48
1350	35.21	32.08
1351	38.63	32.63
1352	13.74	33.16
1353	43.27	33.67
1354	41.80	34.08
1355	26.67	34.36
1356	35.95	34.52
1357	28.87	34.55
1358	45.95	34.40
1359	44.00	34.04
1360	29.60	33.50
1361	38.39	32.88
1362	24.97	32.30
1363	17.16	31.89
1364	28.63	31.71
1365	38.14	31.72
1366	28.14	31.83
1367	31.80	32.00
1368	44.73	32.16
1369	16.67	32.26
1370	40.34	32.31
1371	32.04	32.25
1372	42.29	32.03
1373	33.75	31.66
1374	38.14	31.20
1375	27.16	30.74
1376	16.67	30.44
1377	21.31	30.40
1378	35.95	30.64
1379	28.87	31.07
1380	31.55	31.65
1381	31.80	32.32
1382	24.23	33.00
1383	44.00	33.63
1384	36.68	34.06
1385	39.85	34.24
1386	40.34	34.14
1387	36.92	33.80

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1388	31.07	33.28
1389	32.29	32.70
1390	19.60	32.16
1391	21.55	31.73
1392	37.17	31.37
1393	36.92	31.00
1394	33.99	30.53
1395	42.78	29.95
1396	25.45	29.28
1397	23.26	28.64
1398	36.19	28.14
1399	14.47	27.85
1400	15.94	27.86
1401	28.87	28.19
1402	31.31	28.73
1403	28.87	29.38
1404	36.19	30.05
1405	29.60	30.67
1406	34.97	31.19
1407	17.16	31.59
1408	37.90	31.82
1409	37.65	31.79
1410	44.24	31.41
1411	24.72	30.66
1412	39.12	29.61
1413	17.65	28.34
1414	44.00	26.92
1415	13.74	25.46
1416	22.77	24.08
1417	29.11	22.89
1418	16.43	21.97
1419	13.99	21.44
1420	17.40	21.36
1421	29.11	21.73
1422	14.96	22.56
1423	14.47	23.84
1424	13.74	25.53
1425	32.29	27.51
1426	37.17	29.55
1427	35.95	31.46
1428	46.44	33.11
1429	32.04	34.45
1430	32.04	35.49
1431	41.07	36.26

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1432	25.45	36.76
1433	48.88	37.01
1434	43.75	36.98
1435	37.90	36.70
1436	29.60	36.29
1437	38.39	35.83
1438	19.84	35.42
1439	36.68	35.11
1440	34.48	34.84
1441	39.61	34.58
1442	35.95	34.26
1443	41.07	33.88
1444	27.41	33.45
1445	20.09	33.03
1446	44.24	32.63
1447	37.90	32.18
1448	35.21	31.68
1449	21.55	31.18
1450	19.11	30.77
1451	36.92	30.44
1452	31.80	30.11
1453	37.65	29.73
1454	34.97	29.27
1455	20.82	28.78
1456	28.87	28.34
1457	21.79	27.98
1458	40.58	27.73
1459	23.01	27.58
1460	24.72	27.61
1461	15.21	27.85
1462	29.60	28.33
1463	28.14	28.95
1464	19.11	29.63
1465	32.77	30.26
1466	47.66	30.65
1467	40.83	30.65
1468	37.41	30.25
1469	36.43	29.53
1470	24.97	28.65
1471	10.33	27.82
1472	29.11	27.20
1473	24.97	26.85
1474	25.70	26.81
1475	11.55	27.09

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1476	37.65	27.67
1477	22.77	28.47
1478	44.24	29.41
1479	31.31	30.42
1480	12.28	31.52
1481	34.48	32.75
1482	37.90	33.99
1483	24.23	35.13
1484	50.83	36.08
1485	49.85	36.68
1486	41.07	36.89
1487	26.67	36.79
1488	39.12	36.47
1489	35.46	36.00
1490	34.24	35.41
1491	31.31	34.76
1492	42.53	34.09
1493	25.70	33.40
1494	40.34	32.78
1495	13.99	32.24
1496	35.21	31.85
1497	26.67	31.53
1498	48.63	31.21
1499	39.36	30.83
1500	18.38	30.44
1501	30.33	30.14
1502	28.63	29.98
1503	33.02	29.99
1504	26.92	30.20
1505	29.60	30.64
1506	17.16	31.33
1507	34.97	32.26
1508	36.68	33.30
1509	28.87	34.37
1510	30.82	35.37
1511	48.15	36.18
1512	39.61	36.64
1513	50.34	36.69
1514	42.05	36.33
1515	43.02	35.63
1516	9.84	34.77
1517	19.11	33.93
1518	35.70	33.12
1519	45.22	32.20

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1520	46.19	31.07
1521	48.39	29.74
1522	12.77	28.34
1523	13.50	27.16
1524	16.43	26.38
1525	21.06	26.03
1526	31.31	26.08
1527	30.58	26.44
1528	20.33	27.05
1529	31.31	27.89
1530	30.58	28.90
1531	34.97	30.02
1532	22.53	31.25
1533	33.99	32.56
1534	35.46	33.93
1535	24.97	35.29
1536	40.83	36.60
1537	38.63	37.73
1538	26.43	38.60
1539	49.37	39.09
1540	62.79	39.04
1541	54.49	38.36
1542	16.43	37.17
1543	51.32	35.69
1544	27.41	34.07
1545	23.50	32.49
1546	25.21	31.13
1547	29.36	30.08
1548	21.06	29.36
1549	20.57	28.98
1550	39.61	28.87
1551	24.72	28.93
1552	25.94	29.08
1553	36.68	29.25
1554	29.60	29.34
1555	32.77	29.29
1556	33.99	29.09
1557	38.14	28.71
1558	31.80	28.23
1559	28.14	27.75
1560	12.03	27.46
1561	25.21	27.49
1562	18.87	27.89
1563	20.57	28.66

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1564	29.36	29.70
1565	40.58	30.87
1566	35.21	32.02
1567	22.28	33.06
1568	32.77	33.93
1569	50.34	34.49
1570	46.68	34.61
1571	27.41	34.29
1572	46.19	33.60
1573	14.96	32.63
1574	30.33	31.49
1575	33.26	30.21
1576	16.91	28.78
1577	57.42	27.19
1578	33.75	25.41
1579	10.33	23.60
1580	9.35	22.00
1581	19.60	20.76
1582	22.28	19.91
1583	9.84	19.48
1584	21.79	19.48
1585	10.08	19.86
1586	30.33	20.58
1587	24.72	21.54
1588	29.11	22.68
1589	29.11	24.01
1590	8.62	25.57
1591	23.99	27.45
1592	20.57	29.60
1593	10.33	31.92
1594	51.07	34.22
1595	43.02	36.16
1596	65.47	37.50
1597	53.76	38.11
1598	27.41	38.09
1599	56.93	37.66
1600	17.16	37.04
1601	21.79	36.49
1602	35.46	36.20
1603	36.19	36.19
1604	27.89	36.47
1605	34.73	37.04
1606	39.85	37.81
1607	30.58	38.70

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1608	35.70	39.61
1609	40.83	40.39
1610	63.03	40.84
1611	57.66	40.80
1612	40.09	40.30
1613	39.61	39.48
1614	26.19	38.54
1615	33.26	37.62
1616	24.72	36.83
1617	39.85	36.16
1618	38.63	35.54
1619	33.99	34.91
1620	35.46	34.25
1621	45.22	33.50
1622	37.17	32.67
1623	34.24	31.83
1624	18.13	31.11
1625	19.35	30.63
1626	21.55	30.43
1627	43.02	30.43
1628	25.21	30.50
1629	42.78	30.56
1630	37.41	30.54
1631	27.16	30.46
1632	15.45	30.39
1633	35.70	30.37
1634	35.95	30.34
1635	29.85	30.26
1636	37.41	30.14
1637	27.41	30.02
1638	18.62	29.95
1639	32.04	29.98
1640	34.97	30.08
1641	28.14	30.23
1642	25.94	30.43
1643	38.87	30.68
1644	35.21	30.94
1645	22.40	31.24
1646	30.88	31.63
1647	40.41	32.12
1648	12.20	32.70
1649	34.09	33.38
1650	30.15	34.06
1651	40.65	34.60

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1652	52.97	34.85
1653	41.06	34.71
1654	24.88	34.23
1655	39.29	33.52
1656	32.35	32.64
1657	34.49	31.66
1658	16.58	30.69
1659	30.54	29.81
1660	26.46	29.03
1661	32.92	28.32
1662	29.97	27.67
1663	28.80	27.07
1664	24.70	26.56
1665	31.30	26.17
1666	20.46	25.94
1667	19.75	25.93
1668	24.66	26.17
1669	27.26	26.63
1670	24.33	27.26
1671	29.11	28.02
1672	29.32	28.82
1673	30.98	29.62
1674	32.42	30.36
1675	35.91	30.99
1676	26.63	31.49
1677	34.05	31.87
1678	35.11	32.13
1679	31.78	32.25
1680	41.55	32.25
1681	22.62	32.19
1682	34.33	32.14
1683	38.69	32.13
1684	27.93	32.22
1685	13.80	32.50
1686	32.94	32.99
1687	37.44	33.62
1688	31.88	34.27
1689	46.17	34.85
1690	33.77	35.27
1691	34.20	35.52
1692	45.95	35.59
1693	33.05	35.47
1694	34.51	35.22
1695	40.40	34.90

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1696	19.89	34.57
1697	34.51	34.29
1698	30.67	34.04
1699	41.80	33.79
1700	33.30	33.48
1701	43.41	33.10
1702	27.51	32.66
1703	34.54	32.26
1704	18.88	31.95
1705	23.16	31.79
1706	42.88	31.74
1707	28.89	31.68
1708	42.00	31.57
1709	25.73	31.38
1710	39.61	31.13
1711	21.76	30.83
1712	38.46	30.54
1713	35.93	30.26
1714	24.03	30.06
1715	26.71	30.03
1716	20.75	30.25
1717	29.31	30.72
1718	31.81	31.41
1719	18.59	32.22
1720	38.61	33.08
1721	41.47	33.79
1722	38.80	34.22
1723	41.64	34.27
1724	32.42	33.93
1725	36.25	33.20
1726	39.21	32.13
1727	35.53	30.78
1728	29.45	29.25
1729	14.97	27.72
1730	22.14	26.33
1731	26.22	25.14
1732	29.66	24.16
1733	13.26	23.43
1734	29.18	22.97
1735	17.94	22.80
1736	27.38	22.91
1737	19.19	23.32
1738	19.90	24.03
1739	19.13	25.03

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1740	26.05	26.26
1741	26.54	27.62
1742	22.05	29.00
1743	40.06	30.27
1744	32.17	31.26
1745	38.12	31.85
1746	46.25	31.98
1747	45.70	31.62
1748	14.64	30.90
1749	33.60	30.01
1750	21.93	29.08
1751	34.20	28.21
1752	13.04	27.49
1753	28.94	26.99
1754	33.81	26.72
1755	23.76	26.69
1756	21.97	26.92
1757	15.41	27.47
1758	32.36	28.30
1759	33.41	29.30
1760	23.69	30.39
1761	42.68	31.50
1762	39.94	32.53
1763	17.30	33.48
1764	32.50	34.36
1765	31.99	35.11
1766	45.97	35.62
1767	39.02	35.76
1768	38.07	35.48
1769	37.69	34.78
1770	38.14	33.66
1771	47.22	32.17
1772	30.58	30.42
1773	10.91	28.63
1774	25.54	26.99
1775	24.96	25.59
1776	24.30	24.49
1777	20.94	23.73
1778	27.87	23.34
1779	17.33	23.36
1780	15.03	23.83
1781	19.48	24.73
1782	20.42	25.99
1783	32.56	27.46

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1784	45.84	28.99
1785	29.31	30.44
1786	24.53	31.80
1787	36.15	33.08
1788	35.03	34.23
1789	28.24	35.23
1790	38.63	36.03
1791	39.38	36.57
1792	37.86	36.77
1793	47.21	36.60
1794	38.38	36.04
1795	37.99	35.17
1796	31.94	34.08
1797	29.19	32.89
1798	30.29	31.70
1799	29.22	30.59
1800	31.86	29.62
1801	23.19	28.82
1802	21.07	28.27
1803	28.69	27.95
1804	34.29	27.83
1805	28.63	27.87
1806	15.66	28.06
1807	31.81	28.40
1808	35.30	28.81
1809	23.37	29.23
1810	33.80	29.63
1811	28.70	29.96
1812	28.98	30.20
1813	31.69	30.30
1814	24.30	30.22
1815	39.53	29.92
1816	46.64	29.33
1817	33.56	28.47
1818	13.37	27.48
1819	22.63	26.56
1820	25.49	25.81
1821	33.35	25.27
1822	12.98	25.00
1823	18.09	25.09
1824	21.29	25.55
1825	29.15	26.32
1826	27.30	27.30
1827	28.87	28.42

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1828	38.05	29.59
1829	29.07	30.74
1830	29.60	31.89
1831	29.83	33.00
1832	35.22	34.06
1833	39.67	35.00
1834	40.04	35.79
1835	33.45	36.41
1836	28.90	36.89
1837	33.76	37.24
1838	38.68	37.38
1839	49.49	37.23
1840	43.98	36.70
1841	44.43	35.83
1842	27.19	34.70
1843	28.31	33.48
1844	37.65	32.28
1845	28.07	31.17
1846	27.49	30.26
1847	14.73	29.63
1848	27.82	29.31
1849	38.54	29.23
1850	29.12	29.30
1851	17.20	29.50
1852	35.36	29.79
1853	31.73	30.06
1854	30.87	30.23
1855	35.43	30.22
1856	36.41	29.99
1857	38.26	29.52
1858	38.00	28.88
1859	21.84	28.21
1860	25.72	27.70
1861	11.99	27.54
1862	17.97	27.84
1863	26.37	28.61
1864	18.91	29.76
1865	30.07	31.16
1866	37.16	32.59
1867	39.86	33.83
1868	48.66	34.67
1869	48.22	35.01
1870	32.67	34.83
1871	31.67	34.24

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1872	42.45	33.35
1873	26.60	32.27
1874	25.98	31.13
1875	26.80	30.06
1876	26.16	29.12
1877	35.76	28.36
1878	26.30	27.78
1879	23.33	27.47
1880	13.37	27.47
1881	27.15	27.80
1882	30.59	28.36
1883	23.75	29.03
1884	32.46	29.71
1885	37.92	30.25
1886	32.83	30.55
1887	38.07	30.54
1888	33.25	30.21
1889	30.07	29.60
1890	23.94	28.77
1891	34.33	27.80
1892	30.90	26.75
1893	13.46	25.71
1894	24.16	24.79
1895	26.37	24.02
1896	14.21	23.42
1897	33.10	23.02
1898	30.31	22.79
1899	12.36	22.76
1900	19.02	23.02
1901	27.80	23.61
1902	16.30	24.52
1903	30.59	25.73
1904	10.32	27.21
1905	31.59	28.91
1906	30.95	30.68
1907	46.15	32.37
1908	44.53	33.84
1909	33.17	35.07
1910	25.99	36.14
1911	35.73	37.09
1912	42.50	37.92
1913	33.48	38.58
1914	39.28	39.07
1915	42.04	39.35

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1916	45.65	39.37
1917	40.19	39.12
1918	28.74	38.64
1919	47.64	37.95
1920	45.64	37.04
1921	46.25	35.97
1922	20.62	34.87
1923	25.51	33.93
1924	38.51	33.26
1925	20.09	32.89
1926	38.82	32.86
1927	26.15	33.14
1928	26.62	33.70
1929	32.41	34.47
1930	41.33	35.32
1931	37.97	36.10
1932	48.08	36.71
1933	40.13	37.08
1934	33.23	37.21
1935	41.60	37.17
1936	37.27	36.98
1937	37.68	36.69
1938	30.62	36.37
1939	25.29	36.09
1940	29.42	35.85
1941	44.62	35.58
1942	41.55	35.15
1943	33.32	34.49
1944	40.64	33.59
1945	39.12	32.46
1946	18.96	31.15
1947	29.06	29.76
1948	31.37	28.31
1949	41.22	26.79
1950	18.06	25.27
1951	15.00	23.86
1952	26.98	22.67
1953	21.99	21.73
1954	21.93	21.08
1955	12.54	20.78
1956	10.43	20.88
1957	16.94	21.36
1958	27.31	22.11
1959	22.55	22.99

Year	Annual Reconstructed Values	20 Year Spline Reconstructed Values
1960	33.96	23.88
1961	32.09	24.67
1962	26.05	25.36
1963	23.29	25.98
1964	18.27	26.59
1965	33.24	27.22
1966	28.02	27.85
1967	15.54	28.48
1968	33.80	29.11
1969	35.91	29.65
1970	38.00	30.04
1971	20.17	30.29
1972	37.31	30.43
1973	38.14	30.47
1974	20.86	30.45
1975	42.40	30.47
1976	25.07	30.57
1977	20.42	30.88
1978	26.81	31.47
1979	38.44	32.33
1980	29.65	33.42
1981	30.32	34.73
1982	32.38	36.21
1983	38.69	37.79
1984	28.55	39.35
1985	50.43	40.77
1986	56.64	41.87
1987	47.23	42.52
1988	51.37	42.74
1989	32.58	42.61
1990	31.00	42.24
1991	41.85	41.70
1992	44.62	40.94
1993	38.64	39.91
1994	36.82	38.60
1995	49.93	36.98
1996	18.74	35.01
1997	42.91	32.74
1998	30.33	30.12
1999	40.42	27.16
2000	15.58	23.91
2001	23.07	20.48
2002	7.15	16.96

APPENDIX I
CHAMA RECONSTRUCTED PRECIPITATION VALUES

Ronald H. Towner

Table I.1. Chama Reconstructed Precipitation Values.

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
759	38.11	37.05
760	33.20	38.41
761	41.58	39.78
762	43.02	41.12
763	37.82	42.41
764	32.62	43.64
765	51.98	44.74
766	60.66	45.59
767	48.23	46.12
768	49.09	46.36
769	48.81	46.39
770	43.60	46.34
771	33.78	46.31
772	52.27	46.39
773	32.91	46.61
774	33.20	46.96
775	54.59	47.36
776	69.90	47.61
777	48.52	47.58
778	51.41	47.29
779	41.58	46.82
780	51.12	46.27
781	44.18	45.70
782	36.67	45.21
783	34.35	44.89
784	53.72	44.73
785	43.02	44.67
786	35.51	44.69
787	54.59	44.76
788	43.02	44.79
789	43.89	44.74
790	45.34	44.58
791	51.98	44.28
792	48.52	43.80
793	44.47	43.18
794	43.60	42.51
795	35.51	41.88
796	40.71	41.39
797	26.55	41.09
798	46.20	41.00
799	36.96	41.06
800	43.31	41.19

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
801	43.02	41.31
802	45.92	41.37
803	47.65	41.29
804	44.47	41.09
805	44.47	40.81
806	37.53	40.53
807	33.20	40.36
808	38.11	40.40
809	25.97	40.67
810	37.82	41.14
811	39.27	41.71
812	50.54	42.18
813	61.81	42.39
814	51.70	42.22
815	50.54	41.75
816	31.75	41.12
817	25.11	40.56
818	24.24	40.21
819	35.80	40.09
820	48.81	40.06
821	64.70	39.96
822	47.94	39.71
823	23.08	39.41
824	32.33	39.25
825	32.33	39.29
826	41.29	39.53
827	31.17	39.90
828	63.55	40.33
829	32.33	40.72
830	37.82	41.10
831	51.41	41.48
832	42.45	41.85
833	39.85	42.25
834	34.93	42.75
835	36.96	43.39
836	48.81	44.13
837	47.65	44.91
838	54.01	45.67
839	42.74	46.40
840	26.26	47.14
841	53.14	47.90
842	45.05	48.53
843	73.37	48.89
844	60.08	48.87

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
845	58.63	48.52
846	37.53	48.03
847	32.33	47.65
848	44.18	47.55
849	39.85	47.79
850	49.38	48.36
851	39.85	49.20
852	43.31	50.23
853	61.23	51.28
854	62.10	52.17
855	49.38	52.76
856	68.46	53.01
857	31.17	52.87
858	68.75	52.38
859	54.01	51.46
860	62.97	50.14
861	41.00	48.48
862	55.16	46.64
863	28.86	44.75
864	47.36	42.98
865	45.34	41.38
866	49.96	40.05
867	15.28	39.11
868	19.90	38.72
869	49.38	38.88
870	31.46	39.44
871	51.98	40.26
872	39.27	41.22
873	47.07	42.22
874	43.31	43.20
875	41.58	44.11
876	62.39	44.94
877	51.12	45.64
878	17.88	46.32
879	58.05	47.09
880	45.05	47.91
881	55.74	48.75
882	43.89	49.59
883	52.27	50.46
884	23.08	51.35
885	55.16	52.21
886	65.28	52.82
887	61.52	52.94
888	78.29	52.45

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
889	47.65	51.32
890	60.94	49.73
891	31.46	47.87
892	33.20	45.98
893	61.81	44.19
894	31.46	42.55
895	24.53	41.18
896	51.41	40.13
897	30.60	39.36
898	33.49	38.85
899	52.85	38.51
900	38.98	38.26
901	34.35	38.09
902	38.11	38.01
903	43.60	38.01
904	32.04	38.09
905	61.23	38.25
906	21.93	38.54
907	14.70	39.09
908	58.63	39.93
909	39.85	40.94
910	37.82	42.06
911	58.63	43.27
912	23.95	44.54
913	39.27	45.89
914	47.94	47.23
915	51.98	48.39
916	48.52	49.20
917	69.62	49.51
918	55.74	49.21
919	59.79	48.34
920	45.63	47.00
921	54.30	45.41
922	25.68	43.80
923	38.40	42.42
924	15.57	41.41
925	48.81	40.82
926	38.40	40.55
927	31.75	40.47
928	60.94	40.47
929	48.23	40.41
930	25.39	40.25
931	46.20	40.05
932	41.29	39.77

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
933	43.31	39.39
934	47.07	38.94
935	28.28	38.46
936	39.85	38.06
937	30.60	37.77
938	56.03	37.63
939	22.50	37.65
940	32.33	37.93
941	40.42	38.50
942	36.67	39.32
943	32.33	40.35
944	44.18	41.52
945	39.56	42.73
946	46.20	43.85
947	47.36	44.76
948	50.25	45.33
949	58.92	45.49
950	57.77	45.20
951	42.16	44.55
952	47.07	43.73
953	36.38	42.93
954	21.35	42.36
955	34.93	42.15
956	50.25	42.28
957	41.29	42.64
958	32.62	43.19
959	51.98	43.86
960	49.96	44.51
961	45.92	45.06
962	47.07	45.49
963	53.14	45.78
964	33.78	45.93
965	39.56	45.98
966	56.03	45.90
967	49.96	45.60
968	41.58	45.06
969	43.02	44.30
970	58.63	43.32
971	41.58	42.12
972	24.53	40.83
973	53.43	39.53
974	41.29	38.26
975	23.37	37.09
976	33.78	36.13

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
977	54.59	35.41
978	32.62	34.93
979	38.11	34.83
980	15.57	35.25
981	19.90	36.34
982	31.17	38.08
983	39.85	40.30
984	35.80	42.78
985	54.30	45.25
986	53.14	47.43
987	62.10	49.07
988	65.28	50.03
989	62.97	50.24
990	58.63	49.81
991	38.11	48.97
992	37.24	47.98
993	28.86	47.06
994	48.23	46.29
995	39.56	45.64
996	51.41	45.03
997	50.54	44.37
998	51.41	43.59
999	32.91	42.72
1000	52.85	41.80
1001	35.22	40.85
1002	37.24	39.94
1003	46.49	39.12
1004	34.64	38.42
1005	16.15	37.89
1006	41.29	37.57
1007	45.63	37.32
1008	51.41	37.03
1009	40.13	36.67
1010	36.67	36.29
1011	41.58	36.04
1012	32.04	36.05
1013	19.32	36.48
1014	23.08	37.46
1015	38.11	38.98
1016	46.78	40.90
1017	52.27	43.05
1018	50.83	45.33
1019	30.02	47.71
1020	53.14	50.18

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1021	47.94	52.64
1022	46.49	54.96
1023	64.70	56.97
1024	68.46	58.47
1025	73.66	59.29
1026	62.39	59.36
1027	57.19	58.75
1028	59.79	57.55
1029	67.30	55.84
1030	48.52	53.75
1031	42.16	51.48
1032	47.36	49.18
1033	56.32	46.94
1034	48.52	44.85
1035	19.90	43.04
1036	23.66	41.66
1037	48.52	40.68
1038	42.16	39.93
1039	47.65	39.26
1040	50.54	38.57
1041	29.73	37.82
1042	52.27	37.08
1043	38.69	36.37
1044	27.71	35.83
1045	34.35	35.62
1046	26.55	35.85
1047	34.64	36.58
1048	26.55	37.82
1049	32.33	39.53
1050	41.29	41.57
1051	44.47	43.76
1052	59.21	45.89
1053	47.65	47.77
1054	63.26	49.31
1055	50.25	50.45
1056	54.30	51.25
1057	52.27	51.76
1058	45.63	52.06
1059	42.74	52.26
1060	54.88	52.36
1061	57.19	52.33
1062	31.17	52.14
1063	61.23	51.76
1064	65.28	51.04

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1065	74.53	49.89
1066	60.37	48.37
1067	27.71	46.73
1068	20.77	45.33
1069	38.40	44.35
1070	40.42	43.81
1071	42.16	43.61
1072	48.52	43.65
1073	40.42	43.79
1074	50.83	43.94
1075	41.29	43.99
1076	51.12	43.88
1077	47.07	43.53
1078	35.22	42.95
1079	52.85	42.14
1080	49.09	41.07
1081	32.33	39.79
1082	46.49	38.43
1083	28.00	37.05
1084	38.40	35.78
1085	29.15	34.68
1086	24.24	33.82
1087	36.96	33.21
1088	39.56	32.80
1089	42.74	32.56
1090	17.01	32.54
1091	25.11	32.81
1092	43.02	33.38
1093	23.08	34.17
1094	36.09	35.15
1095	41.87	36.23
1096	45.34	37.32
1097	40.71	38.37
1098	38.69	39.41
1099	32.91	40.50
1100	43.89	41.66
1101	30.89	42.89
1102	54.59	44.16
1103	50.54	45.38
1104	46.20	46.54
1105	37.53	47.65
1106	57.48	48.73
1107	36.67	49.73
1108	46.78	50.63

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1109	64.70	51.35
1110	57.77	51.74
1111	46.49	51.80
1112	63.55	51.52
1113	49.96	50.94
1114	50.54	50.13
1115	39.56	49.19
1116	45.63	48.20
1117	56.32	47.18
1118	43.31	46.13
1119	54.01	45.10
1120	41.58	44.14
1121	29.44	43.38
1122	45.05	42.88
1123	32.91	42.65
1124	50.83	42.66
1125	43.89	42.83
1126	34.35	43.11
1127	36.67	43.49
1128	47.07	43.85
1129	70.19	44.05
1130	51.98	43.99
1131	27.71	43.76
1132	40.13	43.51
1133	46.49	43.31
1134	38.98	43.17
1135	38.69	43.11
1136	46.49	43.14
1137	35.22	43.21
1138	41.29	43.30
1139	54.88	43.33
1140	35.80	43.21
1141	54.01	42.89
1142	48.81	42.36
1143	37.24	41.63
1144	42.45	40.79
1145	48.81	39.90
1146	28.86	39.06
1147	38.98	38.38
1148	30.89	37.96
1149	43.02	37.84
1150	24.24	38.04
1151	20.48	38.57
1152	57.77	39.36

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1153	46.78	40.18
1154	50.54	40.95
1155	46.20	41.65
1156	31.75	42.34
1157	40.42	43.12
1158	34.07	44.01
1159	48.81	45.01
1160	46.49	46.01
1161	34.64	46.95
1162	60.37	47.74
1163	58.63	48.23
1164	55.74	48.36
1165	48.81	48.17
1166	38.69	47.74
1167	53.43	47.20
1168	39.27	46.58
1169	36.38	45.96
1170	45.05	45.35
1171	53.72	44.70
1172	51.12	43.93
1173	53.14	43.06
1174	33.49	42.18
1175	34.35	41.42
1176	37.82	40.89
1177	28.57	40.62
1178	41.29	40.58
1179	43.31	40.68
1180	48.81	40.81
1181	51.41	40.88
1182	30.89	40.88
1183	36.38	40.88
1184	55.16	40.87
1185	51.41	40.84
1186	23.37	40.86
1187	34.35	41.09
1188	43.02	41.57
1189	36.96	42.25
1190	47.36	43.11
1191	49.67	44.07
1192	33.49	45.10
1193	42.45	46.18
1194	47.36	47.23
1195	58.92	48.11
1196	59.50	48.72

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1197	56.90	49.03
1198	40.42	49.10
1199	33.78	49.06
1200	56.90	48.97
1201	53.14	48.79
1202	51.41	48.50
1203	46.49	48.16
1204	50.54	47.81
1205	32.91	47.51
1206	35.80	47.32
1207	55.74	47.17
1208	41.87	46.93
1209	58.34	46.47
1210	51.12	45.69
1211	55.74	44.54
1212	42.74	43.06
1213	53.43	41.38
1214	31.75	39.63
1215	34.07	38.05
1216	28.57	36.80
1217	18.17	36.02
1218	32.04	35.75
1219	48.52	35.88
1220	36.09	36.29
1221	36.09	36.93
1222	35.22	37.76
1223	49.96	38.73
1224	37.24	39.80
1225	30.89	40.99
1226	50.54	42.31
1227	24.53	43.70
1228	49.96	45.11
1229	51.41	46.41
1230	57.48	47.44
1231	56.90	48.12
1232	58.05	48.46
1233	39.56	48.55
1234	37.53	48.55
1235	45.63	48.54
1236	41.58	48.54
1237	51.12	48.49
1238	58.63	48.31
1239	49.09	47.93
1240	30.89	47.35

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1241	64.70	46.58
1242	49.96	45.54
1243	37.82	44.26
1244	51.12	42.80
1245	44.47	41.23
1246	27.71	39.65
1247	41.58	38.16
1248	34.35	36.82
1249	45.92	35.67
1250	36.67	34.77
1251	20.19	34.24
1252	21.06	34.21
1253	47.07	34.69
1254	15.57	35.60
1255	41.00	36.91
1256	36.38	38.46
1257	57.77	40.11
1258	24.82	41.70
1259	61.23	43.19
1260	48.81	44.47
1261	35.51	45.55
1262	63.26	46.44
1263	38.98	47.17
1264	34.07	47.79
1265	47.94	48.37
1266	51.12	48.81
1267	51.70	49.04
1268	61.52	48.99
1269	45.63	48.62
1270	49.38	47.98
1271	44.76	47.14
1272	52.27	46.13
1273	38.98	45.02
1274	36.09	43.89
1275	64.99	42.76
1276	23.37	41.66
1277	53.43	40.69
1278	21.64	39.90
1279	51.70	39.37
1280	22.21	39.10
1281	40.42	39.10
1282	41.00	39.32
1283	48.23	39.65
1284	35.22	40.06

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1285	44.76	40.52
1286	34.07	41.03
1287	51.98	41.58
1288	31.46	42.13
1289	39.85	42.70
1290	71.93	43.24
1291	31.75	43.70
1292	26.84	44.22
1293	62.68	44.86
1294	37.24	45.58
1295	39.56	46.42
1296	34.64	47.38
1297	52.56	48.37
1298	65.86	49.25
1299	45.05	49.86
1300	55.16	50.19
1301	59.21	50.21
1302	54.01	49.95
1303	45.63	49.48
1304	28.86	48.95
1305	61.52	48.41
1306	43.31	47.84
1307	43.60	47.23
1308	41.29	46.58
1309	56.61	45.83
1310	58.05	44.91
1311	39.27	43.84
1312	32.04	42.71
1313	59.79	41.61
1314	50.54	40.57
1315	15.57	39.75
1316	17.59	39.34
1317	39.85	39.38
1318	49.38	39.71
1319	47.94	40.16
1320	41.29	40.65
1321	45.05	41.16
1322	35.80	41.67
1323	38.69	42.21
1324	35.80	42.75
1325	64.12	43.23
1326	43.31	43.57
1327	38.40	43.81
1328	30.60	44.00

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1329	50.25	44.17
1330	51.12	44.23
1331	37.24	44.14
1332	54.59	43.88
1333	53.72	43.43
1334	40.13	42.86
1335	30.31	42.28
1336	36.09	41.82
1337	47.36	41.49
1338	35.51	41.26
1339	56.90	41.14
1340	38.40	41.11
1341	31.17	41.25
1342	36.96	41.62
1343	35.51	42.24
1344	50.25	43.03
1345	49.67	43.88
1346	58.34	44.74
1347	24.82	45.63
1348	43.89	46.62
1349	63.55	47.67
1350	39.85	48.72
1351	50.25	49.78
1352	25.97	50.84
1353	65.57	51.83
1354	64.41	52.56
1355	49.38	52.89
1356	58.92	52.77
1357	56.61	52.18
1358	66.73	51.11
1359	58.63	49.65
1360	35.80	47.98
1361	50.54	46.36
1362	31.46	45.00
1363	32.04	44.08
1364	35.80	43.67
1365	46.78	43.76
1366	41.00	44.26
1367	40.42	45.06
1368	63.26	46.05
1369	29.44	47.12
1370	57.77	48.20
1371	45.34	49.19
1372	61.52	49.98

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1373	54.01	50.51
1374	64.99	50.75
1375	47.07	50.76
1376	25.11	50.70
1377	50.25	50.66
1378	56.90	50.59
1379	51.98	50.38
1380	55.16	49.96
1381	51.70	49.33
1382	32.91	48.47
1383	66.15	47.41
1384	50.25	46.09
1385	46.49	44.55
1386	42.74	42.90
1387	43.89	41.26
1388	31.46	39.78
1389	40.42	38.58
1390	20.48	37.75
1391	33.20	37.36
1392	38.11	37.34
1393	38.69	37.58
1394	39.27	37.99
1395	46.20	38.44
1396	43.31	38.88
1397	40.13	39.28
1398	57.77	39.66
1399	23.37	40.10
1400	29.15	40.75
1401	41.29	41.67
1402	39.85	42.83
1403	36.09	44.15
1404	58.92	45.53
1405	43.02	46.84
1406	60.94	48.01
1407	31.75	48.99
1408	47.65	49.77
1409	62.10	50.26
1410	65.86	50.35
1411	36.38	50.01
1412	62.10	49.32
1413	36.09	48.31
1414	71.93	47.08
1415	31.17	45.66
1416	36.38	44.25

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1417	57.77	42.95
1418	34.93	41.81
1419	32.62	40.98
1420	37.82	40.55
1421	42.45	40.54
1422	38.40	40.96
1423	31.46	41.82
1424	25.68	43.07
1425	47.07	44.60
1426	52.56	46.16
1427	60.37	47.48
1428	71.64	48.39
1429	45.34	48.82
1430	44.18	48.89
1431	48.23	48.72
1432	35.80	48.38
1433	55.16	47.92
1434	59.50	47.33
1435	44.18	46.63
1436	45.63	45.93
1437	34.93	45.35
1438	24.24	44.98
1439	56.03	44.81
1440	47.65	44.70
1441	54.59	44.55
1442	35.51	44.31
1443	58.34	44.00
1444	38.98	43.61
1445	22.79	43.20
1446	51.98	42.79
1447	55.16	42.30
1448	49.38	41.66
1449	29.15	40.94
1450	28.57	40.23
1451	49.38	39.58
1452	44.47	38.92
1453	37.82	38.26
1454	36.09	37.65
1455	25.97	37.15
1456	43.02	36.79
1457	21.35	36.52
1458	54.88	36.32
1459	41.29	36.07
1460	42.16	35.79

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1461	23.95	35.56
1462	38.11	35.49
1463	24.53	35.63
1464	25.39	36.01
1465	32.62	36.57
1466	49.38	37.18
1467	45.63	37.65
1468	37.24	37.91
1469	45.63	37.93
1470	47.07	37.74
1471	25.11	37.39
1472	43.60	37.01
1473	35.22	36.68
1474	31.17	36.48
1475	30.31	36.49
1476	37.24	36.76
1477	34.35	37.27
1478	42.74	38.00
1479	40.42	38.91
1480	18.17	40.00
1481	53.72	41.25
1482	36.96	42.51
1483	38.98	43.69
1484	62.39	44.64
1485	58.63	45.23
1486	51.12	45.45
1487	32.91	45.41
1488	36.09	45.27
1489	45.63	45.10
1490	39.85	44.87
1491	53.43	44.56
1492	51.70	44.12
1493	47.36	43.56
1494	49.96	42.96
1495	19.90	42.44
1496	27.42	42.17
1497	31.75	42.11
1498	60.37	42.11
1499	62.97	41.94
1500	40.13	41.52
1501	42.16	40.91
1502	42.45	40.23
1503	38.40	39.57
1504	35.51	39.08

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1505	41.29	38.86
1506	24.24	39.00
1507	40.13	39.60
1508	21.35	40.64
1509	48.23	42.06
1510	34.35	43.69
1511	44.47	45.33
1512	51.98	46.76
1513	71.64	47.73
1514	66.73	48.06
1515	70.77	47.78
1516	20.19	47.09
1517	22.50	46.35
1518	50.83	45.74
1519	40.42	45.24
1520	55.16	44.82
1521	53.14	44.45
1522	32.91	44.17
1523	42.16	44.08
1524	33.49	44.19
1525	39.27	44.50
1526	47.65	44.92
1527	42.74	45.29
1528	49.67	45.48
1529	64.41	45.34
1530	48.81	44.78
1531	56.32	43.85
1532	31.75	42.67
1533	36.96	41.44
1534	37.97	40.30
1535	28.20	39.32
1536	38.57	38.56
1537	42.40	37.98
1538	29.77	37.54
1539	40.95	37.22
1540	50.23	36.95
1541	42.72	36.70
1542	21.37	36.55
1543	40.50	36.60
1544	33.64	36.88
1545	31.88	37.41
1546	33.22	38.19
1547	39.56	39.16
1548	35.16	40.24

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1549	45.13	41.33
1550	53.14	42.27
1551	37.96	42.99
1552	46.04	43.45
1553	45.94	43.61
1554	44.05	43.44
1555	47.62	42.93
1556	48.20	42.10
1557	52.50	40.99
1558	34.97	39.72
1559	31.22	38.47
1560	29.98	37.43
1561	35.40	36.68
1562	23.24	36.28
1563	34.32	36.21
1564	39.13	36.38
1565	45.51	36.68
1566	37.99	37.01
1567	30.37	37.34
1568	35.53	37.66
1569	41.22	37.89
1570	47.89	37.96
1571	42.71	37.80
1572	44.20	37.45
1573	24.03	36.99
1574	34.70	36.54
1575	39.39	36.13
1576	34.46	35.78
1577	45.26	35.52
1578	32.75	35.38
1579	21.98	35.47
1580	33.24	35.86
1581	36.12	36.52
1582	39.72	37.40
1583	41.11	38.43
1584	37.46	39.56
1585	33.76	40.77
1586	43.81	42.01
1587	41.83	43.18
1588	53.94	44.18
1589	61.95	44.94
1590	32.15	45.44
1591	49.20	45.80
1592	43.27	46.07

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1593	30.79	46.30
1594	56.13	46.51
1595	49.62	46.61
1596	52.88	46.56
1597	57.99	46.39
1598	33.03	46.15
1599	46.05	46.00
1600	37.50	46.00
1601	43.24	46.19
1602	47.45	46.55
1603	51.88	47.02
1604	50.36	47.56
1605	49.93	48.17
1606	44.63	48.85
1607	35.60	49.65
1608	50.15	50.55
1609	49.07	51.43
1610	64.52	52.14
1611	61.21	52.55
1612	54.98	52.61
1613	59.31	52.34
1614	47.74	51.81
1615	39.84	51.15
1616	44.49	50.43
1617	53.43	49.63
1618	59.35	48.70
1619	44.72	47.62
1620	54.22	46.41
1621	49.88	45.15
1622	39.00	43.92
1623	38.50	42.89
1624	37.11	42.14
1625	28.08	41.77
1626	37.27	41.76
1627	49.68	42.01
1628	40.67	42.40
1629	50.61	42.82
1630	53.80	43.18
1631	39.62	43.46
1632	38.60	43.73
1633	40.89	44.01
1634	45.44	44.31
1635	46.81	44.59
1636	50.35	44.82

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1637	41.84	45.01
1638	32.41	45.18
1639	57.10	45.34
1640	58.05	45.43
1641	41.18	45.44
1642	39.45	45.49
1643	44.26	45.65
1644	40.45	45.96
1645	29.52	46.44
1646	54.87	47.02
1647	58.48	47.55
1648	46.91	47.90
1649	50.29	48.04
1650	46.63	47.93
1651	58.88	47.58
1652	43.37	46.96
1653	46.73	46.16
1654	37.16	45.24
1655	58.57	44.23
1656	41.65	43.17
1657	36.19	42.13
1658	31.88	41.24
1659	31.94	40.51
1660	45.06	39.93
1661	47.46	39.38
1662	44.42	38.78
1663	43.66	38.15
1664	30.06	37.54
1665	42.83	37.03
1666	30.41	36.69
1667	34.58	36.59
1668	30.32	36.78
1669	33.60	37.26
1670	37.79	37.99
1671	36.50	38.88
1672	37.66	39.85
1673	50.17	40.79
1674	45.23	41.59
1675	45.46	42.20
1676	33.55	42.62
1677	49.39	42.84
1678	49.33	42.85
1679	39.77	42.63
1680	53.15	42.24

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1681	36.57	41.75
1682	39.40	41.26
1683	42.97	40.89
1684	34.74	40.71
1685	22.33	40.81
1686	43.35	41.20
1687	40.77	41.77
1688	37.51	42.41
1689	60.21	42.97
1690	48.66	43.31
1691	44.09	43.40
1692	50.90	43.28
1693	46.22	43.00
1694	36.86	42.69
1695	40.17	42.47
1696	29.18	42.46
1697	37.93	42.71
1698	38.10	43.19
1699	53.24	43.78
1700	40.33	44.36
1701	60.23	44.85
1702	47.73	45.19
1703	47.61	45.40
1704	34.79	45.57
1705	41.18	45.77
1706	56.53	46.00
1707	35.67	46.24
1708	45.52	46.50
1709	36.32	46.75
1710	68.26	46.92
1711	46.99	46.88
1712	59.23	46.66
1713	52.75	46.31
1714	30.92	46.00
1715	38.76	45.92
1716	32.05	46.18
1717	42.98	46.77
1718	48.65	47.59
1719	30.15	48.48
1720	66.69	49.27
1721	67.38	49.68
1722	55.82	49.57
1723	54.52	48.91
1724	42.53	47.79

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1725	46.13	46.33
1726	55.64	44.60
1727	45.88	42.70
1728	34.94	40.80
1729	20.40	39.10
1730	35.46	37.75
1731	36.06	36.73
1732	43.94	36.02
1733	30.47	35.57
1734	40.25	35.38
1735	29.85	35.44
1736	45.20	35.76
1737	29.57	36.33
1738	33.30	37.19
1739	31.62	38.33
1740	38.15	39.70
1741	39.23	41.21
1742	41.23	42.72
1743	55.70	44.10
1744	37.16	45.20
1745	52.60	45.96
1746	55.04	46.26
1747	70.29	46.06
1748	25.37	45.41
1749	54.58	44.49
1750	36.24	43.43
1751	42.45	42.36
1752	34.23	41.39
1753	39.78	40.60
1754	47.26	40.03
1755	37.43	39.71
1756	31.41	39.72
1757	26.94	40.11
1758	42.80	40.86
1759	47.97	41.86
1760	43.04	42.97
1761	48.79	44.15
1762	53.73	45.31
1763	30.19	46.47
1764	50.81	47.63
1765	49.88	48.73
1766	46.85	49.72
1767	43.12	50.52
1768	53.38	51.05

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1769	44.65	51.18
1770	63.85	50.76
1771	88.11	49.63
1772	57.18	47.76
1773	31.35	45.42
1774	33.96	42.97
1775	28.88	40.68
1776	40.66	38.71
1777	29.91	37.17
1778	36.63	36.10
1779	28.07	35.53
1780	25.94	35.46
1781	31.04	35.84
1782	40.64	36.51
1783	51.41	37.30
1784	51.88	38.06
1785	36.39	38.77
1786	32.28	39.52
1787	40.48	40.39
1788	34.74	41.42
1789	34.01	42.62
1790	39.69	43.94
1791	46.24	45.25
1792	50.21	46.41
1793	67.93	47.25
1794	48.50	47.67
1795	49.42	47.74
1796	38.14	47.53
1797	50.02	47.13
1798	46.79	46.57
1799	41.04	45.90
1800	50.69	45.14
1801	37.09	44.30
1802	41.76	43.42
1803	48.67	42.48
1804	49.92	41.46
1805	42.18	40.38
1806	23.52	39.34
1807	49.55	38.44
1808	35.40	37.69
1809	32.74	37.13
1810	35.31	36.84
1811	32.48	36.81
1812	30.80	37.04

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1813	33.54	37.49
1814	34.74	38.06
1815	44.72	38.59
1816	59.45	38.94
1817	52.61	39.00
1818	27.31	38.84
1819	26.85	38.65
1820	39.48	38.53
1821	52.07	38.48
1822	24.94	38.52
1823	33.27	38.74
1824	37.10	39.14
1825	43.62	39.69
1826	40.51	40.31
1827	41.10	40.96
1828	52.91	41.61
1829	33.06	42.23
1830	41.08	42.87
1831	44.35	43.54
1832	44.70	44.20
1833	46.13	44.83
1834	42.94	45.41
1835	42.93	45.94
1836	39.90	46.38
1837	46.46	46.67
1838	47.96	46.70
1839	58.76	46.35
1840	63.61	45.51
1841	51.74	44.23
1842	36.79	42.65
1843	30.53	41.01
1844	37.62	39.53
1845	39.69	38.29
1846	34.85	37.40
1847	19.00	36.94
1848	37.10	36.96
1849	43.94	37.37
1850	39.83	38.10
1851	24.73	39.08
1852	48.05	40.28
1853	33.23	41.56
1854	40.94	42.82
1855	55.74	43.89
1856	55.53	44.61

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1857	52.65	44.90
1858	52.72	44.81
1859	38.38	44.44
1860	47.53	43.96
1861	22.05	43.51
1862	48.98	43.21
1863	39.07	43.07
1864	34.34	43.07
1865	42.77	43.19
1866	39.29	43.32
1867	49.21	43.35
1868	53.15	43.12
1869	62.77	42.56
1870	37.86	41.66
1871	33.80	40.60
1872	38.94	39.52
1873	33.56	38.53
1874	40.31	37.70
1875	33.58	37.08
1876	28.36	36.73
1877	45.99	36.68
1878	37.86	36.88
1879	32.70	37.38
1880	24.77	38.21
1881	29.84	39.36
1882	48.10	40.71
1883	39.31	42.05
1884	57.86	43.23
1885	51.42	44.11
1886	47.21	44.62
1887	35.67	44.81
1888	53.16	44.71
1889	43.58	44.34
1890	37.00	43.72
1891	51.22	42.91
1892	47.49	41.90
1893	33.19	40.76
1894	36.99	39.59
1895	47.94	38.43
1896	19.02	37.34
1897	55.30	36.37
1898	48.81	35.52
1899	17.76	34.90
1900	22.80	34.70

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1901	38.11	35.03
1902	19.75	35.86
1903	45.80	37.16
1904	18.23	38.81
1905	49.45	40.68
1906	50.30	42.55
1907	62.57	44.21
1908	52.09	45.57
1909	37.12	46.68
1910	41.84	47.62
1911	57.25	48.44
1912	56.27	49.14
1913	28.80	49.78
1914	48.60	50.43
1915	58.06	51.07
1916	52.99	51.60
1917	43.93	52.01
1918	43.93	52.26
1919	65.28	52.27
1920	68.24	51.90
1921	60.48	51.11
1922	45.64	50.01
1923	41.58	48.78
1924	52.11	47.59
1925	29.80	46.55
1926	51.92	45.76
1927	46.45	45.24
1928	40.66	45.01
1929	35.34	45.12
1930	48.17	45.55
1931	38.47	46.24
1932	56.02	47.11
1933	48.15	48.05
1934	43.82	48.98
1935	58.45	49.85
1936	43.48	50.58
1937	67.13	51.12
1938	52.29	51.41
1939	36.24	51.52
1940	41.59	51.47
1941	64.77	51.22
1942	61.61	50.63
1943	43.98	49.65
1944	56.77	48.34

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1945	49.41	46.72
1946	32.94	44.90
1947	41.18	42.96
1948	52.90	40.93
1949	49.32	38.83
1950	28.66	36.75
1951	25.35	34.88
1952	35.54	33.33
1953	27.95	32.18
1954	31.54	31.46
1955	29.13	31.19
1956	16.82	31.40
1957	33.61	32.06
1958	42.65	33.05
1959	27.56	34.26
1960	37.91	35.62
1961	42.69	37.04
1962	43.92	38.46
1963	37.96	39.85
1964	29.33	41.22
1965	52.15	42.57
1966	41.77	43.83
1967	36.75	44.97
1968	55.48	45.95
1969	48.95	46.69
1970	62.49	47.14
1971	34.17	47.35
1972	46.33	47.41
1973	62.88	47.36
1974	37.55	47.26
1975	53.22	47.22
1976	28.93	47.33
1977	35.69	47.70
1978	61.37	48.27
1979	60.01	48.92
1980	52.14	49.60
1981	34.59	50.38
1982	41.17	51.31
1983	48.79	52.34
1984	47.75	53.33
1985	66.94	54.07
1986	74.04	54.35
1987	67.52	54.05
1988	55.09	53.23

Year	Annual Reconstructed Precipitation	20 Year Spline Reconstructed Precipitation
1989	32.36	52.07
1990	44.47	50.76
1991	56.29	49.35
1992	49.42	47.81
1993	39.22	46.18
1994	51.11	44.48
1995	48.60	42.72
1996	17.29	40.94
1997	49.77	39.20
1998	26.63	37.42
1999	53.45	35.55
2000	33.07	33.49
2001	40.33	31.27
2002	15.81	28.93

APPENDIX J
SPLINED Z-SCORE VALUES FOR BOTH RECONSTRUCTIONS

Ronald H. Towner

Table J.1. Splined Z-Score Values for Both Reconstructions.

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
760	-0.05	-1.06
761	0.06	-0.77
762	0.20	-0.49
763	0.32	-0.22
764	0.41	0.04
765	0.47	0.27
766	0.47	0.45
767	0.40	0.56
768	0.27	0.62
769	0.10	0.62
770	-0.10	0.61
771	-0.29	0.60
772	-0.48	0.62
773	-0.66	0.67
774	-0.80	0.74
775	-0.89	0.83
776	-0.97	0.88
777	-1.05	0.87
778	-1.13	0.81
779	-1.19	0.71
780	-1.23	0.60
781	-1.24	0.48
782	-1.21	0.37
783	-1.14	0.30
784	-1.03	0.27
785	-0.92	0.26
786	-0.82	0.26
787	-0.74	0.28
788	-0.70	0.28
789	-0.67	0.27
790	-0.62	0.24
791	-0.53	0.18
792	-0.41	0.08
793	-0.26	-0.05
794	-0.07	-0.20
795	0.18	-0.33
796	0.48	-0.43
797	0.81	-0.50
798	1.15	-0.51
799	1.46	-0.50
800	1.69	-0.48
801	1.79	-0.45

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
802	1.75	-0.44
803	1.57	-0.45
804	1.30	-0.50
805	0.96	-0.56
806	0.61	-0.61
807	0.26	-0.65
808	-0.01	-0.64
809	-0.19	-0.59
810	-0.26	-0.48
811	-0.25	-0.37
812	-0.19	-0.27
813	-0.12	-0.22
814	-0.09	-0.26
815	-0.11	-0.36
816	-0.19	-0.49
817	-0.30	-0.61
818	-0.40	-0.68
819	-0.47	-0.71
820	-0.49	-0.71
821	-0.48	-0.73
822	-0.44	-0.79
823	-0.36	-0.85
824	-0.22	-0.88
825	-0.02	-0.88
826	0.18	-0.82
827	0.34	-0.75
828	0.43	-0.66
829	0.45	-0.57
830	0.40	-0.49
831	0.30	-0.41
832	0.16	-0.34
833	0.00	-0.25
834	-0.16	-0.15
835	-0.30	-0.01
836	-0.40	0.15
837	-0.45	0.31
838	-0.45	0.47
839	-0.42	0.62
840	-0.38	0.78
841	-0.32	0.94
842	-0.28	1.07
843	-0.26	1.15
844	-0.26	1.15
845	-0.27	1.07

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
846	-0.25	0.97
847	-0.18	0.89
848	-0.05	0.87
849	0.15	0.92
850	0.40	1.04
851	0.72	1.22
852	1.08	1.43
853	1.45	1.65
854	1.78	1.84
855	2.04	1.97
856	2.22	2.02
857	2.31	1.99
858	2.30	1.89
859	2.20	1.69
860	2.02	1.41
861	1.76	1.06
862	1.48	0.68
863	1.19	0.28
864	0.90	-0.10
865	0.63	-0.43
866	0.39	-0.72
867	0.16	-0.91
868	-0.01	-1.00
869	-0.12	-0.96
870	-0.18	-0.84
871	-0.18	-0.67
872	-0.15	-0.47
873	-0.13	-0.26
874	-0.13	-0.05
875	-0.14	0.14
876	-0.13	0.32
877	-0.12	0.46
878	-0.09	0.61
879	-0.03	0.77
880	0.04	0.94
881	0.13	1.12
882	0.23	1.30
883	0.37	1.48
884	0.51	1.67
885	0.65	1.85
886	0.75	1.98
887	0.77	2.00
888	0.70	1.90
889	0.53	1.66

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
890	0.28	1.33
891	-0.04	0.93
892	-0.36	0.54
893	-0.67	0.16
894	-0.96	-0.19
895	-1.24	-0.48
896	-1.49	-0.70
897	-1.73	-0.86
898	-1.92	-0.97
899	-2.06	-1.04
900	-2.14	-1.09
901	-2.14	-1.13
902	-2.08	-1.15
903	-1.98	-1.15
904	-1.86	-1.13
905	-1.74	-1.09
906	-1.60	-1.03
907	-1.42	-0.92
908	-1.19	-0.74
909	-0.95	-0.53
910	-0.70	-0.29
911	-0.45	-0.04
912	-0.19	0.23
913	0.08	0.52
914	0.35	0.80
915	0.58	1.04
916	0.76	1.21
917	0.84	1.28
918	0.81	1.22
919	0.70	1.03
920	0.52	0.75
921	0.30	0.42
922	0.09	0.08
923	-0.07	-0.22
924	-0.18	-0.43
925	-0.23	-0.55
926	-0.22	-0.61
927	-0.18	-0.63
928	-0.10	-0.63
929	0.01	-0.64
930	0.14	-0.67
931	0.29	-0.72
932	0.45	-0.78
933	0.60	-0.85

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
934	0.73	-0.95
935	0.84	-1.05
936	0.92	-1.14
937	0.98	-1.20
938	1.03	-1.23
939	1.08	-1.22
940	1.11	-1.16
941	1.13	-1.04
942	1.11	-0.87
943	1.07	-0.65
944	1.02	-0.40
945	0.96	-0.15
946	0.85	0.09
947	0.68	0.28
948	0.45	0.40
949	0.18	0.43
950	-0.13	0.37
951	-0.42	0.23
952	-0.66	0.06
953	-0.81	-0.11
954	-0.86	-0.23
955	-0.81	-0.27
956	-0.68	-0.25
957	-0.51	-0.17
958	-0.31	-0.05
959	-0.08	0.09
960	0.17	0.22
961	0.41	0.34
962	0.65	0.43
963	0.86	0.49
964	1.03	0.52
965	1.16	0.54
966	1.22	0.52
967	1.19	0.46
968	1.04	0.34
969	0.80	0.18
970	0.50	-0.03
971	0.17	-0.28
972	-0.17	-0.55
973	-0.47	-0.82
974	-0.72	-1.09
975	-0.88	-1.34
976	-0.97	-1.54
977	-0.99	-1.69

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
978	-0.97	-1.80
979	-0.90	-1.82
980	-0.77	-1.73
981	-0.57	-1.50
982	-0.29	-1.13
983	0.04	-0.66
984	0.42	-0.14
985	0.81	0.38
986	1.15	0.84
987	1.40	1.19
988	1.52	1.39
989	1.53	1.43
990	1.44	1.34
991	1.33	1.17
992	1.24	0.96
993	1.18	0.76
994	1.13	0.60
995	1.04	0.46
996	0.86	0.34
997	0.58	0.20
998	0.22	0.03
999	-0.17	-0.15
1000	-0.54	-0.35
1001	-0.86	-0.55
1002	-1.09	-0.74
1003	-1.23	-0.91
1004	-1.30	-1.06
1005	-1.30	-1.17
1006	-1.25	-1.24
1007	-1.19	-1.29
1008	-1.15	-1.35
1009	-1.13	-1.43
1010	-1.11	-1.51
1011	-1.05	-1.56
1012	-0.97	-1.56
1013	-0.87	-1.47
1014	-0.76	-1.26
1015	-0.61	-0.94
1016	-0.47	-0.54
1017	-0.32	-0.08
1018	-0.15	0.40
1019	0.06	0.90
1020	0.31	1.42
1021	0.60	1.94

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1022	0.91	2.43
1023	1.21	2.86
1024	1.48	3.17
1025	1.65	3.34
1026	1.72	3.36
1027	1.66	3.23
1028	1.51	2.98
1029	1.28	2.62
1030	1.00	2.18
1031	0.70	1.70
1032	0.41	1.21
1033	0.12	0.74
1034	-0.15	0.30
1035	-0.37	-0.08
1036	-0.54	-0.37
1037	-0.67	-0.58
1038	-0.80	-0.74
1039	-0.93	-0.88
1040	-1.07	-1.03
1041	-1.20	-1.18
1042	-1.31	-1.34
1043	-1.40	-1.49
1044	-1.44	-1.61
1045	-1.43	-1.65
1046	-1.34	-1.60
1047	-1.19	-1.45
1048	-0.98	-1.19
1049	-0.71	-0.83
1050	-0.41	-0.39
1051	-0.10	0.07
1052	0.18	0.52
1053	0.42	0.91
1054	0.60	1.24
1055	0.74	1.48
1056	0.85	1.65
1057	0.95	1.75
1058	1.05	1.82
1059	1.16	1.86
1060	1.27	1.88
1061	1.37	1.88
1062	1.44	1.84
1063	1.46	1.75
1064	1.40	1.60
1065	1.24	1.36

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1066	1.01	1.04
1067	0.73	0.70
1068	0.46	0.40
1069	0.25	0.19
1070	0.10	0.08
1071	-0.01	0.04
1072	-0.08	0.04
1073	-0.12	0.07
1074	-0.14	0.10
1075	-0.12	0.12
1076	-0.08	0.09
1077	-0.04	0.02
1078	-0.01	-0.10
1079	-0.01	-0.28
1080	-0.03	-0.50
1081	-0.07	-0.77
1082	-0.13	-1.06
1083	-0.23	-1.35
1084	-0.35	-1.62
1085	-0.46	-1.85
1086	-0.56	-2.03
1087	-0.66	-2.16
1088	-0.76	-2.25
1089	-0.87	-2.30
1090	-0.99	-2.30
1091	-1.07	-2.24
1092	-1.10	-2.12
1093	-1.12	-1.96
1094	-1.11	-1.75
1095	-1.10	-1.52
1096	-1.08	-1.29
1097	-1.03	-1.07
1098	-0.93	-0.85
1099	-0.76	-0.62
1100	-0.52	-0.38
1101	-0.23	-0.12
1102	0.04	0.15
1103	0.27	0.41
1104	0.46	0.65
1105	0.60	0.89
1106	0.70	1.12
1107	0.78	1.33
1108	0.85	1.52
1109	0.91	1.67

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1110	0.95	1.75
1111	0.96	1.76
1112	0.95	1.71
1113	0.93	1.58
1114	0.93	1.41
1115	0.95	1.21
1116	0.99	1.00
1117	1.02	0.79
1118	1.02	0.57
1119	0.98	0.35
1120	0.90	0.15
1121	0.81	-0.01
1122	0.71	-0.12
1123	0.60	-0.17
1124	0.48	-0.16
1125	0.35	-0.13
1126	0.19	-0.07
1127	0.00	0.01
1128	-0.22	0.09
1129	-0.47	0.13
1130	-0.76	0.12
1131	-1.04	0.07
1132	-1.30	0.02
1133	-1.51	-0.03
1134	-1.66	-0.06
1135	-1.75	-0.07
1136	-1.77	-0.06
1137	-1.73	-0.05
1138	-1.63	-0.03
1139	-1.49	-0.02
1140	-1.33	-0.05
1141	-1.14	-0.12
1142	-0.98	-0.23
1143	-0.85	-0.38
1144	-0.75	-0.56
1145	-0.67	-0.75
1146	-0.62	-0.92
1147	-0.57	-1.07
1148	-0.51	-1.16
1149	-0.43	-1.18
1150	-0.33	-1.14
1151	-0.19	-1.03
1152	-0.02	-0.86
1153	0.11	-0.69

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1154	0.20	-0.52
1155	0.23	-0.38
1156	0.25	-0.23
1157	0.30	-0.07
1158	0.42	0.12
1159	0.61	0.33
1160	0.81	0.54
1161	1.00	0.74
1162	1.15	0.91
1163	1.21	1.01
1164	1.18	1.04
1165	1.07	1.00
1166	0.93	0.91
1167	0.78	0.79
1168	0.63	0.66
1169	0.50	0.53
1170	0.39	0.40
1171	0.30	0.27
1172	0.20	0.10
1173	0.11	-0.08
1174	0.04	-0.27
1175	0.01	-0.43
1176	0.00	-0.54
1177	0.03	-0.60
1178	0.09	-0.60
1179	0.14	-0.58
1180	0.17	-0.56
1181	0.16	-0.54
1182	0.11	-0.54
1183	0.04	-0.54
1184	-0.07	-0.54
1185	-0.20	-0.55
1186	-0.34	-0.54
1187	-0.46	-0.50
1188	-0.52	-0.40
1189	-0.53	-0.25
1190	-0.49	-0.07
1191	-0.42	0.13
1192	-0.32	0.35
1193	-0.18	0.58
1194	0.00	0.80
1195	0.20	0.99
1196	0.41	1.11
1197	0.64	1.18

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1198	0.88	1.19
1199	1.11	1.19
1200	1.32	1.17
1201	1.46	1.13
1202	1.51	1.07
1203	1.47	1.00
1204	1.37	0.92
1205	1.23	0.86
1206	1.08	0.82
1207	0.93	0.79
1208	0.75	0.74
1209	0.53	0.64
1210	0.26	0.47
1211	-0.08	0.23
1212	-0.47	-0.08
1213	-0.90	-0.44
1214	-1.32	-0.80
1215	-1.71	-1.14
1216	-2.04	-1.40
1217	-2.26	-1.57
1218	-2.39	-1.62
1219	-2.41	-1.60
1220	-2.37	-1.51
1221	-2.24	-1.37
1222	-2.04	-1.20
1223	-1.77	-0.99
1224	-1.45	-0.77
1225	-1.07	-0.52
1226	-0.65	-0.24
1227	-0.20	0.05
1228	0.26	0.35
1229	0.69	0.63
1230	1.05	0.84
1231	1.32	0.99
1232	1.52	1.06
1233	1.66	1.08
1234	1.76	1.08
1235	1.82	1.08
1236	1.84	1.08
1237	1.83	1.07
1238	1.78	1.03
1239	1.72	0.95
1240	1.65	0.83
1241	1.55	0.66

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1242	1.40	0.44
1243	1.17	0.17
1244	0.85	-0.13
1245	0.45	-0.47
1246	-0.01	-0.80
1247	-0.48	-1.11
1248	-0.93	-1.40
1249	-1.35	-1.64
1250	-1.70	-1.83
1251	-1.97	-1.94
1252	-2.15	-1.95
1253	-2.22	-1.85
1254	-2.21	-1.65
1255	-2.11	-1.38
1256	-1.95	-1.05
1257	-1.74	-0.70
1258	-1.49	-0.37
1259	-1.21	-0.05
1260	-0.93	0.22
1261	-0.64	0.44
1262	-0.36	0.63
1263	-0.08	0.79
1264	0.19	0.92
1265	0.43	1.04
1266	0.63	1.13
1267	0.75	1.18
1268	0.77	1.17
1269	0.68	1.09
1270	0.50	0.96
1271	0.26	0.78
1272	0.00	0.57
1273	-0.28	0.33
1274	-0.55	0.10
1275	-0.80	-0.14
1276	-1.02	-0.38
1277	-1.19	-0.58
1278	-1.30	-0.75
1279	-1.34	-0.86
1280	-1.32	-0.92
1281	-1.25	-0.91
1282	-1.15	-0.87
1283	-1.03	-0.80
1284	-0.89	-0.71
1285	-0.75	-0.62

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1286	-0.59	-0.51
1287	-0.42	-0.39
1288	-0.24	-0.28
1289	-0.05	-0.16
1290	0.12	-0.04
1291	0.28	0.06
1292	0.45	0.16
1293	0.62	0.30
1294	0.80	0.45
1295	0.99	0.63
1296	1.18	0.83
1297	1.35	1.04
1298	1.47	1.22
1299	1.52	1.35
1300	1.49	1.42
1301	1.39	1.43
1302	1.23	1.37
1303	1.04	1.27
1304	0.85	1.16
1305	0.68	1.05
1306	0.55	0.93
1307	0.47	0.80
1308	0.43	0.66
1309	0.42	0.50
1310	0.40	0.31
1311	0.38	0.08
1312	0.36	-0.15
1313	0.34	-0.39
1314	0.32	-0.60
1315	0.32	-0.78
1316	0.36	-0.86
1317	0.45	-0.86
1318	0.55	-0.79
1319	0.64	-0.69
1320	0.69	-0.59
1321	0.71	-0.48
1322	0.71	-0.37
1323	0.70	-0.26
1324	0.71	-0.15
1325	0.72	-0.04
1326	0.74	0.03
1327	0.76	0.08
1328	0.80	0.12
1329	0.83	0.15

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1330	0.84	0.17
1331	0.79	0.15
1332	0.68	0.09
1333	0.48	0.00
1334	0.21	-0.12
1335	-0.11	-0.24
1336	-0.43	-0.34
1337	-0.71	-0.41
1338	-0.92	-0.46
1339	-1.04	-0.49
1340	-1.08	-0.49
1341	-1.04	-0.46
1342	-0.94	-0.38
1343	-0.79	-0.25
1344	-0.63	-0.09
1345	-0.48	0.09
1346	-0.34	0.28
1347	-0.22	0.46
1348	-0.08	0.67
1349	0.06	0.89
1350	0.21	1.11
1351	0.34	1.34
1352	0.47	1.56
1353	0.59	1.77
1354	0.69	1.92
1355	0.75	1.99
1356	0.79	1.97
1357	0.80	1.84
1358	0.77	1.62
1359	0.68	1.31
1360	0.55	0.96
1361	0.40	0.62
1362	0.26	0.33
1363	0.16	0.13
1364	0.12	0.05
1365	0.12	0.07
1366	0.15	0.17
1367	0.19	0.34
1368	0.23	0.55
1369	0.25	0.78
1370	0.26	1.00
1371	0.25	1.21
1372	0.20	1.38
1373	0.11	1.49

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1374	-0.01	1.54
1375	-0.12	1.54
1376	-0.19	1.53
1377	-0.20	1.52
1378	-0.14	1.51
1379	-0.04	1.46
1380	0.10	1.38
1381	0.26	1.24
1382	0.43	1.06
1383	0.58	0.84
1384	0.68	0.56
1385	0.73	0.23
1386	0.70	-0.11
1387	0.62	-0.46
1388	0.49	-0.77
1389	0.36	-1.03
1390	0.23	-1.20
1391	0.12	-1.28
1392	0.04	-1.29
1393	-0.05	-1.24
1394	-0.17	-1.15
1395	-0.31	-1.05
1396	-0.47	-0.96
1397	-0.62	-0.88
1398	-0.74	-0.80
1399	-0.81	-0.71
1400	-0.81	-0.57
1401	-0.73	-0.37
1402	-0.60	-0.13
1403	-0.44	0.15
1404	-0.28	0.44
1405	-0.13	0.72
1406	-0.01	0.96
1407	0.09	1.17
1408	0.15	1.34
1409	0.14	1.44
1410	0.05	1.46
1411	-0.13	1.39
1412	-0.39	1.24
1413	-0.69	1.03
1414	-1.03	0.77
1415	-1.39	0.47
1416	-1.72	0.17
1417	-2.00	-0.10

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1418	-2.22	-0.34
1419	-2.35	-0.52
1420	-2.37	-0.61
1421	-2.28	-0.61
1422	-2.08	-0.52
1423	-1.77	-0.34
1424	-1.37	-0.08
1425	-0.89	0.24
1426	-0.40	0.57
1427	0.06	0.85
1428	0.46	1.04
1429	0.78	1.14
1430	1.03	1.15
1431	1.21	1.11
1432	1.33	1.04
1433	1.39	0.95
1434	1.38	0.82
1435	1.32	0.67
1436	1.22	0.53
1437	1.11	0.40
1438	1.01	0.33
1439	0.93	0.29
1440	0.87	0.27
1441	0.81	0.23
1442	0.73	0.18
1443	0.64	0.12
1444	0.54	0.03
1445	0.44	-0.05
1446	0.34	-0.14
1447	0.23	-0.24
1448	0.11	-0.38
1449	-0.01	-0.53
1450	-0.11	-0.68
1451	-0.19	-0.82
1452	-0.27	-0.95
1453	-0.36	-1.09
1454	-0.47	-1.22
1455	-0.59	-1.33
1456	-0.69	-1.40
1457	-0.78	-1.46
1458	-0.84	-1.50
1459	-0.87	-1.55
1460	-0.87	-1.61
1461	-0.81	-1.66

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1462	-0.70	-1.68
1463	-0.55	-1.65
1464	-0.38	-1.57
1465	-0.23	-1.45
1466	-0.14	-1.32
1467	-0.14	-1.22
1468	-0.23	-1.17
1469	-0.41	-1.16
1470	-0.62	-1.20
1471	-0.82	-1.28
1472	-0.97	-1.36
1473	-1.05	-1.43
1474	-1.06	-1.47
1475	-0.99	-1.47
1476	-0.85	-1.41
1477	-0.66	-1.30
1478	-0.44	-1.15
1479	-0.19	-0.96
1480	0.07	-0.73
1481	0.37	-0.46
1482	0.67	-0.20
1483	0.94	0.05
1484	1.17	0.25
1485	1.31	0.38
1486	1.36	0.42
1487	1.34	0.42
1488	1.26	0.39
1489	1.15	0.35
1490	1.01	0.30
1491	0.85	0.24
1492	0.69	0.14
1493	0.53	0.03
1494	0.37	-0.10
1495	0.25	-0.21
1496	0.15	-0.27
1497	0.07	-0.28
1498	0.00	-0.28
1499	-0.09	-0.32
1500	-0.19	-0.41
1501	-0.26	-0.53
1502	-0.30	-0.68
1503	-0.29	-0.82
1504	-0.24	-0.92
1505	-0.14	-0.97

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1506	0.03	-0.94
1507	0.25	-0.81
1508	0.50	-0.59
1509	0.76	-0.29
1510	1.00	0.05
1511	1.19	0.40
1512	1.30	0.70
1513	1.32	0.90
1514	1.23	0.98
1515	1.06	0.91
1516	0.85	0.77
1517	0.65	0.61
1518	0.46	0.49
1519	0.24	0.38
1520	-0.04	0.29
1521	-0.36	0.21
1522	-0.69	0.15
1523	-0.97	0.13
1524	-1.16	0.16
1525	-1.25	0.22
1526	-1.24	0.31
1527	-1.15	0.39
1528	-1.00	0.43
1529	-0.80	0.40
1530	-0.56	0.28
1531	-0.29	0.09
1532	0.01	-0.16
1533	0.32	-0.42
1534	0.65	-0.66
1535	0.98	-0.87
1536	1.29	-1.03
1537	1.57	-1.15
1538	1.77	-1.24
1539	1.89	-1.31
1540	1.88	-1.37
1541	1.72	-1.42
1542	1.43	-1.45
1543	1.08	-1.44
1544	0.68	-1.38
1545	0.31	-1.27
1546	-0.02	-1.11
1547	-0.27	-0.90
1548	-0.45	-0.67
1549	-0.54	-0.45

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1550	-0.56	-0.25
1551	-0.55	-0.09
1552	-0.51	0.00
1553	-0.47	0.04
1554	-0.45	0.00
1555	-0.46	-0.11
1556	-0.51	-0.28
1557	-0.60	-0.52
1558	-0.72	-0.79
1559	-0.83	-1.05
1560	-0.90	-1.27
1561	-0.90	-1.43
1562	-0.80	-1.51
1563	-0.62	-1.53
1564	-0.36	-1.49
1565	-0.08	-1.43
1566	0.19	-1.36
1567	0.44	-1.29
1568	0.65	-1.22
1569	0.79	-1.17
1570	0.82	-1.16
1571	0.74	-1.19
1572	0.57	-1.26
1573	0.34	-1.36
1574	0.07	-1.46
1575	-0.24	-1.54
1576	-0.59	-1.62
1577	-0.97	-1.67
1578	-1.40	-1.70
1579	-1.83	-1.68
1580	-2.22	-1.60
1581	-2.51	-1.46
1582	-2.72	-1.27
1583	-2.82	-1.06
1584	-2.82	-0.82
1585	-2.73	-0.56
1586	-2.56	-0.30
1587	-2.33	-0.06
1588	-2.05	0.16
1589	-1.73	0.32
1590	-1.36	0.42
1591	-0.91	0.50
1592	-0.39	0.56
1593	0.17	0.60

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1594	0.72	0.65
1595	1.19	0.67
1596	1.51	0.66
1597	1.66	0.62
1598	1.65	0.57
1599	1.55	0.54
1600	1.40	0.54
1601	1.27	0.58
1602	1.20	0.66
1603	1.20	0.76
1604	1.26	0.87
1605	1.40	1.00
1606	1.58	1.14
1607	1.80	1.31
1608	2.02	1.50
1609	2.20	1.69
1610	2.31	1.84
1611	2.30	1.92
1612	2.18	1.93
1613	1.99	1.88
1614	1.76	1.77
1615	1.54	1.63
1616	1.35	1.47
1617	1.19	1.31
1618	1.04	1.11
1619	0.89	0.88
1620	0.73	0.63
1621	0.55	0.36
1622	0.35	0.10
1623	0.15	-0.12
1624	-0.03	-0.27
1625	-0.14	-0.35
1626	-0.19	-0.36
1627	-0.19	-0.30
1628	-0.17	-0.22
1629	-0.16	-0.13
1630	-0.16	-0.06
1631	-0.18	0.00
1632	-0.20	0.06
1633	-0.20	0.12
1634	-0.21	0.18
1635	-0.23	0.24
1636	-0.26	0.29
1637	-0.29	0.33

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1638	-0.31	0.37
1639	-0.30	0.40
1640	-0.27	0.42
1641	-0.24	0.42
1642	-0.19	0.43
1643	-0.13	0.47
1644	-0.07	0.53
1645	0.00	0.63
1646	0.10	0.76
1647	0.22	0.87
1648	0.35	0.94
1649	0.52	0.97
1650	0.68	0.95
1651	0.81	0.87
1652	0.87	0.74
1653	0.84	0.57
1654	0.72	0.38
1655	0.55	0.17
1656	0.34	-0.06
1657	0.11	-0.28
1658	-0.13	-0.46
1659	-0.34	-0.62
1660	-0.53	-0.74
1661	-0.70	-0.86
1662	-0.85	-0.98
1663	-1.00	-1.12
1664	-1.12	-1.25
1665	-1.21	-1.35
1666	-1.27	-1.42
1667	-1.27	-1.44
1668	-1.21	-1.40
1669	-1.10	-1.30
1670	-0.95	-1.15
1671	-0.77	-0.96
1672	-0.58	-0.76
1673	-0.38	-0.56
1674	-0.21	-0.39
1675	-0.06	-0.26
1676	0.06	-0.17
1677	0.16	-0.13
1678	0.22	-0.13
1679	0.25	-0.17
1680	0.25	-0.25
1681	0.23	-0.36

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1682	0.22	-0.46
1683	0.22	-0.54
1684	0.24	-0.58
1685	0.31	-0.56
1686	0.43	-0.47
1687	0.58	-0.35
1688	0.73	-0.22
1689	0.87	-0.10
1690	0.97	-0.03
1691	1.03	-0.01
1692	1.05	-0.03
1693	1.02	-0.09
1694	0.96	-0.16
1695	0.88	-0.20
1696	0.80	-0.21
1697	0.74	-0.15
1698	0.68	-0.05
1699	0.62	0.07
1700	0.54	0.19
1701	0.45	0.30
1702	0.35	0.37
1703	0.25	0.41
1704	0.18	0.45
1705	0.14	0.49
1706	0.12	0.54
1707	0.11	0.59
1708	0.08	0.65
1709	0.04	0.70
1710	-0.02	0.73
1711	-0.09	0.73
1712	-0.16	0.68
1713	-0.23	0.61
1714	-0.28	0.54
1715	-0.29	0.52
1716	-0.23	0.58
1717	-0.12	0.70
1718	0.04	0.87
1719	0.24	1.06
1720	0.45	1.23
1721	0.62	1.32
1722	0.72	1.29
1723	0.73	1.15
1724	0.65	0.92
1725	0.48	0.61

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1726	0.22	0.24
1727	-0.11	-0.16
1728	-0.47	-0.56
1729	-0.84	-0.92
1730	-1.18	-1.20
1731	-1.46	-1.41
1732	-1.70	-1.57
1733	-1.87	-1.66
1734	-1.98	-1.70
1735	-2.02	-1.69
1736	-2.00	-1.62
1737	-1.90	-1.50
1738	-1.73	-1.32
1739	-1.49	-1.08
1740	-1.19	-0.79
1741	-0.86	-0.47
1742	-0.53	-0.15
1743	-0.23	0.14
1744	0.01	0.37
1745	0.15	0.53
1746	0.18	0.60
1747	0.10	0.55
1748	-0.08	0.42
1749	-0.29	0.22
1750	-0.51	0.00
1751	-0.72	-0.23
1752	-0.90	-0.43
1753	-1.02	-0.60
1754	-1.08	-0.72
1755	-1.09	-0.79
1756	-1.03	-0.78
1757	-0.90	-0.70
1758	-0.70	-0.54
1759	-0.46	-0.33
1760	-0.20	-0.10
1761	0.07	0.15
1762	0.31	0.40
1763	0.54	0.64
1764	0.75	0.88
1765	0.94	1.12
1766	1.06	1.32
1767	1.09	1.49
1768	1.02	1.61
1769	0.85	1.63

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1770	0.59	1.54
1771	0.23	1.31
1772	-0.19	0.91
1773	-0.62	0.42
1774	-1.02	-0.10
1775	-1.35	-0.58
1776	-1.62	-1.00
1777	-1.80	-1.32
1778	-1.89	-1.55
1779	-1.89	-1.67
1780	-1.78	-1.68
1781	-1.56	-1.60
1782	-1.26	-1.46
1783	-0.90	-1.30
1784	-0.54	-1.14
1785	-0.19	-0.99
1786	0.14	-0.83
1787	0.45	-0.64
1788	0.72	-0.43
1789	0.96	-0.17
1790	1.16	0.10
1791	1.28	0.38
1792	1.33	0.63
1793	1.29	0.80
1794	1.16	0.89
1795	0.95	0.91
1796	0.69	0.86
1797	0.40	0.78
1798	0.12	0.66
1799	-0.15	0.52
1800	-0.39	0.36
1801	-0.58	0.18
1802	-0.71	0.00
1803	-0.79	-0.20
1804	-0.81	-0.42
1805	-0.81	-0.65
1806	-0.76	-0.86
1807	-0.68	-1.05
1808	-0.58	-1.21
1809	-0.48	-1.33
1810	-0.38	-1.39
1811	-0.30	-1.40
1812	-0.25	-1.35
1813	-0.22	-1.25

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1814	-0.24	-1.14
1815	-0.31	-1.02
1816	-0.45	-0.95
1817	-0.66	-0.94
1818	-0.90	-0.97
1819	-1.12	-1.01
1820	-1.30	-1.04
1821	-1.43	-1.05
1822	-1.50	-1.04
1823	-1.47	-0.99
1824	-1.36	-0.91
1825	-1.18	-0.79
1826	-0.94	-0.66
1827	-0.67	-0.52
1828	-0.39	-0.39
1829	-0.11	-0.26
1830	0.16	-0.12
1831	0.43	0.02
1832	0.68	0.16
1833	0.91	0.29
1834	1.10	0.42
1835	1.25	0.53
1836	1.36	0.62
1837	1.45	0.68
1838	1.48	0.69
1839	1.44	0.61
1840	1.32	0.44
1841	1.11	0.17
1842	0.84	-0.17
1843	0.54	-0.51
1844	0.25	-0.83
1845	-0.01	-1.09
1846	-0.23	-1.27
1847	-0.38	-1.37
1848	-0.46	-1.37
1849	-0.48	-1.28
1850	-0.46	-1.13
1851	-0.41	-0.92
1852	-0.34	-0.67
1853	-0.28	-0.40
1854	-0.24	-0.13
1855	-0.24	0.09
1856	-0.30	0.25
1857	-0.41	0.31

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1858	-0.56	0.29
1859	-0.72	0.21
1860	-0.85	0.11
1861	-0.89	0.01
1862	-0.81	-0.05
1863	-0.63	-0.08
1864	-0.35	-0.08
1865	-0.01	-0.05
1866	0.33	-0.02
1867	0.63	-0.02
1868	0.83	-0.07
1869	0.91	-0.19
1870	0.87	-0.37
1871	0.73	-0.60
1872	0.51	-0.83
1873	0.25	-1.04
1874	-0.02	-1.21
1875	-0.28	-1.34
1876	-0.50	-1.41
1877	-0.69	-1.43
1878	-0.83	-1.38
1879	-0.90	-1.28
1880	-0.90	-1.10
1881	-0.82	-0.86
1882	-0.69	-0.58
1883	-0.53	-0.29
1884	-0.36	-0.04
1885	-0.23	0.14
1886	-0.16	0.25
1887	-0.16	0.29
1888	-0.24	0.27
1889	-0.39	0.19
1890	-0.59	0.06
1891	-0.82	-0.11
1892	-1.07	-0.33
1893	-1.32	-0.57
1894	-1.55	-0.81
1895	-1.73	-1.06
1896	-1.87	-1.29
1897	-1.97	-1.49
1898	-2.03	-1.67
1899	-2.03	-1.80
1900	-1.97	-1.84
1901	-1.83	-1.77

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1902	-1.61	-1.60
1903	-1.32	-1.33
1904	-0.96	-0.98
1905	-0.56	-0.58
1906	-0.13	-0.19
1907	0.28	0.16
1908	0.63	0.45
1909	0.93	0.68
1910	1.18	0.88
1911	1.41	1.06
1912	1.61	1.20
1913	1.77	1.34
1914	1.89	1.48
1915	1.95	1.61
1916	1.96	1.72
1917	1.90	1.81
1918	1.78	1.86
1919	1.62	1.86
1920	1.40	1.78
1921	1.14	1.62
1922	0.88	1.39
1923	0.65	1.13
1924	0.49	0.88
1925	0.40	0.66
1926	0.39	0.49
1927	0.46	0.38
1928	0.60	0.33
1929	0.78	0.35
1930	0.98	0.45
1931	1.17	0.59
1932	1.32	0.78
1933	1.41	0.97
1934	1.44	1.17
1935	1.43	1.35
1936	1.38	1.51
1937	1.31	1.62
1938	1.24	1.68
1939	1.17	1.70
1940	1.11	1.69
1941	1.05	1.64
1942	0.94	1.52
1943	0.79	1.31
1944	0.57	1.03
1945	0.30	0.69

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1946	-0.02	0.31
1947	-0.35	-0.10
1948	-0.70	-0.53
1949	-1.06	-0.97
1950	-1.43	-1.41
1951	-1.77	-1.81
1952	-2.06	-2.13
1953	-2.28	-2.38
1954	-2.44	-2.53
1955	-2.51	-2.58
1956	-2.49	-2.54
1957	-2.37	-2.40
1958	-2.19	-2.19
1959	-1.98	-1.94
1960	-1.77	-1.65
1961	-1.57	-1.35
1962	-1.41	-1.05
1963	-1.26	-0.76
1964	-1.11	-0.47
1965	-0.96	-0.18
1966	-0.81	0.08
1967	-0.66	0.32
1968	-0.51	0.53
1969	-0.38	0.68
1970	-0.28	0.78
1971	-0.22	0.82
1972	-0.19	0.84
1973	-0.18	0.83
1974	-0.18	0.81
1975	-0.18	0.80
1976	-0.16	0.82
1977	-0.08	0.90
1978	0.06	1.02
1979	0.27	1.16
1980	0.53	1.30
1981	0.84	1.46
1982	1.20	1.66
1983	1.58	1.88
1984	1.96	2.09
1985	2.30	2.24
1986	2.56	2.30
1987	2.72	2.24
1988	2.77	2.06
1989	2.74	1.82

Year	Jemez Smoothed Z-Scores	Chama Smoothed Z-Scores
1990	2.65	1.55
1991	2.52	1.25
1992	2.34	0.92
1993	2.09	0.58
1994	1.77	0.22
1995	1.38	-0.15
1996	0.91	-0.53
1997	0.36	-0.89
1998	-0.26	-1.27
1999	-0.98	-1.66
2000	-1.76	-2.10
2001	-2.58	-2.57
2002	-3.43	-3.06
Mean	0.00	-0.02
SD	0.999134	0.999347

APPENDIX K
SOIL HORIZON NOMENCLATURE, KEYS TO SYMBOLS USED IN DESCRIPTIONS OF SOIL MORPHOLOGY, AND SOIL PROPERTIES USED IN FIELD DESCRIPTIONS

Paul Drakos and Steve Reneau

SOIL HORIZON NOMENCLATURE (from Birkeland 1999)

Description of Master Horizon, Horizon, and Subhorizons

O horizon: Surface accumulations of mainly organic material; may or may not be, or has been, saturated with water. Subdivided on the degree of decomposition as measured by the fiber content after the material is rubbed between the fingers.

Oi horizon: Least decomposed organic materials; rubbed fiber content is greater than 40 percent by volume.

Oe horizon: Intermediate degree of decomposition; rubbed fiber content is between 17 and 40 percent by volume.

A horizon: Accumulation of humified organic matter mixed with mineral function; the latter is dominant. Occurs at the surface or below an O horizon; Ap is used for those horizons disturbed by cultivation.

E horizon: Usually underlies an O or A horizon, and can be used for eluvial horizons within or between parts of the B horizon (e.g., common above fragipan, x). Characterized by less organic matter and/or fewer sesquioxides (compounds or iron and aluminum) and/r less clay than the underlying horizon. Many are marked by a concentration of sand and silt. Horizon is light colored due mainly to the color of the primary mineral grains because secondary coatings on the grains are absent; relative to the underlying horizon, color value will be higher or chroma will be lower.

B horizon: Underlies and O, A., or E horizon, and shows little or no evidence of the original sediment or rock structure. Several kinds of B horizons are recognized, some based on the kinds of materials illuviated into them, others on residual concentrations of materials. Subdisvisions are:

> <u>Bh horizon</u>: Illuvial accumulation of amorphous organic matter-sesquioxide complexes that either coat grains or form sufficient coatings and pore fillings to cement the horizon.
>
> <u>Bhs horizon</u>: Illuvial accumulation of amorphous organic matter-sesquioxide complexes, and sesquioxide component is significant; both color value and chroma are three or less.

Bk horizon: Illuvial accumulation of alkaline earth carbonates, mainly calcium carbonate; the properties do not meet those for the K horizon.

Bl horizon: Illuvial concentrations primarily of silt. Used when silt cap development reaches Stages 5 and 6.

Bo horizon: Residual concentration of sesquioxides, the more soluble materials having been removed.

Bq horizon: Accumulation of secondary silica.

Bs horizon. Illuvial accumulation of amorphous organic matter-sesquioxide complexes if both color value and chroma are greater than three.

Bt horizon: Accumulation of silicate clay that has either formed in situ or is illuvial (clay translocated either within the horizon or into the horizon); hence it will have more clay than the assumed parent material and/or the overlying horizon. Illuvial clay can be recognized as grain coatings, bridges between grains, coatings on ped or grain surfaces or in pores, or thin, single or multiple near-horizontal descrete accumulation layers of pedogenic origin (clay bands or lamellae). In places, subsequent pedogenesis can destroy evidence of illuviation.

Bw horizon: Development of color (redder hue or higher chroma relative to C) or structure, or both, with little or no apparent illuvial accumulation of material.

By horizon: Accumulation of secondary gypsum.

Bz horizon: Accumulation of salts more soluble than gypsum.

K horizon: A subsurface horizon is so impregnated with carbonate that its morphology is determined by the carbonate. Authigenic carbonate coats or engulfs nearly all primary grains in a continuous medium. The uppermost part of a strongly developed horizon is laminated, brecciated, and/or pisolithic (Machette 1985). The cemented horizon corresponds to some caliches and calcretes.

C horizon: A subsurface horizon, excluding R, like or unlike materials from which the soil formed, or is presumed to have formed. Lacks properties of A and B horizons, but includes materials in various stages of weathering.

Cox and Cu horizons: In many unconsolidated deposits, the C horizon consists of oxidized material overlying seemingly unweathered C. The oxidized C does not meet the requirement of the Bw horizon. In stratigraphy, it is important to differentiate between these two kinds of C horizons. Here Cox is used for oxidized C horizons and Cu for unweathered C horizons. Alternatively, the Cox can be termed BC or CB.

Cr horizon: In soils formed on bedrock, there commonly will be a zone of weathered rock between the soil and the underlying rock. If it can be shown that the weathered rock has formed in place, and has not been transported, it is designated Cr. Such material is the saprolite of geologist; in situ formation is demonstrated by preservation of original rock features, such as grain-to-grain texture, layering, or dikes. If such material has been moved, however, the original structural features of the rock are lost, and the transported material may be the C horizon for the overlying soil. Those Cr horizons with translocated clay, as shown by clay films, are termed Crt.

R horizon: Consolidated bedrock underlying soil.

Selected Subordinate Departures

Lower-case letters follow the master horizon designation. Those that are mainly specific to a particular master horizon are given above. Some can be found in a variety of horizons; they are listed below.

b Buried soil horizon with major features formed prior to burial. May be deeply buried and not affected by subsequent pedogenesis; if shallow, they can be part of a younger soil profile.

c Concretion or nodules cemented by accumulations of iron, aluminum, manganeses, or titanium.

f Horizon cemented by permanent ice. Seasonally frozen horizons are not included, nor is dry permafrost material (material that lacks ice but is colder than 0° C).

g Horizon in which gleying is a dominant process that is, either iron has been removed during soil formation or saturation with stagnant water has preserved a reduced state. Common to these soils are neutral colors, with or without mottling. Most have chromas of 2 or less and many have redox concentrations. Strong gleying is indicated by chromas of one or less, and hues bluer than 10Y. Much of the above color is due to the color of reduced iron, or the color of uncoated grains from which iron pigment has been removed. Bg is used for horizons with pedogenic features in addition to gleying; however, if gleying is the only pedogenic feature, the horizon is designated Cg.

j Used in combination with other horizon designation (Btj, Ej) to denote incipient development of that particular feature or property. A rule for some desginations would be to use it for those horizons that do not meet criteria for diagnostic horizons (e.g., Ej for an eluvial horizon that does not meet the criteria of the albic horizon).

k Accumulation of alkaline earth carbonates, commonly $CaCO_3$.

m Horizon that is more than 90 percent cemented. Denote the cementing material (Km, carbonate; qm, silica; Kqm, carbonate and silica, etc.).

n Accumulation of exchangeable sodium.

ss Presence of slickensides.

v Has two uses: 1) One is plinthite, iron-rich, humus-poor, reddish material that hardens irreversibly when dried, and 2) If A horizons in arid environments have a vesicular structure (round voids), they are designated Av.

x Subsurface horizon characterized commonly by a bulk density greater than that of the adjacent horizons, firmness and brittleness, and very coarse prismatic structure with bleached vertical faces (fragipan character). An E horizon may overlie the fragipan horizon at depth as well as between the A and Bt horizons higher in the profile. If the E horizon nomenclature designations are identical, and both are pedogenic, a prime is applied to the lower E horizon. In this example, the profile would be A/E/Bt/E/Bx/Cox.

y Accumulation of gypsum.

z Accumulation of salts more soluble than gypsum (e.g., NaCl).

KEYS TO SYMBOLS USESD IN DESCRIPTIONS OF SOIL MORPHOLOGY

Structure

Grade	Size	Type	Other
1 = weak	vc = very coarse	sbk = subangular blocky	: = parting to (e.g. pr:pf)
2 = moderate	c = coarse	abk = angular blocky	
3 = strong	m = medium	pr = prismatic	
	f = fine	pl = platy	
		sg = single grain	
		m = massive	

Consistence

Dry	Moist	Wet - Stickiness	Wet - Plasticity
lo = loose	lo = loose	so = non sticky	po = non-plastic
so = soft	vfr = very friable	vss = very slightly sticky	vps = very slightly plastic
sh = slightly hard	fr = friable	ss = sticky	ps = slightly plastic
h = hard	fi = firm	s = sticky	p = plastic
vh = very hard	vfi = very firm		

Cutans

Abundance	Thickness/(Distinctness)	Location/Type	Type
n.o. = none observed	n = thin (faint)	po = along pores	man = mangans
v1 = very few (< 5%)	mk = moderately thick (distinct)	co = coating gravel, ped faces	skel = skeletons
1 = few (2 - 25%)	k = thick (prominent)	br = bridging grains	si = silans
2 = common (25 - 50%)		pf = along ped faces (as co + br)	
3 = many (50 - 75%)		pr:pf along prismatic ped faces	
4=near continuous (75+%)		bk:pf on blocky ped faces	
		Lam = lamellae	
		Non-lam = interspace between lamellae	
		PI: ped interior	
		prfc: pressure faces	
		irg = irregular shape	

Horizon Boundary

Thickness	Topography	Carbonate effervescence in HCl
a =abrupt (< 2.5cm)	s = smooth	none = non-effervescent
c = clear (2.5 - 6cm)	w = wavy	e = slightly effervescent
g = gradual (6-12.5cm)	i = irregular	es = strongly effervescent
d = diffuse (> 12.5 cm)	b = broken	ev = violently effervescent
		e- = very slightly effervescent

Texture

s = sand	sil = silt loam
ls = loamy sand	scl = sandy clay loam
sl = sandy loam	sicl = silty clay loam
l = loam	cl = clay loam

SOIL PROPERTIES USED IN FIELD DESCRIPTIONS
(From Birkeland 1999)

Structure

Describe type, grade, and structure size. If the structure is not apparent, take a spade full of the soil and tap it horizontally on the ground and look for repeating patterns.

Type of Structure: Use Table 1.3 to define the type of soil structure.

Grade:

m—massive. Enough aggregation to maintain a vertical face but no formation of structure type (structureless).

sg—single grain. No aggregation (structureless). Loose grains of a sand dune are a good example.

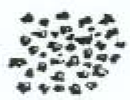
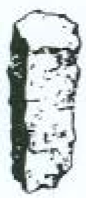
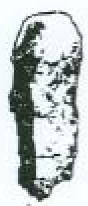
1—weak. Peds barely observable in place, and, when disturbed, few entire peds are observed; much of the material is unaggregated.

2—moderate. Peds easily observable in place. When disturbed, there is a mixture of whole peds, broken peds, and some material not organized into peds.

3—strong. Peds are distinctly visible in place, and, when disturbed, nearly the entire mass consists of whole peds.

Size: Size differs with the kind of structure as shown in Table A1.4. Smaller structural units may be held together in such a way as to form larger units. For example, small subangular blocky units may combine in such a way to form larger prismatic units. The dominant structure is the primary structure when calculating PDI values, and the subordinate structure is the secondary structure.

Table 1.3 Description and Probable Origin of Soil Structure

Type	Sketch[a] and Description		Probable Origin[b]	Usual Associated Soil Horizon
Granular		Spheroidally shaped aggregates with faces that do not accommodate adjoining ped faces	Colloids, mainly organic, bind the particles together; clay and Fe and Al hydroxides may be responsible for some binding, and flocculating capacity of some ions, such as Ca^{2+}, may be helpful; periodic dehydration helps form more stable aggregates	A
Angular blocky		Approximately equidimensional blocks with planar faces that are accommodated to adjoining ped faces; face intersections are sharp with angular blocky, rounded with subangular blocky	Many faces may be intersecting shear planes developed during swelling and shrinkage that accompany changes in soil moisture	Bt
Subangular blocky				
Prismatic		Particles are arranged about a vertical line, and ped is bounded by planar vertical faces that accommodate adjoining faces; prismatic has a flat top, and columnar a rounded top.	Faces develop as a result of tensional forces during times of dehydration; rounded column tops may be due to some combination of erosion by percolating water and greater amounts of upward swelling of column centers on wetting	Bt
Columnar				Bn
Platy		Particles are arranged about a inherited horizontal plane	May be related to particle size orientation from parent material or induced by freeze–thaw processes	E, or those with fragipan
			May be related to layering in cementing material, induced during its precipitation(carbonate, silica, Fe hydroxides)	Km, Bqm, Bs

[a]Taken from Soil Survey Staff (1975).
[b]From Baver (1956), Black (1957), Rode (1962), and White (1966).

Gravel Content

Estimate volume percentage occupied by gravel (>2 mm). Weight percentage can be determined in the field with a screen (one can use an inexpensive 3-mm door screen) and a hand-held portable scale. Be watchful for shape and lithologic changes during the screening process, as they may indicate parent materials of more than one origin.

Consistence

Consistence is a measure of the adherence of the soil particles to the fingers, the cohesion of soil particles to one another, and the resistance of the soil mass to deformation. Soil Survey Division Staff (1993) has changed some of the terms, but the older terms are kept here as PDI values are based on them. Because this property varies with moisture content, it is taken when the soil is dry, moist, and wet. The wet consistence (natural or artificial wetness) is useful in determining texture classes in the field.

Dry Consistence (naturally dry in exposure):

lo—loose. Noncoherent, such as grains of a sand dune.
so—soft. Easily fails to powder or single grain, with very slight force between thumb and forefinger.
sh—slightly hard. Easily fails under slight force between thumb and forefinger.
h—hard. Fails in the hands without difficulty; requires strong force to fail between thumb and forefinger.
vh—very hard. Fails in hands with difficulty, but not between thumb and forefinger.
eh—extremely hard. Cannot be failed in hands.

Moist Consistence (usual moisture when one digs back into exposure):

lo—loose. Noncoherent.
vfr—very friable. Easily fails to powder or single grain, with very slight force between thumb and forefinger.
fr—friable. Fails under slight force between thumb and forefinger.
fi—firm. Fails under moderate force between thumb and forefinger.
vfi—very firm. Fails under strong force between thumb and forefinger.
efi—extremely firm. Fails under very strong force between hands but cannot be crushed between thumb and forefinger.

Wet Consistence (usually wetted artificially, but not so much the mass flows):

Stickiness is measured by pressing the wet soil between the thumb and forefinger and noting its adherence.

so—nonsticky. Practically no adherence to thumb and forefinger when pressure released.
ss—slightly sticky. After release of pressure, soil adheres to both thumb and forefinger but comes off one or the other rather cleanly. Does not appreciably stretch.
s—sticky. After release of pressure, soil adheres to both thumb and forefinger and tends to stretch somewhat before pulling apart from either digit.
vs—very sticky. After release of pressure, soil adheres strongly to both digits and is markedly stretched when they are separated.

Table A1.4 Classes of Soil Structure

0 20 40

Scale (in mm)

Size Class	Diameter of Granules (mm)	Thickness of Plates (mm)	Diameter of Blocks (mm)	Diameter of Prisms (mm)
vf—very fine	<1	<1	<5	<10
f—fine	1–2	1–2	5–10	10–20
m—medium	2–5	2–5	10–20	20–50
c—coarse	5—10	5–10	20–50	50–100
vc—very coarse	>10	>10	>50	>100

Plasticity is measured by rolling the wet soil between the thumb and forefinger and observing whether a roll can be formed and maintained.

po—nonplastic. No roll can be formed.

ps—slightly plastic. A roll 4 cm long and 6 mm thick can be formed and, if held on end, will support its own weight. A 4-mm-thick roll will not support its own weight. The roll is easily deformed and broken.

p—plastic. A roll 4 cm long and 4 mm thick can be formed and support its own weight. A 2-mm-thick roll will not support its own weight.

vp—very plastic. A roll 4 cm long and 2 mm thick can be formed and support its own weight. The roll is readily bent into a half or full circle.

Texture

Use established names from the textural triangle (Fig. A1.3). Screen out gravels and determine the textural class of the <2-mm fraction by noting the grittiness and wet consistence as shown in Fig. A1.4 (see also useful table of properties in Foss and others, 1975). Broad guidelines are given in the figure, but for more accuracy one should calibrate one's fingers by texturing samples with known particle-size distribution.

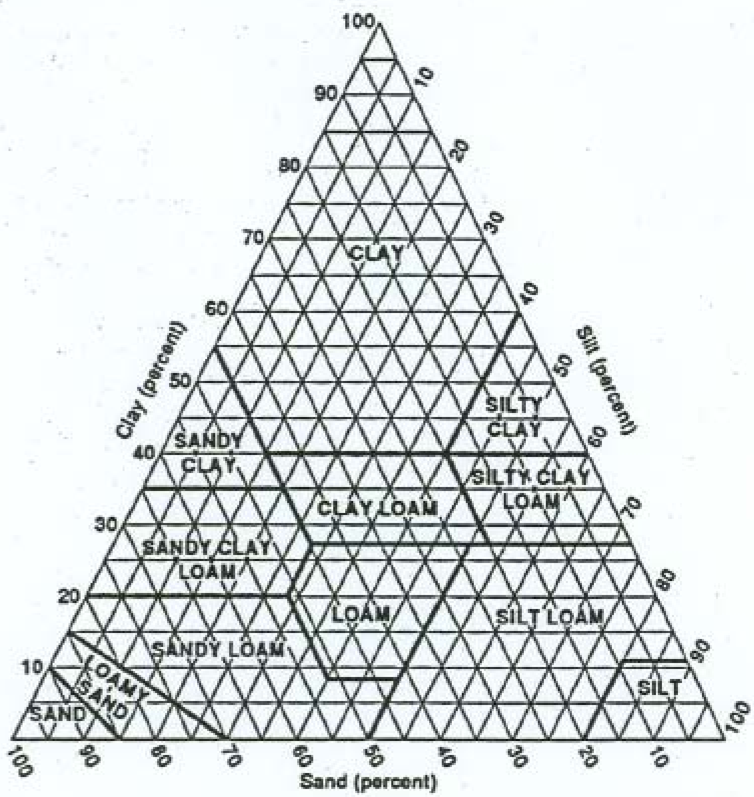


Figure A1.3 Textural names and abbreviations of names versus sand–silt–clay contents. *(Redrawn from Soil Survey Division Staff, 1993, Fig. 3.16.)*

TEXTURAL ABBREVIATIONS:				MODIFIER ABBREVIATIONS:	
C	Clay	SCL	Sandy Clay Loam	vf	very fine
CL	Clay Loam	SL	Sandy Loam	f	fine
L	Loam	Si	Silt	co	coarse
LS	Loamy Sand	SiC	Silty Clay	vco	very coarse
S	Sand	SiCL	Silty Clay Loam	g	gravelly
SC	Sandy Clay	SiL	Silt Loam		

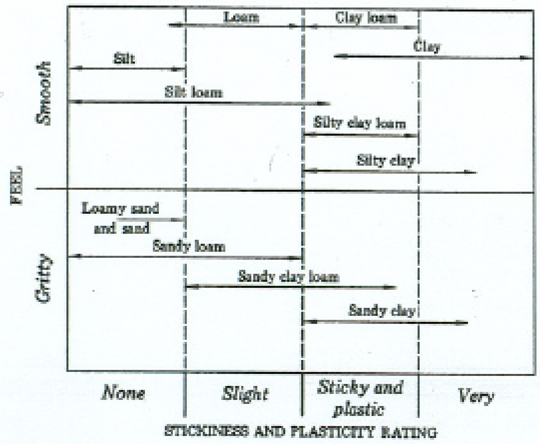


Figure A1.4 Approximate relations between texture class, grittiness, and wet consistence.

Clay Films

Clay films are thin layers of oriented clay and are described by recording their amount, distinctness, and locations. Study the peds with a hand lens in the field, or with a binocular microscope in the laboratory.

Amount:

v1—very few. Occupies less than 5% of the total area of the kind of surface described.
1—few. Occupies 5–25% of the total area of the kind of surface described.
2—common. Occupies 25–50% of the total area of the kind of surface described.
3—many. Occupies more than 50% of the total area of the kind of surface described.

The same classes are used to describe the amount of bridges connecting particles of structureless soil bodies. The amount is judged on the basis of the percentage of particles of the size designated that are joined to adjacent particles of similar size by bridges at contact points.

Distinctness: Distinctness refers to the ease and degree of certainty with which a surface feature can be identified. Distinctness is related to thickness, color contrast with the adjacent material, and other properties, but is not itself a measure of any one of them. Some thick films, for example, are faint, whereas some thin ones are prominent. The distinctness of some surface features changes markedly as the amount of moisture changes; therefore, the soil-water state might be specified. Clay films are difficult to recognize in wet soils. If classifying films on ped faces, compare features on a ped face with those on a nonstructural face broken across the ped. Three distinctness classes are used.

f—faint. Evident only on close examination with 10× magnification and cannot be identified positively in all places without greater magnification. The contrast with the adjacent material in color, texture, and other properties is small.

d—distinct. Can be detected without magnification, although magnification or tests may be needed for positive identification. The feature contrasts enough with the adjacent material that a difference in color, texture, or other properties is evident.

p—prominent. Conspicuous without magnification when compared with a surface broken through the soil. Color, texture, or some other property or combination of properties contrasts sharply with properties of the adjacent material, or the feature is thick enough to be conspicuous.

Location of Clay Films: Oriented clay is present as films on peds, inside of pores, or as bridges between grains and coats on grains. If films are preferential to some orientation (horizontal vs vertical), this should be noted.

pf—clay films occur on ped faces. Where the structure grade is weak or the soil is structureless, ped faces are indistinct or absent. It is probable that only when the structure grade is moderate or strong are the clay films on ped faces discernible.
po—clay films line tubular or interstitial pores.
br—oriented clay occurs as bridges holding mineral grains together. This is probably an initial step that occurs before clay films coat grains and is best observed in coarse-textured soils.
co—colloid coats mineral grains.
cobr—coats and bridges are present. This is probably more common than coats or bridges alone.

In describing clay films, care must be exercised not to confuse pressure faces with clay films. The former are common in soils with high clay content (Vertisols; shrink–swell clay such as smectite is best), and seasonal wetting and drying. Pressure faces arise when swelling pushes structural aggregates together and makes their sides smooth and, in places, reflective. At times these are difficult to differentiate from clay films, but some clay films can also be partly pressure faces. Slickensides are produced in the same manner, but are better developed, being polished and striated, and usually at >50 cm depth. Where slickensides are prominent, they are extensive and oriented at 20–30° from the horizontal to form wedges (Ahmad, 1983). If the shrinking and swelling that produce slickensides are extensive enough, wide and deep ground cracks will form during the dry season.

Examples of Clay-Film Descriptions:

3d po—many distinct clay films in pores.
2f pf and po—common faint clay films on peds and in pores.
3p pf, 2f po—many prominent clay films on ped faces, common faint clay films in pores.

It is important to record clay films because their presence is strong evidence for pedogenically illuviated clay. However, be warned that in places clay films can be original depositional (parent material) features. Waters charged with fine sediment that infiltrate a flood plain can produce clay films at depth (Walker and others, 1978), as can similar waters infiltrating till at the base of a glacier. If these latter parent-material films are present below the main soil-forming zone, their color will be closer to that of the parent material than to that of the soil.

Horizon Boundaries

Describe the lower boundary of each horizon, indicating distinctness and general topography.

Distinctness:

a—abrupt. Transition is less than 2 cm.
c—clear. Transition is 2–5 cm thick.
g—gradual. Transition is 5–15 cm thick.
d—diffuse. Transition is more than 15 cm thick.

Topography: Topography refers to the nature of the surface that separates the horizons. The modifiers sl (slightly) and v (very) may be used in combination with the following abbreviations.

s—smooth. Boundary is planar or parallel to the geomorphic surface.
w—wavy. Undulating surface with pockets wider than they are deep.
i—irregular. If pockets are deeper than their width.
b—broken. If one or both of the horizons separated by the boundary are discontinuous, so that boundary is interrupted.

Stages of Carbonate Morphology

Describe the stage of morphology (Fig. A1.5, Tables A1.5 and A1.6). In some places, there may not be stage II morphology in a sequence of nongravelly soils; rather, filaments of stage I become so common that the horizon meets the approximate percentage requirements for stage II. Holliday (1982) suggests that these latter occurrences be termed IIf to indicate their filamentous morphology.

I want to inject a word of caution on the recognition of carbonate morphological stages. In places, carbonate can be deposited on vertical faces by laterally seeping waters and thereby mask the pedogenic carbonate morphology (Lattman, 1973). In addition, M.N. Machette and R.E. Anderson (personal communication, 1991) have observed strong lateral (on contour) variations in carbonate morphology and accumulation along natural arroyos in arid parts of the eastern Great Basin. Hence, to study the morphology of pedogenic carbonate and avoid surficial cementation, one may have to dig back a meter or more.

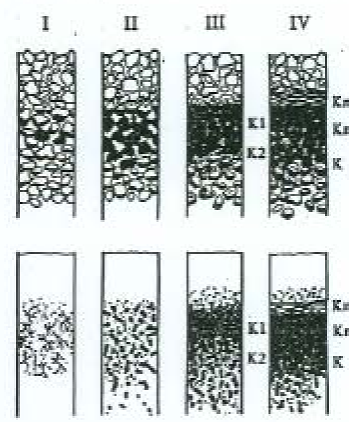


Figure A1.5 Sketch of carbonate buildup stages (I, II, III, IV) for gravelley (top) and nongravelley (bottom) parent materials. Machette (1985) added two more stages beyond stage IV (Table A1.5). In general, the stage morphologies merge to a common form at about stage III. *(Redrawn and modified from Gile and others, 1966, © 1966, The Williams & Wilkins Co., Baltimore.)*

Table A1.5 Stages of Carbonate Morphology

Stage	Gravelly Parent Material	Nongravelly Parent Material
I	Thin discontinuous clast coatings; some filaments; matrix can be calcareous next to stones; about 4% $CaCO_3$	Few filaments or coatings on sand grains; <10% $CaCO_3$
I+	Many or all clast coatings are thin and continuous	Filaments are common
II	Continuous clast coatings; local cementation of few to several clasts; matrix is loose and calcareous enough to give somewhat whitened appearance	Few to common nodules; matrix between nodules is slightly whitened by carbonate (15–50% by area), and the latter occurs in veinlets and as filaments; some matrix can be noncalcareous; about 10–15% $CaCO_3$ in whole sample, 15–75% in nodules
II+	Same as stage II, except carbonate in matrix is more pervasive	Common nodules; 50–90% of matrix is whitened; about 15% $CaCO_3$ in whole sample
Continuity of fabric high in carbonate		
III	Horizon has 50–90% K fabric with carbonate forming an essentially continuous medium; color mostly white; carbonate-rich layers more common in upper part; about 20–25% $CaCO_3$	Many nodules, and carbonate coats so many grains that over 90% of horizon is white; carbonate-rich layers more common in upper part; about 20% $CaCO_3$
III+	Most clasts have thick carbonate coats; matrix particles continuously coated with carbonate or pores plugged by carbonate; cementation more or less continuous; >40% $CaCO_3$	Most grains coated with carbonate; most pores plugged; >40% $CaCO_3$
Partly or entirely cemented		
IV	Upper part of K horizon is nearly pure cemented carbonate (75–90% $CaCO_3$) and has a weak platy structure due to the weakly expressed laminar depositional layers of carbonate; the rest of the horizon is plugged with carbonate (50–75% $CaCO_3$)	
V	Laminar layer and platy structure are strongly expressed; incipient brecciation and pisolith (thin, multiple layers of carbonate surrounding particles) formation	
VI	Brecciation and recementation, as well as pisoliths, are common	

Taken from Gile and others (1981) and Machette (1985), with further modification by R.R. Shroba (written communication, 1982).

Carbonate Effervescence

If dilute HCl (use a 1:10 ratio of concentrated HCl:water) is added to a soil containing $CaCO_3$, it will effervesce. The classes of effervescence are generally related to the amount of carbonate as well as to particle size (more rapid with smaller size) and mineralogy (slight with dolomite). Four classes are recognized:

Very slightly effervescent—few bubbles seen.
Slightly effervescent—bubbles readily seen.
Strongly effervescent—bubbles form low foam.
Violently effervescent—thick foam forms quickly.

For most geomorphic purposes, carbonate morphology stage is more useful than the classification of effervescence.

Salts and Silica Development

Pedogenic gypsum and silica have developmental stages that are similar to the stages of carbonate morphology (Table A1.7). One could devise a similar scheme for halite or any other accumulation of interest.

Cementation

Cementation refers to the brittle, hard consistence caused by some cementing agent, such as silica or $CaCO_3$, which, unlike clay, does not deform under pressure.

cw—weakly cemented. Mass is brittle and hard, but can be broken in hands.

APPENDIX L
DESCRIPTION OF SOIL MORPHOLOGY FROM C&T SITES

Table L.1. Summary of soil morphology for White Rock land transfer parcel soil profiles for geomorphic mapping units (described by Paul Drakos and Steven Reneau, May 2002).

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
Location 3a, West gully wall, northwest side of Parcel														
A	0-6	5	10YR 5/3	10YR 4/3	sl	m	lo	so, po	no	none		as	< 2 ka	vfs
Bw	6-29	<5	10YR 5/3	10YR 4/2	sl	2msbk	so	ss, ps	no	none		as		fs + scattered cs
Bk	29-48	<2	7.5YR 6/3	7.5YR 4/3	sl	2msbk	sh-h	ss, ps	no	ev	1	gs	mid-to-late Holocene (≤ 5 ka)	CaCO3 filaments; fs-vfs
BC	48-59	<2	10YR 5/3	10YR 4/3	sl	1msbk	so	so, po	no	es		cs		fs
Bk1b1	59-67	<2	7.5YR 5/3	7.5YR 4/3	sl	2fabk	h	ss, ps	1npo	es	1-	cs	latest Pleistocene or early Holocene (<10-15 ka)	fs
Bk2b1	67-83	<2	7.5YR 5/3	7.5YR 4/3	sl	2m-csbk	sh-h	ss, ps	1npo	es-ev	1	cs		
Bw1b1	83-102	<2	7.5YR 5/3	7.5YR 4/3	sl	2msbk	sh-h	ss, ps	no	none		gs		some prismatic to sbk structure
Bw2b1	102-148	<2	7.5YR 5/3	7.5YR 4/2	sl	2msbk	sh	so, ps	no	none		cs		
BCb1	148-173	<2	7.5YR 5/3	7.5YR 3/3	ls	1msbk	so	so, po	no	none		as		
Bwb2	173-185+	10-20	7.5YR 6/4	7.5YR 5/4	sl	2msbk	sh	ss, ps	1npo	none		-	<15-20 ka	scattered tuff cobbles
Location 6, North gully wall, north-central Parcel														
AC	0-27	<5	10YR 4/3	10YR 3/3	sl	1msbk	so-sh	ss, ps	no	none		aw	<1 ka (historic?)	fs + cs; slopewash

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
														colluvium
Bkb1	27-61	<2	10YR 5/3	10YR 4/3	sl	2msbk	sh-h	ss, ps	no	es-ev	1	cs	middle-early Holocene	CaCO3 filaments; vfs + minor cs
Btb1	61-84	<2	7.5YR 5/3	7.5YR 4/3	scl	2pr to 2msbk	h	ss, p	1-2npobr	none		cs		vfs + minor cs; presumed late Pleistocene
Bwb1	84-122	<5	10YR 5/3	10YR 4/3	sl	2msbk	sh	so, po	no	none		as		fs + cs; slopewash colluvium
Btb2	122-177	10	7.5YR 6/4	6.75YR 4/4	scl	2-3m-csbk	h	p, s	n-mk co po br	e-		as	> 50-60 ka	discontinuous CaCO3 on ped faces; very slight effervescence; includes tuff cobbles to small boulders and scattered rounded dacite; common cs; possibly bioturbated

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
														alluvium
Bkb2	177-192+	50	7.5YR 7/2	7.5YR 6/4	sl	3fsbk	h	ss, ps	no	ev	2+	-		tuff clasts
Location 9, South gully wall, south side parcel, below power line, next to step in basalt														
A	0-9	<2	7.5YR 4/3	7.5YR 3/3	sl	1-2msbk	so-sh	ss, ps	no	none		cs	< 5 ka (< 2 ka?)	fs-vfs
Bw	9-29	<2	7.5YR 5/4	7.5YR 4/3	sil	2mpr to 2msbk	sh	ss, ps	no	none		cs		fs-vfs
BC	29-50	<5	10YR 5/3	10YR 4/3	sl	1msbk	lo-so	so-ss, ps	no	none		as		vfs; scattered fine Qec pumice
Bk1b1	50-71	<2	7.5YR 5/3	7.5YR 4/3	sl	2msbk	sh	ss, ps	no	es	1	vaw	mid (or early?) Holocene?	CaCO3 filaments; vfs
Bk2b1	71-104	<2	10YR 5/3	10YR 3/4	sl	2msbk	so	ss, ps	no	es	1-	as		fewer filaments than above, rare Qec pumice, 71-81 cm bioturbated; vfs-fs with scattered ms and cs
Btkb2	104-126	<5	7.5YR 6/3	7.5YR 5/4	scl	3f-mabk	h	s, p	3mkbrpopf	es-ev	1	vai	100-200ka	5YR 5/4 ped interior;

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
														"big orange", CaCO3 on ped faces
R	126+													basalt boulders
Location 15, North facing gully wall at Bison antiquus bone site														
AC	0-6	<2	7.5YR3/3	7.5YR2.5/3	sicl	m	lo	s,p	no	non	-	cs	historic	possible recent local slopewash
ABwb1	6-17	<2	7.5YR4/3	7.5YR3/2	sicl	sfsbk	sh	ss,ps	no	non	-	cs	50-100 ka	correlative to pre-El Cajete soil?
Btb1	17-30	<2	7.5YR4/3	7.5YR3/2	sicl	2-3msbk	sh-h	s,ps	1nbrpopf	non	-	cs		bone horizon, est age 50-100 ka
Btkb1 or b2?	30-55	<2	7.5YR5/3	7.5YR4/3	sicl	2-3msbk	sh-h	s,p	2nbrpfpo	ev	I+	gs	100-200 ka?	abrupt increase in carbonate suggests second buried soil?
BCb1 or b2?	55-71	<2	10YR5/4	10YR4/4	l	1-2msbk	so, sh-h	ss,ps	no	e	-	gs		abundant cicada burrows, sh-h, main structure soft dry consistence
Coxb1 or	71-88+	<2	10YR5/4	10YR4/4	ls	1msbk	so-	so,p	no	es	-			fewer

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
b2?							lo	o						cicada burrows
Location 15a, Flat surface 6 m south of gully near bison bone locale, south-central Parcel														
AC	0-6	<2	7.5YR 5/4	7.5YR 4/3	sl	1mgr	lo-so	ss, ps	no	none		cs	<1 ka (historic?)	fs-cs; young slopewash colluvium
Ab1	6-17	<2	7.5YR 4/3	7.5YR 3/3	scl	1fsbk-2mgr	sh	s, ps	no	none		cs	> 50-60 ka (100-200 ka?)	vfs
Btb1	17-37	<2	7.5YR 5/4	7.5YR 4/3	sicl	3msbk	h	s, p	2mkpobrpf	none		cs		
Btkb1	37-50+	<2	7.5YR 5/4	7.5YR 4/3	sicl	3f-msbk	h	s, p	2npobr	es-ev	1+	-		
Location 15b, South gully wall, 5 m west of bison bone locale, south-central Parcel														
AC	0-9	10-20	10YR 6/3	7.5YR 4/4	ls	1f-mpl	so-lo	so, po	no	e-		vas	ca. 50-60 ka	Qec pumice + fines (fs)
Ab1	9-22	<2	7.5YR 4/3	7.5YR 3/3	scl	2f-msbk	sh-h	s,p	vnpobr	none		cs	> 50-60 ka	very few thin bridges and pore fillings
Bk1b1	22-52	<2	7.5YR 5/3	7.5YR 4/3	sl	2msbk	h	ss, ps	no	es-ev	1+	as		filaments and coatings on ped faces
Bk2b1	52-104	<2	7.5YR 5/3	7.5YR 4/3	scl	2msbk	sh-h	ss, ps	vnpobr	es-ev	1-	vas		few CaCO3 coatings on ped faces; vfs, eolian?
Btkb2	104-114+	<5	7.5YR 8/2	7.5YR 5/4	sl	3m-cabk	vh	so, ps	2n-mkbrpo	ev	3-	-	> 100 ka	7.5YR 6/6 mottles, clay films remnant

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
														from Bt horizon, largely impregnated with CaCO3
Location 18, Colluvial Slope, South Side Bandelier Tuff Mesa														
A	0-10	5-10	7.5YR 5/3	7.5YR 4/3	ls	1mgr	lo-so	so, po	no	none		cs	< 1 ka (post-Puebloan?)	loose fs-cs + granules; colluvial slopewash
Bw1	10-33	<5	7.5YR 5/3	7.5YR 4/3	ls	1-2msbk	so-sh	so, po	no	none		cs		fs + ms-cs
Bw2	33-50	5	7.5YR 5/3	7.5YR 4/3	ls	1msbk	so-sh	so, ps	no	es		cs		fs with minor ms + granules; no CaCO3 filaments
Bk (Bkb1?)	50-77	5-10	7.5YR 6/3	7.5YR 4/3	ls	2msbk	sh	so, ps	no	es	1-	as	mid-late Holocene	few filaments, thin discontinuous coatings on pebbles; fs + scattered minor Qec pumice clasts

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
Btkb2	77-103+	20	6.75YR 6/4	6.75 YR 5/6	scl	3f-msbk	h	s, p	2npobr	ev	1+	-	> 50-60 ka	6.75YR 6/6 in peds; 6.75 YR ped faces; continuous CaCO3 coatings on ped faces, filaments within peds; tuff cobbles
Location 21A, Mesa Top														
A	0-9	<2	7.5YR 5/3	7.5YR 3/3	ls	1msbk	lo-so	so, po	no	none		as	<1 ka	loose vfs + organic matter
Bw	9-17	<2	7.5YR 5/3	7.5YR 4/2	sl	2msbk	sh	so, ps	no	none		as		vfs + minor cs
Bk (Bkb1?)	17-43	10	7.5YR 5/3	7.5YR 4/3	sl	2msbk	so	ss, ps	no	es	1-	as	<4-6 ka	few filaments, discontinuous coatings on clasts; fs + ms-cs + tuff granules and small clasts
R	43+											-		tuff
Fence Canyon Borrow Pit, ca. 4000 ^{14}C BP Soil Profile (reference site)														
A	0-23	5-10	7.5YR 5/3	7.5YR 3/3	ls	1msbk to pl	so	so, po	no	none		cs	ca. 4 ka surface	

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
Bw	23-35	5-10	7.5YR 5/4	7.5YR 4/4	sl	2msbk	so-sh	so, po	no	none		as	(mid-Holocene);	
Bk1	35-69	5-10	7.5YR 6/3	7.5YR 5/4	sl	2csbk to 2msbk	sh	ss, ps	no	es-ev	1	cs	ca. 8 ka at depth (early Holocene)	CaCO3 filaments and discontinuous coatings on clasts
Bk2	69-125	5-10	7.5YR 6/4-5/4	7.5YR 4/4	sl	1msbk	so	so, ps	no	es	1-	cw		very sparse CaCO3 filaments
BC	125-169	10-20	7.5YR 6/4-5/4	7.5YR 4/4	ls	1m-csbk	so	so, po	no	e		as		rare filaments and discontinuous clast coatings
C	169+	5	7.5YR 5/4	7.5YR 4/4	s	sg	lo	so, po	no	none		-		sand lens, loose ms-cs

Table L.2. Summary of soil morphology for White Rock land transfer parcel for geomorphic mapping units (described by Paul Drakos and Steven Reneau, May 2002): preliminary descriptions.

Depth (cm)	Horizon	Structure	Preliminary Age Estimate	Notes
Location 14, South gully wall, east of Location 15, confluence of gullies, south-central Parcel				
0-10	A		<1 ka (historic?)	loose fs, minor ms, young Qc or eroded top of old soil profile, reddish
10-17	Bt1b1	2f-msbk	>50-60 ka? (>30 ka?)	slightly grayish: some translocated clay; weak Bt; inferred pre-Qec soil, but not certain
17-30	Bt2b1	2-3msbk		abundant clay films
30-55	Bk1b1			few thin clay films; CaCO3 filaments; Stage 1; less developed Bk than Location 15
55-76	Ab2	2msbk	100-200 ka	grayish, buried A horizon
76-100	Bwb2	2msbk		
100-114+	Btb2	3fsbk		abundant clay films, moderate to thick, orange soil; presumed correlative with Bkb2 @ Location 15
Location 1, West of Bandelier Tuff mesa, thin Qc over Qec				
0-4	A		< 2 ka	loose vfs-ms + organics; pine needles @ surface
4-14	Bw1	1-2msbk		vfs + pumice
14-27	Bw2	1msbk		vfs + pumice; softer peds
27-40	C			loose fs + Qec pumice
40+	Cb1		50-60 ka	Qec pumice
Location 1A, West of Bandelier Tuff mesa, 5 m down gully from Location 1				
0-25	ABw		<2 ka (historic?)	top eroded; bioturbated pumice + fs; see Location 1 for subdivisions of Holocene
25-72	Cb1		50-60 ka	Qec pumice
72-88	Ab2		>50-60 ka (100-200 ka?)	vfs, well-sorted, eolian?; no soil structure; no organics
88-100+	Btb2	3msbk		reddened, moderate to thick clay films on ped faces and bridging grains
Location 2, Northwest of Bandelier Tuff mesa, down gully from Location 1				
0-60			?	tuff boulders to 25+ cm, sub-angular to sub-rounded; basal colluvial (?) layer
60-155				fine-grained pumice, coarse to very coarse sand to granule size, scattered larger Qbt pumice; Qbtt? (sample SLR-02-3)
Location 3b, Surface above east gully wall, northwest side Parcel				

Depth (cm)	Horizon	Structure	Preliminary Age Estimate	Notes
0-14	AC		< 500 yrs (historic?)	loose fs; slightly darkened
14-42	Ab1	2msbk	< 2-4 ka?	fs, darkened, buried A horizon
42-55	Bwb1	2f-msbk		minor CaCO3
55-70+	Btkb2	2-3msbk	>50-60 ka (100-200 ka?)	stage 1 CaCO3, filaments on ped faces; moderately thick clay films; fs
Location 3c, East gully wall 3 m west of Location 3b, 7 m east of Location 3a, eroded bank, northwest side Parcel				
0-5	A	pl	historic	darkened fs-vfs
5-12	Bkb1	2fabk	4-6 ka	darkened horizon with stage 1 CaCO3
12-37	Btkb1	2-3fsbk	20-40 ka?	stage 1 CaCO3; thin to moderate clay films, bridges between grains
37-52	Bt1b1	2msbk		thin clay films, bridges between grains (like overlying horizon, without CaCO3)
52-60	Bt2b1	1msbk		weak Bt
60-93	Ab2	2m-csbk	< 50 ka?	darkened horizon; thin clay films
93-112	Cox?b2	1msbk		fs
112+	Btb3	2-3msbk	100-200 ka?	abundant moderate to thick clay films, bridging grains, coating ped faces, very orange ("big orange")
Location 19, Site of active fan deposition, southwest side Parcel				
0-8	A		2-4 ka?	loose fs-vfs + minor organics
8-30	Bwt1	2pr to 2-3msbk		slightly reddish; some thin bridges and pore fillings (1nkpo: few very thin); vfs + scattered cs; slopewash colluvium
30-59	Bwt2	2m-csbk		slightly reddened, thin bridges, clay films mainly pore fillings; fs + scattered cs + vcs + granules
59-85	Ab1	1-2msbk	4-8 ka?	fs-vfs
85-100	Bkb1	2msbk		stage 1- CaCO3
Location 20, Outside area of active fan deposition, southwest side Parcel				
0-5	A		Late Pleistocene-Early Holocene?	loose fs + scattered granules + organic matter
5-26	Bt1	2mabk		thin bridges + pore fillings; hard; fs
26-44	Bt2	2-3msbk		very thin pore fillings; fs; basalt clast
44-68	Bk	2msbk		weak Bk, stage 1 CaCO3
68-86+	BCk	1mgr		loose, fs + fine pebbles
Location 4a, 10 m North of Location 4 Active Fan Below Gullies, Southwest Side Parcel				

Depth (cm)	Horizon	Structure	Preliminary Age Estimate	Notes
0-22	C		historic	stratified pumice + fines
22-33	Ab1	1msbk	late Holocene	fs; weak buried A horizon
33-44	Bwb1	pr to 2msbk		
44-73	Coxb1	1fsbk to sg		partially loose fine sand; eolian or fine-grained slopewash?
73-103	Bwb2	2msbk	mid-late Holocene?	fs-vfs
103+	Btb3		100-200 ka?	"big orange"; 0-103 cm is Holocene, possibly late Holocene
Location 4b, ~30 m north of Location 4a, south edge sagebrush, active fan below gullies, southwest side Parcel				
0-57	C1		late Holocene/historic?	stratified pumice and fines, fs+ms
57-78	C2			loose vfs
78-92	Bw1	2msbk	late Holocene	
Location 8a, North gully wall, 10 m east of Location 8, north-central Parcel				
0-9	A	1msbk	mid-Late Holocene	fs-vfs; distal slopewash
9-29	Bw	2msbk		vfs; minor CaCO3
29-49	Bk			stage 1- CaCO3; vfs
49+	Btb1		100-200 ka?	"big orange", above CaCO3, above basalt
Location 17, colluvial slope near LA-128805, southeast side Bandelier Tuff mesa				
0-10	A		late Holocene	loose fs + ms-cs, colluvial slopewash
10-25	Bw1	2msbk		vfs-cs; colluvium
25-42	Bw2	1msbk		vfs + ms-cs
42-72	C			fs + abundant fine Qec pumice
72-94+	Btkb1		100-200 ka?	good stage 1 CaCO3, filaments and coatings on ped faces; 2nbrpo clay films, thin; hard; orangeish, coarse sand ("big orange"?)
Location 21, Shallow soil over tuff, mesa top				
0-8	A		late Holocene	loose vfs + organic matter
8-13	Bw1	2fsbk		vfs
13-24	Bw2	2msbk		vfs; late Holocene slopewash ± eolian; finer texture than lower Qc slopes
24+	R			tuff
Location 11, South gully wall, south side Parcel, below power line, east of Location 9 and 10				
0-19	A	1msbk	late Holocene	fs-vfs, scattered granules

Depth (cm)	Horizon	Structure	Preliminary Age Estimate	Notes
19-30	Bw	1-2msbk		fs-vfs, scattered granules
30-61	Btb1	2fpr	late Pleistocene?	clay films (many) 3nbrpopf; vfs with scattered cs; presumed Pleistocene deposit
61-90	BCb1	1msbk		vfs
90-109	Btkb2	2msbk		stage 1- CaCO3, filaments, 1-2npobr clay films; vfs
109+	R			basalt cobbles
Location 10a, South gully wall, south side Parcel, below power line, east of Location 9				
0-8	A	1-2fgr	late Holocene	fs-vfs + organics
8-22	Bwk	2f-mabk		minor CaCO3, stage 1- (or Bw with minor CaCO3)
22-43	Bk1b1		late Pleistocene-early Holocene	stage 1 CaCO3, abundant filaments, vfs, 2npr
43-61	Bk2b1	2fpr to 2msbk		stage 1- CaCO3; vfs with minor ms; no clay films
61-92	Bw1b1 (Bwb2?)			vfs
92-121	Bw2b1	2m-csbk		fs + cs; mangans in peds (few)
121-140+	Bwb2	1-2msbk	Pleistocene (50-60 ka?)	vfs; fine Qec pumice (late-Pleistocene at base?)
Location 22, Colluvial slope near power station, east Parcel				
0-10	A		late Holocene	loose vfs
10-24	Bw1	2mgr		vfs + granules
24-43	Bw2	2msbk		vfs + scattered ms with some tuff clasts
43-65	BC	1msbk		vfs with some tuff clasts
65-110+	C			vfs; thick late Holocene slopewash deposit

Table L.3. Summary of soil morphology at White Rock tract cultural sites (described by Paul Drakos and Steven Reneau).

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
LA- 12587, White Rock Land Transfer Parcel, Area 2, 121-122N, 104E, inside room? (room 4), north of alignment (Feb 18, 2003)													**12587-1**		
AC	0-8	5	10YR4/4	10YR3/4	sl	m	lo	ss,ps	n.o.	none	-	cs		<500 yrs?	
Bw	8-22	10	10YR4/4	10YR3/4	sl	2fsbk	so	ss,ps	n.o.	es	-	aw			
R	22+														tuff rubble with remnant old soil
LA- 12587, White Rock Land Transfer Parcel, Area 2, 119-120N, 104E, between rock alignments, agricultural? architectural? (Feb. 18, 2003)													**12587-2**		
A	0-15	5-10	10YR4/4	10YR3/4	sl	1msbk	so	ss,ps	n.o.	e	-	cs		<500 yrs?	post-rock pile layer
Bw	15-31	10-20	10YR4/4	10YR3/4	sl	1-2msbk	so	ss,ps	n.o.	es	-	ai		< 700-800 yrs	layer filling old room block
R (?)	31+														tuff rubble
LA- 12587, Area 2, rock piles + rock alignments, near 117N, 104E, 30 cm south (Feb. 10, 2003)													**12587-3**		
A	0-9	5	10YR4/4	10YR3/4	ls	1-2msbk	so	so,po	n.o.	none	-	cs		<500 yrs?	post- rock pile ("post occupation 3"), well sorted fs-vfs
Bw	9-29	10-20	10YR4/4	10YR3/4	sl	1msbk	so-lo	so,po	n.o.	es	-	ai		< 700-800 yrs	shards to base, beneath rock piles
R	29+														
LA-12587, White Rock Land Transfer Parcel, rock alignments?, 115N, 103E, inside grid to north (Jan. 10, 2003)													**12587-4**		**Aspect: flat mesa**

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
A	0-7	5-10		7.5YR 3/3	scl	1fsbk	so-lo	svs,pvs (ss,po)	n.o.	none	-	cs		< 700-800 yrs	soil described moist; weak structure difficult to discern
Bw? C?	7-30	10-20		7.5YR 3/4	scl	1msbk? m?	lo	ss,ps	n.o.	es	-	cs			
R	30-36														weathered tuff
R	36+														less weathered tuff
LA-12587, White Rock Land Transfer Parcel, rock alignments?, 113N, 103E, Outside Grid (Jan. 10, 2003)													**12587-5**		**Aspect: flat mesa**
C	0-3	5-10	10YR4/3	10YR3/3	ls	m	lo	so,po	n.o.	none	-	as		< 100 yrs	young slopewash layer
Ab1	3-8	5		7.5YR 3/2	scl	m?	lo	ss,ps	n.o.	none	-	cs		< 700-800 yrs	thin buried soil
Bwb1? Cb1?	8-21	5		7.5YR 3/3	scl	1msbk? m?	lo	ss,ps	n.o.	none	-	ai			soil described moist; weak structure difficult to discern
R	21+														Qbt
LA-12587, White Rock Land Transfer Parcel, N. wall of excavation grid, 17m E of room block, Qbt emerges 3m to E, 106N, 130E (Jan. 22, 2003)													**12587-6**		**Aspect: E sloping top of mesa**
A	0-3	30-40	10YR4/4	10YR3/4	scl	2mpl	so-sh	ss,ps	n.o.	none	-	cs		< 700-800 yrs	contains artifacts; scattered tuff clasts on surface
Bw	3-12	20-30	10YR4/4	10YR3/4	scl	1f-msbk	so-sh	ss,ps	n.o.	none	-	aw			some cicada burrows are sh; artifacts to base
Btkb1	12-19	50	(5YR4/4)	5YR4/4	cl	1f sbk	so	s,p	3ncopobr	e	I	ai		100-200k (middle to late	100-200k eroded soil?

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
														Pleistocene)	
R	19+														Qbt
LA-12587a, White Rock Land Transfer Parcel, N wall of excavation grid, 105N, 109E (July 12, 2002)													**12587-7**		**Aspect: flat mesa**
ABw	0-28	5-10	8.75YR 5/4	8.75YR 4/2	sl	1msbk	so	ss-ps	n.o.	es	-	cs		< 800 yrs	no CaCO3 filaments
Bw	28-41	5-10	8.75YR 5/3	8.75YR 4/2	sl	1msbk-m	so-lo	ss,ps	n.o.	es	-	cs			
Btkb1	41+													middle to late Pleisto-cene	
LA-12587b, White Rock Land Transfer Parcel, S wall of excavation grid, 104N, 104E, next to grinding slicks (August 9, 2002)													**12587-8**		**Aspect: flat mesa**
AC	0-3	5-10	10YR4/3	10YR3/3	ls	1mgr-lo	so-lo	so,po	n.o.	none	-	as		< 100 yrs?	vfs + pine needles, eolian
Bw	3-18	5	7.5YR 4/3	7.5YR 3/3	sl	2f-msbk	so	ss, ps	n.o.	e-	-	cs		< 800 yrs	scattered tuff blocks
C	18-30	30	7.5YR 4/3	7.5YR 3/3	sl	m	lo	so,ps	n.o.	es	-	as			
R	30+														Qbt w/grinding slicks
LA-12587, White Rock Land Transfer Parcel, sheet trash deposits, 101N, 122-125E, (Jan. 10, 2003)													**12587-9**		**Aspect: flat mesa**
A	0-15	10	10YR4/4	10YR3/3	sl	1-2msbk	so	so,ps	n.o.	es	1	gs		< 800 yrs	sherd in gravel, thin discontinuous pebble coatings
Bwk	15-30	40	10YR4/4	10YR4/3	sl	1msbk-m	so-lo	so,ps	n.o.	es	1	ai			dacite + sherds in gravel, cobble size tuff

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
Btkb1	30-42	20-30	7.5YR 4/6	7.5YR 4/6	sc	1-2msbk	so	s,p	lnpobr	es-a	1	ai		late Pleistocene	pockets of disrupted buried soil, sampled for clay analysis
R	42+													-	tuff
LA-12587, White Rock Land Transfer Parcel, 96N, 103E, N wall of excavation grid (Jan. 10, 2003)													**12587-10**		**Aspect: flat mesa**
A	0-5	10	10YR4/4	10YR3/3	ls	2msbk	so-sh	so,po	n.o.	none	-	gs		< 700 yrs?	litter at surface, next to piñon
Bw1	5-10	10-20	7.5YR 4/3	7.5YR 3/3	scl	2 f-msbk	sh	ss,ps	n.o.	e	-	gs			artifacts in gravel
Bw2	10-20	10-20	10YR5/4	10YR4/3	scl	1msbk	so	ss,ps	n.o.	e-es	-	cs			artifacts, Bwk?
Bwk1 (ash + mortar)	20-26	5-10	10YR6/4	10YR4/4	scl	1msbk	so	ss,ps	n.o.	es	-	cs			finer sand than Bw2 (ashy)
IIBwk2	26-40	50	7.5YR 5/4	7.5YR 4/4	scl	1fsbk	so	ss,p	n.o.	es-ev	-	ai		700-800 yrs?	artifacts, construction rubble?, thin clay films in chunks of reworked soil
IIIBtkb1	40-48		5YR5/4	5YR4/4	sc	2-3msbk	sh-h	s,p	2ncobr	es	1	as		middle to late Pleistocene	100-200k eroded soil?
R	48+													-	tuff
LA - 12587, White Rock Land Transfer Parcel, Room 17, gently south-sloping mesa top, 74N, 97E (Feb. 10, 2003)													**12587-11**		
A	0-3	10	10YR4/4	10YR3/3	ls	1mgr	so-lo	so,po	n.o.	e	-	cs		< 700 yrs?	slightly effervescent

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
Bw1	3-23	10	10YR4/4	10YR3/4	sl	1msbk	so-lo	ss,ps	n.o.	e	-	c w			lower 9 cm adjacent to large juniper root, 60 cm from profile = quartzite pebble in horizon, 12 cm deep
Bw2 (Bwb1?)	23-33	20	10YR4/4	10YR3/4	sl	2msbk	so-sh	ss,ps	n.o.	es	-	ai		700-800 yrs?	equivalent, Bw1- Bw2 boundary, may represent age break in past Pueblo units; blocks appear to be set on Bw2
Btkb1 (Btkb2?)	33-44	40	7.5YR 4/3	7.5YR 3/4	sc	2-3fsbk	sh-h	s,p	3ncobr popf	ev	I	ai		late Pleisto-cene	thin discontinuous CaCO3 coatings on clasts, broken tuff
R	44+														Qbt
LA-12587, White Rock Land Transfer Parcel, Area 5, Room 18. Near 72N, 98E (Feb.18, 2003)													**12587-12**		
AC	0-7	10	10YR4/4	10YR3/4	sl	m	lo	ss,ps	n.o.	e	-	cs		< 700 yrs?	top stripped, roots on top of exposure
Bw1	7-19	10	10YR4/4	10YR3/4	sl	1msbk	so-lo	ss,ps	n.o.	es	-	cs			19cm = approx. floor level
Bw2	19-32	40	10YR4/4	10YR3/4	sil	1msbk	so	ss,ps	n.o.	es	-	ai		700-800 yrs?	lower 5 cm with abundant tuff
R	32+														tuff (rubble or bedrock)
LA-12587, White Rock Land Transfer Parcel, Area 8, Test Pit # 4, 51N, 118E (Dec. 9, 2002); inside main artifact scatter													**12587-13**		**Aspect: flat mesa**
A	0-9	20-30	10YR4/4	10YR4/3	sl	1 msbk-m	so-lo	so,po	n.o.	e-	-	cs		Post-Puebloan; possibly <	gravel nodules, angular, basalt

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
BC	9-28	10-20	10YR4/4	10YR4/3	scl	1 msbk	so	ss,ps	n.o.	es	-	ai		several 100 yrs.	young colluvium w/ ceramics + lithics to base
R	28+													-	tuff
LA-12587, White Rock Land Transfer Parcel, Area 8, Test Pit #2, 36N 103E (Dec. 9, 2002); outside main artifact scatter													**12587-14**		**Aspect: flat mesa**
A	0-2	30	10YR4/3	10YR3/3	scl	1-2 mpl	so	ss,ps	n.o.	es	-	cs		Post-Puebloan; possibly < several 100 yrs.	young colluvium
C	2-20	30	10YR4/3	10YR3/3	sl	m	lo	so,po	n.o.	es	-	aw			young colluvium
R	20+														tuff
LA- 86637,White Rock Land Transfer Parcel, artifact scatter on colluvial slope, Coalition Period, Test Pit #1, 108N, 137E (January 29, 2003)													**86637-1**		
AC	0-6	10	10YR6/3	10YR4/3	ls	1m pl	so	so,po	n.o.	es-ev	-	cs		< 100 yrs	young colluvium, post-lab?
Bw1b1	6-15	10	8.5YR 5/3	10YR4/3	sl	1msbk	so-lo	so,po	n.o.	es-ev	-	gs		< 800 yrs	ceramics and lithics scattered throughout AC, Bw1b1, and Bw2b1 horizons
Bw2b1	15-43	20	7.5YR 6/3	7.5YR 4/3	sl	1msbk	so-lo	so,ps	n.o.	es	-	ai			contains small chunks of older soil
Btkb2	43-50+	10	5YR6/4	5YR4/4	scl	2-3msbk	so-sh	ss,ps	1-2nbrpo	es	I+	-		middle to late Pleisto-cene	abundant filaments; 100-200k soil
LA-86637, White Rock Land Transfer Parcel, Test Pit #2, 103N, 79E (January 29, 2003)													**86637-2**		ceramics 0-10 cm, lithics to 30 cm
AC	0-10	5-	10YR5	10YR4	ls	m	lo	so,po	n.o.	es-	-	cs		< 100 yrs	

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
		10	/3	/3						ev					
Bk1b1 (Bwklb1)	10-31	10-20	7.5YR 5/3	7.5YR 4/3	sl	1msbk	so-sh	ss,ps	n.o.	es-ev	I-	gs		< 5 ka (2-5 ka?)	cicada burrows, sh-h w/discontinuous CaCO3 coatings
Bk2b1 (Bwk2b1)	31-46	10-20	7.5YR 5/3	7.5YR 4/3	sl	1-2msbk	so-sh	so,po	n.o.	es-ev	I-	ci			cicada burrows, discontinuous CaCO3 coatings on burrows & gravel
Bkb2	46-50	<10	7.5YR 6/4	7.5YR 6/4	sl	2msbk	sh	so,po	n.o.	ev	II	-		late Pleisto-cene	CaCO3 filaments, small nodules
LA-127631, White Rock Land Transfer Parcel, "field house", test pit ~ 5M N30E from ruin, 108N, 104E (Nov. 7, 2002)													**12763 1-1**		
A	0-7	<5	7.5YR 5/3	7.5YR 4/3	ls	1msbk	so	so,po	n.o.	no ne	-	cs		< 700-800 yrs	fs-vfs
Bw	7-24	<5	7.5YR 6/3	7.5YR 4/3	ls	1msbk	so	so,po	n.o.	no ne	-	cs			fs
ABtb1	24-35	<2	7.5YR 5/2	7.5YR 4/2	si cl	1-2msbk	so	s,p	2nbr	no ne	-	as		middle to late Pleistocene	
Bt1b1	35-47+		5YR6/3	5YR4/3	si cl	3msbk	sh-h	s,p	3npfpo br	no ne	-				
LA- 127631, White Rock Land Transfer Parcel, "field house", adjacent room block, buried ~ 10 - 19 cm, sitting within Bw horizon (at Bw1-Bw2 horizon boundary, above ABtb1 and Bt1b2 (Nov.7, 2002)															
A	0-12	~5	7.5YR 5/3	7.5YR 4/3	sl	1msbk	so	so,po	n.o.	no ne	-	gs	**1276 31-2**	< 700 yrs	fs-vfs
Bw1	12-19	<5	7.5YR 5/4	7.5YR 4/3	sc l	1-2msbk	so	ss,ps	n.o.	no ne	-				may include chunks of reworked Bt horizon
LA-128803, White Rock Land Transfer Parcel, grid garden, profile #1 above upper (southern) alignment, E wall of excavation grid (Jan. 13, 2003)															**Aspect: E sloping top of mesa**

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
AC	0-14	<2		7.5YR 4/3	sl	m	(lo)	so,ps	n.o.	none	-	cs	**128803-1**	< 500 yrs?	Profile moist when described; slopewash upslope of rock alignment
C	14-19	<2		7.5YR 4/3	l	m	(lo)	ss,ps	n.o.	none	-	ai			pockets between boulders
R	19+														basalt boulder
LA-128803, White Rock Land Transfer Parcel, grid garden, profile #2, E. wall excavation grid below upper alignment; 13N, 8E (Jan. 13, 2003)													**128803-2**		
AC	0-13	<2		7.5YR 4/3	sil	m	(lo)	ss,ps	n.o.	none	-	cs		< 500 yrs?	slopewash
C	13-21	<2		7.5YR 4/3	sl	m	(lo)	ss,ps	n.o.	none	-	ai			layer above basalt (boulder or bed rock)
R	21+														basalt (boulders?)
LA-128803, White Rock Land Transfer Parcel, grid garden, profile #3, W. wall excavation grid above lower alignment, 14N, 8E (Jan. 13, 2003)													**128803-3**		
AC	0-16	<2		7.5YR 4/3	sil	m	(lo)	ss,ps	n.o.	none	-	ai		<500 yrs?	slopewash
R	16+														basalt (boulders?)
LA-128803, White Rock Land Transfer Parcel, grid garden, profile #4, N. wall excavation grid (west side), below lower alignment above and between rocks, 15N, 8E (Jan. 13, 2003)															
AC	0-10	10-20		7.5YR 4/3	sil	m	(lo)	ss.ps	n.o.	none	-	as	**128803-4**	<500 yrs?	
Btb1	10-20	20-40		5YR4/3	sicl	2msbk		s,p	1-2nbrco	none	-	ai		middle to late Pleistocene	older soil, between boulders
R	20+														basalt

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
LA-128804, check dam, Test Pit #1, 100N, 100E (Jan. 29, 2003)													**12880 4-1**		
C1	0-16	<2	10YR5 /4	10YR4 /3	s	sg	lo	so,po	n.o.	no ne	-	cs		< 100 yrs?	slightly moist bits of reworked CaCO3, ms-cs
C2	16-32	<2	-	10YR4 /4	ls	m	lo	so,po	n.o.	no ne	-	a w			stratified fs, moist; blocks set on top of C2
Bwb1	32-42+	<2	10YR5 /4	10YR4 /3	sl	1msbk	so-lo	so,po	n.o.	no ne	-	-		<1000 yrs	fine-grained alluvium
LA-128805, White Rock Land Transfer Parcel, field house, 1m SE of SE corner of structure, 102N, 106E (Jan.13, 2003)													**12880 5-1**		
A	0-10	5	10YR4 /4	10YR3 /4	sc l	1msbk	so-lo	ss,ps	n.o.	no ne	-	cs		<500 yrs?	post-occupation slopewash
Bwb1	10-40	<2	10YR4 /4	10YR3 /4	sc l	2msbk	sh	ss,ps	n.o.	no ne	-	cs		< 700-800 yrs	pre-occupation slopewash ?
Btkb2	40-47+	<2	7.5YR 4/3	7.5YR 3/3	sc l	2-3msbk	h	ss,ps	2nbrco po	es	I			late Pleistocene	slopewash; $CaCO_3$ filaments

Table L.4. Summary of soil morphology at Airport tract cultural sites (described by Paul Drakos and Steven Reneau).

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
LA-86534, Airport Land Transfer Parcel, E Wall, 108N/103E (July 12, 2002)													**86534 -1**		
A	0-8	<2	7.5YR4/3	7.5YR3/2	ls	1msbk	so	so po	no	none	-	cs		< 750-850 yrs	abundant organics, vfs-si, scattered ms-cs, w/ tuff blocks at surface, possible cumulative A horizon
Bw	8-25	<2	7.5YR5/3	7.5YR4/3	sl	2msbk	so - sh	ss ps	no	none	-	as			si +vfs, young
Bt1b1	25-45	<2	5YR4/4	5YR4/3	sicl	2-3fabk	sh	vs vp	3nkbr popf	non	-	as (?)		middle - late Pleistocene (100-200ka)	si + clay

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
R	45+														Qbt
LA-86534, Airport Land Transfer Parcel, approx. 3 m N. of NE corner of ruins (August 13, 2002)													**86534-2**		
Oi	+1-0	<5	10YR4/2	10YR2/2	l	s.g.	lo	so,po	no	non	-	as		<100-200 yrs	60% organic matter (piñon litter), 40% vfs
AC	0-5	<5	10YR4/3	10YR4/3	ls	1fsbk	so	so,po	no	non	-	as			
Bw1b1	5-20	10	7.5YR4/3	7.5YR3/3	l	2m-csbk	sh	ss,ps	no	non	-	cw		< 750-850 yrs	scattered tuff clasts
Bw2b1	20-32	60-70	7.5YR4/3	7.5YR3/3	l	1-2msbk	so	ss,ps	no	non	-	cw			tuff clasts
Btb2	32-47	<2	5YR5/6	5YR4/6	sc	3f-vfabk	h	s,p	3mkp opfbr	non	-	as		middle - late Pleisto-cene (100-200ka)	good clay source
R	47+														Qbt
LA-86534, Airport Land Transfer Parcel, approx 60 m E of 86532-2, at old barrow pit (September 13, 2002)													**86534-3**		
AC	0-21	<2	7.5YR4/4	7.5YR4/	ls	m	lo	so,p	no	non	-	as		< 750-	well

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
				3				s						850 yrs	sorted fs - Qe+Qc surface
Bt1b1	21-36	<2	5YR5/3	5YR4/3	sic	2-3f-msbk	sh	s,p	3n-mkbrp opf	non	-	as		middle - late Pleisto-cene (100-200ka)	good clay source
R	36+														Qbt
LA-135290, Profile 1, Airport roomblock, 98N/111.5E, fill in roomblock; base of profile approx. 10 cm above floor (July 24, 2003)													**13529 0-1**		
A	0-10	<2	10YR5/3	10YR3/4	sl	1-2msbk	so	so.p o	n.o.	none	-	cs		<700-800 yrs	
Bw1	10-22	5	10YR4/4	10YR3/3	sil	2msbk	so - sh	ss,p s	n.o.	none	-	cs			post-dates wall collapse to west
Bw2	22-57	5-10	10YR4/4	10YR3/4	si	2msbk	sh -h	ss,p s	n.o.	none	-	as			post-dates wall collapse to west
Bw3	57+														adobe melt with abundant

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
															charcoal + wall collapse
LA-135290, Profile 2, Airport roomblock, 94N/110E, fill in roomblock; base of profile approx. 10 cm above floor (August 5, 2003)													**135290-2**		
A	0-6	20	10YR5/4	10YR4/3	sil	m	lo	so.po	n.o.	none	-	cs		<700-800 yrs	gravel from wall fall, + eolian material
Bw1	6-22	10-20	10YR4/3.5	10YR3/3	si	2msbk	so-sh	ss,ps	n.o.	none	-	gs			pure eolian deposit? + wall fall
Bw2	22-57+	5-10	10YR5/4	10YR3/3	sil	2m-csbk	sh-h	so,ps	n.o.	none	-	-			abundant charcoal; wall fall to east of profile
LA-135290, Profile 3, Airport roomblock, 98N/119.5E, E-W trench to E. of roomblock (September 10, 2003)													**135290-3**		
A	0-12	10-20	10YR3/4 (damp)	10YR3/3	sl	1fsbk-m	so-lo	so.po	n.o.	none	-	gs		<700-800 yrs	described moist; gravelly colluvium

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
															derived from room block
Bw	12-34	10-20	10YR4/3	10YR3/3	sl	1msbk	so	so,ps	n.o.	none	-	aw			gravelly colluvium derived from room block
Bwb1	34-55	<2	10YR4/3	10YR3/3	si	2msbk	h	ss,ps	n.o.	none	-	gs		mid Holocene (4-5 ka?)	eolian deposit with cicada burrows
Btjb1	55-75	<2	8.75YR4/4	8.75YR4/3	si	2mabk	h	ss,ps	1npobr	none	-	as			slightly redder than Bwb1
Btkb2	75-110	<5	7.5YR5/4	7.5YR3/3	sicl	2m-csbk	h	ss,ps	2mkpobr	e-es	I	ci		late Pleisto-cene	thin $CaCO_3$ filaments
R	110+													1.22 Ma	tuff rubble
LA-135290, Profile 4, Airport roomblock, 98N/125.8E, E-W trench to E. of roomblock (September 10,													**13529**		

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
2003)													**0-4**		
A	0-9	<5	10YR4/4 (damp)	10YR3/3	sil	1-2msbk	so	so.ps	n.o.	none	-	as		<700-800 yrs	distal post-Puebloan colluvium
Btjb1	9-41	<2	7.5YR4/4	7.5YR3/3	csi	2m-csbk	h	ss,p	1npobr	none	-	gs		mid Holocene	clayey swale fill? Possibly 1npobr argillans?
Bw1b1	41-72	<2	8.75YR4/4	8.75YR4/3	si	2m-csbk	sh-h	ss,ps	n.o.	none	-	gs			some films appear to be siltans; slightly redder than 10YR
Bw2b1	72-100	<2	10YR4/4	10YR3/4	si	2msbk	sh	ss,ps	n.o.	none	-	ci			
R	100+													1.22 Ma	tuff rubble
LA-135290, Profile 5, Airport roomblock, 101.5N/116E, E-W trench to E. of roomblock (September 10, 2003)													**13529 0-5**		

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
A	0-8	5	10YR4/3	10YR3/3	sil	m-1msbk	so-lo	so.po	n.o.	none	-	cs		<700-800 yrs	post-Puebloan colluvium; contains potsherds, abundant charcoal, abundant krotovinas @ Bwb1 boundary
Bw	8-34	5	10YR4/4	10YR3/3	si	2msbk	sh-h	ss,ps	n.o.	none	-	ci			
Bwb1	34-64	<2	10YR5/4	10YR3/3	si	2-3fsbk	h	ss,p	n.o.	none	-	gs		mid Holocene	
Btjb1	64-80	<2	8.75YR5/4	8.75YR4/3	sicl	2-3msbk	h	ss,ps	1npobr	none	-	cs			
Btkb1	80-97	<2	8.75YR5/4	8.75YR4/3	sic	2-3msbk	h	ss,p	1npobr	es	I	aw			$CaCO_3$ filaments locally common
Btkb2	97-122	5	7.5YR5/4	7.5YR3/3	sicl	2m-csbk	h	ss,p	2-3mkpobrpf	e-es	I	ai		late Pleisto-cene	clay films locally on ped faces
R	122+		5YR5/6 pockets											1.22 Ma	tuff rubble w/pockets of "big

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
															orange" (pockets with soil 100-200 ka)
LA-135290, Profile 6, Airport roomblock, 86N/115.8E, trench, south wall, E of roomblock (October 16, 2003)													**13529 0-5**		
A	0-11	5-10	10YR4/4	10YR3/3	sil	1msbk	so	so,po	n.o.	none	-	gs		<700-800 yrs	
Bw	11-34	<2	10YR4/3	10YR3/4	sil	1-2msbk	so	so,ps	n.o.	none	-	as			
Btjb1	34-51	<2	8.75YR4/4	8.75YR3/3	sicl	2msbk	h	ss,p	1nbrpo	none	-	cs		mid Holocene	
Bw1b1	51-76	<2	8.75YR5/4	8.75YR4/4	sil	2m-csbk	h	ss,ps	n.o.	none	-	gs			
Bw2b1	76-97	<2	10YR5/4	10YR4/3	sil	2msbk	sh-h	ss,ps	n.o.	none	-	as			
Btkb3	97-105	<2	5YR4/4	5YR4/6	sic	2-3fabk	sh-h	s,p	3-4mkcopobrpf	e	I-			100-200 ka	buried soil b3 relative to overall site strati-graphy; "big orange"?

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
R	105+													1.22 Ma	Qbt
LA-135290, Profile 7, Airport roomblock, 93N/110E, description of soil below floor (November 4, 2003)													**135290-7**		
Bw	0-13	2-5	7.5YR5/4	7.5YR3/3	sil	1msbk	so	so,ps	n.o.	none	-	as		mid Holocene ?	0 = base of floor, 90N/110.4E; fill?
Bwb1	13-26+	<2	10YR4/4	10YR3/3	si	2fsbk	sh	ss,ps	n.o.	none	-	-			some siltans
LA-135290, Profile 8, Airport roomblock, 92.25N/108E, description of soil below floor (November 4, 2003)													**135290-8**		0 = base of floor
Bw	0-11	<2	7.5YR4/4	7.5YR3/3	si	1-2msbk	so	so,ps	n.o.	none	-	as		mid Holocene ?	
Bwb1	11-17+	<2	7.5YR5/4	7.5YR3/3	si	2msbk	sh-h	so,ps	n.o.	none	-	-			
LA-135290, Profile 9, Airport roomblock, 97N/109E, description of soil below floor (November 5, 2003)													**135290-9**		0 = base of floor
Bw	0-14	<2	7.5YR5/4	7.5YR4/4	si	1-2msbk	so	so,ps	n.o.	none	-	ci		mid Holocene ?	
Bwb1	14-21+	<2	8.75YR5/4	8.75YR3/3	si	2msbk	sh-h	so,ps	n.o.	none	-	-			
LA 139418-1, Airport Land Transfer Parcel Grid Garden, E Wall, 85.5N/106E (June 23, 2003)													**139418-1**		
AC	0-8	<2	10YR5/4	10YR3/4	sil	1-2msbk	so	so,ps	n.o.	none	-	as		<500 yrs?	scattered clasts

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
															along lower contact suggests strat break
Bw	8-19	5	10YR4/4	10YR3/4	sil	1-2msbk	sh	ss,ps	n.o.	none	-	cs		<700-800 yrs	b1 based on upper contact
Bt1b2	19-27	5-10	7.5YR4/5	7.5YR3/4	sicl	2fsbk	sh	ss,p	1nbrpo	none	-	as		late Pleisto-cene	
Bt2b2	27-39	<2	7.5YR4/6	7.5YR3/4	sic	2-3fabk	sh-h	s,p	3npobrpf	none	-	cs			decrease in gravel from overlying horizon - strat break?
Btkb2	39-50+	<2	7.5YR4/4	7.5YR3/4	sic	2-3msbk	h	s,p	3mkpobrpf	e	I	cs			few $CaCO_3$ filaments
LA 139418-2, Airport Land Transfer Parcel Grid Garden, E Wall, 83.5N/106E (June 23, 2003)													**139418-2**		
AC	0-9	<1	10YR4/4	10YR3/4	sil	1msbk	so	so,ps	n.o.	none	-	as		<500 yrs?	
Bw	9-21	2-5	10YR4/5	10YR3/4	sil	1-	so	ss,p	n.o.	none	-	cs		<700-	large

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
						2msbk	-sh	s						800 yrs	roots, close to junipers
Btb2	21-34	2	8.75YR4/4	8.75YR3/4	sicl	2fsbk	so	ss,p	2npobr	none	-	cs		late Pleistocene	large roots
Btkb2	34-42+	<2	7.5YR4/4	7.5YR4/4	sic	2-3fsbk	sh	s,p	3npobrpf	e	I				few CaCO3 filaments
LA 139418-3, Airport Land Transfer Parcel Grid Garden, E Wall, 80.5N/106E, approx. 1 m S of grid garden (July 17, 2003)													**139418-3**		
AC	0-7	2	10YR4/4	10YR3/4	sil	1msbk	so	so,po	n.o.	none	-	as		<500 yrs?	4 cm pine litter, 1 m NW of piñon trunk
Bw	7-15	5	10YR5/3	10YR4/3	sil	2msbk	so-sh	so,ps	n.o.	none	-	vas		<700-800 yrs	
Btb2	15-23+	<2	7.5YR3.5/4	7.5YR4/4	sic	2-3fabk	h	s,p	3npobrpf	none	-	-		late Pleisto-cene	
LA 139418-4, Airport Land Transfer Parcel Grid Garden, 86N, 121E (15 m E of grid garden) (July 17, 2003)													**139418-4**		
AC	0-6	<2	10YR5/4	10YR4/3	sil	1msbk	so	so,ps	n.o.	none	-	as		<500 yrs?	
Bw	6-16	<2	10YR5/3	10YR4/3	sil	2msbk	so	so,p	n.o.	none	-	vas		<700-	

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
							- sh	s						800 yrs	
Btb2	16-34	<2	7.5YR5/4	7.5YR3/3	sic	2-3fsbk	h	s,p	3npob rpf	none	-	cs		late Pleisto-cene	
Btk1b2	34-42	<2	7.5YR5/3	7.5YR4/3	sic	2msbk	h	ss,p	2npob rpf	es	I	cs			thin $CaCO_3$ filaments
Btk2b2	42-64	<2	7.5YR4/4	7.5YR4/3	si	2msbk	h	ss,ps	1npob r	ev	I +	as			$CaCO_3$ filaments, + coatings on ped faces
Btkb3	64-74	2	7.5YR5/3	7.5YR4/4	sic	2msbk	h	ss,p	4n-mkpo br	e-	I -	vas		Pleisto-cene	possible remnant b3 buried soil, very few thin $CaCO_3$ filaments
R	74+													1.22 Ma	Qbt rubble
LA 141505, Profile 1, Late coalition or Early Classic? field house, 110N/107.3E (December 17, 2003)													**141505-1**		
A	0-5	5-10	10YR4/3	10YR2/2	sl	1msbk	so	so,po	n.o.	none	-	as		<600 to 800 yrs	1.5m from piñon

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
															stump, 30% organic matter, litter
Bw or Bwb1?	5-21+	<2	10YR4/4	10YR3/4	sil	2msbk	sh-h	so,ps	n.o.	none	-	-			tuff blocks imbedded into top of horizon
LA 141505, Profile 2, Late Coalition or Early Classic? fieldhouse, 107.6N/104E (January 6, 2004)													**141505-2**		
A	0-19	80-90	10YR4/3.5	10YR3/3	sil	1fsbk	so-sh	so,ps	n.o.	none	-	cs		<600 to 800 yrs	tuff blocks (wall), eolian material plus wall fall, post-Puebloan
Bw1	19-34	<1	8.75YR4/4	8.75YR3/3	sil	1-2msbk	sh	ss,ps	n.o.	none	-	cs			siltans; possible pps equivalent?

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
Bwb1	34-54	<1	8.75YR4/3	8.75YR3/3	si	2f-msbk	h	ss,p	n.o.	none	-	cs		Mid Holocene (4-6 ka?)	abundant siltans; possible b1?
Btb1	54-76	<1	7.5YR5/4	7.5YR4/3	sic	2f-msbk	h	s.p	2nbrpo	none	-	cs			
Btkb1	76-96	<1	7.5YR5/4	7.5YR3/4	sil	2msbk	h	ss,ps	1nbr	e	I-	as			> 2 mm (< 4 mm) nodules plus rare CaCO3 filaments; age based on weak Stage I CaCO3
Btkb2	96-116	2	7.5YR4/4	7.5YR3/4	scl	2msbk	h	ss,ps	2-3mkpobrpf	e	1	aw		late Pleistocene	CaCO3: few filaments, plus discontinuous coatings on ped faces

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
Qbt	116+													1.22 Ma	Qbt rubble + remnant "big orange" (Btkb3)
EG&G Gully, on mesa top east of Airport Site													**EG&G-1**		
A	0-16	2-5	10Yr4/3	10YR3/2	ls	1msbk	so	so,po	n.o.	none	-	as		Late Holocene (< 1 ka?)	
Bw1b1	16-35	5-10	7.5YR4/5	7.5YR3/4	sl	2msbk	sh	so,ps	n.o.	none	-	cs		Mid Holocene (ca. 4.5 ka)	predominantly tuff gravel, different parent material; "unroof-ing" of Bt horizon upslope, but no clay films
Bw2b1	35-56	<2	10YR5/4	10YR4/3	sil	2msbk	so-	ss,ps	n.o.	none	-	gs			minor csbk

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
							sh								structure; krotovinas near boundary
BCb1	56-104	5	10YR5/4	10YR4/3	l	1msbk-m	so -lo	so,po	n.o.	none	-	as			89cm = dated charcoal, ca. 4 ka BP (4.4 cal ka)
Bwb2	104-133	5	10YR4/4	10YR3/3	scl	2msbk	h	ss,ps	n.o.	none	-	cw		8.8 ka	possibly 1npo argillans
Bkb2	133-148+	2	10YR4/3	10YR3/3	sl	2msbk	sh	so,ps	n.o.	e	I	-			

Table L.5. Summary of soil morphology at Western Rendija tract cultural sites (described by Paul Drakos and Steven Reneau).

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	CaCO3	CaCO3 Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
LA 15116-1, Classic (?) period site, fieldhouse, N-facing slope below Qt2 surface; 1 m W. of west side of field house (July 6, 2004)													**15116-1**		
A	0-10	30-40	10YR5/3	10YR3/2	ls	1msbk	so-lo	so,po	n.o.	none	-	as		Late Holocene (<700 yrs?)	Includes dacite clasts; inferred wallfall
Bw	10-20	20	10YR6/3	10YR4/3	ls	2f-msbk	so	so,po	n.o.	none	-	as			Gravels include common pumice, possibly derived from weathered Qbo source
Btb1	20-40	30-40	7.5YR5/4	7.5YR3/4	ls	2msbk	so	so,po	1-2nco	none	-	aw		Early Holocene?	Possible reworking of older soil; charcoal bearing
Qbo?	40+														Whitish nonwelded tuff; Qbo or Qbt1g
LA 70025-1, Classic or Coalition (?) period field house, on dissected Qc over Qt(?) ridge, 2m W of wall, 100N/101.6E (December 3, 2004)															
A	0-5	2	10YR5/3	10YR3/3	ls	m	lo	so,po	n.o.	none	-	as		Late Holocene (<800 yrs?)	Qc
Bw1	5-14	<2	10YR4/3	10YR3/3	sl	1-2msbk	so	so,ps	n.o.	none	-	cs			
Bw2	14-29	5	10YR4/3	10YR3/3	scl	2msbk	so	ss,ps	n.o.	none	-	cs			post-occupation
Btjb1	29-40	2-5	10YR5/4	10YR3/3.5	scl	2fsbk	sh	ss,ps	1nbr	none	-	cs		Mid-Late Holocene?	pre-occupation
BC	40-50+	<1	10YR4/4	10YR3/4	sil	2msbk	so	ss,ps	n.o.	none	-	-			

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	CaCO3	CaCO3 Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
LA 85403-1, Coalition or Classic (?) period fieldhouse, on Qt2 surface west of Sportsman's Club, 1.4m W of wall, 104.8N/105E (Oct. 26, 2004)													**85403-1**		
A	0-9	10	10YR3/4	10YR3/3	sl	1fsbk	so-lo	so,po	n.o.	none	-	cs		Late Holocene (<800 yrs?)	Moist horizon [10YR5/3 dry?]
Bw	9-22	2-5	8.75YR3/4	8.75YR3/3	si	2msbk	so	ss,ps	n.o.	none	-	aw			Moist, eolian, post-occupation?
Bwb1	22-30+	2-5	7.5YR4/5	7.5YR3/4	si	2msbk	sh-h	ss,ps	n.o.	none	-	-			Some siltans, eolian
LA 85403-2, Coalition or Classic (?) period site, inside structure, below W. wall, 104.8N/106.5E (Oct. 26, 2004)													**85403-2**		
Bwb1	30-35											as		Early Holocene?	Below wall; see Bwb1 description above
Btb1	35-50+	15.20	7.5YR4/5	7.5YR4/4	sic	2msbk	h	ss,p	1-2nbr	none	-	-			
LA 85404-1, Coalition or Classic (?) period fieldhouse, E-facing slope of Qt1 surface; inside fieldhouse, 104N/102E (Sept. 21, 2004)													**85404-1**		
A	0-9	20-30	10YR4/3	10YR3/2	sl	1msbk→gr	so	so,po	n.o.	none	-	as		Late Holocene (<800 yrs?)	
Bw1	9-21	30	10YR5/3	10YR3/3	sl	2fsbk	so	so,po	n.o.	none	-	cs			
Bw2	21-30+	20	10YR5/3	10YR3/3	scl	2msbk	sh-h	ss,po	1nbrco (reworked peds?)	none	-	-			Possible floor preparation/reworking of older soil; charcoal bearing
LA 85404-2, Coalition or Classic (?) period fieldhouse, E-facing slope of Qt1 surface; 1.5m W of fieldhouse, 102.6N/100E (Sept. 30, 2004)													**85404-2**		
A	0-6	20	10YR5/	10YR3/3	sl	1-2fgr	so	so,p	n.o.	none	-	as		Late	profile moist

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	CaCO3	CaCO3 Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
			3					o						Holo-cene (<800 yrs?)	
Bw	6-12	40	10YR4/3	10YR3/3	sl	1-2msbk	so	so,po	n.o.	none	-	aw			some clay coatings on clasts (reworked gravels w/clay films), recycled from Bt horizon
Btb1	12-40+	70-80	7.5YR3/4	7.5YR3/4	scl	2msbk	h	s,p	3nkcopobrpf	none	-	-		Pleisto-cene	moist horizon
LA 86605-1, Coalition or Classic (?) site, fieldhouse; east-sloping shoulder of Qt2 (June 24, 2004)													**86605-1**		
Upper profile = 1.1m W of west wall (0-22 cm); lower profile = 0.5 m W of west wall															
A	0-7	5	10YR4/4	10YR3/3.5	ls	1-2msbk	so-sh	so,po	n.o.	none	-	as		Late Holo-cene (<800 yrs?)	very fine sand
Bw	7-19	<2	7.5YR4/4	7.5YR3/3	sil	2msbk	h	ss,ps	n.o.	none	-	cw			possible 1npobr; slopewash colluvium (Bwb1?); includes sherds and lithics
Btb1	19-35	<2	7.5YR5/4	7.5YR3/3.5	sil	2-3fabk	vh	ss,p	2npobrpf	none	-	cs		Late Pleisto-cene/ Early Holo-cene	2pr breaking to 2-3msbk
Btkb1	35-50+	<2	7.5YR5/4	7.5YR4/4	sil	2mabk	vh	ss,ps	1npo	e-	I-	-			some CaCO3 filaments
Btkb1	54-93+														
LA 86605-2, Coalition or Classic (?) site, field house; east-sloping shoulder of Qt2 (June 24, 2004)													**86605-2**		
Profile described inside 1-room structure, approx. 0.4 m E of west wall; A horizon and upper part of Bw missing; base of Bw approx. 40 cm below top of tuff slab															
A	?														

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	CaCO3	CaCO3 Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
Bw	? to 40-45	5-10	8.75YR4/3	7.5YR3/3	si	2msbk	sh	ss,ps	n.o.	none	-	as		Late Holocene (<800 yrs?)	charcoal scattered throughout, scattered Qbt clasts and granule to pebble size gravel (wall fall?); possibly includes baked soil, partly reddened
Btkb1	(40-45)+										I			Late Pleistocene/ Early Holocene	CaCO3 coatings on ped faces plus filaments; Btk2b1?
LA 86606-1, Classic or Coalition (?) period fieldhouse, on east-facing gentle colluvial slope, Qc over Qt(?), 1 m W of wall, 101.6N/101E (June 29, 2005)													**86606-1**		
A	0-8	30-40	10YR4.5/3	10YR3/2.5	ls	1msbk	so	so,po	n.o.	none	-	cs		Late Holocene (<800 yrs?)	Cerro Grande burn at surface (ashy); gravel = angular to subangular dacite
Bw1	8-22	30	10YR5/3	10YR3/2.5	ls	2f-msbk	sh	so,po	n.o.	none	-	as			abundant charcoal
Bw2	22-36	20-30	10YR5/4	10YR3/3	sl	2msbk	sh	so,po	n.o.	none	-	cs		Middle-Late Holocene?	pre-occupation
Bw3	36-51	30-40	10YR5/4	10YR3/4	sl	1msbk	so	so,po	n.o.	none	-	cs			
Bw4	51-89	30	10YR5/3	10YR3/3	ls	1csbk	so	so,po	n.o.	none	-	cs			common krotovinas at top of horizon

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	CaCO3	CaCO3 Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
BCk	89-120+	30	10YR5/3	10YR3/3	ls	m	lo	so,po	n.o.	none*	I-	-			* thin discontinuous coatings on clasts; no $CaCO_3$ in matrix
LA 86607-1, Classic (?) period field house; on possible high Qt remnant, Qc over Qt? 1.5 m W of W. wall, 103.5N/100E (June 29, 2005)													**86607-1**		
A	0-4	5	10YR4/3	10YR3/3	sl	1msbk	so	so,po	n.o.	none	-	as		Late Holocene (<800 yrs?)	
Btb1	4-33+	5-10	7.5YR5/4	7.5YR3.5/4	c	3f-msbk	h	s,p	3mkcopobrpf	none	-	-		Pleistocene	
											-	-			
LA 87430-1, Middle to late(?) Classic site, field house; north edge of Qt5, 102N, 102.5E, 1.8m E of structure (December 2, 2004)													**87430-1**		
"C"	+22-0														organic matter + loose sand (tree throw)
A	0-6	<2	10YR3/2	10YR2/1	sl	1msbk	so-lo	so,ps	n.o.	none	-	as		Late Holocene (<600 yrs?)	buried horizon
Bw	6-18	5-10	10YR4/3	10YR3/2	sl	1-2msbk	so	so,ps	n.o.	none	-	as			post-occupation
Btb1	18-41	5	10YR4/4	10YR3/4	scl	2msbk	so	ss,ps	1nbrpo	none	-	cs			pre-occupation, Qt5 soil(?)
BCb1	41-54+	<5	10YR4/4	10YR3/3.5	scl	2f-msbk	so	ss,ps	n.o.	none	-	-			
LA 127627-1, Coalition or Classic period site, fieldhouse, N-facing slope below Qt2 surface, SE of SE (upslope) corner of fieldhouse (July 6, 2004)													**127627-1**		

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	CaCO3	CaCO3 Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
A	0-5	10-20	10YR3/3	10YR2.5/2	sl	1msbk	so-lo	so,ps	n.o.	none	-	aw		Late Holocene (<800 yrs?)	Contains Cerro Grande ash and charcoal
Bw	5-21	20-30	10YR4.5/3	10YR3/3	sl	2msbk	h	so,po	n.o.	none	-	aw			siltans
Bt1b1	21-48	25	7.5YR4/4	7.5YR3/4	scl	2msbk	h	ss,ps	2ncopobr	none	-	cs		Late Pleistocene?	
Bt2b1	48-72+	60	7.5YR4/5	7.5YR3/4	scl	2fsbk	h	ss,po	2n-mkcopobr	none	-	-			Clayey sand is alternate texture
LA 127633-1, Slab lined feature, SE-facing slope Qc overlying Qct?, hillslope soil profile below (SW of) site (Sept. 30, 2004)													**127633-1**		
A	0-5	30	10YR5/3	10YR3/3	ls	m	lo	so,po!	n.o.	none	-	cs		Late Holocene (<600 yrs?)	
BC	5-57	20-30	10YR6/3	10YR3/4	ls	1fsbk-m	so-lo	so,po	n.o.	none	-	aw			late Holocene Qc
Btjb1	57-70+	20-30	7.5YR5/4	7.5YR4/3.5	sl	2msbk	so	ss,ps	1nco	none	-	-		Mid-Late Holocene	older Qc
LA 127633-2, Slab lined feature, SE-facing slope Qc overlying Qct?, west side of feature (December 21, 2004)													**127633-2**		
A	0-10													Mid-Late Holocene	frozen; see profile 1 for description; historic Qc
BC	10-56	25	8.75YR5/3	8.75YR4/3	s	m	lo	so,po	n.o.	none	-	gs			possible C horizon; young (Late Holocene) pumice-rich Qc
IIC	56-83	30-	10YR4.5	10YR4/3	s	sg	lo	so,p	n.o.	none	-	aw			sand and angular dacite

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	CaCO3	CaCO3 Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
		40	/4					o							gravel
IIIBwb1	83-110+	20-30	7.5YR4/5	7.5YR4/4	ls	m	lo	so,po	n.o.	none	-	-		Mid-Late Holocene	Qct-derived Qc?; pumice-rich, some reworked with clay films?; 70% pumice, 30% dacite gravel
LA 127634-1, Classic period site, one-room structure with hearth set on Btkb1, on Qct or Qbog hillslope slopewash Qc, 2 m W. of wall, (Sept. 7, 2004)													**135292-1**		
A	0-6	10-20	10YR5/3	10YR3/3	ls	m	lo	so,po	n.o.	none	-	gw		Late Holocene (<600 yrs?)	young colluvium, post-occupation
Btkb1	6-23	30-40	7.5YR4/6	7.5YR4/4	scl	2f-msbk	so-sh	ss,ps	2nbr	e-	I-	aw		Late Pleistocene?	Pleistocene(?) colluvium, discontinuous CaCO3 coatings
IICBk	23-36+														Qct or Qbog w/CaCO3
LA 127635-1, Classic period site, fieldhouse situated on Qc wedge on the backside of pre-Qt6 terrace, 0.5 m E. of E. wall, 104.2N/102E (Sept. 7, 2004)													**127635-1**		
A	0-7	20	10YR5/3	10YR3/3	ls	m	lo	so,po	n.o.	none	-	aw		Late Holocene (<800 yrs?)	young colluvium, post-occupation
Bw	7-19	10-20	10YR5/3.5	10YR3/3	sl	1-2msbk	sh	so,po	n.o.	none	-	cs			post-occupation colluvium with wall fall
Bwb1	19-33	2	8.75YR5/4	8.75YR4/3	scl	2msbk	sh	ss,ps	n.o.	none	-	aw		Mid to Late Holo-	top = likely occupation site
Bkb1	33-43+	5-10	8.75YR5	8.75YR4	scl	2m-csbk	h-vh	ss,ps	n.o.	es	I	-			filaments common on

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	CaCO3	CaCO3 Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
			/4	/5										cene	ped faces and interiors
LA 135291-1, Classic (?) period site, Qt2, N. slope, thin Qc + Qe over Bt, Profile 1= 1.6m E. of wall, 104N/106.5E (Oct. 26, 2004)													**13529 -1**		
A	0-4	5-10	10YR3/3	10YR2.5/2	sl	1fsbk	so-lo	so,ps	n.o.	none	-	cs		Late Holo-cene (<800 yrs?)	Possibly contains Cerro Grande ash
Bw	4-11	5-10	10YR3/4	10YR3/2	sl	1-2f-msbk	so	so,ps	n.o.	none	-	aw			Contains artifacts including biscuitware ceramics
Btb1	11-30+	30	7.5YR3/3	10YR3/2	sc	3fpr	h	s,p	3kpfpobrco	none	-	-		> 100 ka	>100 ka Bt
LA 135292-1, Classic period site, field house, on flat Qt2 surface overlain by slopewash Qc, 1.3 m W. of fieldhouse, N103/E101 (Sept. 7, 2004)													**13529 2-1**		
Lithics + ceramics, 0-30 cm															
A	0-14	5	10YR4/3	10YR3/3	sil	2fgr	so-sh	so,ps	n.o.	none	-	as		Late Holo-cene (<800 yrs?)	Peds commonly made of spheroids, crumbly
Bw1	14-30	2-5	10YR4/4	10YR3/3	sil	1-2msbk	so-sh	so,ps	n.o.	none	-	gs			horizon projects under structure
Bw2	30-44	2	10YR3.5/4	10YR3/4	si	1msbk	so	ss,ps	n.o.	none	-	aw			slopewash colluvium
Btb1	44-61	10-15	8.75YR4/4	8.75YR4/3	si	2msbk	sh	ss,ps	2nbrcopf	none	-	aw		Pleisto-cene	bioturbated soil above Qt2 gravels (Qc?)
Btkb1	61-70+	10	7.5YR3/3	7.5YR2.5/3	sicl	3m-cabk	h	ss,p	3-4ncopobrpf	e	I	-			discontinuous coatings on ped faces; abundant filaments on ped faces and in ped interiors
LA 135292-2, Classic period site, fieldhouse, inside structure, 103N/101.8E (Sept. 7, 2004)													**13529 2-1**		

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	CaCO3	CaCO3 Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
Lithics + ceramics, 0-30 cm															
A	0-28	20-30	10YR4.5/3	10YR3/3	sil	2mgr	sh	so,ps	n.o.	none	-	as		Late Holo-cene (<800 yrs?)	Room fill
Bw1	28-36+	2	10YR4/4	10YR3/3	sil	1-2msbk	so	so,ps	n.o.	none	-	-			Below wall level

Table L.6. Summary of soil morphology at Western Rendija tract fieldhouse and tipi ring sites (described by Paul Drakos and Steven Reneau).

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
LA 85408-1, Classic period fieldhouse, on ridge top, 2 m W of NW corner of fieldhouse (August 17, 2005)													**85408-1**		
A	0-9	20-30	10YR4.5/3	10YR3/3	sl	1fsbk	so	so,po	n.o.	none	-	ai		Late Holocene (<800 yrs?)	angular gravel
Rk	9-20	weathered sandy Qct alluvium, some clay films on cobbles; local carbonate accumulation													
R	20+														sandy Qct alluvium
LA 85411-1, Classic period site, multi-room structure near ridge top on east-facing slope, 2.3 m E of SE corner of Room 2 (July 18, 2005)													**85411-1**		
A	0-4	5-10	10YR4/3	10YR3/2	ls	1msbk	so-lo	so,po	n.o.	none	-	as		Late Holocene (<800 yrs?)	
Bw	4-14	20	10YR4/3	10YR3/2	sl	1-2fsbk	so-lo	so,po	n.o.	none	-	aw			post-occupation Qc
Bwb1	14-30	20-30	7.5YR5/3	7.5YR5/3	sl	1-2fsbk	so	so,po	n.o.	none	-	aw		Mid-Late Holocene?	clay films at underlying contact with Qct; possibly reworked clasts with clay films from older soil upslope?
R	30+														consolidated pumice-rich sandstone
LA 85413-1, Classic period fieldhouse, on contact between Qct and Qc, south-facing slope, 3 m SE of SE corner of fieldhouse (October 13, 2005)													**85413-1**		

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
A	0-7	2	10YR3/3	10YR2/2	ls	m-sg	lo	so,po	n.o.	none	-	aw		post-Classic Period	possibly AC horizon, post-occupation
Bw	7-31	10-20	10YR4/4	10YR3/3	sl	1-2fsbk	so	so,po	n.o.	none	-	aw		Late Holocene (<1 ka?)	Qc, angular to subangular pebble-to-cobble-size gravel
Btk1 b1	31-42	30-40	7.5YR4/4	7.5YR3/4	sc	2-3fabk	h	s,p	3mkpfbrpo	e-	II-	cs		Late Pleistocene	very thin $CaCO_3$ filaments, nearly continuous, thin clast coatings
Btk2 b1	42-56+	10-20	7.5YR5/5	7.5YR4/6	scl	2msbk	so-sh	ss,ps	1nco	ev	I+	-			thin, discontinuous coatings on clasts, very thin filaments, sparser than above
LA 85413-2, Classic period fieldhouse, on contact between Qct and Qc, 0.5 m S of NE corner of fieldhouse, below wall (October 13, 2005)													**85413-2**		
A	0-18	20-30*	10YR4/3	10YR3/3	sl	1msbk	so	so,po	n.o.	none	-	aw		post-Classic Period	boulder (wall block) below soil line = 0-8 cm; *gravel % does not include wall block
Bw	18-46	20-30	10YR5/4	10YR3/3.5	sl	1-2msbk	so	so,po	n.o.	e	-	aw		Late Holocene (<1 ka?)	reworked $CaCO_3$ on clasts
Rk	46-55+	Qct with Stage III carbonate and local clay films													
LA 85414-1, Classic period fieldhouse, on E-facing Qct bench, 1.5 m E of NE corner of fieldhouse (October 25, 2005)													**85414-1**		
A	0-8	5-10	10YR5/3	10YR3/3	ls	1msbk-m	so-lo	so,po	n.o.	none	-	as		Late Holocene	post-occupation Qc

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
Bw	8-15	5	10YR5/3	10YR3/2	sl	1-2fsbk	so	so,po	n.o.	none	-	aw		(<800 yrs?)	described moist
Btb1	15-23	5	7.5YR4/3.5	7.5YR3/3.5	scl	2csbk	sh	ss,ps	2-3ncobrpf	none	-	aw		Late Pleistocene	described moist
R	23+														Qct, weathered
LA 85414-2, 20 cm N. of SW corner of test pit, 0.9 m S. of inside of SE corner of fieldhouse, inside of E. wall (October 25, 2005)													**85414-2**		
(A)	(0-10)													Late Holocene (<800 yrs?)	stripped horizon
Bw	10-20	30	10YR5/3	10YR3/3	sl	1-2fsbk	so	so,po	n.o.	none	-	aw			described moist
Btb1	20-32	5-10	7.5YR4/3	7.5YR3/3	scl	2msbk	so-sh	ss,ps	1-2ncopobr	e-	-	aw		Late Pleistocene /Early Holocene	described moist
Rk	32+										II-				Qct, thin CaCO3 coatings on undersides of most clasts, continuous coatings on some
LA 85417-1, Classic (?) period fieldhouse, on Qct knob merging with hillslope to N, 2 m W of W. wall of fieldhouse (October 25, 2005)													**85417-1**		**104N/102E**
A	0-6	50-60	10YR5/3	10YR3/3	l	1msbk-m	so-lo	so,po	n.o.	none	-	cs		Late Holocene (<800 yrs?)	gravel lag with eolian fines; much more silt than other A horizons
Bw	6-15	50-60	10YR5/3	10YR3/4	ls	1msbk	so-lo	so,po	n.o.	none	-	aw			A and Bw gravel mostly dacite

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
Btb1	15-25+	60-70	7.5YR4/6	7.5YR3/3.5	sc	2fsbk	h	s,ps	3-4ncopo brpf	none	-	a w		Pleistocene	gravel mostly pumice, soil formed in Qct
LA 85417-2, inside W. wall of fieldhouse (November 14, 2005)													**85417-2**		**104.8N/104E**
A	0-7	20	10YR5/3	10YR3/3	sl	1msbk	so	so,po	n.o.	none	-	cs		Late Holocene (<800 yrs?)	matrix between wall blocks, very fine sandy loam; gravel % excludes wall blocks
Bw	7-15	5-10	10YR5/3	10YR4/3	sl	1msbk	so	so,po	n.o.	none	-	a w			wall blocks set on and into Bw horizon
Btb1	15-24+	30	7.5YR4/6	7.5YR3/3	scl	2msbk	so-sh	ss,ps	2ncopo br	none	-	-		Pleistocene	24 cm = floor level, contains charcoal; some rocks set on top of Bt, unclear if set into Bt (may have utilized preexisting rocks)
LA 85861-1, Classic or Coalition (?) period field house, on gently-sloping ridge top below NE-facing hillslope 4 m E of E wall (November 14, 2005)													**85861-1**		**107N/104.5E**
A	0-13	20	10YR5/4	10YR3/3.5	sl	1msbk	so	so,po	n.o.	none	-	cs		Late Holocene (<800 yrs?)	coarse sandy loam, fine gravel (dacite+pumice)
Bw	13-26	30	10YR4/4	10YR4/3	sl	1msbk	so	so,po	n.o.	none	-	a w			coarse sandy loam, fine gravel (dacite+pumice)
Bwb1	26-39	40	7.5YR4/6	7.5YR3/4	sl	1fsbk	so	so,po	n.o.	none	-	ai		Middle-Late Holocene?	gravel is weathered pumice, some dacite
Rk	39+									e	II				

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
LA 85861-2, 6.2 m downslope (NE) from E wall (November 21, 2005)													**8586 1-2**		**109N, 106.5E**
A	0-5	10	10YR5/4	10YR3/3	ls	1msbk	so	so,po	n.o.	none	-	as		Late Holocene (<800 yrs?)	
Bw	5-15	20-30	10YR4/3	10YR3/3	sl	1-2msbk	so	so,po	n.o.	none	-	cw			
Bwb1	15-27	40	7.5YR4/6	7.5YR3/3	scl	1fsbk	so-lo	ss,ps	n.o.	none	-	ai		Mid-Late Holocene?	bioturbated pumice with CaCO3 coatings and colloidal stains
Rk	27+														
LA 85861-3, 1.5 m north from N wall (November 21, 2005)													**8586 1-3**		**109N, 99.6E**
A	0-5														
Bw	5-18														
Bwb1	18-38														
Rk	38+														
LA 85861-4, N side N wall, approx. 15-cm mound on ridge top (November 21, 2005)													**8586 1-4**		**107.4N, 99.4E**
A	0-16	10-20	10YR4/3.5	10YR3/3	l	1-2msbk	so	so,ps	n.o.	none	-	cw		Late Holocene (<800 yrs?)	soil between wall blocks, finer than outside structure
Bw	16-31	20	7.5YR4/6	7.5YR3/4	l	1mgr	so	so,ps	n.o.	none	-	gs			possible back fill next to wall block
Bwb1	31-50	40	7.5YR4/6	7.5YR3/4	scl	1fsbk	so-lo	ss,ps	n.o.	none	-	ai		Middle-Late Holocene?	

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
Rk	50+														
LA 85864; Profile 1; lower tipi ring site in gullied area; 101N/104.7E (December 23, 2003)															
A	0-9	<1	10YR4/4	10YR3/3	sil	1fsbk	so	so,po	n.o.	none	-	as	**85864-1**	Late Holocene	post-Apache
Ab1	9-14+	<1	10YR3/4	10YR3/2	sicl	2msbk	so-sh	s,p	n.o.	none	-				siltans in pores
LA-85864; Profile 2, gully wall; approximately 10m SW of tipi ring (December 23, 2003)													**85864-2**		
A	0-15	<5	10YR4/3	10YR3/3	sil	1 msbk-m	so-lo	ss,ps	n.o.	none	-	cw		Late Holocene	eroded upper surface; possible lumping of multiple horizons (A-Bw?, A-Ab1?)
Bw1	15-40	<2	10YR4/3	10YR3/3	sil	2 msbk	so-sh	ss,ps	n.o.	none	-	as		Mid to Late Holocene	charcoal at 38 cm; siltans
Bw2	40-61	2-5	10YR4/3.5	10YR3/3	sicl	2csbk	h	ss,ps	n.o.	none	-	gs			siltans, possible buried soil (Bwb1?), possibly not
Bw3	61-85	2	8.75YR5/3	8.75YR3/3	sicl	2mpr } 2csbk	h	ss,ps	n.o.	none	-	cs			
Btj	85-104	2	7.5YR5/4	7.5YR4/3	sicl	2mpr }2-3 csbk	h	ss,ps	1nbr	none	-	as			
Bwb1	104-163	5	8.75YR4/4	8.75YR3/3	sicl	2 mpr	h	s,p	n.o.	none	-	as		Mid Holocene?	
Bt1b2	163-201	<2	7.5YR6/3	7.5YR4/3	sicl	2 csbk	h	ss,ps	1ncopo	none	-	as		Late Pleistocene	
Bt2b2	201-213+	<2	7.5YR5/3	7.5YR4/3	sic	2 f-mabk	h	s,p	2ncopobr	none	-	-			

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
LA 85867-1, Classic (?) period fieldhouse, on Qc next to road, south wall inside room, 0.8 m W of SE inside corner (October 13, 2005)													**85867-1**		
A	0-5	20-30	10YR5/4	10YR3/4	sil	m-sg	lo	so,ps	n.o.	none	-	gs		post-Classic Period	Qc with eolian component, fine-grained
Bw1	5-25	10	10YR4/3	10YR3/3	sicl	2msbk	sh	ss,p	n.o.	none	-	gs		Late Holocene (<1 ka?)	base of horizon = approximate base of wall blocks; blocks set into Bw1(?)
Bw2	25-75	5	10YR4/4	10YR3/3	sicl	2fsbk	h-vh	ss,p	n.o.	none	-	cs		Holocene	Holocene Qc
Bw3	75-110+	2-5	10YR4/3	10YR3/3	si	2fsbk	so-sh	ss,ps	n.o.	none	-	-			Holocene Qc
LA 85869, Profile 1, Upper Tipi Ring site, 100.4N/132E; N. shoulder of ridge; (December 9, 2003)													**85869-1**		
A	0-3	20-30	10YR3/4	10YR2/2	sl	m-sg	lo	so,po	n.o.	none	-	as		Late Holocene	includes Cerro Grande ash
Bw	3-9	5	10YR4/3	10YR3/3	scl	1f-msbk	so-lo	ss,ps	n.o.	none	-	as			
Bt1b1	9-22+	10	7.5YR4/4	7.5YR3/4	sic	3fsbk	h	s,p	3-4mkcopobrpf	none	-			Pleistocene	
LA 85869, Profile 2. Upper Tipi Ring site, 78N/158E; inside Feature 2 (Tipi Ring) near ridge crest; (December 23, 2003)													**85869-2**		
A	0-4	40	10YR4/3	10YR3/3	ls	m	lo	so,po	n.o.	none	-	as		Late Holocene	

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate (years BP)	Notes
Bw	4-15	20-30	10YR5/3	10YR3/3	sl	2msbk	so-sh	so,po	n.o.	none	-	aw			tipi ring rocks set on or on top of Bw
Btb1	15+													Pleistocene	see profile #1 for Btb1 description

Table L.7. Summary of soil morphology at Western Rendija tract Archaic/multi-component sites (described by Paul Drakos and Steven Reneau).

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon	Profile #	Preliminary Age Estimate (years BP)	Notes
LA 85859-1, Rendija Canyon Land Transfer Parcel, W. wall of excavation grid, SW corner = 90N/101E, upslope pit in transect (June 10, 2003)													**85859-1**		**Aspect: ESE-facing hillslope**
AC	0-4	30	10YR5/3	10YR3/3	sl	sg	lo	so,po	n.o.	none	-	as		< 600 yrs	young colluvium
2Btb1	4-29	60-70	7.5YR5/3	7.5YR3/3	scl	2fsbk	so-sh	ss,ps	2ncobr	none	-	gs		1.2 - 1.6 Ma (Ma = million years)	colloidal stains common on pumice clasts
2Coxb1	29-35+	90	7.5YR5/3-5/4	7.5YR4/3	s	sg	lo	so,po	n.o.	e	-	-			Qct(?) pumice deposit; 7.5YR7/6 on oxidized clasts; white on inside
LA 85859-2, Rendija Canyon Land Transfer Parcel, N. wall of excavation grid, SW corner = 90N/118E, downslope pit in transect (June 10, 2003)													**85859-2**		**Aspect: ESE-facing hillslope**
A	0-4	30-40	10YR5/3	10YR3/3	sl	sg	lo	so,po	n.o.	none	-	as		< 600 yrs	young colluvium
Bw	4-14	30	8.75YR 5/3	7.5YR4/3	sl	2msbk	sh	so,ps	n.o.	none	-	cs			
Bt1b1	14-39	20	6.25YR4/3	6.25YR 4/3	sc	2fabk	sh	s,p	3-4mkcopobrpf	none	-	gs		ca. 6.7-7.4 ka	
Bt2b1	39-59	20-30	7.5YR5/4	7.5YR4/4	scl	2-3fsbk	sh	ss,p	2ncopobr	none	-	gs			
Btkb1	59-84	10	7.5YR6/4	7.5YR4/4	sl	2msbk	sh-h	so,ps	1npo	es	I	ci			marginal argillans; pumice gravel
Bkb1	84-95	30	7.5YR6/3	7.5YR4/6	ls	2msbk	sh	so,po	n.o.	ev	II-	ai			gravel lag horizon
2Bkb2	95+										III?			1.2 - 1.6 Ma	carbonate cemented pumice
LA 85859-3, Rendija Canyon Land Transfer Parcel, S. end of W. wall of excavation grid, SW corner =													**8585**		**Aspect: ESE-facing**

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon	Profile #	Preliminary Age Estimate (years BP)	Notes
90N/107E (June 13, 2003)													**9-3**		**hillslope**
A	0-5	40	10YR5/3	10YR3/3	sl	sg	lo	so,po	n.o.	none	-	as		< 600 yrs	young colluvium
Bw	5-20	30	10YR5/2	10YR3/3	sl	1-2msbk	so-sh	so,ps		none	-	aw			variable thickness, local swale, min = 9 cm, max = 17 cm
Btb1	20-41	20	7.5YR4/6	7.5YR3/4	sc	2-3fabk	sh	s,p	3mkcopobr	none	-	gs		ca. 6.7-7.4 ka	
Btkb1	41-58	30	7.5YR4/6	7.5YR3/4	scl	2msbk	so-sh	ss,ps	1npobr	e-es	I	cw			
Bkb1	58-67	30-40	10YR4/4	10YR3/4	scl	1msbk	so-sh	ss,ps	n.o.	es	I	cw			
2Btkb2	67-79+	80-90	7.5YR5/3	7.5YR5/4	scl	m	lo	ss,ps	1-2nkco	ev	II			1.2 - 1.6 Ma	pumice clasts Qct(?); colloidal stains and continuous CaCO3 coatings on clasts; clay coatings predominant in upper 4 cm, CaCO3 below this
LA 85859-4, Rendija Canyon Land Transfer Parcel, W. wall of excavation grid, SW corner = 90N/114E (June 19, 2003)													**85859-4**		**Aspect: ESE-facing hillslope**
A	0-4	20	10YR5/3	10YR3/3	sl	sg	lo	so,po	n.o.	none	-	as		< 600 yrs	few lithics
Bw	4-14	20-30	10YR5/3	10YR3/3	sl	2msbk	so-sh	so,po	n.o.	none	-	aw			relatively high density of lithics (10-12)
Bt1b1	14-37	10-20	7.5YR4/3	7.5YR4/3	sc	2-3fsbk	sh-h	s,p	3mkcopobr	none	-	cs		ca. 6.7-7.4 ka	highest density of lithics in top 10 cm
Bt2b1	37-50	40-50	7.5YR4/4	7.5YR3/4	sc	2msbk	sh-h	s,p	2ncopobr	none	-	cs			diminishing density of lithics
Bt3b1	50-65	20	7.5YR5/4	7.5YR4/3	scl	2msbk	sh-h	ss,ps	1ncopobr	none	-	aw			base = top of stone line

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon	Profile #	Preliminary Age Estimate (years BP)	Notes
BCb1	65-79	50-60	7.5YR5/4	7.5YR4/5	scl	1-2msbk	so	ss,ps	n.o.	none	-	aw			clasts with discontinuous CaCO3 coatings, < 1 mm thick, some on tops and sides (reworked clasts)
2CBkb2	79+	90+	7.5YR8/2	7.5YR7/2	s	m	lo	so,po	n.o.	es	I	-		1.2 - 1.6 Ma	Qct(?) pumice bed, thin discontinuous CaCO3 coatings on clasts
LA 85859-5, Rendija Canyon Land Transfer Parcel, S. wall of excavation grid, SW corner = 90N/110E (June 20, 2003)													**85859-5**		**Aspect: ESE-facing hillslope**
A	0-4?													< 600 yrs	estimated 10 cm stripped by archaeologists
Bw	4-13?														
Bt1b1	13-31	30	7.5YR4/4	7.5YR3/4	sic	2-3fsbk	h	s,p	3mkcopobrpf	none	-	cs		ca. 6.7-7.4 ka	some peds = abk; most sbk
Bt2b1	31-46	20-30	7.5YR4/6	7.5YR3/4	sic	2msbk	sh-h	s,p	2ncopobr	e-	-	cs			few thin discontinuous coatings on clasts and on peds
Bt3b1	46-58	20-30	7.5YR4/6	7.5YR4/4	sil	2f-msbk	sh	ss,ps	1ncobr	none	-	cs			few thin discontinuous coatings on clasts and on peds
Bkb1	58-80	50	7.5YR5/4	7.5YR3/4	scl	1msbk	so	ss,ps	n.o.	es	I	aw			dacite clasts 4 cm below top of horizon with discontinuous CaCO3 coatings, < 1 mm thick, some on tops and sides (reworked clasts); obsidian microflake with discontinuous CaCO3 coating in horizon
2CBkb2	80+	100	white		g	m	lo	-	n.o.	ev	II	-		1.2 - 1.6 Ma	Qct(?) pumice bed, continuous CaCO3 coatings on clasts

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon	Profile #	Preliminary Age Estimate (years BP)	Notes
LA 85859-6, Rendija Canyon Land Transfer Parcel, 0 m pt. on topographic profile, on ridgecrest (June 20, 2003)													**85859-6**		**Aspect: N-sloping ridgecrest**
A	0-10	20	10YR3/3	10YR2/2	sl	sg	lo	so,po	n.o.	none	-	as		< 600 yrs	Cerro Grande ash in horizon; pumice gravel
Bw	10-22	20	10YR4/4	10YR3/4	sl	1-2msbk	so	so,po	n.o.	none	-	aw			
2Btb1	22-32	40	7.5YR4/3	7.5YR3/3	sl	1msbk-m	so-lo	ss,po	3nco (on clasts)	none	-	cw		1.2 - 1.6 Ma	extensively bioturbated; colloidal stains common on pumice clasts
2Coxb1	32+	80-90	7.5YR6/2	7.5YR5/2	s	m	lo	so,po	n.o.	none	-	-			Qct(?) pumice deposit
LA 85859-7, Rendija Canyon Land Transfer Parcel, 18 m pt. on topographic profile (June 20, 2003)													**85859-7**		**Aspect: ESE-facing hillslope**
A	0-10	30-40	10YR4/3	10YR3/3	sl	m	lo	so,po	n.o.	none	-	as		< 600 yrs	
Bw	10-23	20-30	10YR4/4	10YR3/4	scl	1-2msbk	so	ss,ps	n.o./1ncobr	none	-	as			argillans on some peds reworked from lower horizons by bioturbation (?) (sparse)
2Btb1	23-41	70	7.5YR4/4	7.5YR3/4	sl	m	lo	ss,po	2nco	e	-	cs		ca. 6.7-7.4 ka	extensively bioturbated; colloidal stains common on pumice clasts
2Coxb1	41+	90	7.5YR6/3	7.5YR4/3	s	m	lo	so,po	n.o.	es	I	-		1.2 - 1.6 Ma	Qct(?) pumice bed, thin discontinuous CaCO3 coatings on clasts
LA 85859-8, Rendija Canyon Land Transfer Parcel, 64 m pt on profile, lower slope (June 20, 2003)													**85859-8**		**Aspect: ESE-facing hillslope**
AC	0-4	30	10YR3/3	10YR3/2	sl	sg	lo	so,po	n.o.	none	-	cs		< 600 yrs	includes Cerro Grande burn layer; pumice gravel
Bw	4-13	20	10YR4/4	10YR3/	sil	1msbk	so	so,p	1nco	none	-	as			argillans possibly reworked

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon	Profile #	Preliminary Age Estimate (years BP)	Notes
				4				o							
Bt1b1	13-28	40-50	7.5YR4/5	7.5YR4/4	sc	2fsbk	so-sh	s,p	2ncopobr	none	-	cs		ca. 6.7-7.4 ka	clasts pumice + dacite (1 large)
Bt2b1	28-38	40-50	7.5YR5/6	7.5YR4/6	scl	2fabk	sh	ss,ps	3ncopobr	none	-	cs			colluvium or Qct soil?
2Bwmb2	38-60+	30-40	7.5YR6/4	7.5YR4/6	sl	3m-cabk	h	so,po	n.o.	e	-			1.2 - 1.6 Ma	Qct soil? Silica cement?, well cemented, CaCO3 filaments on some clasts
LA 99396-1, Archaic (?) site, lithic scatter, 95N/113E; north wall (October 1, 2003)													**99396-1**		
A	0-10	5	10YR4/4	10YR3/4	sl	1-2msbk	so	so,po	n.o.	none	-	as		< 1000 yrs	late Holocene eolian deposit + gravel lag following erosion
Bt1b1	10-19	<2	6.25YR4/3	6.25YR3/3	sic	3mpr } abk	sh-h	s,p	4n-mkpobrpf	none	-	cs		Late Pleisto-cene?	prismatic structure breaking to abk
Bt2b1	19-27	<2	7.5YR4/4	7.5YR3/3	sic	2msbk	h	ss,p	2-3npobrpf	e	-	cs			
Bk1b1	27-40	10-20	8.75YR5/3	8.75YR4/3	sl	2msbk	sh-h	so,ps	n.o.	ev	II	cs			very abundant filaments
Bk2b1	40-56+	10-20	8.75YR5/3	8.75YR3/3	sl	2m-csbk	h	so,po	n.o.	es	I	-			filaments; irregular surface on weathered Qct soil exposed on other walls
LA 99396-2, Archaic (?) site, lithic scatter, S. slope of Qc/Qct or Qbog ridge; 84N/113E; north wall (October 16, 2003)													**99396-2**		
A	0-10	2-5	8.75YR4/4	8.75YR3/4	sl	1-2fsbk	so	so,po	n.o.	none	-	as		Late Holo-cene (<1000 yrs?)	late Holocene Qc (+/- Qe), derived from reworking older soils up slope?

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon	Profile #	Preliminary Age Estimate (years BP)	Notes
Bwb1	10-23	2-5	7.5YR4/4	7.5YR3/4	scl	2msbk	sh-h	ss,ps	n.o.	none	-	as		Late Holocene (1-2 ka)	verging on Btj?; 14C sample LA 99396-c3 collected from @ 22 cm, 84.7N, 114E
Bkb1	23-35+	<5	7.5YR5/3	7.5YR4/3	sl	2mabk	h	so,ps	n.o.	e	1	-			discontinuous CaCO3 coatings on ped faces
LA 99396-3, Archaic (?) site, lithic scatter, 80N/127E; farther down south slope, eroded area (October 16, 2003)													**99396-3**		
A	0-13	5	8.75YR5/4	8.75YR3/4	ls	1msbk	so-lo	so,po	n.o.	none	-	cs		Late Holocene (< 1000 yrs?)	late holocene slope wash (Qc)
Bw	13-23	20-30	7.5YR5/4	7.5YR4/4	ls	2msbk	so-sh	so,po	n.o.	none	-	vas			Holocene Qc
R	23-36+	-	7.5YR7/2.5									-		1.2 - 1.6 Ma	Qct pumice or Qbog
LA 99396-4, Archaic (?) site, lithic scatter, 109N/123E; North wall, slightly north of low ridgecrest (October 16 and November 6, 2003)													**99396-4**		
A	0-10	<2	10YR5/3	10YR4/3	sil	1msbk	so	so,ps	n.o.	none	-	cs		Late Holocene (<1000 yrs?)	eolian
Bt1b1	10-25	<2	8.75YR4/3	8.75YR3/3	sicl	2fsbk	sh-h	ss,p	1nbrco	none	-	cs		Late Pleistocene	8.75YR color
Bt2b1	25-43	<2	7.5YR4/3	7.5YR3/3	sicl	2msbk	h	s,p	2-3nbrpf	none	-	aw			
Bkb1	43-84	<2	7.5YR5/3	7.5YR3/3	sil	2mpr } 2m-csbk	h	so,ps	n.o.	es	II-	cw			
Btkb1	84-123	<2	8.75YR5/3	8.75YR3/3	sil	2csbk	h	so,ps	1nbr	es	-	cs		33.66 ka	some subordinate f-mpr structure; CaCO3 in fine matrix, no filaments

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon	Profile #	Preliminary Age Estimate (years BP)	Notes
2Btb2	123-143+	50	7.5YR4/4	7.5YR3/4	scl	2msbk	h	ss,ps	2mkpobr	none	-	-		1.2 - 1.6 Ma	Qct or Qbog pumice gravel, abundant quartz crystals
LA 99396-5, Inside one-room structure, above occupation surface, 102N, 125E = upper horizon, 102N, 126E = lower horizon (November 4, 2003)													**99396-5**		
A	0-10	2-5	10YR5/4	10YR3/4	sl	1-2fsbk	so	so,po	n.o.	none	-	-		< 1000 yrs	very fine sandy loam
Bw	10-29+	2-5	10YR5/4	10YR3/4	sl	2msbk	sh	so,po	n.o.	none	-	-			
LA 99396-6, Archaic (?) site, lithic scatter, S. slope of Qc/Qct or Qbog ridge; 82N/115E (October 16, 2003)													**99396-6**		
A	0-8													Late Holocene (<1000 yrs?)	
Btb1	8-15								3ncopobrpf					Late Pleistocene?	
Btkb1	15-23+														
LA 99397-1, Archaic (?) site, lithic scatter, 100N/100.4E (August 25, 2003); Btkb1 described @ 99.8N/98E, on November 17, 2003													**99397-1**		
A or Av	0-5	20-25	10YR5/3	10YR3/3	ls	1msbk-pl-sg	so-lo	so,po	n.o.	none	-	as		Late Holocene (<600 yrs?)	contains vesicular peds
Bw	5-11	5	10YR5/3	10YR3/3	ls	2msbk	so	so,po	n.o.	none	-	aw			
Bt1b1	11-34	<2	7.5YR4/3	7.5YR3/3	sic	2mpr} 2-3msbk	h	s,p	3mkcopobr	none	-	cs		Late Pleistocene to	2pr breaking to 2-3msbk
Bt2b1	34-54	<2	7.5YR4/4	7.5YR3	si	2msbk	h	s,p	2npobr	none	-	c			

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon	Profile #	Preliminary Age Estimate (years BP)	Notes
				/3	c							w		early	
Btkb1	54-93+	5	7.5YR5/3	7.5YR4/3	sl	2cabk	h	so,ps	1npo	es	II-	-		Holo-cene	generally continuous CaCO3 ped face coatings, plus filaments; very rare clay films
LA 99397-2, Archaic (?) site, lithic scatter below fieldhouse, 75N/95E (SW corner); thin Qc over Qct? (September 3, 2003)													**9939 7-2**		
A	0-4	30-40	10YR5/3	10YR3/3	ls	1msbk	so-lo	so,po	n.o.	none	-	cs		Late Holo-cene (<600 yrs?)	Young gravelly colluvium, pebbles to small boulders; few artifacts
Bw	4-11	50	10YR5/3	10YR3/3	sl	1-2msbk	so	ss,ps	n.o.	none	-	aw			Young gravelly colluvium, pebbles to small boulders; few artifacts
Btb1	11-18+	10-20	7.5YR4/4	10YR3/3	sc	2msbk	h	s,p	2-3mkcopobr	none	-	-		Late Pleisto-cene to early Holo-cene	Gravel mostly finer than above; no artifacts
LA 99397-3, Archaic (?) site, lithic scatter, 117.1N/67.3E; 5-10 m N of ridgecrest, no artifacts (September 3, 2003)													**9939 7-3**		
AC	0-4	20	10YR3/2	10YR2/1	ls	sg	lo	so,po	n.o.	none	-	vas		Late Holo-cene (<1000 yrs?)	post Cerro Grande fire deposit; pumice + abundant charcoal
A	4-14	10-20	10YR5/2	10YR3/2	ls	1msbk	so	so,po	n.o.	none	-	cs			possible rubification on undersides of clasts
Bw	14-24	30-40	10YR5/3	10YR4/3	s	1msbk	so-lo	so,po	n.o.	none	-	aw			
R	24+		7YR6/6											1.2 - 1.6 Ma	Qct, fine gravel, cemented granules

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon	Profile #	Preliminary Age Estimate (years BP)	Notes
LA 99397-4, 85N/63E; On ridge crest, 7 m W of fieldhouse, young eolian over bioturbated Qct + eolian w/old soil (September 3, 2003)													**99397-4**		
Av?	0-6	10-20	10YR6/2	10YR3/3	sl	1msbk	so-lo	so,po	n.o.	none	-	vas		< 600 yrs	discontinuous gravel cap, primarily at surface, with vesicular peds; rubification on some clasts
Btb1	6-20+	5-10	5YR4/4	5YR4/3	sc	2-3msbk	h	s,p	3-4mkcopobrpf	none	-	-		Pleisto-cene; 100-200 ka?	parent material inferred to be bioturbated Qct + eolian fines; color from ped interiors
LA 99397-5, Gully to northeast of site, west wall, thick Holocene Qc (September 10, 2003)													**99397-5**		
A	0-9	10	10YR5/3	10YR3/3	sl	m	lo	so,po	n.o.	none	-	as		Mid to Late Holo-cene?	moist
Bw1	9-49	5	10YR4/4	10YR3/4	sl	2msbk	sh	so,ps	n.o.	none	-	gs			cicada burrows are hard
Bw2	49-120	10	10YR4/4	10YR3/3	ls	1csbk	so	so,po	n.o.	none	-	gs			fine gravel
BC	120-162	10-20	10YR4/3	10YR3/3	sl	1msbk-m	so	so,po	n.o.	none	-	gs			colluvium
Bkb1	162-182	<5	10YR5/4	10YR3/3	ls	2m-csbk	h	ss,ps	n.o.	e	I-	as		Mid Holo-cene?	some sparse CaCO3 on ped faces, some filaments possible clay films?
Btkb1 or b2?	182-222+	<5	8.75YR5/4	8.75YR 4/4	sil	2-3msbk	h	ss,ps	1-2npobr	e	I-			Late Pleisto-cene to early Holo-cene?	late Pleistocene (?) or early Holocene Qc
LA 99397-6, Archaic (?) site, lithic scatter, 100N/106E; burned stump location (September 11, 2003)													**99397-6**		

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon	Profile #	Preliminary Age Estimate (years BP)	Notes
A	0-4	20-30	10YR5/3	10YR3/3	ls	1-2fsbk	so	so,po	n.o.	none	-	as		< 1000 yrs	areas with vesicular A
Bw	4-9	5-10	10YR5/3	10YR3/3	sl	1-2msbk	so	so,ps	n.o.	none	-	as			
Btb1	9-23+	<2	7.5YR4/4	7.5YR4/3	sic	2-3msbk	h	s,p	3npobrpf	none	-	-		Late Pleisto-cene to early Holo-cene	
LA 99397-7, Archaic (?) site, lithic scatter, 98N/129E; swale fill deposit(?) (October 1, 2003)													**99397-7**		
A	0-7	<5	10YR4/3	10YR3/2	l	1fsbk	so-lo	so,po	n.o.	none	-	cs		Late Holo-cene (<600 yrs?)	young colluvium
Bw	7-21	20-30	10YR4/3	10YR3/3	ls	1-2msbk	so	so,po	n.o.	none	-	aw			contains obsidian flakes, siltan coatings on flakes, highest % in section
Bwb1	21-38	10-20	10YR4/3	10YR3/3	sil	2fsbk	sh-h	ss,ps	n.o.	none	-	aw		Late Holo-cene (1-2 ka)	slightly reddened horizon; abruptness of contact suggests buried soil; no artifacts in this horizon
Bwb2	38-60+	<2	10YR4/3	10YR3/2	sil	2msbk	h	ss,ps	n.o.	none	-	-		Mid to Late Holo-cene	bioturbated at upper boundary
LA 99397-8, Archaic (?) site, lithic scatter, 102N/131.3E; backhoe pit (November 6, 2003)													**99397-8**		
A	0-7	5	10YR4/4	10YR3/4	sl	1mgr-m	so-lo	so,po	n.o.	none	-	as		Late Holo-cene	Qc
Bw	7-23	30	10YR4/3	10YR3/	sl	2msbk	so-	so,p	n.o.	none	-	cs			gravel lag; b1?

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon	Profile #	Preliminary Age Estimate (years BP)	Notes
				3			sh	o						(<600 yrs?)	
Bt1b1	23-48	<2	7.5YR4/3	7.5YR3 /3	cs i	2-3mabk	h	ss,p s	2nbrpf po	none	-	gs		Early Holo-cene?	some subordinate fpr structure
Bt2b1	48-70	5	7.5YR5/4	7.5YR4 /3	cs i	2csbk	h	ss,p s	1nbr	none	-	c w			discontinuous CaCO3 coatings on sparse gravel; matrix does not effervesce
Btk1b1	70-105	2	7.5YR5.5 /3	7.5YR4 /3	si cl	2f-mpr	h	ss,p s	1brpo	ev	II-	c w			CaCO3 filaments and discontinuous coatings on ped faces
Btk2b1	105-127+	2	8.75YR4/3	8.75YR 3/3	sl	2csbk	h	so,p s	1-2nbrpo	e-	I-	-			b2? Suggested by increase in argillans ; eff weakly on ped faces, matrix non-eff; few filaments on ped faces

Table L.8. Summary of soil morphology at TA-74 South tract cultural sites (described by Paul Drakos and Steven Reneau).

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
LA-21592, Bayo Canyon, Otowi grid gardens (TA-74) (July 12, 2002)													**21592-1**		
C	0-8	5	10YR5/3	10YR4/2	sil	m	lo	so po	no	none	-	as		historic	vfs-si, no rocks
CBwb1	0-20	10-20	10YR4/3	10YR3/3	sl	m-1msbk	so-lo	so po	no	none	-	?		post-Puebloan	rocks, micaceous potsherd
	20+														better soil structure
LA-21596 b, TA-74, Pueblo Canyon, inside grid garden, Test Pit # 1, N. side of alignment, artifacts abundant, 0-30 cm, artifacts present but less abundant, 30-50 cm; colluvium															
(Nov. 7, 2002 and Jan. 15, 2003)													**21596-1**		
A	0-5	20-30	10YR4/3	10YR3/3	ls	m-1msbk	so-lo	so,po	n.o.	none	-	cs		<< 650 yrs	vfs; rock alignment layer
Bw1	5-22	20-30	10YR5/3	10YR3/3	ls	1msbk	so	so,po	n.o.	none	-			< 650 yrs	fs-vfs; grid garden built on young Qc, late feature relative to occupation. Artifacts abundant 0-30 cm, artifacts present but less abundant, 30-50 cm
Bw2	22-50+	20-30	10YR5/3	10YR3/3	sl	1-2msbk	so	so,po	n.o.	none	-				
LA-21596 b, TA-74, Pueblo Canyon, S. side of alignment, possibly inside grid; colluvium (Jan. 15, 2003)													**21596-2**		
A	0-6	10-20	10YR4/3	10YR3/3	ls	m (?)	so-lo?	so,po	n.o.	none	-	as		<< 650 yrs	Qc, frozen; rock alignment layer
Bw1	6-27+	10-20	10YR4/3	10YR3/3	s	1msbk	so-lo	so,po	n.o.	none	-			< 650 yrs	possibly inside grid
LA-21596c1, TA-74, Pueblo Canyon grid garden, Test Pit #1, shards to bottom of hole; N. of prominent rock alignment, similar soil across alignment to S (Nov. 7, 2002 and Jan. 15, 2003)															
A	0-4	30-40		10YR2/2	sl	1 msbk	so-lo	ss,ps	n.o.	none	-	as	**21596-3**	<< 650 yrs	organic rich, vfs; rock alignment layer

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
Bw1	4-15	30-40		10YR3/2	sl	1 msbk	so-lo	ss,ps	n.o.	none	-	gs		< 650 yrs	fs-vfs
Bw2	15-50+	30-40		10YR3/3	ls	1 msbk	so-lo	ss,ps	n.o.	none	-	-			rocks, larger than above but fewer
LA- 21596c, TA-74, Pueblo Canyon, Test Pit #2, colluvial slope outside grid garden alignments (Nov. 7, 2002)													**21596-4**		
AC	0-12	30-40		8.75YR 4/2	ls	m-1sbk	lo	so,po	n.o.	none	-	gs		<< 650 yrs	young colluvium, ms-cs
														< 650 yrs	
C	12-34+	40-50		8.75YR 4/2	ls	m	lo	so,po	n.o.	none	-	-			colluvium
LA-86528, TA-74, Pueblo Canyon "rock shelter", Shovel Test Pit #1, edge of overhang (Jan.15,2003)													**86528-1**		
AC	0-5	5-10	10YR2/2	10YR3/3, upper 2-3 cm / 10YR2/1	sl	m	lo	so,po	n.o.	none	-	as		< 500 yrs ?	2-3 cm thick charcoal lens at base
Bwb1	5-21	10	7.5YR5/3	7.5YR4/3	sl	1 msbk	so-lo	so,po	n.o.	none	-	ai		late Holocene	late Holocene
Btb2	21-40+	40	7.5YR4/6	7.5YR4/4	scl	2 msbk	so-sh	ss,ps	1npobr	none	-	-		late Pleisto-cene	older, Pleistocene (?) colluvium
LA-86528, TA-74, Pueblo Canyon "rock shelter", Shovel Test Pit #2, outside overhang (Jan. 15,2003)													**86528-2**		
AC	0-10	-	-	-	-	-	-	-	-	-	-	-		< 500 yrs?	young Qc
Btb1	10-31+	-	-	-	-	-	-	-	-	-	-	-		late Pleisto-cene	older Qc, Pleistocene
LA-86528, TA-74, Pueblo Canyon "rock shelter", Shovel Test Pit #3, under rock, downslope wall (Jan.15,2003)													**86528-3**		

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
C	0-3	10	10Y R5/3	10YR3/ 3	sl	sg	lo	so,p o	n.o.	none	-	as		< 500 yrs	loose Qc, +/- eolian; < 100 yrs?
Ab1	3-10	5-10	10Y R5/3	10YR3/ 3	sl	1-2 msbk	so	so,ps	n.o.	none	-	cs		late Holocene	
Bwb 1	10-20	20	7.5Y R4/3	7.5YR5 /4	scl	1-2 msbk	so	ss,ps	n.o.	none	-	cs			
Btb2	20-30+	40-50	7.5Y R5/4	7.5YR4 /4	scl	2msb k	sh-h	ss,ps	1npob r	none	-	-		late Pleisto-cene	Pleistocene colluvium(?)
LA-86531, TA-74, Pueblo Canyon, ridge (middle(?) Pleistocene eroded terrace), Test Pit #1 (Jan.15, 2002); soil moist/partially frozen													**86531-1**		
C	0-3	20-30	-	7.5YR4 /3	scl	m	lo	s,p	n.o.	e-	-	aw		< 100 yrs?	recent slopewash
A b1	3-10	20-30	-	7.5YR3 /3	scl	m or 1msb k		ss,p	n.o.	none	-	as		< 2k	moist, minor charcoal
Btb2	10-22	20-30	-	5YR4/3	sc	2msb k	sh or h?	s,p	2-3npob rco	none	-	ai		middle - late Pleisto-cene	moist
R	22+	-	-	-	-	-	-	-	-	-	-	-		-	tuff boulders
LA-86531, TA-74, Pueblo Canyon ridge (middle(?) Pleistocene eroded terrace), soil moist/partially frozen Test Pit #2 (Jan.15, 2002)													**86531-2**		
C	0-3	20-30	-	10YR 3/3	sl	m	lo	so,ps	n.o.	none	-	ai		< 100 yrs?	recent slopewash
Ab1	3-14	20	-	10YR3/ 2	scl	m	lo	ss,ps	n.o.	e-es	-	vai		< 500 yrs?	with charcoal, buried horizon
R	14+	-	-	-	-	-	-	-	-	-	-	-		-	tuff boulder
Thin Bk horizon below Ab1, above R, observed in adjacent Test Pit #3													**86531-2add**		
Bk?	12 - +/- 15?	<1	7.5Y R6/4 to	-	sil	-	h	-	-	ev (surfa ce) e	?	-		Pleisto-cene	compacted silt (eolian deposit?) with CaCO3 precipitating on top of

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
			10Y R6/4							(inter-ior)					silt
LA-110121, TA-74, artifact scatter, thin soils over Guaje Pumice Bed (Jan. 22, 2003)													**110121-1**		
A	0-11	60-70	10Y R5/4	10YR3/4	scl	2msbk?	sh?	ss,ps	lnco	none	-	cs		500 to 2000 yrs?	moist
Bw	11-19	>90	10Y R5/4	10YR4/4	s	m	lo	so,po	n.o.	none	-	cw			Qbog w/translocated fines + staining on pumice clasts
C	19+	>90	7.5Y R5/6	-	-	-	-	-	-	-	-	-		-	Qbvg
LA-110126, TA-74, eroded fieldhouse, N. facing colluvial slope, (Nov. 7, 2002)													**110126-1**		
A	0-13	<5		7.5YR4/3	sl	m-1msbk	so-lo	ss,ps	n.o.	none	-	cw		< 650 yrs	moist
Bw	13-29	5-10	7.5Y R5/4	7.5YR4/3	sl	1-2msbk	so-lo	ss,ps	n.o.	none	-	cs			tuff clasts, inside room
Btkb1	29-38+	<2	7.5Y R5/4	7.5YR4/4	cl	3fsbk	sh	s,p	3npfpobr	e-	I-	-		late Pleisto-cene	very thin carbonate filaments, matrix does not fizz
LA-110130, TA-74, "fieldhouse", N. edge of eroded, gently East-sloping terrace, (Jan. 22, 2003)													**110130-1**		
A	0-5	5	-	10YR3/3	sl	m	lo	so,po	n.o.	none	-	cs		< 650 yrs ?	moist
Bw	5-17	10	-	7.5YR3/3	scl	1-2 msbk?	so-sh?	so,po	n.o.	none	-	cw			partially frozen, reworked older soil?, below foundation rocks?
Btbl	17-24+	40-50	-	5YR4/4	scl	1 fsbk	so-lo	ss,ps	1 n co	none	-	-		late Pleisto-cene?	moist, stripped/eroded Pleistocene soil?, coarser sand than Bw

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
LA-110133, TA-74, Pit #1 (Jan.13, 2003)													**110133-1**		
AC	0-16	2-5	10YR5/4	10YR3/4	ls	m	lo	so,po	n.o.	none	-	gs		< 100 yrs?	partially frozen
CBb1	16-94+	10	7.5YR5/4	7.5YR4/3	sl	1msbk	so-lo	so,po	n.o.	none	-			< 500 yrs	young colluvium, artifacts @ 30 and 50 cm
LA-110133, TA-74, Pit #2, Qc, South Side of Pueblo Canyon, Light Scatter of Ceramics and Lithics (Jan.13, 2003)													**110133-2**		
AC	0-19	2-5	10YR5/4	10YR4/4	s	m	lo	so,po	n.o.	none	-	gs		< 100 yrs?	young colluvium, sparse artifacts
CB	19-70	10	7.5YR5/4	7.5YR4/4	sl	1msbk	so-lo	so,po	n.o.	none	-	cs		< 500 yrs	young colluvium
Bq?b2	70-80+	5	7.5YR6/4	7.5YR5/4	sl	2-3 msbk	h	so,po	n.o.	none	-	-		?	silica cement?
LA-117883, TA-74, Pit #1, Pueblo Canyon, Hamilton Bend, artifacts scattered throughout Qc (Jan.13, 2003)													**117883-1**		
AC	0-9	5-10	10YR4/3	10YR3/3	s	m	lo	so,po	n.o.	none	-	gs		< 500 yrs	colluvium + lithics
C	9-37	10-20	10YR5/3	10YR4/3	s	m	lo	so,po	n.o.	none	-	cs			colluvium + lithics
Bwb1	37-55	20	10YR5/3	10YR4/3	s	1m-csbk	so	so,po	n.o.	none	-	cw		<1000 - 2000 yrs	colluvium + lithics
II C	55-71+	50-70	10YR5/3	10YR4/3	s	m-sg	lo	so,po	n.o.	none	-	-		500-2000 yrs (see McDon-ald et al., 1996, Qt8 soil)	terrace gravel with sandy matrix
LA-117883, TA-74, Pit #2, Pueblo Canyon, Hamilton Bend (Jan.13, 2003)													**117883-2**		
AC	0-15	20	10YR4/2	10YR2/2	s	m	lo	so,po	n.o.	none	-	gs		< 500 yrs	colluvium + lithics
C	15-40	20	10Y	10YR2/	s	m	lo	so,p	n.o.	none	-	gs			colluvium + lithics

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Profile #	Preliminary Age Estimate	Notes
			R4/3	2				o							
BCb 1	40-101	20	10Y R5/3	10YR2/2	s	1 msbk-m	so-lo	so,po	n.o.	none	-	aw		< 1000 yrs	colluvium + lithics
II BKb 2	101-106+	<5	10Y R5/3	10YR4/3	ls	3 c p l	h	so,po	1 n po	ev	1+	-		late Pleisto-cene to early Holocene	cemented alluvium

Table L.9. Summary of soil morphology at White Rock Y tract cultural sites (described by Paul Drakos and Steven Reneau).

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
White Rock Y: test pits (October 7, 2002)														
LA-61034; shovel test #2, location 105N/190E, N-facing colluvial slope on Holocene terrace, Qc/Qt, possibly late Holocene Qc overlying stripped gravels surface														
A	0-6	5-10	10YR5/3	10YR4/3	sil	1msbk	so-lo	so, po	n.o.	none	-	cs	Puebloan or post-Puebloan Qc ?	colluvium, incl. ceramics + lithics
Bw	6-14	5	10YR5/4	10YR4/3	scl	2msbk	so	so, ps	n.o.	none	-	as		colluvium, incl. ceramics + lithics
Btj1(b1?)	14-30	10-15	7.5YR5/4	7.5YR4/3	scl	2msbk	sh-h	ss, ps	lnpobr	none	-	cw	Archaic Qc?	colluvium + lithics
Btj2(b1?)	30-40	10-15	7.5YR5/4	7.5YR4/3	scl	2msbk	so-sh	ss, ps	lnpo	none	-	cw		colluvium + lithics; cicada burrows form hard peds
IIBC(b2?)	40-58+	60-70	7.5YR5/3	7.5YR4/3	scl	1-2msbk	so-sh	ss, ps	n.o.	none	-	-	Holocene Qal	rounded gravels with fines matrix from Qc; few lithics; clasts from below bottom of pit have continuous $CaCO_3$ coatings on underside of clasts (Stage I

Horizon	Depth (cm)	Gravel (%)	Dry Color (Matrix)	Moist Color (Matrix)	Texture	Structure	Dry Consistence	Wet Consistence	Argillans	$CaCO_3$	$CaCO_3$ Stage	Lower Horizon Boundary	Preliminary Age Estimate	Notes
														$CaCO_3$)
LA-61035; test pit #1, location 95N/125E, N-facing colluvial slope on Holocene terrace, Qc/Qt, Stage I CaCO3 in gravels under Qc														
A	0-12	10-20	10YR4/3	10YR3/3	ls	1msbk	so	so, po	n.o.	none	-	gs	Puebloan or post-Puebloan Qc	colluvium, incl. ceramics + lithics
Bw	12-45	20-30	10YR5/3	10YR4/3	ls	2msbk	so	so, po	n.o.	none	-	gs		colluvium, incl. ceramics + lithics
C	45-140+	10	10YR5/4	10YR4/4	ls	m	lo	so, po	n.o.	none	-	-	Archaic Qc?	colluvium with filled cicada burrows; incl. lithics only; Qal gravel from below bottom of pit have continuous CaCO3 coatings on underside of clasts (Stage I $CaCO_3$)

APPENDIX M
RADIOCARBON DATES AND AGE CALIBRATIONS

Table M.1. Calibrated radiocarbon dates from samples used for reference soil stratigraphic descriptions in geoarchaeology investigation; calibrations conducted with CALIB 5.01.

Field Number	Laboratory Number	14-C Date (yr BP)	14-C Date Corrected for delta-13C	Median Calibrated Age (yr BP)	1-sigma Calibrated Age Range (yr BP)	2-sigma Calibrated Age Range (yr BP)	Notes
Fence Canyon							
FC-9	Beta-113041	4380±50		4,953	4866–5034	4844–5268	0.45 m deep, pumice-rich non-stratified colluvium
FC-6	Beta-93925	4500±50		5,158	50525–287	4976–5310	0.65 m deep, colluvium, possible shallow channel fill
WR-44	Beta-75307	4660±50		5,405	5317–5465	5300–5579	Archaic hearth, 0.8-0.9 m deep below colluvium
FC-2	Beta-84489	6220±50		7,117	7021–7243	6996–7257	1.3 m deep, colluvium
FC-1	Beta-84488	7780±50		8,556	8463–8603	8428–8641	2.5 m deep, colluvium
FC-8	Beta-113040	7890±50		8,711	8597–8845	8588–8978	2.8 m deep, upper part of buried soil
FC-4	Beta-93924	12,330±70		14,281	14083–14435	14014–14718	3.5 m deep, colluvium, lower part of buried soil
FC-9 + FC-6		4440±35		5,046	4967–5267	4877–5281	samples statistically the same at 95% level; combined
FC-1 + FC-8		7835±35		8,612	8560–8641	8543–8721	samples statistically the same at 95% level; combined
EG&G Gully							
WR-9	Beta-55626 *	4020±80	4040±82	4,543	4418–4796	4297–4824	0.78-0.86 m deep; burn layer

Field Number	Laboratory Number	14-C Date (yr BP)	14-C Date Corrected for delta-13C	Median Calibrated Age (yr BP)	1-sigma Calibrated Age Range (yr BP)	2-sigma Calibrated Age Range (yr BP)	Notes
WR-1	Beta-55622 *	8050±130	8070±131	8,966	8720–9190	8596–9397	2.45-2.5 m deep; coarse sediments below buried soil
WR-5	Beta-59677 *	7875±85	7895 ± 87	8,745	8594–8971	8540–9002	3.55 m deep; 0.6+m above base
WR-1 & WR-5		7949±72		8,810	8656–8977	8607–8997	samples statistically the same at 95% level; combined

*Radiocarbon date was not corrected for d13C; for calibration, the d13C value was assumed to be -23.8±1.2 o/oo based on d13C values of 107 samples collected from the Pajarito Plateau.

Table M.2. Radiocarbon dates from Land Transfer parcels; calibrations conducted with CALIB 5.01.

Radiocarbon Lab Sample Number	ENV-ECO Sample Number	Field Sample Number	Location	Depth	Notes	Conventional Radiocarbon Age (^{14}C yr B.P.)	Calibrated Age, Median Probability (cal yr BP or AD) *	1-Sigma Calibrated ^{14}C Age Range (cal yr BP or AD)	2-Sigma Calibrated ^{14}C Age Range (cal yr BP or AD)
LA-85403									
Beta-215549	85403-53	-	103N/102E		Collected by ENV-ECO; maize; prehistoric pit fill	310±40	AD 1564	AD 1516–1644	AD 1472–1653
LA-85404									
Beta-215550	85404-68	-	104N/102E		Collected by ENV-ECO; maize; around floor level of room	400±40	AD 1490	AD 1442–1616	AD 1432–1632
LA-86605									
Beta-215551	86605-77	-	103N/103E		Collected by ENV-ECO; maize; possible living surface	360±40	AD 1542	AD 1464–1628	AD 1450–1635
LA-87430									
Beta-215552*	87430-139	-	105N/102E		Collected by ENV-ECO; maize; ash deposit surrounding hearth	370±40	AD 1525	AD 1453–1582	AD 1446–1635
Beta-215553*	87430-173	-	105N/103E		Collected by ENV-ECO; maize; ash deposit surrounding	390±40	AD 1503	AD 1445–1617	AD 1437–1634

Radiocarbon Lab Sample Number	ENV-ECO Sample Number	Field Sample Number	Location	Depth	Notes	Conventional Radiocarbon Age (^{14}C yr B.P.)	Calibrated Age, Median Probability (cal yr BP or AD) *	1-Sigma Calibrated ^{14}C Age Range (cal yr BP or AD)	2-Sigma Calibrated ^{14}C Age Range (cal yr BP or AD)
					hearth				
previous 2 samples statistically indistinguishable, allowing summing of probabilities and refinement of age estimate						*380±28*	*AD 1500*	*AD 1451–1616*	*AD 1445–1631*
LA 85859									
Beta-183757	85859-225	-	90N/109E	~37 cm below ground sfc (Btb1?)	Collected by Steve Hoagland	6010±40	6851 BP	6791–6897 BP	6745–6948 BP
Beta-183758	85859-359	85859-c3	90N/14.89E	17 cm below top of Bt1b1	2 charcoal fragments	6310±50	7238 BP	7171–7272 BP	7031–7416 BP
Beta-199370	85959-363	85859-c8	88.5N/113E	26 cm below ground sfc; Bt1b1	single charcoal fragment; good soil structure and relatively high clay content, suggesting good sample site	6140±40	7047 BP	6955–7155 BP	6931–7163 BP
previous 3 samples statistically different, suggesting period of aggradation that included site occupation						*6010–6310*	*6851–7238*	*6791–7272 BP*	*6745–7416 BP*
Beta-183759	85859-360	85859-c6	88.2N 111E	3 cm below top of Bt1b1; 26 cm below ground sfc	single small charcoal fragment; below S-sloping Bw in swale {apparent young charcoal}	570±40	AD 1353	AD 1316–1414 AD	AD 1299–1429
previous sample provides possible age estimate for overlying late Holocene Qc (A-Bw horizons)									

Radiocarbon Lab Sample Number	ENV-ECO Sample Number	Field Sample Number	Location	Depth	Notes	Conventional Radiocarbon Age (^{14}C yr B.P.)	Calibrated Age, Median Probability (cal yr BP or AD) *	1-Sigma Calibrated ^{14}C Age Range (cal yr BP or AD)	2-Sigma Calibrated ^{14}C Age Range (cal yr BP or AD)
LA 99396									
Beta-199376	99396-472				Cultural site; collected by ENV-ECO	810±60	AD 1205	AD 1059–1281	AD 1030–1377
Beta-199377	99396-493				Cultural site; collected by ENV-ECO	860±40	AD 1180	AD 1054–1224	AD 1044–1261
Beta-199378	99396-608				Cultural site; collected by ENV-ECO	890±40	AD 1137	AD 1049–1211	AD 1035–1219
Beta-199379	99396-753				Cultural site; collected by ENV-ECO	930±40	AD 1102	AD 1041–1155	AD 1023–1206
Beta-199380	99396-758				Cultural site; collected by ENV-ECO	870±40	AD 1170	AD 1052–1220	AD 1043–1255
all 5 samples statistically indistinguishable, allowing summing of probabilities and refinement of age estimate						*883±19*	*AD 1168*	*AD 1059–1210*	*AD 1048–1216*
Beta-199381	99396-774	99396-c2	110N/123E	~1.05 m deep (in ped in sieve from soil profile location), in Btkb1	single charcoal fragment, at Profile 4	33,660±320	beyond range of calibration	beyond range of calibration	beyond range of calibration
Beta-199382	99396-775	99396-c3	84.7N/114E	21 cm deep, in Bwb1	single charcoal fragment, near Profile 2 (swale fill?); minimum age for Bwb1 soil?	1000±40	AD 1032	AD 989–1147	AD 975–1155
LA 99397									

Radiocarbon Lab Sample Number	ENV-ECO Sample Number	Field Sample Number	Location	Depth	Notes	Conventional Radiocarbon Age (^{14}C yr B.P.)	Calibrated Age, Median Probability (cal yr BP or AD) *	1-Sigma Calibrated ^{14}C Age Range (cal yr BP or AD)	2-Sigma Calibrated ^{14}C Age Range (cal yr BP or AD)
Beta-199383	99397-211	-	100N/95E	18 cm	collected by ENV-ECO	2110±60	2090 BP	1995–2152 BP	1933–2307 BP
Beta-199384	99397-214	-	91N/100E	5-15 cm	collected by ENV-ECO	2280±40	2263 BP	2183–2347 BP	2157–2352 BP
previous 2 samples similar but statistically different; period of stripped surface that included occupation?						*2110–2380*	*2090–2263 BP*	*1995–2347 BP*	*1933–2352 BP*
Beta-199385	99397-292		98N/129E	26 cm, Bw horizon	collected by ENV-ECO	530±40	1406 AD	AD 1329–1434	AD 1312–1444
Beta-202213	99397-282		100N/106E	12 cm	collected by ENV-ECO; burned stump	880±40	1157 AD	AD 1051–1215	AD 1035–1251
99397-292 + 85859-360 statistically indistinguishable, suggesting same Rendija fire event						*550±28*	*AD 1397*	*AD 1326–1420*	*AD 1314–1432*
LA-127627									
Beta-215554	127627-9	-	103N/104E		Collected by ENV-ECO; maize; top of living surface in room	380±40	AD 1513	AD 1448–1619	AD 1442–1634
Beta-215555	127627-52	-	105N/103E		Collected by ENV-ECO; maize; under rock in room	400±40	AD 1490	AD 1442–1616	AD 1432–1632
previous 2 samples statistically indistinguishable, allowing summing of probabilities and refinement of age estimate						*390±28*	*AD 1486*	*AD 1447–1615*	*AD 1441–1629*
LA-127634									
Beta-215556	127634-105	-	104N/105E		Collected by ENV-ECO; maize; fill from upper part of hearth	350±40	AD 1552	AD 1475–1631	AD 1455–1637

Radiocarbon Lab Sample Number	**ENV-ECO Sample Number**	**Field Sample Number**	**Location**	**Depth**	**Notes**	**Conventional Radiocarbon Age (^{14}C yr B.P.)**	**Calibrated Age, Median Probability (cal yr BP or AD) ***	**1-Sigma Calibrated ^{14}C Age Range (cal yr BP or AD)**	**2-Sigma Calibrated ^{14}C Age Range (cal yr BP or AD)**
Beta-215557	127634-108	-	104N/105E		Collected by ENV-ECO; maize; fill from lower part of hearth	340±40	AD 1556	AD 1487–1633	AD 1462–1642
previous 2 samples statistically indistinguishable, allowing summing of probabilities and refinement of age estimate						*345±28*	*AD 1559*	*AD 1487–1631*	*AD 1466–1636*
LA-127635									
Beta-215558	127635-105	-	106N/100E		Collected by ENV-ECO; maize; fill from lower part of hearth	800±40	AD 1234	AD 1214–1268	AD 1167–1278
Beta-215559	127635-125	-	106N/100E		Collected by ENV-ECO; maize; fill from upper part of hearth	760±40	AD 1255	AD 1227–1279	AD 1189–1294
previous 2 samples statistically indistinguishable, allowing summing of probabilities and refinement of age estimate						*780±28*	*AD 1247*	*AD 1225–1268*	*AD 1215–1278*

*Median probability not recommended as a replacement for cal age ranges or complete probability distribution. but suggested to be a stable estimate of sample calendar age

APPENDIX N
A METAL DETECTION SURVEY OF LA 85864 AND LA 85869, LOS ALAMOS NATIONAL LABORATORY

Charles Haecker

INTRODUCTION

On September 30, 2003, historic archaeologist Charles Haecker conducted a comprehensive metal detector survey of two historic sites, LA 85864 and LA 85869, located on land administered by Los Alamos National Laboratory (LANL). Both sites were initially recorded during a 1991 archaeological survey of the vicinity around Rendija Canyon, as part of the LANL-Bolson Land Exchange archaeology project. At the time of this survey, LA 85864 reportedly consisted of a 5 m-diameter half-circle of tuff cobbles, two sherds, a chalcedony core, and a rhyolite tuff slab with a ground surface. David Hill, the archaeologist who recorded this site, noted that one sherd had a micaceous black paste, whereas the other sherd had a gray paste and tuffaceous temper. Hill noted on the site survey form that LA 85864 was either prehistoric Ancestral Pueblo or a Historic period site of unknown cultural affiliation. Later test excavations at LA 85864 identified the presence of a hearth inside the rock ring, which yielded a radiocarbon date of 130±60 BP (Beta-58428). This indicates that the feature dates to the 18^{th} or 19^{th} centuries.

Hill also recorded LA 85869, located approximately 120 m to the southeast of LA 85864. At the time of its discovery, LA 85869 reportedly consisted of one 4 m-diameter rock ring with an interior hearth, a lithic scatter, and a possible ramada. A concentration of cobbles in association with a mano and metate was situated to the west of the tipi ring. A light scattering of obsidian flakes were found over the surface of the site. Hill did not assign cultural affiliation but suspected that it dated to the "proto-historic" period (ARMS Sites Records; Peterson and Nightengale 1993).

In 2003, LANL archaeologists mapped, surface collected, and subsurface tested the two above-described sites. Three sherds were recovered from testing at LA 85864 but no metallic artifacts were found as a result of metal detecting this site. In contrast, the surface collecting of LA 85869 produced four metallic artifacts and two sherds. In addition, the comprehensive survey of this site prior to testing suggested there may be as many as four semi-permanent structures, consisting of tipis or wickiups and a ramada. Test excavations of LA 85869 in 2003 resulted in the recovery of several more metallic artifacts, as well as three sherds and 156 glass beads within Feature 2, which is a rock ring (see Chapter 42, Volume 2).

JICARILLA APACHE OCCUPATION OF NORTHERN NEW MEXICO

At least seven ethnic groups occupied northern New Mexico at least sporadically from the time of Spanish contact to the late 19^{th} and early 20^{th} centuries: the Utes, the Jicarilla Apache, Navajos, Tewa-speaking Puebloan peoples, the Comanches, the Hispanics, and the Genizaros.

Of these, the Comanches are not likely to have left structural evidence since their presence was in the form of small war parties that did not use structures of any types. The Navajos are reported to have raided throughout the region during 1700s up to the 1860s (Schaafsma 1976), but there is no documentation to suggest the Navajo occupied temporary structures that left rock rings as archaeological evidence of their presence.

Although there are data regarding Ute, Apache, and Plains Indian tipi morphology and size (cf., Adams et al. 2000; Earls et al. 1989; Smith 1974), there are too few consistently recorded attributes that can allow distinctions of ethnicity. The paucity of measurements, the lack of documentation on the subsistence-settlement systems of the group in question, and the difficulty involved in converting ethnographic/historic measurements to measurements on archaeological remains are problems in using ethnographic analogy. While there are enough general data on tipi rings that can be used as a comparative database, there are insufficient data to distinguish ethnicity of rings, and there are insufficient data to distinguish tipi rings from remains of brush structures, which are termed *wickiups*. Nonetheless, it is believed that both sites are the result of Jicarilla Apache occupation. This conclusion is based on what is generally known of the culture history of north-central New Mexico, combined with the significant discoveries of Jicarilla micaceous sherds at LA 85864 and LA 85869.

Prior to European contact, the Jicarilla Apache occupied a territory encompassing much of north-central New Mexico, southern Colorado, and the panhandle of Oklahoma. Historically they acted as itinerant traders and cultural brokers in an ecologically diverse region that linked Puebloan, Southern Plains and Hispanic cultures. These traditional roles changed during the 1800s due to Euro-American encroachment and US government frontier policies. Most of what is currently known about Jicarilla trade and economy comes from written documents that are often biased and incomplete. Little archaeological research has been carried out using Apache materials, and this has led to a critical gap in our understanding of culture contact dynamics along the frontier of New Mexico.

The Jicarilla Apaches occupied the west side of the Rio Grande, including the Jemez Mountains, more intensively and earlier than is commonly thought. The Jicarilla are reported with the Ute in Ute territory (Colorado San Juan Mountains and San Luis Valley) as early as 1818. The east end of the San Luis Valley was occupied even sooner by the Carlanas or Sierra Blancas. According to Thomas (1935), the Jicarillas also regularly traveled to Navajo country during the 18th century. During the 1840s, they were regularly reported to be in the Petaca/Ojo Caliente area and at Abiquiu, the Jicarilla most times in the company of the Utes. Emory (1848) names three of the principal chiefs of the Jicarilla "west of the Del Norte" in 1846. Ethno-historic records indicate that this area was inhabited by several Jicarilla bands by the 1850s, utilizing the mountains and heavily wooded valleys as a refuge during war and raiding campaigns. Hispanic farmers and sheepherders also occupied this area at the same time.

On May 30, 1849, Apaches raided the community of Abiquiu. A company of dragoons lead by Captain John Chapman went into the Jemez Mountains where they encountered these Apaches at the headwaters of the Rio Oso. The band had 40 to 50 lodges and between 200 or 400 members. In 1850, a small band of Jicarillas requested that they be allowed to live west of the Rio Grande, but they were attacked by Hispanics in Ojo Caliente and turned back. This attack was retaliation for an earlier assault on Ojo Caliente, presumably perpetrated by the Jicarilla. By 1853, Steck and Lane succeeded in moving Chacon's band to the Rio Puerco. However, when he explained this move to his superiors who believed it to be in Navajo or Ute territory, Lane argued that it was claimed by the Jicarilla as hunting grounds, and that he merely moved them farther into their existing range. Most of this information comes from Schroeder, Bender, and the compilations of primary document excerpts submitted on behalf of the government's side of the Land Claims.

The Jicarilla roamed the southern San Juan Mountains as early as the early 1800s and the Jemez Mountains before the 1840s. Just which bands is not clear during this early period, but the Jemez Mountains were the fall, summer, and winter hunting grounds of the Jicarilla bands who occupied the Abiquiu, El Rito, and Petaca districts in the 1870s. These mountains were sacred to them. Schroeder (1974:128) interviewed several Jicarilla as part of his Land Claims research report. Henry L. Vicente stated that the "Jemez Mountains were referred to as a ceremonial mountain." Mooney (1898:208) tells how Killer of the Enemies destroyed two giant bears that lived in the mountains west of Santa Clara, probably the Jemez Mountains. Pedernal Peak also is sacred; it forms the "nipple" of the earth that was fashioned in the form of a human body by Killer of the Enemies before he departed the people.

Severo Jaramillo, also interviewed by Schroeder, stated that the Jicarillas in the Jemez Mountains during the 1870s were the Sand People (Saitinde). Mooney (1928; see also Swanton 1952:371) states that the Saitinde, a Jicarilla band, claimed the vicinity of Española. Although the term "sand people" is thought to refer to the Jicarilla practice of mixing sand into their pottery clay, the term more likely makes reference to the band's traditional homeland. The Great Sand Dunes region in Colorado would be a likely candidate since it encompassed the range of the Sierra Blancas or Carlanas Apaches during 1700s. Sierra Blanca is adjacent to the great Sand Dunes on the east side of the San Luis Valley in Colorado. But the Jicarilla also report camping on the Arkansas at a place called "white sands" (Goddard 1911:245), which probably refers to the north branch of the Arkansas, called "the Big Sandy Fork" on an 1874-dated map.

Some of the Carlanas merged with the Jicarilla while they were all at Taos in the 1730s. Chacon usually traveled north to the Sierra Blanca area when fleeing troops or on hunting parties, and was one of the leaders of the Saitinde or Olleros in the 1850s. The Saitinde may constitute the remnant Carlanas band in part. Prior to occupying the Rio Puerco, Chacon and his band reportedly moved back and forth between Truchas and Anton Chico, where they hunted antelope and buffalo and had very good relations with Mexican settlements. The Saitinde farmed along the Chama, near Abiquiu, El Rito, and La Madera/Ojo Caliente on a more permanent basis starting in the 1850s.

John Mills Baltazar, a Jicarilla Apache who was 74 years old when Schroeder interviewed him in 1953, said he was born near Los Alamos. In his testimony before the Land Claims Commission, Hibben argued that births took place in permanent camps, suggesting that Jicarilla testimony regarding their birthplaces also record the locations of permanent camps. Hibben confirmed these locations with historical documents and archaeological survey. This land was annexed from San Ildefonso Pueblo during World War II. The Jicarillas had good connections with San Ildefonso and likely camped near the vicinity. Those fleeing Mescalero in 1886 sought refuge at San Ildefonso and San Juan Pueblos. Some of these Apaches were the disaffected *Olleros* at

Mescalero, who occupied the Jemez Mountains in previous times. Also, San Ildefonso pottery has been found at the Jicarilla sites in the Rio del Oso Valley (Sunday Eiselt, personal communication, October 2003).

PREVIOUS JICARILLA APACHE ARCHAEOLOGICAL STUDIES

Until recently, it was assumed by the archaeological community in the Desert Southwest that Apache encampments are too difficult to identify, thus generally not worthwhile as a subject of research. The apparent assumption was that the Apaches' fabled minimalist lifeways and a concomitant paucity of material possessions precluded discovery or recognition of their encampments via conventional archaeologist field methods (cf. Gregory 1981:266; Oakes 1996; Schaafsma 1981:299; Sebastian and Larralde 1989:93–94). However, recent work conducted by Adams et al. (2000), Haecker (2002, 2003), and by USFS-Carson Forest Archaeologist David Johnson (personal communications, 2002, 2003) indicate that Apache sites can be identified via predictive modeling as it pertains to specific types of landforms that were favored by Apaches. Furthermore, metal detection surveys in recent years of probable Apache encampment sites identified by such modeling often result in the discovery of an abundance of subsurface Apachean artifacts, as well as the identification of intra-site features such as rock rings, hearths, grinding stations, bedrock mortars, rock-stacked breastworks, and culturally modified trees.

Unfortunately, there is still a general lack of sustained research regarding Jicarilla Apache material culture in New Mexico, although much work has been conducted sporadically in a cultural resource management context (Biella and Wetherbee 1997; Earls et al. 1989; Girard 1988; Hammack 1965; Levine 1984; Levine and Mobley 1974; Levine et al. 1984; Mobley 1978; Schaafsma 1975; Winter 1988). The result is that, while potential Jicarilla Apache sites have been identified, few have attempted to interpret Jicarilla material culture. Isolating and interpreting Apache sites requires an interdisciplinary approach that combines historical documents, ethnographic research, archaeological methodologies that include remote sensing techniques such as metal detecting, and ceramic analytical techniques. According to Sunday Eiselt (personal communication, December 2003), it has been difficult for researchers to develop a holistic context for investigating Jicarilla Apache archaeological sites, and thus there has been little synthetic work in this area since the 1970s.

Much of what is presently known about the Jicarilla Apache archaeological record has been generated by James and Dolores Gunnerson on the Southern Plains and the foothills of New Mexico (Gunnerson 1979). J. Gunnerson described 12 potential Jicarilla encampments that were then compared to the historical materials collected by D. Gunnerson (1974). Two types of micaceous pottery have been identified as a result of this work: *Ocate Micaceous Type*, which dates from AD 1550–1750, and the *Cimarron Type,* dating from AD 1750 to the 1900s. The attributes of these ceramic types are described in detail by Brugge (1984), Franklin (1988), Gunnerson (1969), Gunnerson and Gunnerson (1971), Marshall (1987), and Warren (1976, 1981).

Artifacts and features associated with the Ocate pottery include adobe room blocks and ovoid pit houses, Desert Side-Notched projectile points, clay pipes, bone and shell artifacts, and small slab metates. Artifacts and features associated with the Cimarron pottery include rock-ring house features with central hearths, debitage, micaceous pipes, and ground stone, but artifacts are not generally abundant. Most of the sites excavated by Gunnerson lay east of the Sangre de Cristos Mountains, representing only half of the Jicarilla territory (Eiselt 1999:4).

The important research conducted by Anschuetz (1993, 1995b) and Eiselt (2001) in the Rio del Oso Valley, west of the town of Española, New Mexico, has renewed interest in the topic of Jicarilla Apache archaeology. Anschuetz recorded 48 rock ring sites that he attributes to the Jicarilla Apache within the Rio del Oso Valley, located approximately 35 km to the northeast of the LANL project area. He notes that the Jicarilla Apache history in the Rio del Oso Valley is the result of their migration from the Sangre de Cristo Mountains Front Range homeland, this due to economic, social, and cultural pressure first exerted by Comanche, then by Hispanic and Anglo-American populations, all of whom were competing for limited resources within the southwestern Plains. By the late 19th century, some Jicarilla Apache families of the Ollero band came to consider the Rio del Oso Valley as their homeland (Anschuetz 2000:3).

Additional work by Eiselt within this valley has refined and expanded upon the findings of Anschuetz. Jicarilla encampments appear to be characterized by between 10 to 15 rock rings with clearly associated 19th century trash and Apache micaceous ceramics. These rock rings often occur as discrete clusters less than 50 m apart. Clusters consist on average of two- to- three closely spaced rings and often associated with possible corrals, garden plots, and water control devices. Metal artifacts such as barrel hoop fragments, buckles, buttons, cone tinklers made from strips of food cans, metal projectile points, and the detritus from making these points, are found associated with Rio del Oso tipi rings (Eiselt 1999:8).

Additionally, Haecker (2003) recovered a similar variety of metal objects during his investigation of late 19th and early 20th century Jicarilla tipi rings on Ghost Ranch, located approximately 60 km to the north of the LANL project area. Significantly, the material culture found at the Ghost Ranch sites indicates occasional Jicarilla occupation of this area perhaps as late as the first decade of the 20th century. Such occupation of the area around Abiquiu by Jicarilla families would have constituted an unauthorized, and thus illegal, leaving of the Jicarilla Reservation.

METAL DETECTION SURVEY OF LA 85864 AND 85869

A metal detection survey of the two sites was deemed appropriate given the likelihood that both sites date to the Historic period. If metallic artifacts were discovered, these artifacts would provide an accurate assessment as to the period of occupation. Also, discovery of surface finds of native-made ceramics, resulting from a close inspection of the ground surface during metal detection, would also provide information regarding the probable ethnicity of the sites' occupants.

Metal detection of the two sites adhered to field methods typically employed by archaeologists who utilize this remote sensing tool. Specifically, at LA 85869, the surveyor traversed a series of overlapping two meter-wide transects. The surveyor, using an overlapping sweeping motion with the machine coil, ultimately inspected virtually 100 percent of the site area. In addition, an estimated 15 meter-wide buffer around the site boundary was also inspected in this fashion. Once detected, a metal target was then excavated and exposed using a trowel. Objects that were of 20th century manufacture, for example, .22 rifle shell casings, were given to LANL archaeologists to discard off-site. Other objects that were likely or possibly associated with the site were assigned field specimen (FS) numbers and collected by LANL for later processing. Upon completing the survey, LANL archaeologists point-provenienced the artifacts locations and features via a total station established over a site datum.

SURVEY RESULTS

An intensive metal detector sweep of LA 85864 did not result in the discovery of any metallic artifacts. However, at LA 85869, 16 metal artifacts were discovered and collected. In addition, three sherds had been surface collected by LANL archaeologists from this site and prior to the metal detector survey. These artifacts are described as follows.

FS 129: The following describes the results of analysis conducted by Sunday Eiselt, a specialist in Jicarilla Apache ceramics:

The sherd is a body fragment made of primary micaceous clay. The sherd can be grouped with other historic micaceous types that are part of the ill-defined ware category of *Sangre de Cristos Micaceous* (Baugh and Eddy 1987). Without a rim, it is difficult to attribute it to the Apache, but given the character of the site, it probably is [prior to her analysis, Ms. Eiselt was given a general description of the site, including recovered metal artifacts, by Haecker]. There are a few other characteristics of the sherd that suggest an Apache origin:

- The Apache whole vessels dating to the turn of the century that I have analyzed as well as the fragmentary Cimarron ceramics from archaeological sites in the Chama district and elsewhere are relatively thin (4-6 mm). The interior surface is compacted and slightly faceted, indicating that the vessel interior surface is compacted and slightly faceted, indicating that the vessel interior was burnished with a recurved stick or stone or lightly sanded, but not polished to a high luster (unlike most Pueblo ceramics except Picuris).

- Interior surface texture remains rough. The exteriors commonly display scrape marks, and frequently these are smoothed over through the application of a thin mica slurry or wash, probably applied with the hands or with a chamois while the pot was leather hard. The exterior treatment tends to give the sherds a waxy texture, and this may be due to the application of the slurry, which floats small pieces of mica to the surface, but it also could be that the exterior pot was rag polished once dry. This would force larger mica fragments to bend over any rough edges or bumps caused by protruding aplastic inclusions. Relatively large and abundant aplastic inclusions are typical in Apache ceramic pastes. They only removed the aplastics that they could feel with the fingers (as did the Pueblos).

- The pot from which the sherd derives was thin (5.6 mm). It has a lightly burnished/sanded interior that is smudged either through use or during firing (pots were typically fired upside down). While relatively flat, the interior surface also is rough and compacted. The exterior may contain light corn-cob scrape marks, but aplastic bumps are also present. The exterior surface treatment is nonetheless consistent with Apache finishing practices. The surface is waxy, and aplastic bumps are smoothed over and lightly polished with something soft like leather or bare hands. A mica slurry was applied to the exterior only. The clay is primary micaceous clay of unknown origin although the extremely small size of mica flakes is consistent with U.S. Hill clays. Other inclusions include quartz primarily. Apache pottery techniques, and archaeological sherd description can be found in Opler (1971), and Gunnerson (1969).

- According to Guthe (1925), San Ildefonso produced micaceous pottery on a limited basis. The San Ildefonso potters called micaceous clay "Apache clay." They got the clay from Truchas or Santa Fe Canyon. The finishing techniques described by Guthe indicate the use of a gourd scraper or *kajepe* by San Ildefonso potters. "Finishing touches" are not described very well. A gourd scraper will produce a flat, smooth, and non-undulating vessel surface. No scraper will produce a flat, smooth, and non-undulating vessel surface. No corncob scraper marks will be visible, even if one was used during initial thinning. Apache pots, on the other hand, will almost always contain undulating surfaces because they did not use gourd scrapers. They smoothed vessels with the hands or cloth after scraping. Many Picuris and Taos pots that I have analyzed have been scraped with a gourd scraper, and this is a distinctive practice for Pueblo potters more generally. The exterior of FS 129 does not appear to have been scraped with a gourd. I have not analyzed San Ildefonso micaceous pottery, so I cannot comment any further on potential differences there. Richard Lang describes a type called Tewa Micaceous (1997:250), but this is a very thick micaceous ware that is similar to Vadito Micaceous described by Dick (1965).

An assignment as Apache based on surface treatment and wall construction alone is tentative at best, but taken with other evidence at the site, it is suggestive. If any quartz-muscovite and schist nodules are present on the site, this is very consistent with the mobile production practices of the Apache. The nodules are cleaning debris, and they are frequently associated with rings or can be found at lookout locations. The Jicarilla carried raw clay on horseback and produced pottery in locations distant from the sources.

The following artifacts were recovered as a result of metal detection at LA 85869:

FS 135: Metal strip, believed to be of tin/zinc alloy; 1 cm wide, 4.2 cm long, end bent together; oxidized; function unknown.

FS 197: Can fragments (10); portion of a can seam indicates the fragments are from a "sanitary seal" can, a post-1897 manufacturing innovation (Busch 1981:97).

FS 199: Can fragments (2); portion of a can seam indicates the fragments are from a "sanitary seal" can, post-1897.

FS 209: Bridle jingle or *coscojo*, two parts joined by a hook. Coscojos of this type are machine-manufactured, are Hispanic in origin. They have been found on both Jicarilla Apache and Ute encampments in north-central New Mexico, on Mescalero Apache sites in southeastern New Mexico, and Chiricahua Apache sites in southwestern New Mexico (Adams et al. 2000; Haecker 2003). Together, these sites have a date range of circa 1840–1900+.

FS 210: Straight pin or round wire fragment, ferrous; 3.0 cm long; 19th century to present.

FS 211: Trapezoidal-shaped white metal (tin?) sheet, folded, edges cut; 4.0 x 2.5 cm. Function unknown, although its shape and method of modification suggests that this is a cone tinkler, or the detritus resulting from making a cone tinkler; 19th century to present.

FS 212: White metal (tin?) fragment, cut on all sides; possibly detritus resulting from making a cone tinkler; oxidized; 19th century to present.

FS 213: Can fragment, cut into a strip; possible fastener hole; strip is "wavy" in profile; 3.0 x 1.0 cm. Function unknown.

FS 214: Lead/alloy rifle ball; .50 cal.; cast seam is visible; ball has an impact surface. The metal alloy is not known but either tin or antimony were alloyed with lead in the manufacture of bullets after the Civil War. Also, black powder firearms are presently used in the vicinity of the project area (Steve Hoagland, personal communication). It is believed that, since the ball has been fired, it is not associated with 19th century Native American occupation component of the site.

FS 215: Lead rifle ball; .50 cal.; sprue is present, indicating it was cast in a mold; dropped/not fired; relatively more oxidized than FS 214, suggesting greater age. The softness of the metal (object could be scratched with a fingernail) indicates it is unalloyed lead, which is characteristic of firearm projectiles prior to circa 1870. It is likely, therefore, that the artifact was deposited by Native American occupants of the site.

FS 216: Base fragment of a .30 cal. brass pistol shell casing; rim-fired; post-1871 (Suydam 1960:67).

FS 217: Lead fragment, presumably from a fired bullet; slightly oxidized; cannot determine if it is alloyed or unalloyed lead; 19th century to present.

FS 218: Brass fragment of a rifle shell, caliber unknown; 20th century to present.

FS 219: Fragment of white metal (tin?) sheet, cut on two sides; oxidized. Function unknown but possibly detritus resulting from making a cone tinkler; 19th century to present.

FS 220: Bridle jingle or *coscojo*, three parts joined. (See FS 209).

FS 221: Bridle jingle or *coscojo*, two parts joined. (See FS 209).

Bead Analysis

A total of 156 glass beads were discovered at LA 85869 during the excavation of a tipi ring (Feature 2) and sample areas immediately adjacent to this feature (see Table N.1). All but two of the beads (n = 154) are of the so-called "seed" bead category. The two anomalous beads include one-half of a blue "pony" bead (FS 304) and a red with white core bead (FS 232), termed a *cournaline d'Aleppo* or "Hudson's Bay Company" bead (Ross 2000:31). Pony beads are about 3/32 inch in diameter and almost always blue or white. The pony bead moved slowly west and did not reach the Plains in quantity until about 1800. It was followed in about 1840 in the west by a type of very small bead that were of a variety of colors and often faceted. This tiny "cut" bead and the pony bead continued together until the appearance about 1855 in the west of the "seed" bead. The pony beads then disappeared, except in Idaho, northwest Montana and eastern Washington. The cut beads continued, but always in the minority to seed beads (Douglas 1936:90–92, *in* Ross 2000:A-3). Pony beads were prized by Mescalero Apaches well into the 1870s (see Figure N.1), whereupon they were replaced in popularity by seed beads by the early 1880s.

Table N.1. Artifacts derived from test excavations from LA 85869.

FS #	ARTIFACT TYPE	NO.	DESCRIPTION
232	bead	2	White seed (1); red w/ white core, 3 mm dia. (1)
234	"	2	White seed (1); red seed (1)
238	Metal flake, possibly lead alloyed w/ tin or antimony	1	5 x 7 mm; function or source unknown
245	bead	12	White seed (8); blue seed (4)
250	"	1	White seed (1)
251	"	5	White seed (2); blue seed (2); Pink-red seed (1)
258	"	19	White seed (12); dark blue seed (3); blue seed (1); tan seed (3)
259	"	2	White seed (1); tan seed (1)
268	Rolled steel strip, 1.5" x 0.75"; 3 sides are cut, one side showing metal fatigue from bending back and forth; metal strip is "wavy" in profile	1	Function unknown
273	bead	13	White seed (7); blue seed (6); tan seed (1)
274	"	12	White seed (9); blue seed (1); tan seed (2)
275	"	2	White seed (2)
276	"	2	White seed (1); blue seed (1)
279	"	9	White seed (6); blue seed (3)
280	"	7	White seed (6); blue seed (1)

FS #	ARTIFACT TYPE	NO.	DESCRIPTION
281	"	15	White seed (5); blue seed (2); dark blue seed (4); tan seed (4)
284	"	2	White seed (1); blue seed (1)
289	"	2	White seed (1); tan seed (1)
290	"	7	White seed (4); blue seed (1); pink-red seed(1); tan seed (1)
292	"	5	White seed (4); blue seed (1)
298	"	10	White seed (8); blue seed (2)
300	"	1	Blue seed (1)
301	"	1	White seed (1)
303	"	8	White seed (3); blue seed (4); pink-red seed (1)
304	"	1	"pony"-type bead, half fragment, 20 mm dia.
310	Lead ball, out-of-round, split, approx. 0.30" dia.	1	Possible fish line weight
312	bead	7	White seed (5); blue seed (1); tan seed (1)
315	bead	4	White seed (2; one slightly larger w/ larger hole); blue seed (1); brown/tan seed (1)
316	"	3	White seed (2); blue seed (1)
317	"	1	White seed

The term *cornaline d'Aleppo* identifies a red, double-layered polychrome, cut-type bead. Since gold was used to make red or ruby-colored glass, red beads were expensive relative to the other beads offered to North American Indians during the 19th century. Thus, expensive red glass was layered on inexpensive white glass to reduce the production cost of red beads. Brilliant red beads cost almost five times as much as black beads, that is, the cheapest bead color type (Ross 2000:31).

Seed beads were supplied by traders in a number of sizes, all of them quite small. The largest are about one-sixteenth of an inch in diameter, about half the size of the next largest type of trade bead. According to Hanson (1989:2), citing various authors, traders introduced seed beads to the Northern Plains and Upper Missouri River Indian tribes around 1830. The popularity of seed beads for embroidery spread south and westward, reaching the Southern Cheyenne by around the mid-1830s, the western Sioux and Crow by the 1840s and, among the Blackfeet, seed beads became popular by 1875 (Ewers 1945:38). The Athapaskan-speaking tribes of Colorado, Utah, and Idaho began using seed beads in great numbers by 1890 (Duncan 1989:16).

Figure N.1. Jicarilla Apache maiden, 1873.
Note necklace of "pony" beads, and an absence of seed bead embroidery, which is dominant on Jicarilla Apache clothing by circa 1880.

The earliest type of seed beads are opaque and have softer colors than those introduced toward the end of the 19th century. From the analysis of over 430,000 beads archaeologically recovered from Fort Union, North Dakota, as well as from analyzing beads from 13 other regional trading post sites (Ross 2000), it is evident that there occurred a transition in native preference regarding bead colors. For hundreds of years the dominant bead color among Indians across North America had been white, reflecting a common use of shell in bead making. Blue was the second-most desired bead color. Later, with ever-increasing contact, Indians accepted a greater range of unfamiliar colors. With the arrival of Europeans and their glass beads, initial bead colors of choice among most Native Americans in western North America continued to be primarily white, followed by blue (Ross 2000:136).

Blue and white beads dominate archaeological assemblages that date to the 1830s, with limited occurrences of red, amber-colored, black, and green beads. By the 1840s, blue and white beads continued to dominate, but red and black beads were becoming more common, with limited amounts of green beads. By the 1850s, blue and white beads retained their popularity but continued to diminish in frequency, while red, black, and amber-colored beads increased in popularity. During the 1860s, the use of a wide range of colors became popular, including yellow, pink, green, light and dark blue, and light and dark purple. By the mid-1880s, virtually all Native American peoples employed almost exclusively the smallest of seed beads for their embroidery. By then seed beads had an even wider range of colors and possessed more brilliant hues, as compared to those available in previous decades. Old bead sample cards used by traders just prior to 1900 show more than 80 colors of seed beads from which Indian women could make selections (Douglas 1936:90–92; Ross 2000:167, A-6).

It is not statistically valid to compare and contrast the types and characteristics of the relatively few beads recovered from LA 85869 with the massive amounts found at, for example, Fort Union, North Dakota. However, it is noteworthy that the most common bead color represented at LA 85869 is white (n = 94, or 64%), followed by blue (n = 41, or 26%). This suggests that the occupants of the tipi site possessed the same general bead color preference as their fellow Native Americans throughout 19th century North America. Seed beads of the smallest size (i.e., 0.5-0.7 mm diameter), are well represented in the collection. This indicates that the site was occupied at least as early as circa 1880. And, as noted above, the tan, brown-tan, and pink-red seed beads are colors that likely would not have been introduced to the Jicarilla Apaches until the 1880s, or possibly even later.

The fragment of blue pony bead, and possibly also the *cornaline d'Aleppo* cut bead, likely pre-date the seed beads insofar as when these two beads were first acquired and used by an occupant(s) of LA 85869. The fragmented condition of the pony bead suggests it was deposited as a result of on-site breakage. The cut bead, given that it is red, would have possessed some intrinsic value greater than all the other beads found on the site. The size of this bead (2 mm in diameter) precludes its use on embroidery; rather, it likely would have been strung alongside other beads of similar or greater size, on a necklace or beaded tassel.

CONCLUSIONS

The rock ring features found at LA 85869 and the one rock ring feature of LA 85864 are characteristic of mid- to- late 19th and early 20th century Jicarilla encampments located within north-central New Mexico, and specifically within the Rio del Oso Valley. Also, several of the artifact types, which include micaceous sherds, *coscojos*, the cast rifle ball of pure lead, scraps of cut sheet metal, and glass beads, are duplicated by the artifacts found at two mid-19th century Jicarilla sites located east of Pilar, New Mexico (David Johnson, personal communication, October 2003), and on late 19th century Jicarilla Apache sites within the Rio del Oso Valley, New Mexico (Sunday Eiselt, personal communication, October 2003). Also, two Jicarilla Apache encampments have been identified on Ghost Ranch property, and have been dated to circa 1886–1910 (Haecker 2003). Just as at LA 85869, the Ghost Ranch sites also contain fragments of sanitary seal cans, which point to a post-1897 occupation. If Jicarilla Apaches deposited sanitary seal cans at LA 85869 and not the result of a later, non-Indian component, this would indicate a Post-Reservation occupation of lands that eventually became LANL property. Furthermore, this Jicarilla re-occupation would have constituted an unauthorized trespass onto lands that they had been forced to officially abandon after 1882 (Tiller 1992). Finally, it is reported by Tiller (1992:121–122) that, for many years after the establishment of the Jicarilla reservation in 1887, it was a common practice for some Jicarilla families to leave the reservation without official permission. These families would engage in trade with neighboring communities, visit friends, "or just to have something to do." Since there were few opportunities for wage work on the reservation, Jicarilla families sold or traded handcrafted articles such as baskets, buckskin moccasins, beaded accessories, bows and arrows, and pottery. The market for Jicarilla arts and crafts was limited due to the remoteness of the reservation. Therefore, it was necessary for those engaged in such endeavors to travel to, among other places, the various Rio Grande pueblos during their annual celebrations. Given that San Ildefonso had a provided temporary refuge for those Jicarilla families who had "illegally departed" the Mescalero reservation in 1886 (Tiller 1992:93), it is not surprising to find archaeologist evidence of late 19th century Jicarilla encampments on LANL property.

APPENDIX O
REPORT FOR CERAMICS FROM LA 85864 AND LA 85869

B. Sunday Eiselt

The following descriptions are for micaceous clay ceramic fragments collected from sites LA 85869 and LA 85864 (non-micaceous fragments are listed but not described). Included in descriptions of micaceous ceramics are notes regarding surface finish and paste characteristics. Suggestions regarding ethnic affiliation and geological origin of clays are provided, but these identifications are tentative. Ethnic affiliation is difficult to determine from body sherds alone. The identification of clay sources for the unknown sherds also are tentative. These identifications are based on comparisons with sampled (known source) clays using a binocular microscope.

Primary micaceous clays are found decomposing from the Vadito Group, a Precambrian formation containing abundant muscovite mica and quartz-mica schist. Vadito Group outcrops are located in the vicinity of Petaca, Picuris, Cordova, Guadalupita, Pecos, and Las Vegas. Paste mineralogies for all micaceous sherds recovered from LA 85869 and LA 85864 are consistent with the general characteristics of Vadito Group micaceous clay deposits. Aplastic inclusions include angular and subangular translucent quartz and white quartz (dominant). Muscovite mica is dominant. Iron-stained quartz, quart-mica schist, hematite, and magnetite also are present. No exotic inclusions were noted in the current sample, suggesting that temper was not intentionally added to clays in order to create ceramic pastes.

The exact geographic locations of the primary clays used to make the ceramics is difficult to determine based on mineralogy alone. Vadito Group lithologies are similar throughout the northern Rio Grande, and the petrographic studies needed to separate clay districts or clay sources have not been carried out. Visual examination of a comparative collection of over 123 clay samples from Petaca, Picuris, Cordova, and Guadalupita do, however, suggest that some mineralogical differences may exist. The source determinations provided in this report are based on these comparisons.

LA 85864

FS 575 - Two small body fragments (one vessel) – primary micaceous clay.

Sherds contain only a moderate amount of mica. Rosy quartz and possible magnetite are present but rare. The presence of rosy quartz and magnetite in the same sample indicates a Cordova-Truchas origin. Exterior and interior sherd surfaces are compacted (probably scraped with a gourd scraper, sanded, or burnished towards the end of the production sequence) and display striations consistent with wiping with a wet object (cloth or hand) while the vessel was wet (during the final step in the production sequence). No corncob striations (from scraping vessel walls) are present. The vessel may be attributed to Taos, Picuris, or Jicarilla makers based on surface finish (Tewa micaceous vessels rarely display such compacted surfaces).

FS 572 – One body fragment origin unknown

This fragment appears to be made from an alluvial clay containing mica rather than a primary micaceous clay. Mica fragments are silt-to-clay-sized and larger fragments are rare. Aplastics are subangular to subrounded. Origin of clays unknown, although alluvial micaceous clays are present north of Abiquiu. Surface slip or float does not appear to be micaceous. Ethnic affiliation unknown.

FS 574 – Prehistoric, non-micaceous painted ware (Wiyo? Biscuit A?)

LA 85869

FS 309 – Two small body fragments (one vessel) – primary micaceous clay.

Sherds contain abundant muscovite mica in a gradient of sizes. Biotite and booked biotite also is common. Aplastics include translucent to white quartz (dominant) and magnetite (rare). The abundance of booked biotite in combination with the presence of magnetite suggest a Picuris, Cordova, or Guadalupita origin. If garnet is found, then Picuris is the likely source. If rosy quartz is found, then the clay may have come from Cordova or Guadalupita. A micaceous float (slurry) was applied to the exterior surface. Interior and exterior surfaces are compacted. No wipe or scrape marks are visible. Vessel may be attributed to the Taos, Picuris, or Jicarilla makers based on surface finish.

FS 328 - Four body fragments (one vessel) – primary micaceous clay.

Sherds contain abundant muscovite in a gradient of sizes. Quartz mica-schist also is common. Iron-stained quartz and magnetite present. One small fragment of hematite noted. The abundance of quartz-mica schist and the presence of iron-stained quartz and hematite strongly suggest a Petaca origin. Vessel was fired upside down (smudged exterior, oxidized exterior). Red surface color on exterior also suggests a Petaca origin for the clay. Interior and exterior surfaces are compacted, but wipe-marks also are visible. Vessel walls were sanded or burnished prior to the application of a mica slip or slurry. This is consistent with Jicarilla Apache techniques. Given that the clay most likely originated at Petaca and given the surface finish, this vessel probably was made by Jicarillas (Cimarron Micaceous). Surface color, surface finish, and paste characteristics are very similar to Jicarilla ceramic sherds recovered in the nearby Rio del Oso Valley.

FS 325 – Historic(?) plain ware ceramic

Conclusion

The small ceramic assemblage recovered from LA 85869 is consistent with other sherd assemblages found at 19^{th} century Jicarilla Apache sites in the Chama District and elsewhere.

The clays from each of the two recovered vessels came from different locations (Picuris-Cordova-Guadalupita and Petaca). Geochemical source analysis of Jicarilla sherd assemblages demonstrates that they typically contain a variety of clay sources. In particular, they contain clays obtained from widely distributed sources, unlike Pueblo assemblages, which tend to be more homogenous and regionally restricted. A heterogeneous sherd assemblage containing clays obtained at multiple sources (including those located in the Petaca, Picuris, and Cordova clay districts) is characteristic of Jicarilla pottery production.

The sherds from LA 85869 definitely were made from different clays based on paste mineralogy, even though exact source identifications are tentative. This in combination with ceramic surface finish helps to narrow down ethnic affiliation to the Jicarilla (probable). Jicarilla sites also contain historic plain or decorated ceramics obtained through trade from Pueblo potters, but these finds are rare. Ceramic assemblages are dominated by micaceous sherds. If quartz and quartz-mica schist nodules were (or are) found at this site in association with tipi rings, then this also is very characteristic of Apache ceramic production during the 19th century. Clay frequently was transported on horseback and cleaned at distant camps. Less can be said about LA 85864.

Santa Clara Pueblo potters utilized Cordova-Chimayo area clays according to Hill and Lang (1982:83). There also was a "supposed" micaceous source located near the pueblo that was covered by floods some time in the recent past, although there are no micaceous (Precambrian) outcrops in this area. However, the surface finish of vessels combined with the diversity of clay sources represented, is more consistent with Apache practices.

Petrographic analysis may be useful in separating regional clay districts and localized sources based on the relative abundances of rare minerals (as indicated above). It should be noted, however, that mineralogical information obtained from LA 85869 petrographic analysis will have limited utility until a comparative clay source study is completed.

APPENDIX P
RECONSTRUCTIBLE VESSEL ANALYSIS

Marlene Owens and Dean Wilson

As part of the Los Alamos Project ceramic analysis, whole vessels recovered during earlier excavations of sites near Los Alamos, and which were stored at MIAC (Museum of Indian Arts and Culture), were analyzed. This resulted in the examination of 23 reconstructible vessels from several sites in the area. Characteristics recorded for each of these vessels include: 1) the site and provenience (if known) from where the vessel was recovered; 2) the curation (catalog) number from the MIAC; 3) the vessel number assigned during the present study (this number is the order in which the vessel was analyzed); 4) basic information recorded for the analysis of most Los Alamos pottery ceramics including the pottery type, form, temper, interior and exterior surface manipulation and type of pigment, of the vessel; and 5) additional information recorded during vessels analysis including design motifs and layouts, size, reconstruction status, firing condition including sooting, post-firing wear and modifications, and the completeness and maximum volume

The maximum volume was calculated using the formula $V = \pi r^2 h$. Volume capacity was estimated from the profile of the vessel by measuring height divided into equal increments of two centimeters or four centimeters (depending on the size of the vessel) then multiplied by the radius of the increments subsequently multiplied by pi (3.141), then summed together into cubic centimeters, which then is converted to liters. One thousand cubic centimeters is equal to one liter. This is a tedious process but a slightly more accurate one. Vessel form was utilized in this case as a description between the types of pottery and function was implied. This analysis does not delve into the functions of the vessel due to the wide range of the potential usage of any vessel assemblage. Additional attributes were also recorded, such as modifications to the vessel possibly implying use. A description of each the vessels analyzed during the present study follow.

RECONSTRUCTIBLE VESSEL DESCRIPTIONS

Vessel 1

Vessel one was recovered from LA 169 (Otowi). The vessel was classified as Wiyo Black-on-white and is a shallow bowl, which is 80 percent complete (Figure P.1). The interior surface was highly polished with a white slip and the exterior was unpolished. Surface conditions indicated it was slightly oxidized. The base has slight to moderate abrasion with a few scattered fire clouds. Rim chipping is evident, but most likely not from use. Designs are boldly executed on the interior surface in an organic pigment. The interior design band is made up of hatchured lines with bold triangles in between the diamond panels. The diagonally placed panels have bold opposing triangles down the center and smaller bold triangles in opposite corners. Two framing lines are near the bottom of the band. There was no rim decoration. The band is approximately

12 cm in width. The center design has four isolated triangles with a spiraling line square. The dimensions of the bowl are shown in Table P.1.

Figure P.1. Santa Fe Black-on-white vessel from Otowi.

Table P.1. Dimensions for Vessel 1.

Rim Diameter	29.5 cm
Height	13.4 cm
Maximum Diameter	29.5 cm
Maximum volume	6.55 L

Vessel 2

Vessel two was recovered from LA 170 (Tsirege). The vessel is an unpolished miniature Mudware seed jar (Figure P.2). The exterior surface had variable portions reduced in firing and surfaces were oxidized. The exterior had a slight abrasion with poorly defined fire clouds. The dimensions of the jar are shown in Table P.2.

Table P.2. Measured dimensions for Vessel 2.

Rim Diameter	6.0 cm
Height	5.0 cm
Maximum Diameter	7.5 cm
Maximum volume	.16L

Figure P.2. Mudware seed jar from Tsirege.

Vessel 3

Vessel 3 was recovered from LA 170 (Tsirege). The vessel represents an unusually shaped Biscuit B (Bandelier Black-on-gray) shallow bowl (Figure P.3).

Figure P.3. Biscuit B vessel from Tsirege.

The interior and exterior of the bowl had an unevenly, but well-polished grayish cream slip. The surfaces are slightly oxidized and the exterior surface has abrasions in two places at the base of the bowl. Designs are executed on both sides in organic paint. The rim ticking consists of six isolated repetitions of 4 to 5 dots. The interior design consisted of isolated motifs of connecting line flags covering the whole bowl. The exterior design was organized as a band consisting of a zig-zag line with parallel ticked lines on both sides. This band had a single framing line on the top and bottom. The dimensions of the bowl are shown in Table P.3.

Table P.3. Measured dimensions for Vessel 3.

Rim Diameter	25.0 cm
Height	9.0 cm
Maximum Diameter	25.0 cm
Maximum volume	3.68 L

Vessel 4

Vessel 4 was recovered from LA 170 (Tsirege), and was identified as a shallow Biscuit B (Bandelier Black-on-gray) bowl. The interior and exterior surface is well polished over a cream slip. The surfaces were slightly oxidized with a moderate abrasion concentrated at the base. The exterior slip was spalled and had sporadic sooting. Designs are executed on both sides in organic paint. Rim decoration consisted of four occurrences of five dots. The interior of the bowl had a band down the center of the vessel consisting of triangles of dots with connecting line flags framed with a single line. There were stylized linear zoomorphs on the interior of the rim. Linear curving designs and isolated parallel line segments were on both sides of the center design band. The exterior portion of the bowl had a band of several panels of diagonal flag triangles framed on both sided by three different sizes of lines. The dimensions of the bowl are shown in Table P.4.

Figure P.4. Biscuit B vessel from Tsirege.

Table P.4. Measured dimensions for Vessel 4.

Rim Diameter	22.4 cm
Height	10.0 cm
Maximum Diameter	24.0 cm
Maximum volume	3/60 L

Vessel 5

It is not known from what site vessel five originated. It is a slightly lopsided Biscuitware jar. Because of its form, it was not assigned to a specific type. The interior is slightly polished and buff with a moderately polished exterior cream slip (Figure P.5). The jar was slightly oxidized with concentrated abrasions and fire clouds near the base. Designs are executed in the interior surface in organic paint. The design consists of rim ticking, with the top portion of the vessel having a band of several panels incorporated with zoomorphs, framed with single lines. The lower portion of the jar consists of several pairs of parallel perpendicular lines around the vessel. The dimensions of the jar are as shown in Table P.5.

Figure P.5. Biscuitware jar from the Pajarito Plateau.

Table P.5. Measured dimensions for Vessel 5.

Rim Diameter	10.9 cm
Height	8.3 cm
Maximum Diameter	13.5 cm
Maximum volume	0.74 L

Vessel 6

Vessel six was recovered from LA 170 (Tsirege). The vessel was identified as a Kotyiti Glaze F, glaze-on-red constricted bowl with a spout that was much like a tea kettle (Figure P.6). The interior and exterior surfaces are polished over a red slip. The exterior had a sporadic slip, mostly on the lower three-quarters of the bowl. The bowl was poorly oxidized and the exterior base of the bowl was moderately to heavily worn. The design was a band of a runny glaze consisting of "chevron" lines and triangles ending at a break. The dimensions of the bowl are shown in Table P.6.

Figure P.6. Kotyiti Glaze F vessel from Tsirege.

Table P.6. Measured dimensions for Vessel 6.

Rim Diameter	17.8 cm
Height	11.0 cm
Maximum Diameter	22.0 cm
Maximum volume	3.26 L

Vessel 7

Vessel 7 was recovered from LA 170 (Tsirege). The vessel was classified as an Espinosa Glaze C Polychrome and is a shallow bowl (Figure P.7). The exterior and interior surfaces are polished over a red slip with some areas of polished buff. The interior of the bowl was oxidized and the exterior is poorly oxidized. Extremely small fire clouds were evident on the exterior portion of the vessel (Figure P.8). There was no evidence of abrasion on the base. Designs were executed on both sides in a polychrome glaze paints. The interior design layout consisted of two parallel glaze lines; within the lines was a red slip. A zoomorphic figure was in the interior center. The exterior design band consists of four plain panels with four perpendicular panel lines, in between the panel lines is filled in with a red slip. This band was framed on top and bottom by a single line. These lines were also filled in with a red slip. The dimensions of the bowl are shown in Table P.7.

Table P.7. Measured dimensions for Vessel 7.

Rim Diameter	18.8 cm
Height	8.5 cm
Maximum Diameter	20.0 cm
Maximum volume	2.24 L

Figure P.7. Espinosa Glaze C Polychrome vessel from Tsirege.

Figure P.8. Fire clouds present on the exterior portion of the Espinosa Glaze C vessel.

Vessel 8

It is unknown where vessel eight came from. The vessel is a shallow Wiyo black-on-white bowl that is 40 percent complete (Figure P.9). The interior surface is highly polished with a cream slip. The exterior surface appears to have an unusual polished white slip and an unknown red stain. It is difficult to determine the extent of the exterior slip due to the high amount of surface exfoliation. The interior was slightly oxidized. The exterior had a single fire cloud with a slight to moderate abrasion of the base. The interior surface was decorated in organic pigment. The interior slip appears to be a band completely covered with a series of curvilinear spirals with hatchured and dotted filling. Three drill holes were observed near the rim; two of these were parallel. Due to 60 percent of the vessel missing, the dimensions were obtained by the using a template that measured the radius of the rim in one centimeter increments of the partial vessel. The approximate dimensions are shown in Table P.8.

Table P.8. Measured dimensions for Vessel 8.

Rim Diameter (approx.)	22.0 cm
Height (approx.)	10.0 cm
Maximum Diameter (approx.)	22.0 cm
Maximum volume (approx.)	2.67 L

Figure P.9. Wiyo Black-on-white vessel from an unknown site on the plateau.

Vessel 9

Vessel 9 was recovered from LA 170 (Tsirege). The vessel was classified as a shallow Sankawi Black-on-cream bowl. The interior and exterior surfaces are polished with cream slips, which were in shades of white to tarnished gray in color (Figures P.10 and P.11).

Table P.9. Measured dimensions for Vessel 9.

Rim Diameter	24.5 – 35.0 cm
Height	13.5 cm
Maximum Diameter	29.0 – 35.0 cm
Maximum volume (approx.)	8.71 L

Figure P.10. Sankawi Black-on-cream bowl from Tsirege.

Figure P.11. Interior of Sankawi Black-on-cream vessel from Tsirege.

There was slight oxidation of both surfaces and fire clouds on the exterior. The base of the vessel had slight abrasion. Both surfaces were decorated in organic pigment. Groups of rim ticking were observed along the rim of the vessel. The interior design consisted of what appears to be a double headed awanyu across the bowl consisting of parallel lines, ticked lines, dots, triangles and rectangular ribbons filled with dots (Figure P.11). Along the interior edge of the rim was a zig-zag line. The exterior design was a band consisting of rectangular ribbons filled with dots with bold diagonal flags. The band was framed with five multiple sized lines, two on top, three on the bottom. It is possible the shape of the bowl was caused by firing, or that the shape was intentional, to incorporate the interior design of the awanyu. Due to the irregular shape of the bowl, the minimum and maximum dimensions were recorded and are shown in Table P.9.

Vessel 10

The site of origin for Vessel 10 is unknown. The vessel was identified as San Lazaro Glaze D glaze-on-red shallow bowl (Figure P.12). The interior and exterior surfaces were polished over red slips. Both surfaces of the bowl were oxidized with fire clouds. The interior design was a band with panels that exhibit elements such as triangles and horizontal lines. The band was framed on both sides with a single line. The exterior band consisted of a masked figure near the rim edge (Figure P.13). Within the band was a series of opposing triangles with line segments in between. The dimensions of the bowl are shown in Table P.10.

Figure P.12. San Lazaro Glaze D glaze-on-red bowl from Tsirege.

Figure P.13. Masked figure on the exterior of a Glaze D bowl.

Table P.10. Measured dimensions for Vessel 10.

Rim Diameter	20.5 cm
Height	8.0 cm
Maximum Diameter	20.5 cm
Maximum volume	1.84 L

Vessel 11

Vessel 11 was recovered from LA 170 (Tsirege). The vessel was classified as a San Lazaro Glaze D glaze-on-red shallow bowl (Figure P.14). The interior and exterior surfaces were polished over a red slip. The interior was oxidized and the exterior poorly oxidized. There was slight abrasion on the exterior at the base of the bowl. Interior design layout had a band consisting of a scalloped line along the interior rim edge and three straight lines that connect to a large mask with feathers at the interior bottom of the bowl (Figure P.15). The exterior had a band of flagged triangles and horizontal lines. The dimensions of the bowl were recorded and are shown in Table P.11.

Figure P.14. San Lazaro Glaze D bowl from Tsirege.

Figure P.15. Interior decoration on a San Lazaro Glaze D bowl.

Table P.11. Measured dimensions for Vessel 11.

Rim Diameter	20.5 cm
Height	8.0 cm
Maximum Diameter	20.5 cm
Maximum volume	1.84 L

Vessel 12

Vessel 12 was recovered from LA 170 (Tsirege). The vessel was assigned to Sankawi Black-on-cream and is a wide mouth jar (Figure P.16). The interior of the jar was an unslipped polished buff with a polished cream slip. The exterior firing conditions were neutral, and very lightly oxidized. A moderate abrasion was observed at the base of the vessel. The exterior surface was decorated in organic paint. The bulge of the jar had a band of motifs that consisted of triangles and rectangular lines with dots, with two framing lines at the top and bottom. The underslope of the jar had a zig-zag line below the band. The rim decoration consisted of bold triangles angled downwards. The paint has faded in some areas, leaving a negative space. The dimensions of the jar are shown in Table P.12.

Figure P.16. Sankawi Black-on-cream jar from Tsirege.

Table P.12. Measured dimensions for Vessel 12.

Rim Diameter	22.0 cm
Height	30.0 cm
Maximum Diameter	38.0 cm
Maximum volume	21.50 L

Vessel 13

Vessel 13 was recovered from LA 170 (Tsirege). The vessel was classified as a Sankawi Black-on-cream wide mouth jar (Figure P.17). The interior of the jar was a polished buff; the exterior surface displayed a polished cream slip. The reflected conditions are neutral to slightly oxidizing with moderate to heavy abrasions along the high point of the concave base of the vessel. Fire clouds were present near the base. Designs were executed in an organic paint and formed a band consisting of three parallel lines in a zig-zag pattern. The center line had ticked lines on both sides. The band had two framing lines with a single thick zig-zag line on the underslope of the vessel. The rim decoration consisted of a band with a checkerboard pattern. The jar dimensions are presented in Table P.13.

Figure P.17. Sankawi Black-on-cream jar from Tsirege.

Table P.13. Measured dimensions for Vessel 13.

Rim Diameter	19.8 cm
Height	33.0 cm
Maximum Diameter	37.0 cm
Maximum volume	23.07 L

Vessel 14

Vessel 14 was recovered from LA 170 (Tsirege). The vessel is a Potsui'i Incised wide mouth jar that is 70 percent complete (Figure P.18). The lower portions of the jar were absent but reproduced with plaster, and thus the height of the vessel was estimated. The exterior surface was incised and polished with a light mica slip. The interior surface was plain and polished and was fired in reduced firing conditions and both surfaces were lightly sooted as indicated by the gray to brown color. The exterior had two bands of incised designs. The upper band consisted of several parallel lines in a zig-zag pattern with a couple of upper framing lines. The lower band had hatchured triangles. The dimensions of the jar are shown in Table P.14.

Figure P.18. Potsui'i Incised wide mouth jar from Tsirege.

Table P.14. Measured dimensions for Vessel 14.

Rim Diameter	22.5 cm
Height (approx.)	31.0 cm
Maximum Diameter	36.0 cm
Maximum volume	21.16 L

Vessel 15

The site of origin of Vessel 15 is unknown. The vessel was classified as an Ocate Micaceous wide mouth pitcher that was 80 percent complete (Figure P.19). The exterior surface had a very thin micaceous slip with numerous striations. The striations were present on both the interior and exterior surfaces with no apparent pattern. The interior striations were more pronounced on the upper portions of the neck. The pot displayed portions that were both reduced and slightly oxidized. The exterior surface had oxidation in areas that reflect use in cooking. There is a singe strap handle extending from the upper middle portion of the body. The bottom portion of the vessel is missing. Both the exterior and interior surfaces are sooted. The rim has abrasion and chipping is most likely from use. The surface manipulation and vessel shape suggest a very late form, circa 1900, which was most likely produced by Jicarilla Apache potters. The dimensions of the vessel are shown in Table P.15.

Figure P.19. Ocate Micaceous wide mouth pitcher from the plateau.

Table P.15. Measured dimensions for Vessel 15.

Rim Diameter	20.5 cm
Height (approx.)	23.5 cm
Maximum Diameter	30.0 cm
Maximum volume	10.99 L

Vessel 16

The site of origin of Vessel 16 is unknown. The vessel was a Sapawi Gray wide mouth utilityware jar (Figure P.20). The exterior consisted of a smeared plain corrugated surface and the interior was plain and unpolished. The paste does not appear to have any mica although a thin mica slip was observed. Surface conditions indicated reduced firing and it was sooted on the exterior surfaces most likely from cooking. The base of the jar had a highly abraded surface. The exterior surface manipulation was corrugated from the top ¾ and the lower portion was a plain unpolished surface. The dimensions of the jar are shown in Table P.16.

Table P.16. Measured dimensions for Vessel 16.

Rim Diameter	31.5 cm
Height	40.5 cm
Maximum Diameter	47.0 cm
Maximum volume	47.80 L

Figure P.20. Sapawi Gray wide mouth utilityware jar from the plateau.

Vessel 17

The site of origin of Vessel 17 is unknown. The vessel was identified as Sapawe Micaceous and is a wide-mouth utilityware jar (Figure P.21). The exterior consisted of a smeared plain corrugated surface and the interior was plain and unpolished. It did not appear to have a mica slip. The jar had reduced firing and was sooted on the exterior and is most likely from cooking. The base of the vessel had moderate to heavy abrasion. The exterior surface manipulation was corrugated from the top ¾ and the lower portions had a plain unpolished surface. The dimensions of the vessel are shown in Table P.17.

Figure P.21. Sapawe Micaceous utilityware jar from the plateau.

Table P.17. Measured dimensions for Vessel 17.

Rim Diameter	25.5 cm
Height	24.5 cm
Maximum Diameter	31.5 cm
Maximum volume	13.75 L

Vessel 18

It is not known where Vessel 18 was recovered. This vessel was identified as an indented-corrugated wide-mouth utilityware jar (Figure P.22). The exterior had an indented-corrugated surface manipulation and the interior was plain and unpolished. The jar was fired in reduced firing conditions and displays sooting on the exterior. The dimensions of the jar are shown in Table P.18.

Figure P.22. Indented corrugated utilityware jar from the plateau.

Table P.18. Measured dimensions for Vessel 18.

Rim Diameter	11.8 cm
Height	14.0 cm
Maximum Diameter	15.5 cm
Maximum volume	1.95 L

Vessel 19

Vessel 19 was recovered from LA 4631. The vessel was identified as a smeared-indented corrugated bowl that is 80 percent complete (Figure P.23). Portions of this bowl were reconstructed using plaster. The exterior had an indented-corrugated surface manipulation and the interior was plain and unpolished. It was fired in a reduced atmosphere and exhibited slight sooting on both surfaces. Slight to moderate abrasion was observed on the base of the bowl. The interior portion had stains in an unknown pigment. The dimensions of the bowl are shown in Table P.19.

Figure P.23. Smeared-indented corrugated vessel from LA 4631.

Table P.19. Measured dimensions for Vessel 19.

Rim Diameter	13.3 cm
Height	6.5 cm
Maximum Diameter	13.3 cm
Maximum volume	0.57 L

Vessel 20

Vessel 20 was recovered from LA 4712. The vessel was identified as a smeared-indented corrugated utilityware jar (Figure P.24). The exterior surface manipulation was smeared-indented corrugated and the interior was plain and unpolished. The vessel was fired in reduced conditions and had sooting on the exterior. The base had moderate abrasions. Patterns of sooting indicate probable use for cooking. Organic paint was observed on the interior surface. It consisted of four parallel organic lines that angle from the rim. The vessel dimensions are shown in Table P.20.

Figure P.24. Smeared-indented corrugated vessel from LA 4712.

Table P. 20. Measured dimensions for Vessel 20.

Rim Diameter	25.5 cm
Height	33.0 cm
Maximum Diameter	36.0 cm
Maximum volume	23.34 L

Vessel 21

There is no provenience information for Vessel 20. The vessel was identified as a smeared-indented corrugated wide mouth jar (Figure P.25). The exterior surface manipulation consisted of smeared-indented corrugated texture with the interior plain and unpolished. The firing conditions were mostly reduced with some areas oxidized. Post-firing conditions consisted of sooting and oxidation, probably from cooking. The base of the vessel had slight abrasion. Two pairs of repair holes were observed near the rim and another pair at the bottom of the vessel. The rim also had four pronounced fillets. The vessel dimensions are showing in Table P.21.

Figure P.25. Smeared-indented corrugated jar from the plateau.

Table P.21. Measured dimensions for Vessel 21.

Rim Diameter	23.5 cm
Height	29.0 cm
Maximum Diameter	33.0 cm
Maximum volume	17.68 L

Vessel 22

Vessel 22 was recovered from LA 4634. The vessel was unidentified as a highly unusual square Santa Fe black-on-white shallow bowl (Figure P.26), which was analyzed while on display at the museum. The interior and exterior surface consisted of a polished white slip. The bowl had neutral firing conditions. Some sooting was visible on the exterior surface, although the extent is unknown. The interior is decorated with organic pigment. The design band consisted of four panels; two of the panels were of the checkerboard pattern, opposite one another, the other two panels consisting of opposing parallel "chevron" lines with bold ticked triangles in the corners and in the center of the lines. There appears to be two repair holes near the rim. The dimensions of the bowl are taken from the cataloging card and are shown in Table P.22.

Table P.22. Measured dimensions for Vessel 22.

Rim Dimensions (l x w)	17.1 cm by 17.1 cm
Height	8.3 cm
Maximum Diameter	17.1 cm
Maximum volume	1.82 L

Figure P.26. Square Santa Fe Black-on-white bowl form LA 4634.

Vessel 23

Provenience information for Vessel 23 is unknown. The vessel was identified as a shallow Biscuit B (Bandelier Black-on-gray) bowl (Figure P.27). The analysis of this bowl occurred while it was on display at the museum. The surface manipulation appears to be a polished cream slip. The exterior design and surface could not be seen, and was not analyzed. The vessel had neutral firing conditions. The interior is decorated with organic pigment. The interior design layout consisted of a band that included panels of triangles and parallel lines with dots, which were divided into two distinct patterns. The band was framed with multiple sized lines on top and bottom. There were several groupings of ticked rim lines. The dimensions of the bowl were taken from the catalog card and are shown in Table P.23.

Table P.23. Measured dimensions for Vessel 23.

Rim Diameter	33.7 cm
Height	15.3 cm
Maximum Diameter	35.7 cm
Maximum volume	11.96 L

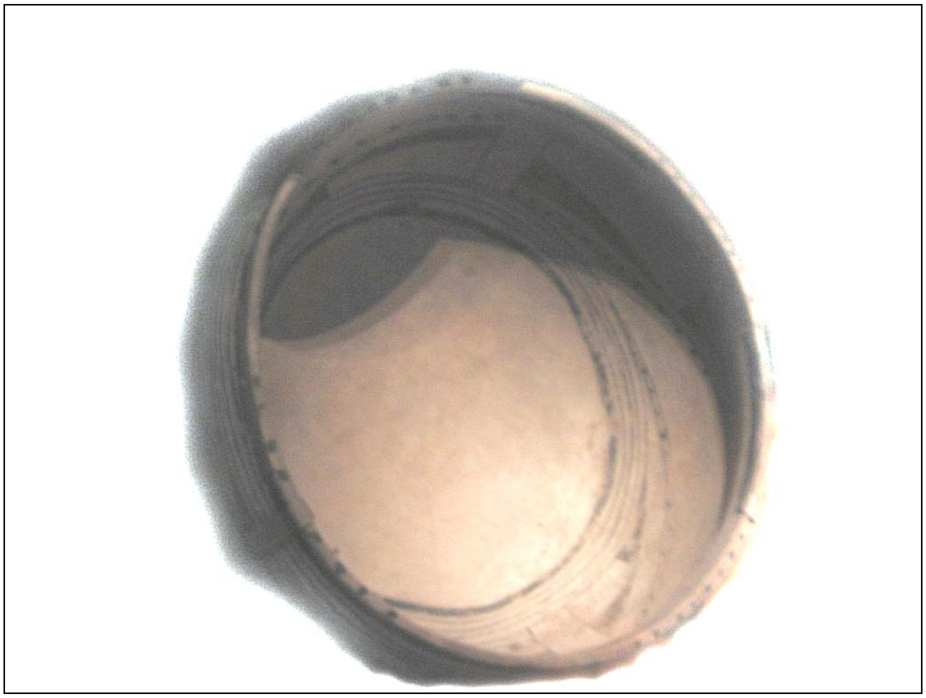


Figure P.27. Biscuit B bowl from an unknown site on the plateau.

Summary

All the vessels are recovered from the general Los Alamos area. Nine vessels had an unknown site number. According to the Museum of Indian Arts and Culture, these unknown vessels were recovered by Mike Burkheimer, Conway Smith, and John Marshall in 1964 and are on loan by the Department of Energy and the Los Alamos Historical Museum. Tables P.24 through P.27 summarize the information collected during the analyses of the whole vessels.

Table P.24. Vessel type and form for each ware.

Northern Rio Grande Whiteware	
Santa Fe Black-on-white (22)	Square Bowl
Wiyo Black-on-white (8)	Shallow Bowl
Wiyo Black-on-white (1)	Shallow Bowl
Biscuit A Abiquiu Black-on-gray (5)	Wide Mouth Jar
Biscuit B Bandelier Black-on-gray (3)	Shallow Bowl
Biscuit B Bandelier Black-on-gray (4)	Constricted Bowl
Biscuit B Bandelier Black-on-gray (23)	Shallow Bowl
Sankawi Black-on-tan (9)	Shallow Bowl
Sankawi Black-on-tan (12)	Wide Mouth Jar
Sankawi Black-on-tan (13)	Wide Mouth Jar
Northern Rio Grande Utilityware	
Mudware (2)	Miniature Seed Jar
Smeared Plain Corrugated (19)	Shallow Bowl
Smeared Plain Corrugated (21)	Wide Mouth Jar
Smeared Plain Corrugated (20)	Wide Mouth Jar
Indented Corrugated (18)	Wide Mouth Jar
Sapawe Micaceous (17)	Wide Mouth Jar
Sapawe Micaceous (16)	Wide Mouth Jar
Potsuwi'i Incised (14)	Wide Mouth Jar
Northern Rio Grande Glazeware	
Espinosa Glaze Polychrome, Glaze C (7)	Constricted Bowl
San Lazaro Glaze Black-on-red, Glaze D (11)	Shallow Bowl
San Lazaro Glaze Black-on-red, Glaze D (10)	Shallow Bowl
Kotyiti Glaze-on-red, Glaze F (6)	Constricted Bowl
Jicarilla Apache Utilityware	
Ocate Micaceous (15)	Wide Mouth Jar

Table P.25. Distributions by form for whole vessels.

Miniature Seed Jar
Mudware (2)
Square Bowl
Santa Fe Black-on-white (22)
Constricted Bowls
Biscuit B Bandelier Black-on-gray (4)
Espinosa Glaze Polychrome, Glaze C (7)
Kotyiti Glaze-on-red, Glaze F (6)
Shallow Bowls
Wiyo Black-on-white (1)
Wiyo Black-on-white (8)
Biscuit B Bandelier Black-on-gray (3)
Biscuit B Bandelier Black-on-gray (23)

Sankawi Black-on-tan (9)
Smeared Plain Corrugated (19)
San Lazaro Glaze Black-on-red, Glaze D (10)
San Lazaro Glaze Black-on-red, Glaze D (11)
Wide-Mouth Jars
Biscuit A Abiquiu Black-on-gray (5)
Sankawi Black-on-tan (12)
Sankawi Black-on-tan (13)
Smeared Plain Corrugated (20)
Smeared Plain Corrugated (21)
Indented Corrugated (18)
Sapawe Micaceous (16)
Sapawe Micaceous (17)
Potsuwi'i Incised (14)
Ocate Micaceous (15)

Table P.26. Distribution of whole vessels by site.

LA 169	
(1) Wiyo Black-on-white	Shallow Bowl
LA 170	
(2) Mudware	Miniature Seed Jar
(5) Biscuit A Abiquiu Black-on-gray	Wide Mouth Jar
(3) Biscuit B Bandelier Black-on-gray	Shallow Bowl
(4) Biscuit B Bandelier Black-on-gray	Constricted Bowl
(9) Sankawi Black-on-tan	Shallow Bowl
(12) Sankawi Black-on-tan	Wide Mouth Jar
(13) Sankawi Black-on-tan	Wide Mouth Jar
(7) Espinosa Glaze Polychrome, Glaze C	Constricted Bowl
(14) Potsuwi'i Incised	Wide Mouth Jar
(11) San Lazaro Glaze Black-on-red, Glaze D	Shallow Bowl
(6) Kotyiti Glaze-on-red, Glaze F	Constricted Bowl
LA 4631	
(19) Smeared Plain Corrugated	Shallow Bowl
LA 4712	
(20) Smeared Plain Corrugated	Wide Mouth Jar
UNKNOWN SITE NUMBER	
(21) Smeared Plain Corrugated	Wide Mouth Jar
(18) Indented Corrugated	Wide Mouth Jar
(22) Santa Fe Black-on-white	Square Bowl
(8) Wiyo Black-on-white	Shallow Bowl
(16) Sapawe Micaceous	Wide Mouth Jar
(17) Sapawe Micaceous	Wide Mouth Jar
(23) Biscuit B Bandelier Black-on-gray	Shallow Bowl
(10) San Lazaro Glaze Black-on-red, Glaze D	Shallow Bowl

(15) Ocate Micaceous	Wide Mouth Jar

Table P.27. Distribution of vessels by size.

(2) Mudware	Miniature Seed Jar	0.16
(19) Smeared Plain Corrugated	Shallow Bowl	0.57
(5) Biscuit A Abiquiu Black-on-gray	Wide Mouth Jar	0.74
(22) Santa Fe Black-on-white	Square Bowl	1.82
(11) San Lazaro Glaze Black-on-red, Glaze D	Shallow Bowl	1.84
(18) Indented Corrugated	Wide Mouth Jar	1.95
(7) Espinosa Glaze Polychrome, Glaze C	Constricted Bowl	2.24
(10) San Lazaro Glaze Black-on-red, Glaze D	Shallow Bowl	2.46
(8) Wiyo Black-on-white	Shallow Bowl	2.67
(3) Biscuit B Bandelier Black-on-gray	Shallow Bowl	2.68
(6) Kotyiti Glaze-on-red, Glaze F	Constricted Bowl	3.26
(4) Biscuit B Bandelier Black-on-gray	Constricted Bowl	3.6
(1) Wiyo Black-on-white	Shallow Bowl	6.55
(9) Sankawi Black-on-tan	Shallow Bowl	8.71
(15) Ocate Micaceous	Wide Mouth Jar	10.99
(23) Biscuit B Bandelier Black-on-gray	Shallow Bowl	11.96
(17) Sapawe Micaceous	Wide Mouth Jar	13.75
(21) Smeared Plain Corrugated	Wide Mouth Jar	17.68
(14) Potsuwi'i Incised	Wide Mouth Jar	21.16
(12) Sankawi Black-on-tan	Wide Mouth Jar	21.5
(13) Sankawi Black-on-tan	Wide Mouth Jar	23.07
(20) Smeared Plain Corrugated	Wide Mouth Jar	23.34
(16) Sapawe Micaceous	Wide Mouth Jar	47.8

APPENDIX Q
PETROGRAPHIC TABLES

Table Q.1. Inventory of all sherds selected for petrographic analysis showing object identifier numbers, ceramic type, and site.

Analysis Year	Sample	Object Identifier[a]	Ware[b]	Ceramic type	Site	Period	Site Type
2002	PAX33-001	4624-143-123	Plain	Plain	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-002	4624-143-124	Plain	Plain	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-003	4624-1-142	Plain	Plain	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-004	4624-12-279	Plain	Plain	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-005	4624-21-360	Santa Fe	Santa Fe B/w	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-006	4624-49-595	Corrugated	Indented corrugated	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-007	4624-50-606	Santa Fe	Santa Fe	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-008	4624-61-695	Plain	Plain	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-009	4624-154-780	Corrugated	Smeared-indented corrugated	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-010	4624-48-794	Santa Fe	Santa Fe B/w	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-011	4624-152-833	Santa Fe	Santa Fe	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-012	4624-152-837	Corrugated	Indented corrugated	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-013	4624-126-991	Corrugated	Indented corrugated	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-014	4624-185-1021	Santa Fe	Santa Fe B/w	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-015	4624-125-1043	Corrugated	Smeared-indented corrugated	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-016	4624-95-1080	Plain	Plain	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-017	4624-85-1149	Corrugated	Indented corrugated	LA 4624	Early Middle Coalition	Roomblock
2002	PAX33-018	4624-86-1151	Plain	Plain	LA 4624	Early Middle Coalition	Roomblock
2004	PAX37-0001	86534-351-2	Corrugated	Smeared-indented corrugated	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0002	86534-585-2	Corrugated	Indented corrugated	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0003	86534-596-7	Corrugated	Smeared-indented corrugated	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0004	86534-666-1	Santa Fe	Santa Fe B/w	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0005	86534-708-2	Santa Fe	Santa Fe B/w	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0006	86534-708-2	Santa Fe	Santa Fe B/w	LA 86534	Middle Coalition	Roomblock

Analysis Year	Sample	Object Identifier[a]	Ware[b]	Ceramic type	Site	Period	Site Type
2004	PAX37-0007	86534-708-2	Santa Fe	Santa Fe B/w	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0008	86534-708-26	Corrugated	Smeared-indented corrugated	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0009	86534-735-7	Santa Fe	Santa Fe B/w	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0010	86534-735-12	Corrugated	Smeared-indented corrugated	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0011	86534-1712-7	Corrugated	Indented corrugated	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0012	86534-1748-12	Santa Fe	Santa Fe B/w	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0013	86534-1748-13	Santa Fe	Santa Fe B/w	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0014	86534-1596-1	Corrugated	Indented corrugated	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0015	86637-79-1	Biscuit	Biscuit	LA 86637	Late Archaic; Middle Classic; Historic	Lithic/Ceramic Scatter
2004	PAX37-0016	86637-84-1	Santa Fe	Santa Fe B/w	LA 86637	Late Archaic; Middle Classic; Historic	Lithic/Ceramic Scatter
2004	PAX37-0017	86637-7-1	Corrugated	Smeared-indented corrugated	LA 86637	Late Archaic; Middle Classic; Historic	Lithic/Ceramic Scatter
2004	PAX37-0018	86637-109-1	Corrugated	Smeared corrugated	LA 86637	Late Archaic; Middle Classic; Historic	Lithic/Ceramic Scatter
2004	PAX37-0019	86637-110-1	Corrugated	Smeared corrugated	LA 86637	Late Archaic; Middle Classic; Historic	Lithic/Ceramic Scatter
2004	PAX37-0020	12587-3244-5	Corrugated	Smeared corrugated	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0021	12587-3244-15	Santa Fe	Santa Fe B/w	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0022	12587-3908-37	Corrugated	Indented corrugated	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0023	12587-3908-18	Santa Fe	Santa Fe B/w	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0024	12587-3908-18	Santa Fe	Santa Fe B/w	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0025	12587-3908-43	Corrugated	Smeared-indented corrugated	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0026	12587-3908-45	Corrugated	Smeared-indented corrugated	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0027	12587-3228-9	Santa Fe	Santa Fe B/w	LA 12587	middle Late Coalition/Classic	Roomblock/

Analysis Year	Sample	Object Identifier[a]	Ware[b]	Ceramic type	Site	Period	Site Type
							Fieldhouse
2004	PAX37-0028	12587-3228-9	Santa Fe	Santa Fe B/w	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0029	12587-3228-11	Santa Fe	Santa Fe B/w	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0030	12587-3228-27	Corrugated	Smeared-indented corrugated	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0031	12587-3228-27	Corrugated	Indented corrugated	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0032	12587-3233-5	Santa Fe	Santa Fe B/w	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0033	12587-3233-5	Santa Fe	Santa Fe B/w	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0034	12587-3233-5	Santa Fe	Santa Fe B/w	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0035	12587-3233-5	Corrugated	Smeared-indented corrugated	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0036	12587-3233-5	Corrugated	Smeared-indented corrugated	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0037	128804-90-1	Corrugated	Smeared-indented corrugated	LA 128804	Historic with Late Classic?	Check dam
2004	PAX37-0038	128804-167-1	Biscuit	Biscuit B	LA 128804	Historic with Late Classic?	Check dam
2004	PAX37-0039	128804-128-4	Biscuit	Biscuit	LA 128804	Historic with Late Classic?	Check dam
2004	PAX37-0040	128804-230-1	Biscuit	Biscuit	LA 128804	Historic with Late Classic?	Check dam
2004	PAX37-0041	128804-179-1	Corrugated	Smeared-indented corrugated	LA 128804	Historic with Late Classic?	Check dam
2004	PAX37-0042	128805-158-1	Biscuit	Biscuit B	LA 128805	Late Classic	Fieldhouse
2004	PAX37-0043	128805-232-1	Corrugated	Smeared-indented corrugated	LA 128805	Late Classic	Fieldhouse
2004	PAX37-0044	128805-197-2	Biscuit	Biscuit	LA 128805	Late Classic	Fieldhouse
2004	PAX37-0045	128805-203-2	Plain	Plainware rim	LA 128805	Late Classic	Fieldhouse
2004	PAX37-0046	21596-17-5	Biscuit	Biscuit B	LA 21596	Coalition/Classic	Grid garden
2004	PAX37-0047	21596-12-17	Plain	Thin Plainware	LA 21596B	Coalition/Classic	Grid garden
2004	PAX37-0048	21596-12-2	Biscuit	Biscuit B	LA 21596B	Coalition/Classic	Grid garden
2004	PAX37-0049	21596-9-17	Plain	Thin Plainware	LA 21596	Coalition/Classic	Grid garden
2004	PAX37-0050	21596-9-5	Biscuit	Biscuit B	LA 21596B	Coalition/Classic	Grid garden
2004	PAX37-0051	21596-16-4	Sapawi'i	Sapawi'i	LA 21596B	Coalition/Classic	Grid garden

Analysis Year	Sample	Object Identifier[a]	Ware[b]	Ceramic type	Site	Period	Site Type
				Micaceous			
2004	PAX37-0052	21596-19-11	Biscuit	Biscuit B	LA 21596	Coalition/Classic	Grid garden
2004	PAX37-0053	86534-735-1	Santa Fe	Santa Fe B/w	LA 86534	Middle Coalition	Roomblock
2004	PAX37-0054	127625-22-1	Biscuit	Biscuit B	LA 127625	Und. Coalition	Lithic/Ceramic Scatter
2004	PAX37-0055	127625-64-1	Corrugated	Smeared corrugated	LA 127625	Und. Coalition	Lithic/Ceramic Scatter
2004	PAX37-0056	12587-2127-8	Corrugated	Smeared corrugated	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0057	12587-2127-24	Santa Fe	Santa Fe B/w	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0058	12587-40414-33	Santa Fe	Santa Fe B/w	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0059	12587-40414-8	Corrugated	Smeared corrugated	LA 12587	middle Late Coalition/Classic	Roomblock/ Fieldhouse
2004	PAX37-0060	86534-1688-8	Santa Fe	Santa Fe B/w	LA 86534	Middle Coalition	Roomblock
2005	PAX41-0139-2	135290-0139-2	Santa Fe	Santa Fe B/w	LA 135290	Late Coalition	Pueblo
2005	PAX41-0166-1	4618-0166-7	Corrugated	Smeared Corrugated	LA 4618	Middle Coalition	Roomblock
2005	PAX41-0166-2	4618-0166-1	Santa Fe	Santa Fe B/w	LA 4618	Middle Coalition	Roomblock
2005	PAX41-0171-1	4618-0171-6	Corrugated	Smeared Corrugated	LA 4618	Middle Coalition	Roomblock
2005	PAX41-0171-2	4618-0171-1	Santa Fe	Santa Fe B/w	LA 4618	Middle Coalition	Roomblock
2005	PAX41-0197-1	4618-0197-12	Corrugated	Smeared Corrugated	LA 4618	Middle Coalition	Roomblock
2005	PAX41-0197-2	4618-0197-4	Santa Fe	Santa Fe B/w	LA 4618	Middle Coalition	Roomblock
2005	PAX41-0204-1	4618-0204-13	Corrugated	Smeared Corrugated	LA 4618	Middle Coalition	Roomblock
2005	PAX41-0204-2	4618-0204-1	Santa Fe	Santa Fe B/w	LA 4618	Late Coalition	Pueblo
2005	PAX41-0248-01	135290-0248-1	Corrugated	Smeared Corrugated	LA 135290	Late Coalition	Pueblo
2005	PAX41-0248-1	4618-0248-9	Corrugated	Smeared Corrugated	LA 4618	Late Coalition	Pueblo
2005	PAX41-0248-2	4618-0248-6	Santa Fe	Santa Fe B/w	LA 4618	Late Coalition	Pueblo
2005	PAX41-0256-1	99396-0256-1	Corrugated	Smeared Corrugated	LA 99396	Late Coalition	Pueblo
2005	PAX41-0371-1	4618-0371-7	Corrugated	Smeared	LA 4618	Late Coalition	Pueblo

Analysis Year	Sample	Object Identifier[a]	Ware[b]	Ceramic type	Site	Period	Site Type
				Corrugated			
2005	PAX41-0371-2	4618-0371-12	Santa Fe	Santa Fe B/w	LA 4618	Late Coalition	Pueblo
2005	PAX41-0456-1	99396-0456-1	Corrugated	Smeared Corrugated	LA 99396	Late Coalition	Pueblo
2005	PAX41-0579-1	4618-0579-12	Corrugated	Smeared Corrugated	LA 4618	Late Coalition	Pueblo
2005	PAX41-0579-2	4618-0579-6	Santa Fe	Santa Fe B/w	LA 4618	Late Coalition	Pueblo
2005	PAX41-0631-1	99396-0631-1	Corrugated	Smeared Corrugated	LA 99396	Late Coalition	Pueblo
2005	PAX41-0642-1	4618-0642-30	Corrugated	Smeared Corrugated	LA 4618	Late Coalition	Pueblo
2005	PAX41-0642-2	4618-0642-15	Santa Fe	Santa Fe B/w	LA 4618	Late Coalition	Pueblo
2005	PAX41-0652-1	4618-0652-7	Corrugated	Smeared Corrugated	LA 4618	Late Coalition	Pueblo
2005	PAX41-0652-2	4618-0652-21	Santa Fe	Santa Fe B/w	LA 4618	Late Coalition	Pueblo
2005	PAX41-0715-1	4618-0715-15	Corrugated	Smeared Corrugated	LA 4618	Late Coalition	Pueblo
2005	PAX41-0715-2	4618-0715-8	Santa Fe	Santa Fe B/w	LA 4618	Late Coalition	Pueblo
2005	PAX41-0872-1	135290-872-5	Santa Fe	Santa Fe B/w	LA 135290	Middle Coalition	Roomblock
2005	PAX41-0925-2	135290-0925-1	Santa Fe	Santa Fe B/w	LA 135290	Late Archaic; Und.	Lithic scatter; 1-room
2005	PAX41-0942-1	135290-0942-2	Corrugated	Smeared Corrugated	LA 135290	Late Archaic; Und.	Lithic scatter; 1-room
2005	PAX41-0969-1	135290-969-1	Santa Fe	Santa Fe B/w	LA 135290	Middle Coalition	Roomblock
2005	PAX41-1254-01	135290-1254-1	Santa Fe	Santa Fe B/w	LA 135290	Middle Coalition	Roomblock
2005	PAX41-1254-1	135290-1254-15	Corrugated	Smeared Corrugated	LA 135290	Middle Coalition	Roomblock
2005	PAX41-1254-2	135290-1254-3	Santa Fe	Santa Fe B/w	LA 135290	Middle Coalition	Roomblock
2005	PAX41-1352-1	135290-1352-8	Corrugated	Smeared Corrugated	LA 135290	Middle Coalition	Roomblock
2005	PAX41-1352-2	135290-1352-1	Santa Fe	Santa Fe B/w	LA 135290	Middle Coalition	Roomblock
2005	PAX41-1384-1	135290-1384-3	Corrugated	Smeared Corrugated	LA 135290	Middle Coalition	Roomblock
2005	PAX41-1384-2	135290-1384-1	Santa Fe	Santa Fe B/w	LA 135290	Middle Coalition	Roomblock
2005	PAX41-1753-1	135290-1753-8	Corrugated	Smeared Corrugated	LA 135290	Middle Coalition	Roomblock
2005	PAX41-1753-2	135290-1753-2	Santa Fe	Santa Fe B/w	LA 135290	Middle Coalition	Roomblock

Analysis Year	Sample	Object Identifier[a]	Ware[b]	Ceramic type	Site	Period	Site Type
2005	PAX41-1900-1	135290-1900-10	Corrugated	Smeared Corrugated	LA 135290	Middle Coalition	Roomblock
2005	PAX41-1900-2	135290-1900-3	Santa Fe	Santa Fe B/w	LA 135290	Middle Coalition	Roomblock
2005	PAX41-2106-2	135290-2106-2	Corrugated	corr or washboard	LA 135290	Middle Coalition	Roomblock
2005	PAX41-2202-2	135290-2202-1	Santa Fe	Santa Fe B/w	LA 135290	Late Coalition	Pueblo
2005	PAX41-2307-1	135290-2307-7	Corrugated	Smeared Corrugated	LA 135290	Late Coalition	Pueblo
2005	PAX41-2307-2	135290-2307-5	Santa Fe	Santa Fe B/w	LA 135290	Middle Coalition	Roomblock
2005	PAX41-2351-1	135290-2351-8	Corrugated	Smeared Corrugated	LA 135290	Late Coalition	Pueblo
2005	PAX41-2351-2	135290-2351-5	Santa Fe	Santa Fe B/w	LA 135290	Middle Coalition	Roomblock
2005	PAX41-2421-1	135290-2421-17	Corrugated	Smeared Corrugated	LA 135290	Middle Coalition	Roomblock
2006	LANL4-0001	15116-016-01	Biscuit	Biscuit	LA 15116	Late Classic	Fieldhouse
2006	LANL4-0002	15116-057-01	Sapawi'i	Sapawi'i Micaceous	LA 15116	Late Classic	Fieldhouse
2006	LANL4-0003	70025-032-01	Sapawi'i	Sapawi'i Micaceous	LA 70025	Late Classic	Fieldhouse
2006	LANL4-0004	70025-044-02	Biscuit	Biscuit B	LA 70025	Late Classic	Fieldhouse
2006	LANL4-0005	85404-083-03	Corrugated	Smeared-indented corrugated	LA 85404	Coalition/Classic	Fieldhouse
2006	LANL4-0006	85404-086-02	Santa Fe	Santa Fe B/w	LA 85404	Coalition/Classic	Fieldhouse
2006	LANL4-0007	85404-086-03	Sapawi'i	Sapawi'i Micaceous	LA 85404	Coalition/Classic	Fieldhouse
2006	LANL4-0008	85404-011-01	Biscuit	Biscuit	LA 85404	Coalition/Classic	Fieldhouse
2006	LANL4-0009	86605-83-02	Biscuit	Biscuit B	LA 86605	Late Classic	Fieldhouse
2006	LANL4-0010	86605-97-01	Biscuit	Biscuit B	LA 86605	Late Classic	Fieldhouse
2006	LANL4-0011	87430-012-03	Sapawi'i	Sapawi'i Micaceous	LA 87430	Late Classic	Fieldhouse
2006	LANL4-0012	87430-014-01	Sapawi'i	Sapawi'i Micaceous	LA 87430	Late Classic	Fieldhouse
2006	LANL4-0013	87430-019-01	Biscuit	Biscuit B	LA 87430	Late Classic	Fieldhouse
2006	LANL4-0014	87430-088-03	Biscuit	Biscuit B	LA 87430	Late Classic	Fieldhouse
2006	LANL4-0015	87430-092-02	Sapawi'i	Sapawi'i Micaceous	LA 87430	Late Classic	Fieldhouse
2006	LANL4-0016	87430-106-01	Biscuit	Biscuit	LA 87430	Late Classic	Fieldhouse
2006	LANL4-0017	127627-090-03	Plain	Plain gray	LA 127627	Und. Classic	Fieldhouse

Analysis Year	Sample	Object Identifier[a]	Ware[b]	Ceramic type	Site	Period	Site Type
2006	LANL4-0018	127634-034-01	Biscuit	Biscuit A	LA 127634	Late Classic	Fieldhouse
2006	LANL4-0019	127634-100-04	Biscuit	Biscuit B	LA 127634	Late Classic	Fieldhouse
2006	LANL4-0020	127634-067-01	Sapawi'i	Sapawi'i Micaceous	LA 127634	Late Classic	Fieldhouse
2006	LANL4-0021	127635-002-01	Corrugated	Smeared Corrugated	LA 127635	Coalition/Classic	Fieldhouse
2006	LANL4-0022	127635-005-02	Corrugated	Smeared-indented Corrugated	LA 127635	Coalition/Classic	Fieldhouse
2006	LANL4-0023	127635-068-04	Corrugated	Smeared-indented Corrugated	LA 127635	Coalition/Classic	Fieldhouse
2006	LANL4-0024	127635-031-01	Sapawi'i	Sapawi'i Micaceous	LA 127635	Coalition/Classic	Fieldhouse
2006	LANL4-0025	127635-037-04	Santa Fe	Santa Fe B/w	LA 127635	Coalition/Classic	Fieldhouse
2006	LANL4-0026	127635-039-03	Corrugated	Smeared-indented corrugated	LA 127635	Coalition/Classic	Fieldhouse
2006	LANL4-0027	127635-064-05	Corrugated	Smeared-indented corrugated	LA 127635	Coalition/Classic	Fieldhouse
2006	LANL4-0028	127635-106-01	Corrugated	Smeared-indented corrugated	LA 127635	Coalition/Classic	Fieldhouse
2006	LANL4-0029	127635-129-01	Biscuit	Biscuit A	LA 127635	Coalition/Classic	Fieldhouse
2006	LANL4-0030	127635-146-01	Biscuit	Biscuit B	LA 127635	Coalition/Classic	Fieldhouse
2006	LANL4-0031	135291-038-01	Corrugated	Smeared-indented corrugated	LA 135291	Early Classic	Fieldhouse
2006	LANL4-0032	135291-072-01	Biscuit	Biscuit B	LA 135291	Early Classic	Fieldhouse
2006	LANL4-0033	135292-023-02	Corrugated	Smeared Corrugated	LA 135292	Late Classic	Fieldhouse
2006	LANL4-0034	135292-025-02	Biscuit	Biscuit B	LA 135292	Late Classic	Fieldhouse
2006	LANL4-0035	135292-046-02	Biscuit	Biscuit	LA 135292	Late Classic	Fieldhouse
2007	LANL5-01	85408-31-1	Biscuit	Biscuit B	LA 85408	Late Classic	Fieldhouse
2007	LANL5-02	85411-97-1	Biscuit	Biscuit A	LA 85411	Early-Late Classic	Fieldhouse
2007	LANL5-03	85413-103-1	Biscuit	Biscuit A	LA 85413	Early Classic	Fieldhouse
2007	LANL5-04	85413-79-1	Biscuit	Biscuit A	LA 85413	Early Classic	Fieldhouse
2007	LANL5-05	85408-60-4	Biscuit	Biscuit B	LA 85408	Late Classic	Fieldhouse
2007	LANL5-06	85411-14-1	Biscuit	Biscuit B	LA 85411	Early-Late Classic	Fieldhouse
2007	LANL5-07	85411-97-3	Biscuit	Biscuit B	LA 85411	Early-Late Classic	Fieldhouse
2007	LANL5-08	85413-97-1	Sapawi'i	Sapawi'i Micaceous	LA 85413	Early Classic	Fieldhouse

Analysis Year	Sample	Object Identifier[a]	Ware[b]	Ceramic type	Site	Period	Site Type
2007	LANL5-09	85413-164-1	Sapawi'i	Sapawi'i Micaceous	LA 85413	Early Classic	Fieldhouse
2007	LANL5-10	85413-89-1	Sapawi'i	Sapawi'i Micaceous	LA 85413	Early Classic	Fieldhouse
2007	LANL5-11	85413-71-2	Sapawi'i	Sapawi'i Micaceous	LA 85413	Early Classic	Fieldhouse
2007	LANL5-12	85413-79-2	Sapawi'i	Sapawi'i Micaceous	LA 85413	Early Classic	Fieldhouse
2007	LANL5-13	86606-67-4	Corrugated	Smeared Corrugated	LA 86606	Coalition/Classic	Fieldhouse
2007	LANL5-14	86606-40-1	Corrugated	Smeared Corrugated	LA 86606	Coalition/Classic	Fieldhouse
2007	LANL5-15	85417-143-1	Corrugated	Smeared Corrugated	LA 85417	Coalition/Classic	Fieldhouse

aSome sherds could not be thin-sectioned for size or other considerations, but this inventory preserves the complete original list of sherds sent for analysis.
bThis column contains object-specific identifier information, in the format "Site-Accession code-Catalog number" or "Site-Provenience code-Object number."

Table Q.2. Inventory of all sherds selected for petrographic analysis showing temper characterization.

Analysis Year	Sample	Object Identifier[a]	Ceramicist's Temper Designation (if available)	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
2002	PAX33-001	4624-143-123	-	Sand	Sand	Anthill
2002	PAX33-002	4624-143-124	-	Sand	Sand	Anthill
2002	PAX33-003	4624-1-142	-	Sand	Sand	Anthill
2002	PAX33-004	4624-12-279	-	Sand	Sand	Granitic
2002	PAX33-005	4624-21-360	-	Sand	Sand	Anthill
2002	PAX33-006	4624-49-595	-	Sand	Sand	Anthill
2002	PAX33-007	4624-50-606	-	Sand	Sand	Anthill
2002	PAX33-008	4624-61-695	-	Sand	Sand	Anthill
2002	PAX33-009	4624-154-780	-	Sand	Sand	Anthill
2002	PAX33-010	4624-48-794	-	Sand	Sand	Anthill
2002	PAX33-011	4624-152-833	-	Sand	Tuff	Tuff 2
2002	PAX33-012	4624-152-837	-	Sand	Sand	Anthill
2002	PAX33-013	4624-126-991	-	Sand	Sand	Granitic
2002	PAX33-014	4624-185-1021	-	Sand	Sand	Anthill
2002	PAX33-015	4624-125-1043	-	Sand	Sand	Anthill
2002	PAX33-016	4624-95-1080	-	Sand	Sand	Anthill
2002	PAX33-017	4624-85-1149	-	Sand	Sand	Anthill
2002	PAX33-018	4624-86-1151	-	Sand	Sand	Anthill
2004	PAX37-0001	86534-351-2	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0002	86534-585-2	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0003	86534-596-7	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0004	86534-666-1	Fine tuff or ash	Tuff 2	Tuff	Tuff 2
2004	PAX37-0005	86534-708-2	Fine tuff or ash	Tuff 2	Tuff	Tuff 2
2004	PAX37-0006	86534-708-2	Fine tuff or ash	Tuff 1	Sand	Anthill
2004	PAX37-0007	86534-708-2	Fine tuff or ash	Tuff 2	Sand	Anthill
2004	PAX37-0008	86534-708-26	Anthill sand	-	-	-
2004	PAX37-0009	86534-735-7	Fine tuff or ash, with shale	Tuff 2	Sand	Anthill
2004	PAX37-0010	86534-735-12	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0011	86534-1712-7	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0012	86534-1748-12	Fine tuff or ash	Tuff 2	Tuff	Tuff 2
2004	PAX37-0013	86534-1748-13	Fine tuff or ash	Tuff 2	Sand	Anthill
2004	PAX37-0014	86534-1596-1	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0015	86637-79-1	Fine tuff or ash	Tuff 1	Tuff	Tuff 1
2004	PAX37-0016	86637-84-1	Fine tuff or ash	Tuff 2	Tuff	Tuff 2

Analysis Year	Sample	Object Identifier[a]	Ceramicist's Temper Designation (if available)	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
2004	PAX37-0017	86637-7-1	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0018	86637-109-1	Granite with mica	Granitic	Sand	Granitic
2004	PAX37-0019	86637-110-1	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0020	12587-3244-5	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0021	12587-3244-15	Tuff and sand	Tuff 1	Tuff	Tuff 1
2004	PAX37-0022	12587-3908-37	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0023	12587-3908-18	Fine tuff or ash	Tuff 2	Tuff	Tuff 2
2004	PAX37-0024	12587-3908-18	Fine tuff or ash	Tuff 2	Tuff	Tuff 2
2004	PAX37-0025	12587-3908-43	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0026	12587-3908-45	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0027	12587-3228-9	Tuff and anthill	Tuff 2	Tuff	Tuff 2
2004	PAX37-0028	12587-3228-9	Tuff and anthill	Tuff 2	Tuff	Tuff 1
2004	PAX37-0029	12587-3228-11	Tuff and anthill	Tuff 2	Tuff	Tuff 2
2004	PAX37-0030	12587-3228-27	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0031	12587-3228-27	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0032	12587-3233-5	Fine tuff or ash	Tuff 2	Tuff	Tuff 2
2004	PAX37-0033	12587-3233-5	Fine tuff or ash	Tuff 2	Tuff	Tuff 2
2004	PAX37-0034	12587-3233-5	Fine tuff or ash with shale	Anthill/Clay	Sand	Anthill
2004	PAX37-0035	12587-3233-5	Anthill sand	Anthill/Clay	Sand	Anthill
2004	PAX37-0036	12587-3233-5	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0037	128804-90-1	Anthill sand	Granitic	Sand	Granitic
2004	PAX37-0038	128804-167-1	Fine tuff or ash	Tuff 1	Tuff	Tuff 1
2004	PAX37-0039	128804-128-4	Fine tuff or ash	Tuff 1	Tuff	Tuff 2
2004	PAX37-0040	128804-230-1	Fine tuff or ash	Tuff 1	Tuff	Tuff 1
2004	PAX37-0041	128804-179-1	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0042	128805-158-1	Fine tuff or ash	Tuff 1	Tuff	Tuff 1
2004	PAX37-0043	128805-232-1	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0044	128805-197-2	Fine tuff or ash	Tuff 1	Tuff	Tuff 1
2004	PAX37-0045	128805-203-2	Anthill sand?	Granitic	Sand	Granitic
2004	PAX37-0046	21596-17-5	Ash, mica and sand	Tuff 1	Tuff	Tuff 1
2004	PAX37-0047	21596-12-17	Granite with mica	Tuff 2	Tuff	Tuff Other
2004	PAX37-0048	21596-12-2	Tuff and phenocrystals	Tuff 1	Tuff	Tuff 1
2004	PAX37-0049	21596-9-17	Granite with mica	Granitic	Sand	Granitic
2004	PAX37-0050	21596-9-5	Fine tuff or ash	Tuff 1	Tuff	Tuff 1
2004	PAX37-0051	21596-16-4	Granite with mica	Granitic	Sand	Granitic
2004	PAX37-0052	21596-19-11	Fine tuff or ash	Tuff 1	Tuff	Tuff 1
2004	PAX37-0053	86534-735-1	Fine tuff or ash	Tuff 1	Tuff	Tuff 1

Analysis Year	Sample	Object Identifier[a]	Ceramicist's Temper Designation (if available)	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
2004	PAX37-0054	127625-22-1	Tuff and phenocrystals	Tuff 1	Tuff	Tuff 1
2004	PAX37-0055	127625-64-1	Anthill sand	-	-	-
2004	PAX37-0056	12587-2127-8	Anthill sand	Anthill	Sand	Anthill
2004	PAX37-0057	12587-2127-24	Indeterminate	Sedimentary	Sedimentary	Sedimentary
2004	PAX37-0058	12587-40414-33	Indeterminate	Tuff 1	Tuff	Tuff 2
2004	PAX37-0059	12587-40414-8	Indeterminate	Anthill	Sand	Anthill
2004	PAX37-0060	86534-1688-8	Fine tuff or ash	Tuff 2	Tuff	Tuff 2
2005	PAX41-0139-2	135290-0139-2	-	-	-	-
2005	PAX41-0166-1	4618-0166-7	-	Anthill	Sand	Anthill
2005	PAX41-0166-2	4618-0166-1	-	-	-	-
2005	PAX41-0171-1	4618-0171-6	-	Anthill	Sand	Anthill
2005	PAX41-0171-2	4618-0171-1	-	Anthill	Sand	Anthill
2005	PAX41-0197-1	4618-0197-12	-	Anthill	Sand	Anthill
2005	PAX41-0197-2	4618-0197-4	-	Tuff 1	Tuff	Tuff 2
2005	PAX41-0204-1	4618-0204-13	-	Anthill	Sand	Anthill
2005	PAX41-0204-2	4618-0204-1	-	Granitic	Sand	Anthill
2005	PAX41-0248-01	135290-0248-1	-	Anthill	Sand	Anthill
2005	PAX41-0248-1	4618-0248-9	-	Anthill	Sand	Anthill
2005	PAX41-0248-2	4618-0248-6	-	Tuff 1	Tuff	Tuff 1
2005	PAX41-0256-1	99396-0256-1	-	-	-	-
2005	PAX41-0371-1	4618-0371-7	-	Anthill	Sand	Anthill
2005	PAX41-0371-2	4618-0371-12	-	Tuff 1	Tuff	Tuff 1
2005	PAX41-0456-1	99396-0456-1	-	Anthill	Sand	Anthill
2005	PAX41-0579-1	4618-0579-12	-	Anthill	Sand	Anthill
2005	PAX41-0579-2	4618-0579-6	-	Granitic	Sand	Anthill
2005	PAX41-0631-1	99396-0631-1	-	Anthill	Sand	Anthill
2005	PAX41-0642-1	4618-0642-30	-	Anthill	Sand	Anthill
2005	PAX41-0642-2	4618-0642-15	-	Tuff 1	Tuff	Tuff 1
2005	PAX41-0652-1	4618-0652-7	-	Anthill	Sand	Anthill
2005	PAX41-0652-2	4618-0652-21	-	Tuff 1	Tuff	Tuff 2
2005	PAX41-0715-1	4618-0715-15	-	Anthill	Sand	Anthill
2005	PAX41-0715-2	4618-0715-8	-	Tuff 1	Tuff	Tuff 1
2005	PAX41-0872-1	135290-872-5	-	Anthill/Clay	Sand	Tuff/sand/clay
2005	PAX41-0925-2	135290-0925-1	-	Anthill/Clay	Sand	Tuff/sand/clay
2005	PAX41-0942-1	135290-0942-2	-	Anthill	Sand	Anthill
2005	PAX41-0969-1	135290-969-1	-	Anthill/Clay	Sand	Tuff/sand/clay

Analysis Year	Sample	Object Identifier[a]	Ceramicist's Temper Designation (if available)	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
2005	PAX41-1254-01	135290-1254-1	-	Anthill/Clay	Sand	Tuff/sand/clay
2005	PAX41-1254-1	135290-1254-15	-	Anthill	Sand	Anthill
2005	PAX41-1254-2	135290-1254-3	-	Anthill/Clay	Sand	Tuff/sand/clay
2005	PAX41-1352-1	135290-1352-8	-	Anthill	Sand	Anthill
2005	PAX41-1352-2	135290-1352-1	-	Anthill/Clay	Tuff	Tuff/sand/clay
2005	PAX41-1384-1	135290-1384-3	-	Anthill	Sand	Anthill
2005	PAX41-1384-2	135290-1384-1	-	Anthill/Clay	Sand	Tuff/sand/clay
2005	PAX41-1753-1	135290-1753-8	-	Anthill	Sand	Anthill
2005	PAX41-1753-2	135290-1753-2	-	-	-	-
2005	PAX41-1900-1	135290-1900-10	-	Anthill	Sand	Anthill
2005	PAX41-1900-2	135290-1900-3	-	Anthill/Clay	Sand	Tuff/sand/clay
2005	PAX41-2106-2	135290-2106-2	-	Anthill	Sand	Anthill
2005	PAX41-2202-2	135290-2202-1	-	Anthill/Clay	Sand	Tuff/sand/clay
2005	PAX41-2307-1	135290-2307-7	-	Anthill	Sand	Anthill
2005	PAX41-2307-2	135290-2307-5	-	-	-	-
2005	PAX41-2351-1	135290-2351-8	-	Anthill	Sand	Anthill
2005	PAX41-2351-2	135290-2351-5	-	-	-	-
2005	PAX41-2421-1	135290-2421-17	-	-	-	-
2006	LANL4-0001	15116-016-01	Fine tuff	Tuff 1	Tuff	Tuff 1
2006	LANL4-0002	15116-057-01	Granitic (micaceous)	Granitic	Sand	Granitic
2006	LANL4-0003	70025-032-01	Granitic (micaceous)	Granitic	Sand	Granitic
2006	LANL4-0004	70025-044-02	Fine tuff	-	-	-
2006	LANL4-0005	85404-083-03	Anthill sand	Anthill	Sand	Anthill
2006	LANL4-0006	85404-086-02	Fine tuff	Tuff 1	Tuff	Tuff 1
2006	LANL4-0007	85404-086-03	Granitic (micaceous)	Granitic	Sand	Granitic
2006	LANL4-0008	85404-011-01	Fine tuff	Tuff 1	Tuff	Tuff 1
2006	LANL4-0009	86605-83-02	Fine tuff	Tuff 1	Tuff	Tuff 1
2006	LANL4-0010	86605-97-01	Fine tuff	Tuff 1	Tuff	Tuff 1
2006	LANL4-0011	87430-012-03	Granite with mica	Granitic	Sand	Granitic
2006	LANL4-0012	87430-014-01	Granite with mica	-	-	-
2006	LANL4-0013	87430-019-01	Fine tuff	Tuff 1	Tuff	Tuff 1
2006	LANL4-0014	87430-088-03	Fine tuff	Tuff 1	Tuff	Tuff 1
2006	LANL4-0015	87430-092-02	Granitic (micaceous)	Granitic	Sand	Granitic
2006	LANL4-0016	87430-106-01	Fine tuff	Tuff 1	Tuff	Tuff 2
2006	LANL4-0017	127627-090-03	Granite	Granitic	Sand	Granitic
2006	LANL4-0018	127634-034-01	Fine tuff	Tuff 1	Tuff	Tuff 1

Analysis Year	Sample	Object Identifier[a]	Ceramicist's Temper Designation (if available)	Petrographer's Original Temper Designation	Final Temper Type	Final Temper Group
2006	LANL4-0019	127634-100-04	Fine tuff	Tuff 1	Tuff	Tuff 1
2006	LANL4-0020	127634-067-01	Granitic (micaceous)	Granitic	Sand	Granitic
2006	LANL4-0021	127635-002-01	Anthill sand	-	-	-
2006	LANL4-0022	127635-005-02	Anthill sand	Anthill	Sand	Anthill
2006	LANL4-0023	127635-068-04	Anthill sand	Anthill	Sand	Anthill
2006	LANL4-0024	127635-031-01	Granitic (micaceous)	Granitic	Sand	Granitic
2006	LANL4-0025	127635-037-04	Fine tuff	Tuff 2	Tuff	Tuff 2
2006	LANL4-0026	127635-039-03	Anthill sand	Anthill	Sand	Anthill
2006	LANL4-0027	127635-064-05	Anthill sand	-	-	-
2006	LANL4-0028	127635-106-01	Anthill sand	-	-	-
2006	LANL4-0029	127635-129-01	Fine tuff	Tuff 2	Tuff	Tuff 2
2006	LANL4-0030	127635-146-01	Fine tuff	Tuff 1	Tuff	Tuff 1
2006	LANL4-0031	135291-038-01	Anthill sand	Anthill	Sand	Anthill
2006	LANL4-0032	135291-072-01	Fine tuff	Tuff 1	Tuff	Tuff 1
2006	LANL4-0033	135292-023-02	Anthill sand	Anthill	Sand	Anthill
2006	LANL4-0034	135292-025-02	Fine tuff	Tuff 1	Tuff	Tuff 1
2006	LANL4-0035	135292-046-02	Fine tuff	Tuff 1	Tuff	Tuff 1
2007	LANL5-01	85408-31-1	fine tuff and sand	Tuff 1	Tuff	Tuff 1
2007	LANL5-02	85411-97-1	fine tuff and sand	Tuff 1	Tuff	Tuff 2
2007	LANL5-03	85413-103-1	fine tuff and sand	Tuff 1	Tuff	Tuff 1
2007	LANL5-04	85413-79-1	fine tuff and sand	Tuff 1	Tuff	Tuff 1
2007	LANL5-05	85408-60-4	fine tuff and sand	Tuff 1	Tuff	Tuff Other
2007	LANL5-06	85411-14-1	fine tuff and sand	Tuff 1	Tuff	Tuff 1
2007	LANL5-07	85411-97-3	fine tuff and sand	Tuff 1	Tuff	Tuff 2
2007	LANL5-08	85413-97-1	Granitic (micaceous)	Granitic	Sand	Granitic
2007	LANL5-09	85413-164-1	Granitic (micaceous)	Granitic	Sand	Granitic
2007	LANL5-10	85413-89-1	Granitic (micaceous)	Granitic	Sand	Granitic
2007	LANL5-11	85413-71-2	Granitic (micaceous)	Granitic	Sand	Granitic
2007	LANL5-12	85413-79-2	Granitic (micaceous)	Granitic	Sand	Granitic
2007	LANL5-13	86606-67-4	Anthill sand	Anthill	Sand	Anthill
2007	LANL5-14	86606-40-1	Anthill sand	Anthill	Sand	Anthill
2007	LANL5-15	85417-143-1	Anthill sand	Anthill	Sand	Anthill

aSome sherds could not be thin-sectioned for size or other considerations, but this inventory preserves the complete original list of sherds sent for analysis.

Table Q.3. Rock and sand samples collected for comparison to Los Alamos Land Transfer Project sherds.

Sample	Thin Section Number	Sample Type	Rock Type	Site No./Location	UTM Northing	UTM Easting	Macroscopic Observations
BV-07-02-01	-	Rock	Upper Otowi Member	Los Alamos Canyon	N 3970842	E 386554	Bottom of exposure
BV-07-02-02	-	Rock	Upper Otowi Member	Los Alamos Canyon	N 3970842	E 386554	Top of exposure; OU 1106, Strat. 1-5
BV-07-02-03	PAX37-0062	Rock	Cerro Toledo	Los Alamos Canyon	N 3970842	E 386554	Lower; OU 1106, Strat. 1-6
BV-07-02-04	-	Rock	Cerro Toledo	Los Alamos Canyon	N 3970842	E 386554	Upper; OU 1106, Strat. 1-9
BV-07-02-05	PAX37-0063	Rock	Tsankawi Member	Los Alamos Canyon	N 3970842	E 386554	Pumice bed
BV-07-02-06	PAX37-0064	Rock	Qbt 1g	Los Alamos Canyon	N 3970842	E 386554	Lower
BV-07-02-07	-	Rock	Qbt 1g	Los Alamos Canyon	N 3970842	E 386554	Upper; OU 1106, Strat. 1-8
BV-07-02-08	PAX37-0065	Rock	Qbt 1v	Los Alamos Canyon	N 3970842	E 386554	Colonnade Tuff
BV-07-02-09	-	Rock	Qbt 1v	Los Alamos Canyon	N 3970842	E 386554	Great White Way
BV-07-02-10	PAX37-0066	Rock	Qbt 2	Los Alamos Canyon	N 3970842	E 386554	
BV-07-02-11	-	Rock	Qbt 3	Los Alamos Canyon	N 3970842	E 386554	
BV-07-02-12	-	Rock	Guaje Pumice	S.R. 502 road cut	N 3969966	E 391618	Lower
BV-07-02-13	-	Rock	Cerros del Rios	S.R. 502 road cut	N 3969966	E 391618	Basalt
BV-07-02-14	PAX37-0061	Rock	Guaje Pumice	S.R. 502 road cut	N 3969966	E 391618	Upper
BV-07-02-15	-	Rock	Otowi Member	S.R. 502 road cut	N 3969966	E 391618	Lower
BV-07-02-16	-	Rock	Cerro del Medio (?)	Canyon Road (Los Alamos)	N 3971804	E 381640	Lower section
BV-07-02-17	-	Rock	Cerro del Medio (?)	Canyon Road (Los Alamos)	N 3971804	E 381640	Upper section
BV-07-02-18	-	Rock	El Cajete Pumice	Ski Hill Road	N 3971127	E 378649	road cut
BV-03-03-01	PAX37-0067	Anthill sand	Bandelier Tuff "Colonnade"	White Rock Site (LA 12587)	N 3965299	E 389718	Ant hill at White Rock
BV-03-03-02	-	Rock	Bandelier Tuff	TA-8			Red Clay Deposit
BV-03-03-03	-	Rock	Contact between Cerros del Rios basalt and Guaje Pumice	TA-74, State Road 4			Clay deposit
BV-03-03-04	-	Rock	Puye Formation	TA-74			Clay deposit
BV-03-03-05	-	Rock	Bandelier Tuff	White Rock Site (LA 12587)	N 3965299	E 389718	Clay deposit
GDL-06-03-01	PAX37-0068	Anthill sand	Bandelier Tuff "Unit 3"	Airport Site (LA 86534)	N 3970909	E 386403	Ant hill at Airport

Sample	Thin Section Number	Sample Type	Rock Type	Site No./Location	UTM Northing	UTM Easting	Macroscopic Observations
GDL-06-03-02	PAX37-0069	Alluvial sand	-	Pajarito Canyon	N 3965114	E 388681	From a channel in Pajarito Canyon, between TA's 36 & 54
GDL-06-03-03	PAX37-0070	Alluvial sand	-	Pueblo Canyon	N 3971539	E 385719	From a trench across a channel in Pueblo Canyon

Table Q.4a. Sherd point count data, part 1: total, quartz and feldspars (felsic, light-colored minerals).

						F							
						K				Tplag			
Sample	**Use count data?[a]**	**Analyst[b]**	**Total**	**Qtz**	**Sqtz**	**Kspar**	**Skspar**	**Micr**	**Sanid**	**Plag**	**Plagal**	**Plaggn**	**Splag**
PAX33-001	Yes	CPLR/SCR	152	62	0	50	0	0	.	16	1	0	0
PAX33-002	Yes	CPLR/SCR	81	25	0	15	0	0	.	5	7	1	0
PAX33-003	Yes	CPLR/SCR	118	42	0	10	0	0	.	18	8	1	0
PAX33-004	Yes	CPLR/SCR	212	90	0	24	0	3	.	20	49	0	0
PAX33-005	Yes	CPLR/SCR	135	31	0	18	0	0	.	9	11	0	0
PAX33-006	Yes	CPLR/SCR	100	27	0	32	0	0	.	2	3	0	0
PAX33-007	Yes	CPLR/SCR	124	42	0	18	0	0	.	19	5	1	0
PAX33-008	Yes	CPLR/SCR	152	35	0	82	0	0	.	7	6	0	0
PAX33-009	Yes	CPLR/SCR	143	26	0	77	0	0	.	3	2	0	0
PAX33-010	Yes	CPLR/SCR	102	40	0	15	0	0	.	1	1	1	0
PAX33-011	Yes	CPLR/SCR	52	5	0	3	0	1	.	4	3	2	0
PAX33-012	Yes	CPLR/SCR	136	27	0	80	0	0	.	5	2	1	0
PAX33-013	Yes	CPLR/SCR	138	58	0	10	0	5	.	19	25	2	0
PAX33-014	Yes	CPLR/SCR	103	45	0	13	0	0	.	8	6	0	0
PAX33-015	Yes	CPLR/SCR	205	61	1	105	0	0	.	7	2	0	0
PAX33-016	Yes	CPLR/SCR	83	32	0	33	0	0	.	1	3	0	0
PAX33-017	Yes	CPLR/SCR	119	20	0	67	0	0	.	2	2	0	0
PAX33-018	Yes	CPLR/SCR	145	55	0	37	0	1	.	7	6	0	0
PAX37-0001	Yes	SCR	104	34	0	0	0	1	45	6	0	0	0
PAX37-0002	Yes	SCR	111	34	0	5	0	0	20	7	0	0	0
PAX37-0003	Yes	SCR	147	55	0	0	0	0	55	4	0	0	0
PAX37-0004	Yes	SCR	73	19	0	6	0	2	0	12	0	0	0
PAX37-0005	Yes	SCR	168	55	0	2	0	0	0	16	0	0	0
PAX37-0006	Yes	SCR	144	34	0	0	0	0	54	20	0	0	0
PAX37-0007	Yes	SCR	183	96	0	0	0	1	36	19	2	0	0
PAX37-0009	Yes	SCR	102	25	0	10	0	0	39	12	0	0	0
PAX37-0010	Yes	SCR	124	36	0	0	0	0	46	15	0	0	0
PAX37-0011	Yes	SCR	80	23	0	0	0	0	1	24	4	0	0
PAX37-0012	Yes	SCR	101	10	0	0	0	0	8	8	0	0	0
PAX37-0013	Yes	SCR	130	63	0	0	0	0	37	8	2	1	0
PAX37-0014	Yes	SCR	205	74	0	0	0	0	53	23	5	0	0
PAX37-0015	Yes	SCR	131	3	0	7	0	0	0	7	0	0	0
PAX37-0016	Yes	SCR	116	19	0	0	0	0	32	8	0	0	0

						F							
						K				Tplag			
Sample	Use count data?[a]	Analyst[b]	Total	Qtz	Sqtz	Kspar	Skspar	Micr	Sanid	Plag	Plagal	Plaggn	Splag
PAX37-0017	Yes	SCR	219	96	0	0	0	1	57	18	2	3	0
PAX37-0018	Yes	SCR	192	83	0	2	0	24	0	20	26	3	0
PAX37-0019	Yes	SCR	132	33	0	0	0	0	52	13	1	0	0
PAX37-0020	Yes	SCR	333	78	0	0	0	0	132	26	2	0	0
PAX37-0021	Yes	SCR	277	9	0	0	0	0	15	1	0	0	0
PAX37-0022	Yes	SCR	152	35	0	0	0	0	79	7	0	0	0
PAX37-0023	Yes	SCR	85	28	0	0	0	0	7	17	0	0	0
PAX37-0024	Yes	SCR	58	11	0	3	0	0	0	14	0	0	0
PAX37-0025	Yes	SCR	164	54	0	0	0	0	37	39	6	0	0
PAX37-0026	Yes	SCR	183	75	0	0	0	0	54	22	5	0	0
PAX37-0027	Yes	SCR	131	53	0	0	0	2	16	16	0	0	0
PAX37-0028	Yes	SCR	148	1	0	0	0	0	8	1	0	0	0
PAX37-0029	Yes	SCR	145	19	0	0	0	0	11	3	0	0	0
PAX37-0030	Yes	SCR	112	32	0	0	0	0	50	7	0	0	0
PAX37-0031	Yes	SCR	111	69	0	0	0	1	16	8	0	0	0
PAX37-0032	Yes	SCR	193	20	0	0	0	1	21	5	0	0	0
PAX37-0033	Yes	SCR	47	10	0	3	0	0	0	4	0	1	0
PAX37-0034	Yes	SCR	55	3	0	0	0	0	2	8	0	0	0
PAX37-0035	Yes	SCR	132	42	0	0	0	1	12	23	0	0	0
PAX37-0036	Yes	SCR	214	59	0	0	0	0	97	15	4	0	0
PAX37-0037	Yes	SCR	177	69	0	6	0	27	0	23	22	2	0
PAX37-0038	Yes	SCR	114	4	0	0	0	0	4	0	0	0	0
PAX37-0039	Yes	SCR	125	23	0	0	0	0	6	1	2	0	0
PAX37-0040	Yes	SCR	270	10	0	0	0	0	17	0	0	0	0
PAX37-0041	Yes	SCR	127	38	0	0	0	0	39	13	2	0	0
PAX37-0042	Yes	SCR	139	2	0	0	0	0	0	1	0	0	0
PAX37-0043	Yes	SCR	228	105	0	0	0	0	70	20	4	0	0
PAX37-0044	Yes	SCR	192	1	0	0	0	0	0	2	0	0	0
PAX37-0045	Yes	SCR	192	88	0	5	0	32	0	32	14	5	0
PAX37-0046	Yes	SCR	174	10	0	0	0	1	1	4	0	0	0
PAX37-0047	Yes	SCR	262	9	0	0	0	0	1	38	0	0	0
PAX37-0048	Yes	SCR	340	13	0	0	0	0	5	8	0	0	0
PAX37-0049	Yes	SCR	315	144	0	4	0	3	0	24	28	2	2
PAX37-0050	Yes	SCR	334	6	0	1	0	0	1	2	0	0	0
PAX37-0051	Yes	SCR	288	146	0	2	0	8	0	20	45	1	0

						F							
						K				Tplag			
Sample	**Use count data?[a]**	**Analyst[b]**	**Total**	**Qtz**	**Sqtz**	**Kspar**	**Skspar**	**Micr**	**Sanid**	**Plag**	**Plagal**	**Plaggn**	**Splag**
PAX37-0052	Yes	SCR	238	7	0	4	0	1	0	1	0	0	0
PAX37-0053	Yes	SCR	121	4	0	0	0	0	7	0	0	0	0
PAX37-0054	Yes	SCR	133	12	0	0	0	0	8	1	0	0	0
PAX37-0056	Yes	SCR	204	79	0	0	0	1	58	9	3	1	0
PAX37-0057	Yes	SCR	149	59	0	14	0	4	0	11	15	0	0
PAX37-0058	Yes	SCR	50	5	0	0	0	0	1	5	0	0	0
PAX37-0059	Yes	SCR	197	66	0	0	0	3	36	42	5	0	0
PAX37-0060	Yes	SCR	208	40	0	0	0	0	10	11	1	0	0
PAX41-0166-1	Yes	SCR	291	98	0	0	0	0	81	10	2	0	0
PAX41-0171-1	Yes	SCR	239	96	0	0	0	2	66	13	4	0	0
PAX41-0171-2	Yes	SCR	141	35	0	1	0	7	19	13	6	2	0
PAX41-0197-1	Yes	SCR	231	85	0	2	0	2	70	7	2	0	0
PAX41-0197-2	Yes	SCR	133	26	0	1	0	1	11	2	0	0	0
PAX41-0204-1	Yes	SCR	184	57	0	2	0	0	65	9	0	0	0
PAX41-0204-2	Yes	SCR	211	79	0	7	0	5	9	19	1	0	0
PAX41-0248-01	Yes	SCR	229	93	0	1	0	0	77	10	0	0	0
PAX41-0248-1	Yes	SCR	246	64	0	0	0	0	104	5	1	0	0
PAX41-0248-2	Yes	SCR	225	7	0	0	0	0	9	1	0	0	0
PAX41-0371-1	Yes	SCR	271	118	0	3	0	0	57	14	2	1	0
PAX41-0371-2	Yes	SCR	238	6	0	0	0	0	8	0	0	0	0
PAX41-0456-1	Yes	SCR	118	35	0	0	0	0	46	3	1	0	0
PAX41-0579-1	Yes	SCR	218	54	0	0	0	0	28	15	1	2	0
PAX41-0579-2	Yes	SCR	200	92	0	13	0	5	3	21	5	2	0
PAX41-0631-1	Yes	SCR	116	47	0	0	0	0	43	2	2	0	0
PAX41-0642-1	Yes	SCR	187	69	0	0	0	0	48	17	4	0	0
PAX41-0642-2	Yes	SCR	156	7	0	0	0	0	16	1	0	0	0
PAX41-0652-1	Yes	SCR	211	82	0	0	0	0	55	10	3	1	0
PAX41-0652-2	Yes	SCR	142	26	0	2	0	2	28	5	0	0	0
PAX41-0715-1	Yes	SCR	267	136	0	0	0	0	60	5	3	1	0
PAX41-0715-2	Yes	SCR	222	11	0	0	0	0	37	1	0	0	0
PAX41-0872-1	Yes	SCR	205	32	0	3	0	2	7	4	0	0	0
PAX41-0925-2	Yes	SCR	202	32	0	0	0	0	11	3	0	0	0
PAX41-0942-1	Yes	SCR	249	88	0	0	0	0	97	7	1	0	0
PAX41-0969-1	Yes	SCR	220	29	0	1	0	0	25	5	0	0	0
PAX41-1254-01	Yes	SCR	165	19	0	0	0	0	9	3	0	0	0

						F							
						K				Tplag			
Sample	**Use count data?[a]**	**Analyst[b]**	**Total**	**Qtz**	**Sqtz**	**Kspar**	**Skspar**	**Micr**	**Sanid**	**Plag**	**Plagal**	**Plaggn**	**Splag**
PAX41-1254-1	Yes	SCR	193	41	0	1	0	0	63	14	3	2	0
PAX41-1254-2	Yes	SCR	154	14	0	0	0	0	12	1	0	0	0
PAX41-1352-1	Yes	SCR	201	72	0	7	0	0	88	8	2	0	0
PAX41-1352-2	Yes	SCR	253	12	0	0	0	0	8	4	0	0	0
PAX41-1384-1	Yes	SCR	173	59	0	4	0	0	52	20	2	0	0
PAX41-1384-2	Yes	SCR	158	26	0	0	0	0	17	7	0	0	0
PAX41-1753-1	Yes	SCR	172	71	0	0	0	0	56	10	0	0	0
PAX41-1900-1	Yes	SCR	225	55	0	0	0	0	100	13	0	0	0
PAX41-1900-2	Yes	SCR	154	27	0	1	0	0	16	3	0	0	0
PAX41-2106-2	Yes	SCR	199	72	0	0	0	2	48	27	0	2	0
PAX41-2202-2	Yes	SCR	117	21	0	0	0	0	15	5	0	0	0
PAX41-2307-1	Yes	SCR	180	54	0	0	0	0	79	11	0	1	0
PAX41-2351-1	Yes	SCR	194	60	0	0	0	0	88	5	1	0	0
LANL4-0001	Yes	SCR	226	4	0	0	0	0	0	0	0	0	0
LANL4-0002	Yes	SCR	191	92	0	0	0	26	0	21	22	4	0
LANL4-0003	Yes	SCR	268	130	0	0	0	62	0	29	25	4	0
LANL4-0005	Yes	SCR	247	90	0	0	0	0	44	21	4	0	0
LANL4-0006	Yes	SCR	236	2	0	0	0	0	1	1	0	0	0
LANL4-0007	Yes	SCR	206	94	0	1	0	29	0	19	28	3	0
LANL4-0008	Yes	SCR	226	9	0	0	0	0	6	6	0	0	0
LANL4-0009	Yes	SCR	170	11	0	0	0	0	3	1	0	0	0
LANL4-0010	Yes	SCR	133	1	0	0	0	0	0	1	0	0	0
LANL4-0011	Yes	SCR	267	122	0	0	0	28	0	15	32	7	0
LANL4-0013	Yes	SCR	160	3	0	0	0	0	2	0	0	0	0
LANL4-0014	Yes	SCR	181	4	0	0	0	0	4	0	0	0	0
LANL4-0015	Yes	SCR	218	101	0	0	0	21	0	36	21	0	0
LANL4-0016	Yes	SCR	191	39	0	0	0	2	1	5	7	0	0
LANL4-0017	Yes	SCR	182	90	0	2	0	23	0	26	19	5	0
LANL4-0018	Yes	SCR	233	17	0	0	0	0	3	3	0	0	0
LANL4-0019	Yes	SCR	222	1	0	0	0	0	1	1	0	0	0
LANL4-0020	Yes	SCR	243	83	19	4	1	47	0	16	16	6	1
LANL4-0022	Yes	SCR	164	64	0	0	0	0	48	7	0	0	0
LANL4-0023	Yes	SCR	177	69	0	0	0	0	55	8	0	0	0
LANL4-0024	Yes	SCR	250	120	0	1	0	22	0	38	25	1	0
LANL4-0025	Yes	SCR	214	32	0	3	0	0	7	5	3	0	0

						F							
						K				Tplag			
Sample	**Use count data?[a]**	**Analyst[b]**	**Total**	**Qtz**	**Sqtz**	**Kspar**	**Skspar**	**Micr**	**Sanid**	**Plag**	**Plagal**	**Plaggn**	**Splag**
LANL4-0026	Yes	SCR	138	45	0	0	0	0	37	4	0	0	0
LANL4-0029	Yes	SCR	200	28	0	0	0	0	15	2	0	0	0
LANL4-0030	Yes	SCR	178	29	0	1	0	0	4	2	3	2	0
LANL4-0031	Yes	SCR	211	74	0	2	0	0	42	16	8	0	0
LANL4-0032	Yes	SCR	151	10	0	0	0	0	2	3	0	0	0
LANL4-0033	Yes	SCR	207	88	0	0	0	0	44	20	4	2	0
LANL4-0034	Yes	SCR	179	8	0	0	0	0	0	0	0	0	0
LANL4-0035	Yes	SCR	161	6	0	0	0	0	0	3	0	0	0
LANL5-01	Yes	Miksa	234	8	0	2	0	0	.	28	4	0	0
LANL5-02	Yes	Miksa	222	31	0	6	0	2	.	12	23	0	0
LANL5-03	Yes	Miksa	346	19	0	2	0	0	.	0	10	0	0
LANL5-04	Yes	Miksa	323	9	0	23	0	0	.	3	2	0	0
LANL5-05	Yes	Miksa	106	13	0	2	0	0	.	36	5	0	0
LANL5-06	Yes	Miksa	271	7	0	4	0	0	.	13	12	0	0
LANL5-07	Yes	Miksa	320	64	0	3	0	0	.	34	18	2	0
LANL5-08	Yes	Miksa	306	105	0	6	0	4	.	8	52	0	0
LANL5-09	Yes	Miksa	266	115	0	6	0	18	.	14	58	1	0
LANL5-10	Yes	Miksa	228	100	0	3	0	4	.	5	43	0	0
LANL5-11	Yes	Miksa	230	84	0	1	0	4	.	24	76	0	0
LANL5-12	Yes	Miksa	210	99	0	16	0	5	.	37	36	3	0
LANL5-13.1	No	Miksa	31	10	0	4	0	0	.	4	2	0	0
LANL5-13.2	Yes	Miksa	277	72	0	18	0	0	.	60	54	0	0
LANL5-14	Yes	Miksa	138	37	0	32	0	0	.	14	8	0	0
LANL5-15	Yes	Miksa	134	31	0	12	0	0	.	30	13	0	0

Table Q.4b. Sherd point count data, part 2: dark-colored minerals, micas, and accessory minerals.

	Dusk-Colored (Mafic) Minerals, Micas, and Other Accessory Minerals														
	Pyr		Micas						Topaq		Mafic Accessory Minerals				
Sample	Px	Amph	Biot	Sbiot	Chlor	Schlor	Musc	Smusc	Opaq	Sopaq	Oliv	Epid	Sphene	Gar	Unkn
PAX33-001	0	1	1	0	1	0	0	0	11	0	0	1	0	0	0
PAX33-002	0	0	1	0	1	0	0	0	9	0	0	0	0	0	0
PAX33-003	0	1	0	0	2	0	0	0	18	0	0	0	0	0	1
PAX33-004	2	1	5	0	4	0	3	0	5	0	0	1	0	0	1
PAX33-005	3	0	3	0	1	0	0	0	22	0	0	0	0	0	0
PAX33-006	0	1	0	0	0	0	0	0	10	0	0	0	0	0	1
PAX33-007	1	1	2	0	0	0	0	0	26	0	0	0	0	0	0
PAX33-008	0	1	2	0	0	0	0	0	12	0	0	0	0	0	0
PAX33-009	0	0	2	0	0	0	0	0	11	0	0	0	0	0	0
PAX33-010	4	1	2	0	0	0	0	0	5	0	0	0	0	0	0
PAX33-011	0	0	1	0	1	0	2	0	8	0	0	0	0	0	0
PAX33-012	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
PAX33-013	0	0	4	0	2	0	4	0	5	0	0	2	0	0	1
PAX33-014	2	0	1	0	1	0	0	0	12	0	0	0	0	0	0
PAX33-015	1	1	1	0	0	0	0	0	4	0	0	0	0	0	0
PAX33-016	0	0	3	0	0	0	0	0	2	0	0	0	0	0	0
PAX33-017	2	0	1	0	0	0	0	0	7	0	0	1	0	0	0
PAX33-018	0	0	1	0	1	0	1	0	5	0	0	0	0	0	0
PAX37-0001	1	0	0	0	4	0	0	0	0	0	0	0	0	0	0
PAX37-0002	0	0	0	0	1	0	0	0	3	0	0	0	0	0	1
PAX37-0003	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
PAX37-0004	0	0	0	0	3	0	0	0	5	0	0	0	0	0	3
PAX37-0005	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
PAX37-0006	3	1	1	0	3	0	0	0	4	0	0	0	2	0	0
PAX37-0007	1	0	0	0	2	0	0	0	6	0	0	0	0	0	2
PAX37-0009	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
PAX37-0010	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1
PAX37-0011	0	0	0	0	3	0	0	0	2	0	0	0	1	0	0
PAX37-0012	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0
PAX37-0013	0	0	0	0	0	0	1	0	5	0	0	0	0	0	0
PAX37-0014	0	1	0	0	5	0	1	0	9	0	0	0	0	0	1
PAX37-0015	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
PAX37-0016	3	0	0	0	1	0	0	0	4	0	0	0	0	0	0

	Dusk-Colored (Mafic) Minerals, Micas, and Other Accessory Minerals														
	Pyr		Micas						Topaq		Mafic Accessory Minerals				
Sample	Px	Amph	Biot	Sbiot	Chlor	Schlor	Musc	Smusc	Opaq	Sopaq	Oliv	Epid	Sphene	Gar	Unkn
PAX37-0017	1	0	1	0	2	0	0	0	9	0	0	0	0	0	0
PAX37-0018	1	0	0	0	3	0	23	0	7	0	0	0	0	0	0
PAX37-0019	0	0	0	0	2	0	1	0	4	0	0	0	0	0	0
PAX37-0020	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0
PAX37-0021	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
PAX37-0022	1	0	0	0	1	0	0	0	1	0	0	0	0	0	1
PAX37-0023	1	2	0	0	0	0	0	0	3	0	0	0	0	0	0
PAX37-0024	1	0	0	0	6	0	0	0	4	0	0	0	0	0	1
PAX37-0025	2	2	0	0	3	0	0	0	4	0	0	0	0	0	1
PAX37-0026	0	2	0	0	0	0	0	0	3	0	0	0	0	0	0
PAX37-0027	1	0	1	0	5	0	0	0	4	0	0	0	0	0	1
PAX37-0028	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PAX37-0029	0	0	0	0	1	0	0	0	5	0	0	0	0	0	1
PAX37-0030	1	0	0	0	2	0	0	0	2	0	0	0	0	0	0
PAX37-0031	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
PAX37-0032	4	0	0	0	0	0	0	0	5	0	0	0	1	0	1
PAX37-0033	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
PAX37-0034	0	0	0	0	2	0	1	0	1	0	0	0	0	0	0
PAX37-0035	0	1	0	0	4	0	0	0	2	0	0	0	0	0	0
PAX37-0036	0	1	0	0	4	0	0	0	9	0	0	0	0	0	0
PAX37-0037	0	1	2	0	3	0	10	0	3	0	0	3	0	0	1
PAX37-0038	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
PAX37-0039	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
PAX37-0040	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0
PAX37-0041	1	0	1	0	3	0	0	0	0	0	0	0	0	0	0
PAX37-0042	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
PAX37-0043	0	0	0	0	0	0	2	0	14	0	0	0	0	0	0
PAX37-0044	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
PAX37-0045	0	0	1	0	0	0	3	0	5	0	0	0	0	0	0
PAX37-0046	0	0	0	0	11	0	1	0	0	0	0	0	0	0	0
PAX37-0047	6	2	0	0	0	0	0	0	7	0	0	0	0	0	1
PAX37-0048	1	0	0	0	0	0	0	0	2	0	0	0	0	0	1
PAX37-0049	0	0	6	0	21	0	63	0	14	0	0	0	1	0	0
PAX37-0050	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
PAX37-0051	0	0	0	0	14	0	41	0	11	0	0	0	0	0	0

	Dusk-Colored (Mafic) Minerals, Micas, and Other Accessory Minerals														
	Pyr		Micas						Topaq		Mafic Accessory Minerals				
Sample	Px	Amph	Biot	Sbiot	Chlor	Schlor	Musc	Smusc	Opaq	Sopaq	Oliv	Epid	Sphene	Gar	Unkn
PAX37-0052	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0
PAX37-0053	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
PAX37-0054	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
PAX37-0056	0	0	0	0	0	0	0	0	8	0	0	0	0	0	1
PAX37-0057	2	0	0	0	2	0	2	0	3	0	0	0	0	0	1
PAX37-0058	2	0	0	0	1	0	0	0	2	0	0	0	0	0	0
PAX37-0059	4	0	0	0	3	0	2	0	15	0	0	0	0	0	1
PAX37-0060	0	0	1	0	1	0	0	0	7	0	0	0	0	0	1
PAX41-0166-1	1	0	0	0	1	0	1	0	2	0	0	0	0	0	0
PAX41-0171-1	0	1	0	0	2	0	0	0	4	0	0	0	0	0	2
PAX41-0171-2	0	2	0	0	19	0	0	0	16	0	0	2	0	0	0
PAX41-0197-1	0	0	0	0	2	0	0	0	5	0	0	0	0	0	0
PAX41-0197-2	1	0	1	0	1	0	0	0	2	0	0	0	0	0	0
PAX41-0204-1	0	1	0	0	1	0	0	0	9	0	0	0	0	0	1
PAX41-0204-2	0	0	0	0	24	0	3	0	5	0	0	1	0	0	1
PAX41-0248-01	1	1	0	0	0	0	0	0	2	0	0	0	0	0	0
PAX41-0248-1	0	0	0	0	1	0	0	0	5	0	0	0	0	0	0
PAX41-0248-2	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
PAX41-0371-1	1	0	0	0	2	0	0	0	6	0	0	0	0	0	1
PAX41-0371-2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1
PAX41-0456-1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
PAX41-0579-1	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0
PAX41-0579-2	0	0	0	0	10	0	1	0	12	0	0	0	0	0	0
PAX41-0631-1	0	0	0	0	1	0	0	0	3	0	0	0	0	0	2
PAX41-0642-1	0	0	0	0	1	0	0	0	4	0	0	0	0	0	0
PAX41-0642-2	0	0	0	0	3	0	1	0	0	0	0	0	0	0	0
PAX41-0652-1	0	0	0	0	1	0	0	0	6	0	0	0	0	0	2
PAX41-0652-2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
PAX41-0715-1	0	1	0	0	2	0	0	0	4	0	0	1	0	0	1
PAX41-0715-2	2	0	0	0	0	0	0	0	6	0	0	0	0	0	1
PAX41-0872-1	2	1	0	0	0	0	0	0	1	0	0	0	0	0	1
PAX41-0925-2	0	2	0	0	4	0	2	0	5	0	0	0	0	0	0
PAX41-0942-1	0	1	0	0	0	0	0	0	5	0	0	0	0	0	0
PAX41-0969-1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
PAX41-1254-01	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1

	Dusk-Colored (Mafic) Minerals, Micas, and Other Accessory Minerals														
	Pyr		Micas						Topaq		Mafic Accessory Minerals				
Sample	**Px**	**Amph**	**Biot**	**Sbiot**	**Chlor**	**Schlor**	**Musc**	**Smusc**	**Opaq**	**Sopaq**	**Oliv**	**Epid**	**Sphene**	**Gar**	**Unkn**
PAX41-1254-1	0	2	0	0	4	0	0	0	2	0	0	0	0	0	1
PAX41-1254-2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
PAX41-1352-1	0	0	0	0	0	0	0	0	4	0	0	0	0	0	3
PAX41-1352-2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
PAX41-1384-1	2	0	0	0	0	0	0	0	3	0	0	0	0	0	1
PAX41-1384-2	0	1	0	0	1	0	0	0	1	0	0	0	0	0	1
PAX41-1753-1	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0
PAX41-1900-1	0	0	0	0	1	0	0	0	4	0	0	0	1	0	1
PAX41-1900-2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1
PAX41-2106-2	1	1	1	0	0	0	0	0	3	0	0	0	0	0	1
PAX41-2202-2	0	1	0	0	2	0	0	0	7	0	0	0	0	0	2
PAX41-2307-1	0	1	0	0	1	0	0	0	5	0	0	0	0	0	0
PAX41-2351-1	3	2	0	0	0	0	0	0	2	0	0	0	0	0	0
LANL4-0001	0	0	0	0	0	0	0	0	2	0	0	0	0	0	6
LANL4-0002	0	0	1	0	4	0	16	0	2	0	0	0	0	0	3
LANL4-0003	0	1	1	0	3	0	5	0	1	0	0	1	0	0	4
LANL4-0005	0	0	0	0	0	0	0	0	2	0	0	0	0	0	13
LANL4-0006	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
LANL4-0007	0	0	0	0	4	0	16	0	4	0	0	0	0	0	8
LANL4-0008	1	0	0	0	8	0	0	0	3	0	0	0	0	0	4
LANL4-0009	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
LANL4-0010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
LANL4-0011	0	0	0	0	15	0	25	0	13	0	0	0	0	0	10
LANL4-0013	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
LANL4-0014	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
LANL4-0015	0	0	3	0	10	0	11	0	2	0	0	0	0	0	5
LANL4-0016	0	0	0	0	0	0	0	0	4	0	0	0	0	0	1
LANL4-0017	0	2	1	0	4	0	3	0	3	0	0	0	0	0	2
LANL4-0018	0	0	0	0	1	0	0	0	1	0	0	1	0	0	4
LANL4-0019	0	0	0	0	0	0	0	0	5	0	0	0	0	0	2
LANL4-0020	0	0	1	0	9	0	13	8	4	0	0	0	0	0	7
LANL4-0022	0	1	0	0	0	0	0	0	8	0	0	0	0	0	13
LANL4-0023	0	1	0	0	0	0	0	0	7	0	0	0	0	0	12
LANL4-0024	0	1	0	0	4	0	16	0	4	0	0	0	0	0	3
LANL4-0025	0	2	0	0	2	0	0	0	3	0	0	0	0	0	7

	Dusk-Colored (Mafic) Minerals, Micas, and Other Accessory Minerals														
	Pyr		Micas						Topaq		Mafic Accessory Minerals				
Sample	**Px**	**Amph**	**Biot**	**Sbiot**	**Chlor**	**Schlor**	**Musc**	**Smusc**	**Opaq**	**Sopaq**	**Oliv**	**Epid**	**Sphene**	**Gar**	**Unkn**
LANL4-0026	0	0	0	0	0	0	0	0	3	0	0	0	1	0	12
LANL4-0029	0	0	0	0	1	0	0	0	1	0	0	0	0	0	6
LANL4-0030	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
LANL4-0031	0	0	0	0	1	0	0	0	10	0	0	0	0	0	21
LANL4-0032	0	2	0	0	5	0	0	0	4	0	0	0	0	0	7
LANL4-0033	0	1	0	0	1	0	0	0	5	0	0	0	0	0	14
LANL4-0034	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
LANL4-0035	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
LANL5-01	0	0	10	0	0	0	0	0	0	0	0	2	0	0	2
LANL5-02	0	0	10	0	0	0	1	0	1	0	0	0	0	0	5
LANL5-03	0	3	10	0	1	0	0	0	12	0	0	0	0	0	4
LANL5-04	0	1	2	0	0	0	0	0	1	0	0	0	0	0	1
LANL5-05	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
LANL5-06	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
LANL5-07	0	0	5	0	0	0	2	0	1	0	0	0	0	0	1
LANL5-08	0	0	32	0	7	0	67	0	12	0	0	0	1	0	1
LANL5-09	1	0	9	0	2	0	15	0	5	0	0	0	0	0	4
LANL5-10	0	2	10	0	4	0	46	0	5	0	0	0	0	0	1
LANL5-11	0	7	15	0	0	0	1	0	0	0	0	0	0	0	0
LANL5-12	1	0	2	0	2	0	1	0	0	0	0	0	0	0	2
LANL5-13.1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1
LANL5-13.2	0	0	7	0	2	0	2	0	2	0	0	0	0	0	1
LANL5-14	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0
LANL5-15	0	0	1	0	0	0	1	0	3	0	0	0	0	0	0

Table Q.4c. Sherd point count data, part 3: lithic fragments.

	Lithic Fragments (L)															
	Volcanic Lithic Fragments (Lv)						Metamorphic Lithic Fragments (Lm)			Sedimentary Lithic Fragments (Ls)						
Sample	Lvf	Lvfb	Lvm	Lvi	Lvv	Lvh	Lma2	Lmttp	Lmmf	Lss	Lsa	Lsch	Lsca1	Lsca2	Lsca3	Caco[a]
PAX33-001	0	0	0	0	2	0	2	0	0	0	0	4	0	0	0	0
PAX33-002	7	4	0	1	2	0	0	0	0	0	0	3	0	0	0	0
PAX33-003	7	4	0	1	1	0	2	0	0	0	0	1	0	0	0	1
PAX33-004	0	1	0	0	1	0	0	0	0	0	0	2	0	0	0	0
PAX33-005	8	0	0	1	25	0	1	0	0	0	0	2	0	0	0	0
PAX33-006	8	0	0	0	12	0	1	1	0	0	0	2	0	0	0	0
PAX33-007	4	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
PAX33-008	4	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0
PAX33-009	8	5	0	0	7	0	1	0	0	0	0	1	0	0	0	0
PAX33-010	13	0	0	1	17	0	0	1	0	0	0	0	0	0	0	0
PAX33-011	0	0	0	0	20	0	1	0	0	0	0	0	0	0	0	0
PAX33-012	6	1	0	0	10	0	0	0	0	0	0	0	0	0	0	0
PAX33-013	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
PAX33-014	4	0	0	1	6	0	0	0	1	0	0	2	1	0	0	0
PAX33-015	9	0	0	0	4	0	0	1	1	0	0	7	0	0	0	0
PAX33-016	3	1	0	0	4	0	0	0	0	0	0	0	1	0	0	0
PAX33-017	7	0	0	0	6	0	0	1	1	0	0	2	0	0	0	0
PAX33-018	9	6	0	0	6	0	0	3	3	0	1	3	0	0	0	0
PAX37-0001	8	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
PAX37-0002	22	0	0	0	17	0	0	0	0	0	0	0	0	1	0	0
PAX37-0003	19	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0
PAX37-0004	6	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0
PAX37-0005	44	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0
PAX37-0006	3	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0
PAX37-0007	9	1	0	0	7	0	0	0	0	0	0	0	1	0	0	0
PAX37-0009	9	0	0	0	2	2	0	0	0	0	0	0	0	1	0	0
PAX37-0010	18	0	0	0	5	1	0	0	0	0	0	0	0	0	0	0
PAX37-0011	9	0	0	0	9	1	0	0	0	0	0	0	1	0	0	0
PAX37-0012	24	0	0	0	47	0	0	0	0	0	0	0	0	0	0	0
PAX37-0013	4	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0
PAX37-0014	20	1	0	0	9	1	0	0	0	0	0	0	0	0	1	0
PAX37-0015	0	0	0	0	111	0	0	0	0	0	0	0	0	0	0	0
PAX37-0016	9	0	0	1	39	0	0	0	0	0	0	0	0	0	0	0

	Lithic Fragments (L)															
	Volcanic Lithic Fragments (Lv)						Metamorphic Lithic Fragments (Lm)			Sedimentary Lithic Fragments (Ls)						
Sample	**Lvf**	**Lvfb**	**Lvm**	**Lvi**	**Lvv**	**Lvh**	**Lma2**	**Lmttp**	**Lmmf**	**Lss**	**Lsa**	**Lsch**	**Lsca1**	**Lsca2**	**Lsca3**	**Caco[a]**
PAX37-0017	23	0	0	0	5	0	0	0	0	0	0	0	0	1	0	0
PAX37-0018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PAX37-0019	20	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
PAX37-0020	52	2	0	0	35	0	0	0	0	0	0	0	0	0	0	0
PAX37-0021	3	0	0	0	247	0	0	0	0	0	0	0	0	0	0	0
PAX37-0022	13	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0
PAX37-0023	7	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0
PAX37-0024	0	0	0	0	16	0	0	0	0	0	0	0	1	0	0	0
PAX37-0025	14	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
PAX37-0026	10	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0
PAX37-0027	5	0	0	0	27	0	0	0	0	0	0	0	0	0	0	0
PAX37-0028	2	0	0	0	135	0	0	0	0	0	0	0	0	1	0	0
PAX37-0029	3	0	0	0	102	0	0	0	0	0	0	0	0	0	0	0
PAX37-0030	5	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0
PAX37-0031	11	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0
PAX37-0032	9	0	0	0	122	0	0	0	0	0	0	0	0	0	0	0
PAX37-0033	2	0	0	0	23	0	0	0	0	0	0	0	0	0	0	0
PAX37-0034	4	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
PAX37-0035	7	0	0	0	4	0	0	0	0	0	0	0	1	0	0	0
PAX37-0036	19	0	0	0	5	0	0	0	0	0	0	0	1	0	0	0
PAX37-0037	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0
PAX37-0038	4	0	0	0	101	0	0	0	0	0	0	0	0	0	0	0
PAX37-0039	6	0	0	0	83	0	0	0	0	0	0	0	1	0	0	0
PAX37-0040	14	0	0	0	226	0	0	0	0	0	0	0	0	0	0	0
PAX37-0041	19	0	0	0	9	0	0	0	0	0	0	0	2	0	0	0
PAX37-0042	0	0	0	0	134	0	0	0	0	0	0	0	0	0	0	0
PAX37-0043	10	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
PAX37-0044	0	0	0	0	187	0	0	0	0	0	0	0	0	0	0	0
PAX37-0045	1	0	0	0	1	0	0	0	0	0	0	0	5	0	0	0
PAX37-0046	1	0	0	0	145	0	0	0	0	0	0	0	0	0	0	0
PAX37-0047	104	3	0	73	18	0	0	0	0	0	0	0	0	0	0	0
PAX37-0048	7	0	0	0	303	0	0	0	0	0	0	0	0	0	0	0
PAX37-0049	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
PAX37-0050	1	0	0	0	320	0	0	0	0	0	0	0	0	0	0	0
PAX37-0051	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Lithic Fragments (L)															
	Volcanic Lithic Fragments (Lv)						Metamorphic Lithic Fragments (Lm)			Sedimentary Lithic Fragments (Ls)						
Sample	**Lvf**	**Lvfb**	**Lvm**	**Lvi**	**Lvv**	**Lvh**	**Lma2**	**Lmttp**	**Lmmf**	**Lss**	**Lsa**	**Lsch**	**Lsca1**	**Lsca2**	**Lsca3**	**Caco[a]**
PAX37-0052	1	0	0	0	220	0	0	0	0	0	0	0	0	0	0	0
PAX37-0053	4	0	0	0	102	0	0	0	0	0	0	0	2	0	0	0
PAX37-0054	1	0	0	0	109	0	0	0	0	0	0	0	0	0	0	0
PAX37-0056	22	3	0	0	19	0	0	0	0	0	0	0	0	0	0	0
PAX37-0057	4	0	0	0	7	0	0	0	0	0	2	0	19	0	0	0
PAX37-0058	3	0	0	0	29	0	0	0	0	0	0	0	2	0	0	0
PAX37-0059	10	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
PAX37-0060	8	0	0	0	122	0	0	0	0	0	0	0	1	2	0	0
PAX41-0166-1	27	0	0	0	67	1	0	0	0	0	0	0	0	0	0	0
PAX41-0171-1	27	0	0	0	14	0	0	0	0	6	0	0	0	0	0	0
PAX41-0171-2	6	0	0	0	1	0	0	0	0	4	0	0	2	0	0	0
PAX41-0197-1	23	0	0	0	33	0	0	0	0	0	0	0	0	0	0	0
PAX41-0197-2	14	1	0	0	68	0	0	0	0	0	0	0	0	0	0	0
PAX41-0204-1	19	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0
PAX41-0204-2	25	0	0	0	7	0	0	0	0	0	0	0	10	0	0	0
PAX41-0248-01	26	0	0	1	14	0	0	0	0	2	1	0	0	0	0	0
PAX41-0248-1	38	0	0	0	23	0	0	0	0	0	0	0	0	0	0	0
PAX41-0248-2	2	0	0	0	203	0	0	0	0	0	0	0	1	0	0	0
PAX41-0371-1	27	0	0	0	39	0	0	0	0	0	0	0	0	0	0	0
PAX41-0371-2	5	0	0	0	215	0	0	0	0	0	0	0	0	0	0	0
PAX41-0456-1	18	0	0	0	10	0	0	0	0	0	0	0	1	0	0	0
PAX41-0579-1	30	0	0	0	41	0	0	0	0	0	2	0	0	0	0	0
PAX41-0579-2	9	0	0	0	4	0	0	0	0	0	0	0	1	0	0	0
PAX41-0631-1	11	0	0	0	4	0	0	0	0	0	0	0	1	0	0	0
PAX41-0642-1	32	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0
PAX41-0642-2	5	0	0	0	121	0	0	0	0	0	0	0	0	0	0	0
PAX41-0652-1	35	0	0	0	9	0	0	0	0	4	0	0	0	0	0	0
PAX41-0652-2	18	0	0	3	47	0	0	0	0	1	0	0	0	0	0	0
PAX41-0715-1	38	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0
PAX41-0715-2	6	0	0	0	157	0	0	0	0	0	0	0	0	0	0	0
PAX41-0872-1	15	0	0	0	63	0	0	0	0	0	0	0	0	0	0	0
PAX41-0925-2	9	0	0	0	64	0	0	0	0	1	0	0	0	0	0	0
PAX41-0942-1	25	0	0	0	24	0	0	0	0	0	0	0	0	0	0	1
PAX41-0969-1	22	0	0	0	48	0	0	0	0	0	0	0	0	0	0	0
PAX41-1254-01	9	0	0	0	47	0	0	0	0	0	0	0	0	0	0	0

	Lithic Fragments (L)															
	Volcanic Lithic Fragments (Lv)						Metamorphic Lithic Fragments (Lm)			Sedimentary Lithic Fragments (Ls)						
Sample	**Lvf**	**Lvfb**	**Lvm**	**Lvi**	**Lvv**	**Lvh**	**Lma2**	**Lmttp**	**Lmmf**	**Lss**	**Lsa**	**Lsch**	**Lsca1**	**Lsca2**	**Lsca3**	**Caco[a]**
PAX41-1254-1	30	1	0	0	24	0	0	0	0	0	0	0	2	0	0	0
PAX41-1254-2	4	0	0	0	48	0	0	0	0	0	0	0	0	0	0	0
PAX41-1352-1	13	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
PAX41-1352-2	16	0	0	0	152	0	0	0	0	0	0	0	0	0	0	0
PAX41-1384-1	22	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
PAX41-1384-2	7	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0
PAX41-1753-1	26	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
PAX41-1900-1	41	0	0	0	8	0	0	0	0	0	0	0	1	0	0	0
PAX41-1900-2	8	0	0	0	54	0	0	0	0	0	0	0	0	0	0	0
PAX41-2106-2	22	0	0	0	18	0	0	0	0	1	0	0	0	0	0	0
PAX41-2202-2	7	0	0	0	39	0	0	0	0	0	0	0	0	0	0	0
PAX41-2307-1	17	0	0	0	8	1	0	0	0	0	0	0	0	0	0	0
PAX41-2351-1	19	0	0	0	9	0	0	0	0	1	0	0	4	0	0	0
LANL4-0001	2	0	0	1	211	0	0	0	0	0	0	0	0	0	0	0
LANL4-0002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LANL4-0003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LANL4-0005	19	0	0	0	49	5	0	0	0	0	0	0	0	0	0	0
LANL4-0006	0	0	0	0	231	0	0	0	0	0	0	0	0	0	0	0
LANL4-0007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LANL4-0008	4	0	0	0	184	0	0	0	0	0	0	0	0	0	0	0
LANL4-0009	0	0	0	0	142	0	0	0	0	0	0	0	0	0	0	0
LANL4-0010	1	0	0	0	120	0	0	0	0	0	0	0	0	0	0	0
LANL4-0011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LANL4-0013	1	0	0	0	148	0	0	0	0	0	0	0	0	0	0	0
LANL4-0014	0	0	0	0	169	0	0	0	0	0	0	0	0	0	0	0
LANL4-0015	0	0	0	0	0	0	1	2	0	0	0	0	2	0	1	0
LANL4-0016	8	0	0	0	114	0	0	0	0	0	0	0	0	0	3	0
LANL4-0017	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
LANL4-0018	1	0	0	0	201	1	0	0	0	0	0	0	0	0	0	0
LANL4-0019	4	0	0	0	201	0	0	0	0	0	0	0	0	0	0	0
LANL4-0020	0	0	0	0	0	0	0	1	0	0	0	0	0	0	6	0
LANL4-0022	8	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0
LANL4-0023	19	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
LANL4-0024	0	0	0	0	0	0	0	0	0	0	0	0	9	0	6	0
LANL4-0025	10	1	0	0	136	0	0	0	0	0	0	0	0	0	0	0

	Lithic Fragments (L)															
	Volcanic Lithic Fragments (Lv)						Metamorphic Lithic Fragments (Lm)			Sedimentary Lithic Fragments (Ls)						
Sample	**Lvf**	**Lvfb**	**Lvm**	**Lvi**	**Lvv**	**Lvh**	**Lma2**	**Lmttp**	**Lmmf**	**Lss**	**Lsa**	**Lsch**	**Lsca1**	**Lsca2**	**Lsca3**	**Caco[a]**
LANL4-0026	3	0	0	0	26	0	0	0	0	0	0	0	0	0	0	0
LANL4-0029	4	0	0	0	141	0	0	0	0	0	0	0	0	0	0	0
LANL4-0030	6	0	0	0	129	0	0	0	0	0	0	0	0	0	0	0
LANL4-0031	8	0	0	1	24	0	0	0	0	0	0	0	0	0	2	0
LANL4-0032	0	0	0	0	118	0	0	0	0	0	0	0	0	0	0	0
LANL4-0033	8	0	0	1	19	0	0	0	0	0	0	0	0	0	0	0
LANL4-0034	1	0	0	0	169	0	0	0	0	0	0	0	0	0	0	0
LANL4-0035	1	0	0	0	147	0	0	0	0	0	0	0	0	0	0	0
LANL5-01	1	0	0	0	177	0	0	0	0	0	0	0	0	0	0	0
LANL5-02	14	10	0	14	93	0	0	0	0	0	0	0	0	0	0	0
LANL5-03	0	0	0	8	277	0	0	0	0	0	0	0	0	0	0	0
LANL5-04	1	0	0	1	273	0	0	0	0	0	0	0	0	0	0	0
LANL5-05	1	0	0	0	46	0	0	0	0	0	0	0	0	0	0	0
LANL5-06	0	0	0	1	232	0	0	0	0	0	0	0	0	0	0	0
LANL5-07	8	0	3	8	166	0	0	4	0	0	0	1	0	0	0	0
LANL5-08	6	0	0	1	1	1	0	1	0	0	0	1	0	0	0	0
LANL5-09	6	0	3	0	8	0	0	0	0	0	0	0	0	0	0	0
LANL5-10	1	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0
LANL5-11	0	0	0	0	4	3	7	0	1	0	0	0	0	0	0	0
LANL5-12	3	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
LANL5-13.1	1	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0
LANL5-13.2	23	0	1	13	12	0	4	0	1	0	0	0	0	0	0	0
LANL5-14	0	0	0	18	26	0	0	0	0	0	0	0	0	0	0	0
LANL5-15	4	0	0	3	33	0	2	0	1	0	0	0	0	0	0	0

Table Q.4d. Sherd point count data, part 4: paste parameters and calculated values.

	Paste Parameters and Calculated Paste Ratios[a]							Compositional Comparison Measures: Mineral:lithic ratio[b]		Bulk Composition[c]				Feldspar Ratios[c]					
Sample	Clay lump	Grog	Paste	Voids	P+V+T	pastepct	Sandpct	M/M + L	M/M + Lv	Q	F	L	QFL	K	Tplag	K/F	Kspar/F	Micr/F	Tplag/F
PAX33-001	0	0	375	100	627	59.8%	24.2%	0.99	0.95	62	67	8	137	50	17	0.75	0.75	0.00	0.25
PAX33-002	0	0	285	85	451	63.2%	18.0%	0.82	0.79	25	28	17	70	15	13	0.54	0.54	0.00	0.46
PAX33-003	0	0	400	50	568	70.4%	20.8%	0.88	0.85	42	37	17	96	10	27	0.27	0.27	0.00	0.73
PAX33-004	0	0	185	265	662	27.9%	32.0%	0.99	0.98	90	96	4	190	27	69	0.28	0.25	0.03	0.72
PAX33-005	0	0	345	155	635	54.3%	21.3%	0.74	0.73	31	38	37	106	18	20	0.47	0.47	0.00	0.53
PAX33-006	0	0	.	.	.	.	.	0.79	0.76	27	37	24	88	32	5	0.86	0.86	0.00	0.14
PAX33-007	0	0	.	.	.	.	.	0.93	0.93	42	43	9	94	18	25	0.42	0.42	0.00	0.58
PAX33-008	0	0	.	.	.	.	.	0.97	0.95	35	95	7	137	82	13	0.86	0.86	0.00	0.14
PAX33-009	0	0	335	99	577	58.1%	24.8%	0.86	0.85	26	82	22	130	77	5	0.94	0.94	0.00	0.06
PAX33-010	0	0	126	52	280	45.0%	36.4%	0.69	0.69	40	18	32	90	15	3	0.83	0.83	0.00	0.17
PAX33-011	1	0	158	26	236	66.9%	22.0%	0.60	0.59	5	13	21	39	4	9	0.31	0.23	0.08	0.69
PAX33-012	0	0	285	67	488	58.4%	27.9%	0.88	0.88	27	88	17	132	80	8	0.91	0.91	0.00	0.09
PAX33-013	0	0	139	81	358	38.8%	38.5%	0.99	0.99	58	61	1	120	15	46	0.25	0.16	0.08	0.75
PAX33-014	0	0	395	24	522	75.7%	19.7%	0.89	0.85	45	27	15	87	13	14	0.48	0.48	0.00	0.52
PAX33-015	0	0	359	47	611	58.8%	33.6%	0.93	0.89	62	114	22	198	105	9	0.92	0.92	0.00	0.08
PAX33-016	0	0	.	.	.	.	.	0.90	0.89	32	37	9	78	33	4	0.89	0.89	0.00	0.11
PAX33-017	0	0	302	39	460	65.7%	25.9%	0.89	0.86	20	71	17	108	67	4	0.94	0.94	0.00	0.06
PAX33-018	0	0	210	75	430	48.8%	33.7%	0.84	0.79	55	51	31	137	38	13	0.75	0.73	0.02	0.25
PAX37-0001	0	0	397	15	516	76.9%	20.2%	0.88	0.88	34	52	13	99	46	6	0.88	0.00	0.02	0.12
PAX37-0002	0	0	232	9	352	65.9%	31.5%	0.64	0.64	34	32	40	106	25	7	0.78	0.16	0.00	0.22
PAX37-0003	1	0	554	8	709	78.1%	20.7%	0.79	0.79	55	59	31	145	55	4	0.93	0.00	0.00	0.07
PAX37-0004	0	0	362	11	446	81.2%	16.4%	0.67	0.67	19	20	23	62	8	12	0.40	0.30	0.10	0.60
PAX37-0005	0	0	331	35	534	62.0%	31.5%	0.44	0.44	55	18	94	167	2	16	0.11	0.11	0.00	0.89
PAX37-0006	0	0	728	11	883	82.4%	16.3%	0.85	0.85	34	74	22	130	54	20	0.73	0.00	0.00	0.27
PAX37-0007	0	0	613	92	888	69.0%	20.6%	0.91	0.90	96	58	18	172	37	21	0.64	0.00	0.02	0.36
PAX37-0009	0	0	485	28	615	78.9%	16.6%	0.87	0.86	25	61	14	100	49	12	0.80	0.16	0.00	0.20
PAX37-0010	0	0	386	15	525	73.5%	23.6%	0.80	0.80	36	61	24	121	46	15	0.75	0.00	0.00	0.25
PAX37-0011	2	0	529	30	639	82.8%	12.5%	0.75	0.74	23	29	20	72	1	28	0.03	0.00	0.00	0.97

	Compositional Comparison Measures																		
	Paste Parameters and Calculated Paste Ratios[a]							Mineral:lithic ratio[b]		Bulk Composition[c]				Feldspar Ratios[c]					
Sample	Clay lump	Grog	Paste	Voids	P+V+T	pastepct	Sandpct	M/M + L	M/M + Lv	Q	F	L	QFL	K	Tplag	K/F	Kspar/F	Micr/F	Tplag/F
PAX37-0012	1	0	373	14	488	76.4%	20.7%	0.29	0.29	10	16	71	97	8	8	0.50	0.00	0.00	0.50
PAX37-0013	0	0	529	93	752	70.3%	17.3%	0.90	0.90	63	48	13	124	37	11	0.77	0.00	0.00	0.23
PAX37-0014	1	0	631	15	851	74.1%	24.1%	0.85	0.84	74	81	32	187	53	28	0.65	0.00	0.00	0.35
PAX37-0015	0	0	436	32	599	72.8%	21.9%	0.15	0.15	3	14	111	128	7	7	0.50	0.50	0.00	0.50
PAX37-0016	0	0	501	38	655	76.5%	17.7%	0.58	0.58	19	40	49	108	32	8	0.80	0.00	0.00	0.20
PAX37-0017	0	0	611	17	847	72.1%	25.9%	0.87	0.87	96	81	29	206	58	23	0.72	0.00	0.01	0.28
PAX37-0018	0	0	373	25	590	63.2%	32.5%	1.00	1.00	83	75	0	158	26	49	0.35	0.03	0.32	0.65
PAX37-0019	0	0	433	11	576	75.2%	22.9%	0.80	0.80	33	66	26	125	52	14	0.79	0.00	0.00	0.21
PAX37-0020	0	0	620	19	972	63.8%	34.3%	0.73	0.73	78	160	89	327	132	28	0.83	0.00	0.00	0.18
PAX37-0021	0	0	380	32	689	55.2%	40.2%	0.09	0.09	9	16	250	275	15	1	0.94	0.00	0.00	0.06
PAX37-0022	5	0	661	15	828	79.8%	18.4%	0.85	0.85	35	86	22	143	79	7	0.92	0.00	0.00	0.08
PAX37-0023	1	0	377	8	470	80.2%	18.1%	0.69	0.69	28	24	26	78	7	17	0.29	0.00	0.00	0.71
PAX37-0024	1	0	506	13	577	87.7%	10.1%	0.71	0.70	11	17	17	45	3	14	0.18	0.18	0.00	0.82
PAX37-0025	0	0	667	10	841	79.3%	19.5%	0.90	0.90	54	82	16	152	37	45	0.45	0.00	0.00	0.55
PAX37-0026	1	0	506	13	702	72.1%	26.1%	0.88	0.88	75	81	21	177	54	27	0.67	0.00	0.00	0.33
PAX37-0027	0	0	470	20	621	75.7%	21.1%	0.75	0.75	53	34	32	119	18	16	0.53	0.00	0.06	0.47
PAX37-0028	0	0	392	22	562	69.8%	26.3%	0.07	0.07	1	9	138	148	8	1	0.89	0.00	0.00	0.11
PAX37-0029	0	0	506	25	676	74.9%	21.4%	0.27	0.27	19	14	105	138	11	3	0.79	0.00	0.00	0.21
PAX37-0030	0	0	301	11	424	71.0%	26.4%	0.84	0.84	32	57	18	107	50	7	0.88	0.00	0.00	0.12
PAX37-0031	0	0	380	20	511	74.4%	21.7%	0.87	0.86	69	25	15	109	17	8	0.68	0.00	0.04	0.32
PAX37-0032	4	0	452	30	675	67.0%	28.6%	0.30	0.30	20	27	131	178	22	5	0.81	0.00	0.04	0.19
PAX37-0033	0	0	298	21	366	81.4%	12.8%	0.47	0.47	10	8	25	43	3	5	0.38	0.38	0.00	0.63
PAX37-0034	2	26	321	8	384	83.6%	14.3%	0.63	0.63	3	10	10	23	2	8	0.20	0.00	0.00	0.80
PAX37-0035	3	32	457	15	604	75.7%	21.9%	0.89	0.88	42	36	12	90	13	23	0.36	0.00	0.03	0.64
PAX37-0036	0	0	570	43	827	68.9%	25.9%	0.89	0.88	59	116	25	200	97	19	0.84	0.00	0.00	0.16
PAX37-0037	0	0	323	17	517	62.5%	34.2%	1.00	0.97	69	80	5	154	33	47	0.41	0.08	0.34	0.59
PAX37-0038	0	0	240	32	386	62.2%	29.5%	0.08	0.08	4	4	105	113	4	0	1.00	0.00	0.00	0.00
PAX37-0039	0	0	232	14	371	62.5%	33.7%	0.28	0.28	23	9	90	122	6	3	0.67	0.00	0.00	0.33
PAX37-0040	0	0	789	18	1077	73.3%	25.1%	0.11	0.11	10	17	240	267	17	0	1.00	0.00	0.00	0.00
PAX37-0041	0	0	327	16	470	69.6%	27.0%	0.78	0.76	38	54	30	122	39	15	0.72	0.00	0.00	0.28
PAX37-0042	0	0	250	73	462	54.1%	30.1%	0.04	0.04	2	1	134	137	0	1	0.00	0.00	0.00	1.00

	Paste Parameters and Calculated Paste Ratios[a]							Compositional Comparison Measures												
								Mineral:lithic ratio[b]		Bulk Composition[c]				Feldspar Ratios[c]						
Sample	**Clay lump**	**Grog**	**Paste**	**Voids**	**P+V+T**	**pastepct**	**Sandpct**	**M/M + L**	**M/M + Lv**	**Q**	**F**	**L**	**QFL**	**K**	**Tplag**	**K/F**	**Kspar/F**	**Micr/F**	**Tplag/F**
PAX37-0043	0	0	603	74	905	66.6%	25.2%	0.94	0.94	105	94	13	212	70	24	0.74	0.00	0.00	0.26
PAX37-0044	0	0	416	22	630	66.0%	30.5%	0.03	0.03	1	2	187	190	0	2	0.00	0.00	0.00	1.00
PAX37-0045	0	0	381	33	606	62.9%	31.7%	0.99	0.96	88	88	7	183	37	51	0.42	0.06	0.36	0.58
PAX37-0046	0	0	543	73	790	68.7%	22.0%	0.16	0.16	10	6	146	162	2	4	0.33	0.00	0.17	0.67
PAX37-0047	0	0	455	15	732	62.2%	35.8%	0.24	0.24	9	39	198	246	1	38	0.03	0.00	0.00	0.97
PAX37-0048	0	0	378	18	736	51.4%	46.2%	0.09	0.09	13	13	310	336	5	8	0.38	0.00	0.00	0.62
PAX37-0049	0	0	540	30	885	61.0%	35.6%	1.00	0.99	144	63	3	210	7	56	0.11	0.06	0.05	0.89
PAX37-0050	0	0	550	51	935	58.8%	35.7%	0.04	0.04	6	4	321	331	2	2	0.50	0.25	0.00	0.50
PAX37-0051	0	0	525	42	855	61.4%	33.7%	1.00	1.00	146	76	0	222	10	66	0.13	0.03	0.11	0.87
PAX37-0052	1	0	467	189	894	52.2%	26.6%	0.07	0.07	7	6	221	234	5	1	0.83	0.67	0.17	0.17
PAX37-0053	0	0	344	7	472	72.9%	25.6%	0.11	0.11	4	7	108	119	7	0	1.00	0.00	0.00	0.00
PAX37-0054	1	0	222	4	359	61.8%	37.0%	0.17	0.17	12	9	110	131	8	1	0.89	0.00	0.00	0.11
PAX37-0056	0	0	391	69	664	58.9%	30.7%	0.78	0.78	79	72	44	195	59	13	0.82	0.00	0.01	0.18
PAX37-0057	4	0	306	28	483	63.4%	30.8%	0.91	0.78	59	44	32	135	18	26	0.41	0.32	0.09	0.59
PAX37-0058	0	0	324	4	378	85.7%	13.2%	0.33	0.32	5	6	34	45	1	5	0.17	0.00	0.00	0.83
PAX37-0059	4	0	598	27	822	72.7%	24.0%	0.92	0.92	66	86	16	168	39	47	0.45	0.00	0.03	0.55
PAX37-0060	3	0	582	21	811	71.8%	25.6%	0.35	0.35	40	22	133	195	10	12	0.45	0.00	0.00	0.55
PAX41-0166-1	0	0	547	40	878	62.3%	33.1%	0.67	0.67	98	93	95	286	81	12	0.87	0.00	0.00	0.13
PAX41-0171-1	0	2	506	89	834	60.7%	28.7%	0.82	0.80	96	85	47	228	68	17	0.80	0.00	0.02	0.20
PAX41-0171-2	6	0	555	17	713	77.8%	19.8%	0.95	0.90	35	48	13	96	27	21	0.56	0.02	0.15	0.44
PAX41-0197-1	0	0	642	39	912	70.4%	25.3%	0.76	0.76	85	83	56	224	74	9	0.89	0.02	0.02	0.11
PAX41-0197-2	4	0	434	32	599	72.5%	22.2%	0.36	0.36	26	15	83	124	13	2	0.87	0.07	0.07	0.13
PAX41-0204-1	1	3	613	59	856	71.6%	21.5%	0.80	0.80	57	76	35	168	67	9	0.88	0.03	0.00	0.12
PAX41-0204-2	15	0	460	53	724	63.5%	29.1%	0.83	0.78	79	41	42	162	21	20	0.51	0.17	0.12	0.49
PAX41-0248-01	0	0	624	31	884	70.6%	25.9%	0.82	0.81	93	88	44	225	78	10	0.89	0.01	0.00	0.11
PAX41-0248-1	1	4	449	97	792	56.7%	31.1%	0.75	0.75	64	110	61	235	104	6	0.95	0.00	0.00	0.05
PAX41-0248-2	0	0	375	20	620	60.5%	36.3%	0.08	0.08	7	10	206	223	9	1	0.90	0.00	0.00	0.10
PAX41-0371-1	0	0	517	39	827	62.5%	32.8%	0.76	0.76	118	77	66	261	60	17	0.78	0.04	0.00	0.22
PAX41-0371-2	0	0	545	34	817	66.7%	29.1%	0.07	0.07	6	8	220	234	8	0	1.00	0.00	0.00	0.00
PAX41-0456-1	0	1	353	20	491	71.9%	24.0%	0.76	0.75	35	50	29	114	46	4	0.92	0.00	0.00	0.08
PAX41-0579-1	33	3	668	20	906	73.7%	24.1%	0.61	0.60	54	46	73	173	28	18	0.61	0.00	0.00	0.39

Sample	Clay lump	Grog	Paste	Voids	P+V+T	pastepct	Sandpct	M/M + L	M/M + Lv	Q	F	L	QFL	K	Tplag	K/F	Kspar/F	Micr/F	Tplag/F
	Paste Parameters and Calculated Paste Ratios[a]							Compositional Comparison Measures: Mineral:lithic ratio[b]		Bulk Composition[c]				Feldspar Ratios[c]					
PAX41-0579-2	22	0	562	108	870	64.6%	23.0%	0.93	0.92	92	49	14	155	21	28	0.43	0.27	0.10	0.57
PAX41-0631-1	0	0	366	32	514	71.2%	22.6%	0.87	0.86	47	47	16	110	43	4	0.91	0.00	0.00	0.09
PAX41-0642-1	0	0	556	36	779	71.4%	24.0%	0.76	0.76	69	69	44	182	48	21	0.70	0.00	0.00	0.30
PAX41-0642-2	2	0	448	18	622	72.0%	25.1%	0.18	0.18	7	17	126	150	16	1	0.94	0.00	0.00	0.06
PAX41-0652-1	0	3	544	36	791	68.8%	26.7%	0.78	0.77	82	69	48	199	55	14	0.80	0.00	0.00	0.20
PAX41-0652-2	3	5	413	87	642	64.3%	22.1%	0.48	0.48	26	37	69	132	32	5	0.86	0.05	0.05	0.14
PAX41-0715-1	0	2	615	47	929	66.2%	28.7%	0.81	0.81	136	69	51	256	60	9	0.87	0.00	0.00	0.13
PAX41-0715-2	1	0	534	57	813	65.7%	27.3%	0.26	0.26	11	38	163	212	37	1	0.97	0.00	0.00	0.03
PAX41-0872-1	74	0	542	76	823	65.9%	24.9%	0.40	0.40	32	16	78	126	12	4	0.75	0.19	0.13	0.25
PAX41-0925-2	69	0	557	60	819	68.0%	24.7%	0.45	0.44	32	14	74	120	11	3	0.79	0.00	0.00	0.21
PAX41-0942-1	0	0	579	28	856	67.6%	29.1%	0.80	0.80	88	105	50	243	97	8	0.92	0.00	0.00	0.08
PAX41-0969-1	88	0	320	134	674	47.5%	32.6%	0.47	0.47	29	31	70	130	26	5	0.84	0.03	0.00	0.16
PAX41-1254-01	75	0	518	67	750	69.1%	22.0%	0.37	0.37	19	12	56	87	9	3	0.75	0.00	0.00	0.25
PAX41-1254-1	0	3	595	27	815	73.0%	23.7%	0.71	0.70	41	83	57	181	64	19	0.77	0.01	0.00	0.23
PAX41-1254-2	74	0	524	73	751	69.8%	20.5%	0.35	0.35	14	13	52	79	12	1	0.92	0.00	0.00	0.08
PAX41-1352-1	0	0	385	83	669	57.5%	30.0%	0.91	0.91	72	105	17	194	95	10	0.90	0.07	0.00	0.10
PAX41-1352-2	60	0	414	116	783	52.9%	32.3%	0.13	0.13	12	12	168	192	8	4	0.67	0.00	0.00	0.33
PAX41-1384-1	0	0	453	34	660	68.6%	26.2%	0.83	0.83	59	78	30	167	56	22	0.72	0.05	0.00	0.28
PAX41-1384-2	57	0	718	20	896	80.1%	17.6%	0.53	0.53	26	24	47	97	17	7	0.71	0.00	0.00	0.29
PAX41-1753-1	0	0	499	66	737	67.7%	23.3%	0.81	0.81	71	66	32	169	56	10	0.85	0.00	0.00	0.15
PAX41-1900-1	0	0	611	47	883	69.2%	25.5%	0.78	0.78	55	113	50	218	100	13	0.88	0.00	0.00	0.12
PAX41-1900-2	42	0	549	33	736	74.6%	20.9%	0.44	0.44	27	20	62	109	17	3	0.85	0.05	0.00	0.15
PAX41-2106-2	0	0	472	222	893	52.9%	22.3%	0.80	0.79	72	79	41	192	50	29	0.63	0.00	0.03	0.37
PAX41-2202-2	18	0	727	20	864	84.1%	13.5%	0.53	0.53	21	20	46	87	15	5	0.75	0.00	0.00	0.25
PAX41-2307-1	0	2	470	23	673	69.8%	26.7%	0.85	0.85	54	91	26	171	79	12	0.87	0.00	0.00	0.13
PAX41-2351-1	0	0	634	85	913	69.4%	21.2%	0.85	0.83	60	94	33	187	88	6	0.94	0.00	0.00	0.06
LANL4-0001	0	0	383	22	631	60.7%	35.8%	0.03	0.03	4	0	214	218	0	0	.	.	.	.
LANL4-0002	0	0	343	103	637	53.8%	30.0%	1.00	1.00	92	73	0	165	26	47	0.36	0.00	0.36	0.64
LANL4-0003	2	0	322	80	670	48.1%	40.0%	1.00	1.00	130	120	0	250	62	58	0.52	0.00	0.52	0.48
LANL4-0005	0	0	380	57	684	55.6%	36.1%	0.69	0.69	90	69	73	232	44	25	0.64	0.00	0.00	0.36
LANL4-0006	0	0	321	43	600	53.5%	39.3%	0.02	0.02	2	2	231	235	1	1	0.50	0.00	0.00	0.50

								Compositional Comparison Measures											
	Paste Parameters and Calculated Paste Ratios[a]							Mineral:lithic ratio[b]		Bulk Composition[c]				Feldspar Ratios[c]					
Sample	Clay lump	Grog	Paste	Voids	P+V+T	pastepct	Sandpct	M/M + L	M/M + Lv	Q	F	L	QFL	K	Tplag	K/F	Kspar/F	Micr/F	Tplag/F
LANL4-0007	0	0	220	53	479	45.9%	43.0%	1.00	1.00	94	80	0	174	30	50	0.38	0.01	0.36	0.63
LANL4-0008	1	0	397	29	652	60.9%	34.7%	0.15	0.15	9	12	188	209	6	6	0.50	0.00	0.00	0.50
LANL4-0009	3	0	422	18	610	69.2%	27.9%	0.10	0.10	11	4	142	157	3	1	0.75	0.00	0.00	0.25
LANL4-0010	1	0	381	33	547	69.7%	24.3%	0.02	0.02	1	1	121	123	0	1	0.00	0.00	0.00	1.00
LANL4-0011	0	0	269	88	624	43.1%	42.8%	1.00	1.00	122	82	0	204	28	54	0.34	0.00	0.34	0.66
LANL4-0013	0	0	425	62	647	65.7%	24.7%	0.06	0.06	3	2	149	154	2	0	1.00	0.00	0.00	0.00
LANL4-0014	0	0	412	47	640	64.4%	28.3%	0.06	0.06	4	4	169	177	4	0	1.00	0.00	0.00	0.00
LANL4-0015	2	0	373	22	613	60.8%	35.6%	1.00	0.97	101	78	6	185	21	57	0.27	0.00	0.27	0.73
LANL4-0016	7	0	257	99	547	47.0%	34.9%	0.32	0.32	39	15	125	179	3	12	0.20	0.00	0.13	0.80
LANL4-0017	0	0	302	134	618	48.9%	29.4%	0.99	0.99	90	75	2	167	25	50	0.33	0.03	0.31	0.67
LANL4-0018	0	0	314	117	664	47.3%	35.1%	0.11	0.11	17	6	203	226	3	3	0.50	0.00	0.00	0.50
LANL4-0019	2	0	353	36	611	57.8%	36.3%	0.04	0.04	1	2	205	208	1	1	0.50	0.00	0.00	0.50
LANL4-0020	1	0	286	20	549	52.1%	44.3%	1.00	0.97	102	91	7	200	52	39	0.57	0.05	0.52	0.43
LANL4-0022	0	2	441	11	616	71.6%	26.6%	0.86	0.86	64	55	21	140	48	7	0.87	0.00	0.00	0.13
LANL4-0023	1	0	386	31	594	65.0%	29.8%	0.85	0.85	69	63	24	156	55	8	0.87	0.00	0.00	0.13
LANL4-0024	0	0	319	47	616	51.8%	40.6%	1.00	0.94	120	87	15	222	23	64	0.26	0.01	0.25	0.74
LANL4-0025	3	0	427	52	693	61.6%	30.9%	0.28	0.28	32	18	147	197	10	8	0.56	0.17	0.00	0.44
LANL4-0026	0	5	429	31	598	71.7%	23.1%	0.76	0.76	45	41	29	115	37	4	0.90	0.00	0.00	0.10
LANL4-0029	1	1	277	44	521	53.2%	38.4%	0.24	0.24	28	17	145	190	15	2	0.88	0.00	0.00	0.12
LANL4-0030	0	0	224	87	489	45.8%	36.4%	0.23	0.23	29	12	135	176	5	7	0.42	0.08	0.00	0.58
LANL4-0031	1	1	382	31	624	61.2%	33.8%	0.82	0.81	74	68	35	177	44	24	0.65	0.03	0.00	0.35
LANL4-0032	0	0	308	49	508	60.6%	29.7%	0.18	0.18	10	5	118	133	2	3	0.40	0.00	0.00	0.60
LANL4-0033	0	0	344	4	555	62.0%	37.3%	0.85	0.85	88	70	28	186	44	26	0.63	0.00	0.00	0.37
LANL4-0034	0	0	341	28	548	62.2%	32.7%	0.05	0.05	8	0	170	178	0	0	.	.	.	.
LANL4-0035	0	0	330	54	545	60.6%	29.5%	0.06	0.06	6	3	148	157	0	3	0.00	0.00	0.00	1.00
LANL5-01	0	0	338	20	592	57.1%	39.5%	0.23	0.23	8	34	178	220	2	32	0.06	0.06	0.00	0.94
LANL5-02	0	0	410	59	691	59.3%	32.1%	0.40	0.40	31	43	131	205	8	35	0.19	0.14	0.05	0.81
LANL5-03	0	0	483	27	856	56.4%	40.4%	0.17	0.17	19	12	285	316	2	10	0.17	0.17	0.00	0.83
LANL5-04	3	3	494	22	839	58.9%	38.5%	0.13	0.13	9	28	275	312	23	5	0.82	0.82	0.00	0.18
LANL5-05	0	0	173	13	292	59.2%	36.3%	0.56	0.56	13	43	47	103	2	41	0.05	0.05	0.00	0.95
LANL5-06	0	0	356	22	649	54.9%	41.8%	0.14	0.14	7	29	233	269	4	25	0.14	0.14	0.00	0.86

	Compositional Comparison Measures																			
	Paste Parameters and Calculated Paste Ratios[a]							Mineral:lithic ratio[b]		Bulk Composition[c]				Feldspar Ratios[c]					
Sample	**Clay lump**	**Grog**	**Paste**	**Voids**	**P+V+T**	**pastepct**	**Sandpct**	**M/M + L**	**M/M + Lv**	**Q**	**F**	**L**	**QFL**	**K**	**Tplag**	**K/F**	**Kspar/F**	**Micr/F**	**Tplag/F**
LANL5-07	0	0	344	65	729	47.2%	43.9%	0.41	0.40	64	57	190	311	3	54	0.05	0.05	0.00	0.95
LANL5-08	0	0	244	48	598	40.8%	51.2%	0.97	0.96	105	70	11	186	10	60	0.14	0.09	0.06	0.86
LANL5-09	0	1	322	67	655	49.2%	40.6%	0.93	0.93	115	97	17	229	24	73	0.25	0.06	0.19	0.75
LANL5-10	0	0	233	80	541	43.1%	42.1%	0.99	0.98	100	55	5	160	7	48	0.13	0.05	0.07	0.87
LANL5-11	3	0	368	9	607	60.6%	37.9%	0.97	0.93	84	105	15	204	5	100	0.05	0.01	0.04	0.95
LANL5-12	0	1	487	15	712	68.4%	29.5%	0.98	0.98	99	97	5	201	21	76	0.22	0.16	0.05	0.78
LANL5-13.1	0	4	143	10	184	77.7%	16.8%	0.88	0.85	10	10	4	24	4	6	0.40	0.40	0.00	0.60
LANL5-13.2	0	5	316	43	636	49.7%	43.6%	0.82	0.80	72	132	54	258	18	114	0.14	0.14	0.00	0.86
LANL5-14	0	0	347	28	513	67.6%	26.9%	0.68	0.68	37	54	44	135	32	22	0.59	0.59	0.00	0.41
LANL5-15	0	0	310	15	459	67.5%	29.2%	0.69	0.68	31	55	43	129	12	43	0.22	0.22	0.00	0.78

[a]Paste parameters and related calculated parameters: P + V + T = Paste + Voids + Total. Paste percent = Paste/P + V + T. Sand percent = Total (from Table Q.4a)/P + V + T. Paste values are missing from some sherds. Mineral to Lithic Ratios: M = Total mineral grains (Q + F + sum of Px to Gar, Table Q.4b). Lv = Sum of volcanic lithic grains (Lv___). Lm = Sum of metamorphic lithic grains (Lm___). Ls = Sum of sedimentary lithic grains (Ls___). L = Lv + Lm + Ls. Bulk Composition and Feldspar Ratios: Q = Qtz + Sqtz. F = K + Tplag. Tkspar = Kspar + Skspar. K = Kspar + Skspar + Micr + Sanid. Tplag = Plag + Plagal + Plaggn + Splag.

Table Q.5. Sand point count data.

					Q		F							
							K				Tplag			
Sample	Sand type	Ts_use	Analyst	Total	Qtz	Sqtz	Kspar	Skspar	Micr	Sanid	Plag	Plagal	Plaggn	Splag
PAX37-0067	Anthill	1	SCR	350	262	0	1	0	0	69	0	0	0	0
PAX37-0068	Anthill	1	SCR	319	161	4	1	0	4	94	1	7	0	0
PAX37-0069	Alluvial	1	SCR	396	100	0	2	0	4	109	6	6	0	0
PAX37-0070	Alluvial	1	SCR	372	136	0	0	0	0	134	4	0	0	0

Sample	Px	Amph	Biot	Sbiot	Chlor	Schlor	Musc	Smusc	Opaq	Sopaq	Oliv	Epid	Sphene	Gar	Unkn
PAX37-0067	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PAX37-0068	0	0	0	0	1	0	0	0	2	0	0	0	0	0	2
PAX37-0069	0	1	0	0	1	0	1	0	15	0	0	0	0	0	1
PAX37-0070	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0

Sample	L													
	Volcanic lithic fragments (Lv)						Metamorphic lithic fragments (Lm)			Sedimentary lithic fragments (Ls)				
	Lvf	Lvfb	Lvm	Lvi	Lvv	Lvh	Lma2	Lmttp	Lmmf	Lss	Lsa	Lsch	Lsca1	Caco
PAX37-0067	16	0	0	0	2	0	0	0	0	0	0	0	0	0
PAX37-0068	33	1	0	4	4	0	0	0	0	0	0	0	0	0
PAX37-0069	120	1	0	14	13	0	0	0	0	2	0	0	0	0
PAX37-0070	55	0	0	7	32	1	0	0	0	0	0	0	0	0

Sample	m/m+lv	m/m+l	Q	F	L	QFL	K	Tplag	Tkspar/F	Micr/F	K/F	Tplag/F
Pax37-67	0.95	0.95	262	70	18	350	70	0	0.01	0.00	1.00	0.00
Pax37-68	0.87	0.87	165	107	42	314	99	8	0.01	0.04	0.93	0.07
Pax37-69	0.62	0.62	100	127	150	377	115	12	0.02	0.03	0.91	0.09
Pax37-70	0.74	0.74	136	138	95	369	134	4	0.00	0.00	0.97	0.03

TQtz = Qtz + Sqtz; Tkspar = Kspar + Skspar; K = Kspar + Skspar + Micr + Sanid; Tplag = Plag + Plagal + Plaggn + Splag; F = K + Tplag; M = Total mineral grains (Q + F + [sum of Px to Gar]); Lv = Sum of volcanic lithic grains (Lv__); Lm = Sum of metamorphic lithic grains (Lm__); Lv = Sum of sedimentary lithic grains (Ls__); L = Lv + Lm + Ls

Table Q.6. Qualitative attributes, texture, morphology, and grain types of sand-sized grains in the Los Alamos sherds.

	Texture and Grain Size Distributions				Most abundant grain types			
Sample	Spher-icity	Angularity	Sorting	Modal grain size	Dominant sand-sized grain type	Accessory 1	Accessory 2	Accessory 3
PAX33-001	-	-	Bimodal	Fine	Quartz	K-feldspar	Plagioclase	-
PAX33-002	-	-	Mod. poor	Fine	Quartz	K-feldspar	-	-
PAX33-003	-	-	Mod. poor	Fine	Quartz	Feldspar	Micas	-
PAX33-004	-	-	Mod. poor	Bimodal	Quartz	K-feldspar	Plagioclase	Micas
PAX33-005	-	-	Moderate	Fine	Quartz	K-feldspar	Plagioclase	-
PAX33-006	-	-	Moderate	Medium	Quartz	K-feldspar	Micas	-
PAX33-007	-	-	Moderate	Fine	Quartz	Plagioclase	-	-
PAX33-008	-	-	Poor	Coarse	Quartz	K-feldspar	Micas	Opaques
PAX33-009	-	-	Mod. poor	Bimodal	Quartz	K-feldspar	-	-
PAX33-010	-	-	Bimodal	Coarse	Quartz	K-feldspar	Vitric felsite	-
PAX33-011	-	-	Bimodal	Medium	Vitric felsite	Quartz	K-feldspar	-
PAX33-012	-	-	Bimodal	Medium	Quartz	Opaques	K-feldspar	Plagioclase
PAX33-013	-	-	Mod. poor	Medium	Quartz	Plagioclase	K-feldspar	Micas
PAX33-014	-	-	Bimodal	Fine	Quartz	K-feldspar	Plagioclase	-
PAX33-015	-	-	Bimodal	Medium	Quartz	K-feldspar	Plagioclase	-
PAX33-016	-	-	Bimodal	Medium	Quartz	K-feldspar	Vitric felsite	-
PAX33-017	-	-	Mod. poor	Coarse	Quartz	K-feldspar	Opaques	Plagioclase
PAX33-018	-	-	Bimodal	Medium	Quartz	K-feldspar	Plagioclase	Biotite
PAX37-0001	High	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. felsite	Plagioclase
PAX37-0002	Moderate	Angular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. felsite	Plagioclase
PAX37-0003	Moderate	Angular	Mod. poor	V. coarse	Sanidine	Quartz	Sanid. tuff	Plagioclase
PAX37-0004	High	Subround	Well sorted	V. fine	Quartz	K-feldspar	Biotite	Vitric felsite
PAX37-0005	Moderate	Subangular	Bimodal	Bimodal	Vitric felsite	Quartz	Sanidine	-
PAX37-0006	Low	Angular	Moderate	Coarse	Sanidine	Quartz	Plagioclase	Felsites
PAX37-0007	High	Angular	Moderate	V. fine	Quartz	Sanidine	Plagioclase	Amphibole
PAX37-0009	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. felsite	Plagioclase
PAX37-0010	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. felsite	Plagioclase
PAX37-0011	Moderate	Subangular	Poor	V. fine	Sanidine	Vitric felsite	Quartz	Plagioclase
PAX37-0012	Moderate	Subangular	Bimodal	Bimodal	Vitric felsite	Vitric felsite	Sanidine	Plagioclase
PAX37-0013	Moderate	Subangular	Bimodal	Bimodal	Quartz	Sanidine	Sanid. felsite	Plagioclase
PAX37-0014	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. felsite	Grog
PAX37-0015	Low	V. angular	Mod. well	Medium	Vitric felsite	Quartz	Sanidine	Plagioclase

	Texture and Grain Size Distributions				Most abundant grain types			
Sample	Spher-icity	Angularity	Sorting	Modal grain size	Dominant sand-sized grain type	Accessory 1	Accessory 2	Accessory 3
PAX37-0016	Moderate	Subangular	Mod. well	Coarse	Sanidine	Vitric felsite	Quartz	Plagioclase
PAX37-0017	Moderate	V. angular	Bimodal	Bimodal	Sanidine	Quartz	Plagioclase	Sanid. felsite
PAX37-0018	Moderate	Angular	Poor	Medium	Granite or Granite-Gneiss	Quartz	Plagioclase	Microcline
PAX37-0019	Moderate	Angular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. felsite	Plagioclase
PAX37-0020	Moderate	Angular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. felsite	Plagioclase
PAX37-0021	Low	Angular	Moderate	Coarse	Vitric felsite	Sanidine	Quartz	Pyroxene
PAX37-0022	Moderate	Angular	Moderate	Coarse	Sanidine	Sanid. felsite	Quartz	Plagioclase
PAX37-0023	Moderate	Subangular	Mod. well	Fine	Quartz	Vitric felsite	Sanidine	Plagioclase
PAX37-0024	Moderate	Subangular	Mod. well	V. fine	Quartz	Felsites	Chlorite	K. feldspars
PAX37-0025	Moderate	Angular	Bimodal	Bimodal	Quartz	Plagioclase	Sanidine	Felsites
PAX37-0026	Moderate	Angular	Bimodal	Bimodal	Sanidine	Quartz	Plagioclase	Vitric felsite
PAX37-0027	Moderate	Subangular	Moderate	V. fine	Quartz	Plagioclase	Vitric felsite	K. feldspars
PAX37-0028	Moderate	V. angular	Mod. poor	Medium	Vitric felsite	Sanidine	Quartz	Sanid. vitric felsite
PAX37-0029	Moderate	Subangular	Mod. well	Fine	Vitric felsite	Quartz	Sanidine	-
PAX37-0030	Moderate	Angular	Bimodal	Bimodal	Sanidine	Quartz	Felsites	Plagioclase
PAX37-0031	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Felsites	Plagioclase
PAX37-0032	Moderate	Angular	Moderate	Medium	Vitric felsite	Quartz	Sanidine	Plagioclase
PAX37-0033	Moderate	Subangular	Moderate	Fine	Vitric felsite	Quartz	Chlorite	Plagioclase
PAX37-0034	Moderate	Subangular	Bimodal	Bimodal	Quartz	Sanidine	Sanid. felsite	-
PAX37-0035	Moderate	Subround	Bimodal	Bimodal	Quartz	Sanidine	Felsites	-
PAX37-0036	Moderate	V. angular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. felsite	Plagioclase
PAX37-0037	Moderate	V. angular	Moderate	V. coarse	Quartz	Plagioclase	Microcline	Meta-granite
PAX37-0038	Low	Angular	Moderate	Fine	Vitric felsite	Sanidine	Quartz	-
PAX37-0039	Low	Angular	Mod. poor	Coarse	Vitric felsite	Quartz	Sanidine	Qtz. felsite
PAX37-0040	Low	V. angular	Moderate	V. coarse	Vitric felsite	Quartz	Sanidine	Plagioclase
PAX37-0041	Moderate	Angular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. felsite	-
PAX37-0042	Low	V. angular	Mod. well	Medium	Vitric felsite	Sanidine	Quartz	Microcline
PAX37-0043	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Felsites	Plagioclase
PAX37-0044	Low	V. angular	Mod. well	Medium	Vitric felsite	Quartz	Plagioclase	Sanidine
PAX37-0045	Low	V. angular	Poor	V. coarse	Quartz	Microcline	Plagioclase	Meta-granite
PAX37-0046	Low	Angular	Moderate	Coarse	Vitric felsite	Quartz	Plagioclase	K. feldspars
PAX37-0047	Moderate	Subangular	Moderate	V. coarse	Interm. volc.	Plagioclase	Quartz	Sanidine
PAX37-0048	Low	V. angular	Moderate	Fine	Vitric felsite	Sanidine	Quartz	Interm. volc.

	Texture and Grain Size Distributions				Most abundant grain types			
Sample	**Spher-icity**	**Angularity**	**Sorting**	**Modal grain size**	**Dominant sand-sized grain type**	**Accessory 1**	**Accessory 2**	**Accessory 3**
PAX37-0049	Moderate	V. angular	Mod. poor	V. coarse	Quartz	Meta-granite	Muscovite	Plagioclase
PAX37-0050	Low	Angular	Mod. well	Medium	Vitric felsite	Quartz	Plagioclase	K. feldspars
PAX37-0051	Low	V. angular	Moderate	V. coarse	Quartz	Meta-granite	Muscovite	Plagioclase
PAX37-0052	Low	Angular	Mod. well	Medium	Vitric felsite	Quartz	Plagioclase	K. feldspars
PAX37-0053	Low	Angular	Moderate	Fine	Vitric felsite	Sanidine	Quartz	Sanid-qtz. felsite
PAX37-0054	Low	Angular	Moderate	Medium	Vitric felsite	Quartz	Sanidine	-
PAX37-0056	Moderate	Angular	Bimodal	Bimodal	Quartz	Sanidine	Sanid. felsite	Plagioclase
PAX37-0057	Moderate	Angular	Mod. well	Medium	Quartz	Limestone	K-feldspar	Plagioclase
PAX37-0058	High	Subround	Mod. well	V. fine	Quartz	Vitric felsite	Sanidine	Plagioclase
PAX37-0059	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Plagioclase	Sanid. felsite
PAX37-0060	Moderate	Subangular	Moderate	Fine	Quartz	Vitric felsite	Sanidine	Plagioclase
PAX41-0166-1	Moderate	Angular	Mod. poor	V. coarse	Sanidine	Vitric felsite	Quartz	Plagioclase
PAX41-0171-1	Moderate	Angular	Mod. poor	V. coarse	Quartz	Sanidine	Sanid. felsite	Interm. volc.
PAX41-0171-2	Moderate	Angular	Mod. well	Fine	Quartz	Plagioclase	K-feldspar	Opaques
PAX41-0197-1	Moderate	Angular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. vitric felsite	Interm. volc.
PAX41-0197-2	Moderate	Angular	Moderate	V. fine	Vitric felsite	Quartz	Sanidine	Plagioclase
PAX41-0204-1	Moderate	Angular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. felsite	Plagioclase
PAX41-0204-2	Moderate	Angular	Mod. well	V. fine	Quartz	Plagioclase	K-feldspar	Caliche
PAX41-0248-1	Moderate	Angular	Bimodal	Bimodal	Sanidine	Quartz	Tuff	Vitric felsite
PAX41-0248-1	Moderate	Subangular	Mod. poor	V. coarse	Sanidine	Quartz	Sanid. felsite	Vitric felsite
PAX41-0248-2	Low	V. angular	Moderate	Medium	Vitric felsite	Sanidine	Quartz	Pyroxene
PAX41-0371-1	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Plagioclase	Sanid. felsite
PAX41-0371-2	Low	V. angular	Moderate	Medium	Vitric felsite	Sanidine	Quartz	-
PAX41-0456-1	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. vitric felsite	Interm. volc.
PAX41-0579-1	Moderate	Subangular	Bimodal	Bimodal	Quartz	Sanidine	clay lump/argillite	Sanid. vitric felsite
PAX41-0579-2	Moderate	Angular	Moderate	Medium	Quartz	Plagioclase	K-feldspar	clay lump/argillite
PAX41-0631-1	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. vitric felsite	Interm. volc.
PAX41-0642-1	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Felsite	Opaques
PAX41-0642-2	Moderate	V. angular	Moderate	Coarse	Vitric felsite	Sanidine	Quartz	-
PAX41-0652-1	Moderate	Subangular	Bimodal	Bimodal	Quartz	Sanidine	Sanid. felsite	Plagioclase
PAX41-0652-2	Moderate	V. angular	Mod. poor	Coarse	Vitric felsite	Felsite	Quartz	Sanidine
PAX41-0715-1	Moderate	Subangular	Bimodal	Bimodal	Quartz	Sanidine	Sanid. felsite	Sanid. vitric felsite

	Texture and Grain Size Distributions				Most abundant grain types			
Sample	**Spher-icity**	**Angularity**	**Sorting**	**Modal grain size**	**Dominant sand-sized grain type**	**Accessory 1**	**Accessory 2**	**Accessory 3**
PAX41-0715-2	Low	V. angular	Moderate	Coarse	Vitric felsite	Sanidine	Quartz	Pyroxene
PAX41-0872-1	Moderate	Subangular	Bimodal	Bimodal	Clay lump/argillite	Vitric felsite	Sanidine	Quartz
PAX41-0925-2	Moderate	Subangular	Bimodal	Bimodal	Clay lump/argillite	Vitric felsite	Quartz	Sanidine
PAX41-0942-1	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Sanid. felsite	Felsite
PAX41-0969-1	Low-mod.	Angular	Bimodal	Bimodal	Clay lump/argillite	Vitric felsite	Sanidine	Quartz
PAX41-1254-01	Low-mod.	Angular	Bimodal	Bimodal	Clay lump/argillite	Vitric felsite	Sanidine	Quartz
PAX41-1254-1	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Vitric felsite	Plagioclase
PAX41-1254-2	Moderate	Subangular	Bimodal	Bimodal	Clay lump/argillite	Vitric felsite	Sanidine	Quartz
PAX41-1352-1	Moderate	Angular	Bimodal	Bimodal	Sanidine	Quartz	K-feldspar	Interm. volc.
PAX41-1352-2	Moderate	Angular	Bimodal	Bimodal	Vitric felsite	clay lump/argillite	Quartz	Sanidine
PAX41-1384-1	Moderate	Angular	Bimodal	Bimodal	Sanidine	Quartz	Plagioclase	Sanid. vitric felsite
PAX41-1384-2	Moderate	Subangular	Bimodal	Bimodal	Clay lump/argillite	Quartz	Sanidine	Vitric felsite
PAX41-1753-1	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Interm. volc.	Sanid. felsite
PAX41-1900-1	Moderate	Angular	Mod. poor	V. coarse	Sanidine	Sanid. felsite	Quartz	Plagioclase
PAX41-1900-2	Moderate	Subangular	Bimodal	Bimodal	Clay lump/argillite	Quartz	Vitric felsite	Sanidine
PAX41-2106-2	Moderate	Angular	Bimodal	Bimodal	Sanidine	Quartz	Plagioclase	Felsic volcanic
PAX41-2202-2	Moderate	Angular	Moderate	Silt	Clay lump/argillite	Sanidine	Quartz	Vitric felsite
PAX41-2307-1	Moderate	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Plagioclase	Sanid. felsite
PAX41-2351-1	Moderate	Angular	Moderate	V. coarse	Sanidine	Quartz	Sanid. vitric felsite	Interm. volc.
LANL4-0001	Low	V. Angular	Moderate	V. fine	Vitric felsite	Sanidine	Quartz	Plagioclase
LANL4-0002	Low	V. Angular	Poor	V. Coarse	Quartz	Microcline	Chlorite	Plagioclase
LANL4-0003	Low	V. Angular	Poor	V. coarse	Quartz	Microcline	Plagioclase	Muscovite
LANL4-0005	Low	Angular	Bimodal	Bimodal	Sanidine	Quartz	Vitric felsite	Qtz-sanid. felsite
LANL4-0006	Low	V. Angular	Mod. well	Medium	Vitric felsite	Quartz	Sanidine	-
LANL4-0007	Low	V. Angular	Poor	V. coarse	Quartz	Meta-granite	Microcline	Muscovite

	Texture and Grain Size Distributions				Most abundant grain types			
Sample	**Spher-icity**	**Angularity**	**Sorting**	**Modal grain size**	**Dominant sand-sized grain type**	**Accessory 1**	**Accessory 2**	**Accessory 3**
LANL4-0008	Low	V. Angular	Mod. well	Medium	Vitric felsite	Quartz	Chlorite	Feldspars
LANL4-0009	Low	V. Angular	Mod. well	Medium	Vitric felsite	Quartz	Diatoms	Sanidine
LANL4-0010	Low	V. Angular	Mod. well	Medium	Vitric felsite	Quartz	Sanidine	Diatoms
LANL4-0011	Low	V. Angular	Poor	V. coarse	Quartz	Microcline	Muscovite	Meta-granite
LANL4-0013	Low	V. Angular	Moderate	Coarse	Vitric felsite	Clay lump/Fe oxides	Quartz	Sanidine
LANL4-0014	Low	V. Angular	Mod. well	Medium	Vitric felsite	Quartz	Clay lump/Fe oxides	Sanidine
LANL4-0015	Moderate	Angular	Bimodal	Bimodal	Quartz	Meta-granite	Plagioclase	Muscovite
LANL4-0016	Moderate	Angular	Moderate	Coarse	Vitric felsite	Quartz	Sanidine	Clay lump/argillite
LANL4-0017	Moderate	Angular	Poor	V. coarse	Granite or Granite-Gneiss	Quartz	Alt. plagioclase	Microcline
LANL4-0018	Low	V. Angular	Moderate	Medium	Vitric felsite	-	-	-
LANL4-0019	Low	V. Angular	Moderate	Medium	Vitric felsite	Quartz	Sanidine	-
LANL4-0020	Low	V. Angular	Poor	V. coarse	Granite or Granite-Gneiss	Quartz	Muscovite	Microcline
LANL4-0022	High	Subangular	Bimodal	Bimodal	Quartz	Sanidine	Felsites	Qtz. vitric felsite
LANL4-0023	High	Subangular	Bimodal	Bimodal	Quartz	Sanidine	Felsites	-
LANL4-0024	Low	V. Angular	Poor	Coarse	Quartz	Meta-granite	Microcline	Muscovite
LANL4-0025	Low	Angular	Moderate	Medium	Quartz	Vitric felsite	Clay lump/argillite	Sanidine
LANL4-0026	High	Subangular	Bimodal	Bimodal	Sanidine	Quartz	Grog	Felsites
LANL4-0029	Moderate	V. Angular	Mod. poor	Medium	Vitric felsite	Quartz	Sanidine	Tuff
LANL4-0030	Moderate	V. Angular	Moderate	Medium	Vitric felsite	Quartz	Alt. plagioclase	Felsites
LANL4-0031	High	Subangular	Bimodal	Bimodal	Quartz	Sanidine	Interm. volc.	Vitric felsite
LANL4-0032	Low	V. Angular	Moderate	Medium	Vitric felsite	Quartz	Sanidine	Clay lump/argillite
LANL4-0033	Moderate	Angular	Bimodal	Bimodal	Quartz	Sanidine	Felsites	Opaque
LANL4-0034	Low	V. Angular	Mod. well	Fine	Vitric felsite	Quartz	Sanidine	-
LANL4-0035	Low	V. Angular	Mod. well	Fine	Vitric felsite	Quartz	Sanidine	-
LANL5-01	Moderate	Subangular	Mod. well	Fine	Vitric felsite	-	-	-
LANL5-02	Moderate	Subround	Moderate	Fine	Vitric felsite	Plagioclase	Quartz	Felsite
LANL5-03	Moderate	Subangular	Moderate	Fine	Vitric felsite	Quartz	Plagioclase	-
LANL5-04	Moderate	Subangular	Mod. poor	Medium	Vitric felsite	K-feldspar	-	-
LANL5-05	Moderate	Subround	Bimodal	Bimodal	Vitric felsite	Plagioclase	Quartz	-

	Texture and Grain Size Distributions				Most abundant grain types			
Sample	**Spher-icity**	**Angularity**	**Sorting**	**Modal grain size**	**Dominant sand-sized grain type**	**Accessory 1**	**Accessory 2**	**Accessory 3**
LANL5-06	Moderate	Subround	Mod. poor	Medium	Vitric felsite	-	-	-
LANL5-07	Low-mod.	Subround	Mod. poor	Medium	Vitric felsite	Quartz	Plagioclase	-
LANL5-08	Low-mod.	Subround	Very poor	Coarse	Granite or Granite-Gneiss	Quartz	Plagioclase	Micas
LANL5-09	Low-mod.	Subround	Very poor	Coarse	Granite or Granite-Gneiss	Quartz	Plagioclase	Micas
LANL5-10	Moderate	Subangular	Very poor	Coarse	Granite or Granite-Gneiss	Quartz	Plagioclase	Micas
LANL5-11	Moderate	Subangular	Bimodal	Bimodal	Granite or Granite-Gneiss	Plagioclase	Quartz	Micas
LANL5-12	Moderate	Subround	Bimodal	Bimodal	Quartz	Plagioclase	Granite-gneiss	-
LANL5-13	Moderate	Subround	Bimodal	Bimodal	Plagioclase	Quartz	Felsite	Vitric felsite
LANL5-14	Moderate	Subround	Bimodal	V. fine	Quartz	K-feldspar	Plagioclase	Vitric felsite
LANL5-15	Moderate	Subround	Bimodal	Fine	Plagioclase	Quartz	Vitric felsite	K-feldspar

Table Q.7. Temper characterizations for the Los Alamos sherds.

Sample	Ceramicist's temper characterizations	Petrographer's initial temper characterization (before full analysis)	Working temper characterizations ("lumped" analytical groups/ reassessments)	Final temper characterizations	
				Temper type	Temper group
PAX33-001	-	Sand	Sand	Sand	Anthill
PAX33-002	-	Sand plus grog	Sand	Sand	Anthill
PAX33-003	-	Sand	Sand	Sand	Anthill
PAX33-004	-	Sand	Sand	Sand	Granitic
PAX33-005	-	Sand	Sand	Sand	Anthill
PAX33-006	-	Sand	Sand	Sand	Anthill
PAX33-007	-	Sand	Sand	Sand	Anthill
PAX33-008	-	Sand	Sand	Sand	Anthill
PAX33-009	-	Sand	Sand	Sand	Anthill
PAX33-010	-	Sand plus grog	Sand	Sand	Anthill
PAX33-011	-	Sand	Tuff 2	Tuff	Tuff 2
PAX33-012	-	Sand	Sand	Sand	Anthill
PAX33-013	-	Sand	Sand	Sand	Granitic
PAX33-014	-	Sand	Sand	Sand	Anthill
PAX33-015	-	Sand plus grog	Sand	Sand	Anthill
PAX33-016	-	Sand	Sand	Sand	Anthill
PAX33-017	-	Sand plus grog	Sand	Sand	Anthill
PAX33-018	-	Sand plus grog	Sand	Sand	Anthill
PAX37-0001	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0002	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0003	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0004	Fine tuff or ash	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2
PAX37-0005	Fine tuff or ash	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2
PAX37-0006	Fine tuff or ash	Unmodified volcanic tuff	Anthill	Sand	Anthill
PAX37-0007	Fine tuff or ash	Modified volcanic tuff	Tuff 2	Sand	Anthill
PAX37-0009	Fine tuff or ash, with shale	Modified volcanic tuff	Tuff 2	Sand	Anthill
PAX37-0010	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0011	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0012	Fine tuff or ash	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2
PAX37-0013	Fine tuff or ash	Modified volcanic tuff	Tuff 2	Sand	Anthill
PAX37-0014	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0015	Fine tuff or ash	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX37-0016	Fine tuff or ash	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2

Sample	Ceramicist's temper characterizations	Petrographer's initial temper characterization (before full analysis)	Working temper characterizations ("lumped" analytical groups/ reassessments)	Final temper characterizations	
				Temper type	Temper group
PAX37-0017	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0018	Granite with mica	Granitic sand	Granitic	Sand	Granitic
PAX37-0019	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0020	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0021	Tuff and sand	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX37-0022	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0023	Fine tuff or ash	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2
PAX37-0024	Fine tuff or ash	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2
PAX37-0025	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0026	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0027	Tuff and anthill	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2
PAX37-0028	Tuff and anthill	Modified volcanic tuff	Tuff 2	Tuff	Tuff 1
PAX37-0029	Tuff and anthill	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2
PAX37-0030	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0031	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0032	Fine tuff or ash	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2
PAX37-0033	Fine tuff or ash	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2
PAX37-0034	Fine tuff or ash with shale	Anthill sand with clay lumps	Anthill	Sand	Anthill
PAX37-0035	Anthill sand	Anthill sand with clay lumps	Anthill	Sand	Anthill
PAX37-0036	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0037	Anthill sand	Granitic sand	Granitic	Sand	Granitic
PAX37-0038	Fine tuff or ash	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX37-0039	Fine tuff or ash	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 2
PAX37-0040	Fine tuff or ash	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX37-0041	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0042	Fine tuff or ash	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX37-0043	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0044	Fine tuff or ash	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX37-0045	Anthill sand?	Granitic sand	Granitic	Sand	Granitic
PAX37-0046	Ash, mica and sand	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX37-0047	Granite with mica	Intermediate volcanic tuff	Tuff 2	Tuff	Tuff Other
PAX37-0048	Tuff and phenocrystals	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX37-0049	Granite with mica	Granitic sand	Granitic	Sand	Granitic
PAX37-0050	Fine tuff or ash	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX37-0051	Granite with mica	Granitic sand	Granitic	Sand	Granitic
PAX37-0052	Fine tuff or ash	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1

Sample	Ceramicist's temper characterizations	Petrographer's initial temper characterization (before full analysis)	Working temper characterizations ("lumped" analytical groups/ reassessments)	Final temper characterizations	
				Temper type	Temper group
PAX37-0053	Fine tuff or ash	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX37-0054	Tuff and phenocrystals	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX37-0056	Anthill sand	Anthill sand	Anthill	Sand	Anthill
PAX37-0057	Indeterminate	Quartz with limestone	Sedimentary	Sedimentary	Sedimentary
PAX37-0058	Indeterminate	Unmodified volcanic tuff	Tuff 2	Tuff	Tuff 2
PAX37-0059	Indeterminate	Anthill sand	Anthill	Sand	Anthill
PAX37-0060	Fine tuff or ash	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2
PAX41-0166-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0171-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0171-2	-	Granitic sand	Anthill	Sand	Anthill
PAX41-0197-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0197-2	-	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 2
PAX41-0204-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0204-2	-	Granitic sand	Granitic	Sand	Anthill
PAX41-0248-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0248-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0248-2	-	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX41-0371-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0371-2	-	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX41-0456-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0579-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0579-2	-	Granitic sand	Granitic	Sand	Anthill
PAX41-0631-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0642-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0642-2	-	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX41-0652-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0652-2	-	Unmodified volcanic tuff	Tuff 2	Tuff	Tuff 2
PAX41-0715-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0715-2	-	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
PAX41-0872-1	-	Anthill sand with clay lumps	Anthill/Clay	Sand	Anthill/Clay
PAX41-0925-2	-	Anthill sand with clay lumps	Anthill/Clay	Sand	Anthill/Clay
PAX41-0942-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-0969-1	-	Anthill sand with clay lumps	Anthill/Clay	Sand	Anthill/Clay
PAX41-1254-01	-	Anthill sand with clay lumps	Anthill/Clay	Sand	Anthill/Clay
PAX41-1254-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-1254-2	-	Anthill sand with clay lumps	Anthill/Clay	Sand	Anthill/Clay

Sample	Ceramicist's temper characterizations	Petrographer's initial temper characterization (before full analysis)	Working temper characterizations ("lumped" analytical groups/ reassessments)	Final temper characterizations	
				Temper type	Temper group
PAX41-1352-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-1352-2	-	Anthill sand with clay lumps	Tuff 1	Tuff	Tuff 1/Clay
PAX41-1384-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-1384-2	-	Anthill sand with clay lumps	Anthill/Clay	Sand	Anthill/Clay
PAX41-1753-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-1900-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-1900-2	-	Anthill sand with clay lumps	Anthill/Clay	Sand	Anthill/Clay
PAX41-2106-2	-	Anthill sand	Anthill	Sand	Anthill
PAX41-2202-2	-	Anthill sand with clay lumps	Anthill/Clay	Sand	Anthill/Clay
PAX41-2307-1	-	Anthill sand	Anthill	Sand	Anthill
PAX41-2351-1	-	Anthill sand	Anthill	Sand	Anthill
LANL4-0001	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL4-0002	Granitic (micaceous)	Granitic crushed rock with mica	Granitic	Sand	Granitic
LANL4-0003	Granitic (micaceous)	Granitic crushed rock with mica	Granitic	Sand	Granitic
LANL4-0005	Anthill sand	Anthill sand	Anthill	Sand	Anthill
LANL4-0006	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL4-0007	Granitic (micaceous)	Granitic crushed rock with mica	Granitic	Sand	Granitic
LANL4-0008	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL4-0009	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL4-0010	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL4-0011	Granite with mica	Granitic crushed rock with mica	Granitic	Sand	Granitic
LANL4-0013	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL4-0014	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL4-0015	Granitic (micaceous)	Granitic crushed rock with mica	Granitic	Sand	Granitic
LANL4-0016	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 2
LANL4-0017	Granite	Granitic crushed rock with mica	Granitic	Sand	Granitic
LANL4-0018	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL4-0019	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL4-0020	Granitic (micaceous)	Granitic crushed rock with mica	Granitic	Sand	Granitic

Sample	Ceramicist's temper characterizations	Petrographer's initial temper characterization (before full analysis)	Working temper characterizations ("lumped" analytical groups/ reassessments)	Final temper characterizations	
				Temper type	Temper group
LANL4-0022	Anthill sand	Anthill sand	Anthill	Sand	Anthill
LANL4-0023	Anthill sand	Anthill sand	Anthill	Sand	Anthill
LANL4-0024	Granitic (micaceous)	Granitic crushed rock with mica	Granitic	Sand	Granitic
LANL4-0025	Fine tuff	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2
LANL4-0026	Anthill sand	Anthill sand	Anthill	Sand	Anthill
LANL4-0029	Fine tuff	Modified volcanic tuff	Tuff 2	Tuff	Tuff 2
LANL4-0030	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL4-0031	Anthill sand	Anthill sand	Anthill	Sand	Anthill
LANL4-0032	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL4-0033	Anthill sand	Anthill sand	Anthill	Sand	Anthill
LANL4-0034	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL4-0035	Fine tuff	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL5-01	fine tuff and sand	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL5-02	fine tuff and sand	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 2
LANL5-03	fine tuff and sand	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL5-04	fine tuff and sand	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL5-05	fine tuff and sand	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff Other
LANL5-06	fine tuff and sand	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 1
LANL5-07	fine tuff and sand	Unmodified volcanic tuff	Tuff 1	Tuff	Tuff 2
LANL5-08	Granitic (micaceous)	Granitic sand	Granitic	Sand	Granitic
LANL5-09	Granitic (micaceous)	Granitic sand	Granitic	Sand	Granitic
LANL5-10	Granitic (micaceous)	Granitic sand	Granitic	Sand	Granitic
LANL5-11	Granitic (micaceous)	Granitic sand	Granitic	Sand	Granitic
LANL5-12	Granitic (micaceous)	Granitic sand	Granitic	Sand	Granitic
LANL5-13	Anthill sand	Anthill sand	Anthill	Sand	Anthill
LANL5-14	Anthill sand	Anthill sand	Anthill	Sand	Anthill
LANL5-15	Anthill sand	Anthill sand	Anthill	Sand	Anthill

APPENDIX R:
DEBITAGE CODING SHEET

LA #
Area #
Room #
Feature #
Stratum #
Level #
FS #

Artifact Type

1. angular debris
2. core flake
3. blade
4. biface flake
5. uniface flake
6. notching flake
7. channel flake
8. bipolar flake
9. *piece esquillee*
10. core trimming flake
11. core tablet
12. burin spall
13. opposing core flake (struck from bottom of core)
14. change-of-orientation flake (overstruck core flake that removes bottom of core)
15. *outrepasse* (overstruck biface thinning flake)
16. pot lid
17. hammerstone flake
18. ground stone flake
19. manuport
20. microdebitage (< 10 mm)
21. und. Flake
22. fire-cracked rock

Material Type

See lithic material coding sheet

Material Grain

1. fine (glossy)
2. medium (smooth surface)
3. coarse (grainy to the touch)

Condition

1. whole (incl. angular debris, FCR, manuport)

2. proximal
3. midsection
4. distal
5. lateral
6. und. Fragment (includes microdebitage)

Measurements

length (mm for whole flakes and manuports that are river cobbles)
weight (0.1 gm; all)

Platform Type

1. absent
2. cortical
3. single-faceted
4. dihedral
5. multi-faceted
6. collapsed
7. crushed
8. battered (HS flakes)
9. non-applicable (angular debris, microdebitage, FCR, manuport)

Platform Preparation

1. none
2. abraded/crushed
3. ground
4. abraded/ground
5. retouched
6. retouched/abraded
7. retouched/ground
8.
9. und./non-applicable (collapsed, crushed, battered platform, flake frag) or (absent, angular debris, microdebitage, FCR, manuport)

Cortex Type (Raw Material Form)

1. absent
2. nodular
3. tabular
4. waterworn
5. quartz crystal
6. undetermined

Cortex Placement

1. absent
2. platform only
3. dorsal only
4. platform and partial dorsal

5. orange rind
6. platform and/or 100% dorsal
7. non-applicable (flake fragments, HS flakes, angular debris, microdebitage FCR, manuports)

Burning
1. absent
2. present

No. of Damaged Edges

Location of damage
1. end
2. lateral
3. projection
4. dorsal

Edge Outline
1. straight
2. concave
3. convex
4. straight/concave
5. straight/convex
6. concave/convex
7. projection (graver/perforator)
8. flat (abraded/ground surface)

Edge Angle (blank for projections and flat edge outlines)

CORES AND HEAVY-DUTY TOOLS

Artifact Type
20. core
21. tested material
22. cobble uniface
23. cobble biface
24. hammerstone
25. anvil

Material Type
See lithic material coding sheet

Material Grain
1. fine
2. medium

3. coarse

Condition
1. whole
2. fragment

Measurements
length (mm)
width (mm)
thickness (mm)
weight (gm; core fragments)

Core Type
1. single-directional (nodule blank)
2. bidirectional (nodule blank)
3. multi-directional (nodule blank)
4. bipolar core (nodule or flake blank)
5. core fragment (nodule or flake blank)
6. non-applicable (tm, cobbles, hammerstones)
7. flake core (flake blank)

Core platform orientation/shape
single-directional cores
1. single-face
2. multi-faces
3. prismatic
4. pyramidal

bidirectional cores
5. change of orientation
6. discoidal
7. bifacial
8. opposed same face
9. opposed different face
10. 90 degrees

multi-directional cores
11. globular
12. opposed/ 90 degrees
13. opposed same and different face

other cores
14. bipolar core
15. core fragment

non-applicable

16. non-cores (tm, cobbles, hammerstones)

Number of Core Platforms (zero for core fragments and non-cores, 1 for bipolar cores).

Core Platform type
1. cortical (e.g., cores on large flakes or angular debris)
2. single-faceted
3. cortical and single-faceted
4. multi-faceted
5. undetermined/non-applicable (core fragments, non-cores)

Core Platform Preparation
1. none
2. abraded/crushed
3. ground
4. abraded/ground
5.
6. undetermined/non-applicable (core fragments, non-cores)

Cortex Type (Raw Material Form)
1. absent
2. nodular
3. tabular
4. waterworn
5. quartz crystal
6. undetermined

Percent Cortical/Unflaked surface
1. <25%
2. 25-50%
3. 51-75%
4. >75%
5. undetermined (core frags)

Reason for Discard
1. broken: material flaw
2. broken: culturally induced fracture
3. extensive hinging/stepping
4. exhausted
5. still useable
6. extensive edge battering (e.g., core/hammerstone, cobble biface)
7. burned
8. undetermined
9. non-applicable (e.g., hammerstones)

Burning

1. absent
2. present

Number of Damaged Loci

Type of Damage (1-4)

1. battering
2. rounding
3. scarring
4. abrasion/ground

Location of Damage (1-4)

1. edge
2. convex surface
3. ridge
4. flat surface
5. flake scar ridge
6. all over

RETOUCHED TOOL CODING SHEET

Artifact Type

30. retouched pieces
31. notch (1-2 contiguous notches)
32. denticulate (>2 contiguous notches)
33. biface
34. projectile point
35. uniface
36. end scraper
37. side scraper
38. nosed scraper
39. circular scraper
40. transverse scraper
41.
42.
43. drill
44. perforator
45. graver
46. burin
47. ret. flake/perforator
48. perforator/notch
49. denticulate/notch
50. uniface/notch
51.

Material Type

See lithic material coding sheet

Material Gain

1. fine
2. medium
3. coarse

Condition (Note: manufacture, use, or undetermined for break type in comments)

1. whole
2. proximal
3. midsection
4. distal
5. lateral
6. und. fragment

Measurements (note also use separate form for projectile point metrics)

length (mm)
width (mm)
thickness (mm)
weight (gm; fragments)

Cortex Type (Raw Material Form)

1. absent
2. nodular
3. tabular
4. waterworn
5. quartz crystal
6. undetermined

Biface shape/Point Type

1-165. See list of point types
180. stemmed (shouldered or tanged)
181. contracting stem
182. corner-notched
183. side-notched
184. side-notched with basal-notch
185. fluted
186. und. fragment
201. ovoid
202. ovate
203. lanceolate
204. round
205. triangular
210. n/a (not a biface/pt)
211. cruciform

Burning
1. absent
2. present

Number of Separate Retouched Edges (1-formal tools; n- retouched pieces)

Retouch Type (1-4)
1. unidirectional ventral (inverse)
2. unidirectional dorsal (obverse)
3. bidirectional (both faces)
4. alternating (uni. ventral and dorsal along same edge)
5. alternate (uni. Ventral and dorsal along opposite edges)
6. beveled
7. alternate/beveled
8. use-wear
9. burination
10. backed
11. bidirectional/beveled

Edge Outline (1-4)
1. straight
2. concave
3. convex
4. straight/concave
5. straight/convex
6. concave/convex (denticulate or double notch)
7. projection (graver/perforator)
8. flat (abraded/ground surface)
9. undetermined (point frags)

Damage Present (1-4)
1. absent
2. present
3. undetermined (e.g., point base frags)

Edge Angle (1-4) (monitor on blade for pts and bifaces, scraper edges, and blank on point base frags)

PROJECTILE POINT CODING SHEET

1. Late Paleo-concave-based, convex blade: 1a (narrow) and 1b (wide)
2. Late Paleo-square-based; also may have convex blade
3. Jay (convex or straight base)
4. Bajada (concave base)

5. James Allen
6. Contracting stem: Gypsum Cave
7. Preform
8. Undetermined
9. Middle Archaic: San Jose
10. Late Archaic-Armijo
11. Foothill Mountain (convex blade, concave base/Angostura)
12. Late Paleo: Sierra Vista
13. Undetermined large side-notched
14. Long contracting stem (Hellgap/Agate Basin)
15. Great Basin
16. Large side-notched (straight base; Sudden or Northern)
17.
18. Large side-notched (concave base; San Rafael)
19. Late Archaic: corner-notched
20. Late Archaic: side-notched
21. Late Archaic: stemmed (straight or concave base)
22. Late Archaic: leaf-shaped
23. Late Archaic: contracting stem

Metrics

Overall length
Blade length
Blade width
Neck width
Stem length
Stem width
Max thickness
Basal depth
Weight

Condition

1. Whole
2. Proximal
3. Midsection
4. Distal
5. Lateral
6. Undetermined
7. Broken

Blade Shape

1. Straight (angled)
2. Parallel
3. Convex
4. Serrated
5. Concave
6. Irregular

7. Other
8. Undetermined

Base Shape

1. Straight
2. Concave
3. Notched
4. Convex (contracting)
5. Other
6. Undetermined

Ground

1. Base & lateral
2. Lateral
3. Base
4. Undetermined
5. Absent

Reworked

1. Absent
2. Blade
3. Base
4. Blade & Base
5. Undetermined

Beveling

1. Absent
2. Present
3. Undetermined

GROUND STONE CODING SHEET

Artifact Type

50. one-hand mano (<170 mm)
51. two-hand mano (>170 mm)
52. undetermined mano fragment
53. millingstone (>250 mm)
54. basin metate
55. formal slab metate
56. trough metate
57.
58. grinding slab (<250 mm)
59. undetermined metate fragment
60. polishing stone

61. palette
62. mortar
63. pestle
64. abrading stone (generalized)
65. grooved abrader
66. axe
67. maul
68. hoe
69. tchamajilla
70. ornament
71. pipe
72. stone ceramic lid
73. comal
74. misc. ground stone
75. vent plug (tiponi)
80. undetermined ground stone fragment
81. whet stone
82. shaped slab

Material Type
See lithic material coding sheet

Condition
1. whole
2. fragment

Measurements
length (mm)
width (mm)
thickness (mm)
weight (gm)

Primary Grinding Surface length (mm)

Primary Grinding Surface width (mm)

Use Location
1. single unopposed surface
2. two opposed surfaces
3. perimeter (e.g., abrading stone)
4. edge (e.g., axe)
5. other
6. undetermined (frags)
7. non-applicable (e.g., ornament, stone lids, shaped slab)

Grinding surface cross-section (single or double surfaces)

1. plano (flat)
2. concave
3. convex
4. bi-plano
5. plano-convex
6. plano-concave
7. bi-convex
8. wedge shaped
9. n/a (w/out grinding surfaces)
10. undetermined
11. beveled/flat
12. beveled/beveled
13. beveled (single surface)

Grinding Surface(s) Shape

1. ovoid
2. rectangular
3. n/a
4. undetermined
5. irregular (e.g., abrader)

Surface(s) modification

1. ground
2. pecked
3. ground/pecked
4. polished/ground
5. flaked (e.g., axe, hoe, shaped slab)
6. flaked/ground (e.g., axe)

Mano fingerholds

1. absent
2. one side
3. two sides
4. undetermined (mano frags)/ non-applicable (non-manos)

Other ground stone use-wear

1. absent
2. battering (mano/hammerstone, maul)
3. scarred/rounded edge (axe, tchamajilla)
4. core (e.g., 1-hand mano)
5. trough metate wear on mano

Burned

1. absent
2. present

LITHIC RAW MATERIAL TYPES

100. undetermined Igneous
110. basalt
    111. vesicular basalt
120. rhyolite
130. andesite
140. granite/diorite
150. dacite
180. obsidian
    181. black translucent (Jemez); also w/ white inclusions, banded and smokey.
    182. black opaque (with brown edges)
    183. black dusty (Polvadera)
    184. green (Jemez)
    185. brown (Jemez)
    186. gray (Cerro del Medio?)
    187. mahogany (Cerro del Medio?)
190. tuff
191. welded tuff
192.
193. pumice
200. Undetermined Sedimentary
    210. sandstone
    211. concretion
    212. fossil
    213. orthoquartzite
    214. conglomerate
    215. breccia
220. Siltstone
230. Shale
240. Jet
250. Limestone
260. Chalcedony
270. Chert
    271. Pedernal chert/chalcedony (with black, red and/or yellow)
    272. Alibates - 5RP 4/2, grayish/red/purple to 10R 4/2, grayish red
    273. Greenish/Gray/ mottled chert – N7, light gray to N4 medium dark gray
    274. Salmon pink chert – 10R 7/4, moderate orange pink
    275. Yellow/Butterscotch chert – 10YR 5/4, moderate yellowish brown to 10YR 6/6 dark yellow orange
    276. Jasper/red/burgundy chert – 10R 2/2,very dusky red
    277. Yellowish/brown, (w/fossil incl.) – 10YR 5/4, moderate yellowish brown
    278. Green mottled chert, w/rust colored incl. – 5Y 4/1, olive gray, 10Y 6/2 pale olive to 5GY 5/2, dusky yellow green

279. Mottled tan/white chert – 5YR 6/1, light brownish gray to N7 light gray (was #261).

290. Silicified Wood
400. Undetermined Metamorphic
410. Quartzite
420. Schist
430. Soapstone
440. Metaconglomerate
450. Greenstone
460. Gneiss
470. Slate
899. Undetermined mineral

900. Quartz	904. Selenite/gypsum	908. Kaolinite
901. Quartz Crystal	905. Calcite	909. Turquoise
902. Hematite	906. Mica	910. Augite
903. Limonite	907. Azurite	911. Malachite

APPENDIX S
C&T FLOTATION SAMPLE SUMMARY INFORMATION

Table S.1. C&T summary flotation information.

Site	FS	Volume (liters)	Weight (grams)	Roots	Insects	Other
White Rock Tract						
LA 12587	632	1.65	140.8	+	+	rodent feces
LA 12587	641	1.7	14.9	+	+	-
LA 12587	656	1.65	52.0	+	+	-
LA 12587	695	1.8	31.4	+	+	-
LA 12587	708	1.9	33.5	+	+	-
LA 12587	758	1.8	17.0	+	+	-
LA 12587	881	2	31.7	+	+	-
LA 12587	956	2	19.5	+	+	-
LA 12587	957	1.7	15.6	+	+	rodent feces
LA 12587	1000	2	19.0	+	+	rodent feces
LA 12587	1064	1.3	19.8	+	+	1 u bone
LA 12587	1092	1.95	70.3	+	+	rodent feces
LA 12587	1200	1.25	7.5	+	+	-
LA 12587	1280	1.75	25.2	+	+	-
LA 12587	1485	2	88.5	+	+	-
LA 12587	1493	1.45	31.0	+	+	-
LA 12587	1579	0.8	5.4	+	+	-
LA 12587	1593	1.8	44.3	+	+	-
LA 12587	1699	1.8	9.6	+	+	-
LA 12587	1726	1.32	13.1	+	+	-
LA 12587	1886	1.95	34.9	+	+	-
LA 12587	1891	0.9	9.7	+	+	-
LA 12587	1917	1.9	44.3	+	+	-
LA 12587	2040	2	44.2	+	+	-
LA 12587	2080	1.25	23.8	+	+	2 u bones
LA 12587	2107	2	33.3	+	+	1 u bone
LA 12587	2397	0.6	3.7	+	+	1 u bone
LA 12587	2551	1.5	13.8	+	+	-
LA 12587	2555	2.1	234.9	+	+	-
LA 12587	2564	1.7	24.5	+	+	-
LA 12587	2571	2.6	18.6	+	+	-
LA 12587	2592	1.85	54.1	+	+	-
LA 12587	2630	2.2	10.1	+	+	-
LA 12587	2632	2.45	31.9	+	+	rodent feces
LA 12587	2635	2.2	25.4	+	+	-
LA 12587	2644	1.8	31.7	+	+	1 * bone
LA 12587	2645	1.9	144.1	+	+	1 u bone

Site	FS	Volume (liters)	Weight (grams)	Roots	Insects	Other
LA 12587	2646	2	29.6	+	+	-
LA 12587	2666	2	9.0	+	+	-
LA 12587	2667	1.9	49.4	+	+	-
LA 12587	2668	1.8	14.5	+	+	-
LA 12587	2673	2	12.8	+	+	-
LA 12587	2680	1.9	15.7	+	+	-
LA 12587	2697	2	31.4	+	+	6* bones
LA 12587	2698	0.5	7.0	+	+	-
LA 12587	2711	2.2	16.6	+	+	1 u bone
LA 12587	2714	2.2	35.1	+	+	rodent feces, 1 * bone, 1 u bone
LA 12587	2745	1.8	9.0	+	+	-
LA 12587	2831	1.95	101.9	+	+	-
LA 12587	2832	2.15	84.9	+	+	-
LA 12587	2876	1.4	32.6	+	+	-
LA 12587	2905	1.8	14.0	+	+	-
LA 12587	2924	2.9	15.7	+	+	-
LA 12587	2932	1.8	12.7	+	+	-
LA 12587	2962	2.2	24.5	+	+	-
LA 12587	2989	2	24.6	+	+	-
LA 12587	2994	2	27.9	+	+	rodent feces, 1 u bone
LA 12587	3000	2.6	42.4	+	+	-
LA 12587	3049	2.6	15.2	+	+	-
LA 12587	3081	2.8	33.0	+	+	-
LA 12587	3256	2	23.5	+	+	2 u bones
LA 12587	3273	1.9	18.0	+	+	-
LA 12587	3274	2.5	21.9	+	+	-
LA 12587	3275	2.1	32.2	+	+	-
LA 12587	3276	1.6	29.3	+	+	-
LA 12587	3277	1.9	51.0	+	+	-
LA 12587	3278	1.65	13.4	+	+	-
LA 12587	3279	1.8	13.7	+	+	-
LA 12587	3280	1.4	11.9	+	+	-
LA 12587	3281	2	16.5	+	+	-
LA 12587	3282	2	9.6	+	+	-
LA 12587	3299	1.5	5.4	+	+	-
LA 12587	3308	1	13.7	+	+	-
LA 12587	3309	1.7	15.7	+	+	2 u bones
LA 12587	3319	1.9	18.2	+	+	rodent feces
LA 12587	3320	1.9	19.1	+	+	rodent feces, 1 u bone
LA 12587	3321	2.2	31.0	+	+	rodent feces
LA 12587	3322	0.9	5.1	+	+	-
LA 12587	3323	2	20.1	+	+	-

Site	FS	Volume (liters)	Weight (grams)	Roots	Insects	Other
LA 12587	3324	2	14.5	+	+	-
LA 12587	3368	2	18.0	+	+	-
LA 12587	3471	0.5	0.7	-	+	-
LA 12587	3472	0.3	0.6	-	+	-
LA 12587	3496	1.4	3.8	+	+	-
LA 12587	3497	2	24.7	+	+	-
LA 12587	3500	1.15	14.8	+	+	-
LA 12587	3501	1.65	17.6	+	+	-
LA 12587	3544	1.9	14.4	+	+	-
LA 12587	3557	1.5	5.8	+	+	-
LA 12587	3558	1.8	11.2	+	+	-
LA 12587	3560	2.2	8.1	+	+	-
LA 12587	3709	1.8	17.9	+	+	-
LA 12587	3730	1.7	9.0	+	+	-
LA 12587	3761	2	35.4	+	+	-
LA 12587	3796	1.8	32.8	+	+	-
LA 12587	3873	1.6	32.0	+	+	-
LA 12587	3888	2.5	24.0	+	+	-
LA 12587	3983	1.2	7.7	+	+	-
LA 12587	3984	2	15.9	+	+	-
LA 12587	3985	2.2	15.6	+	+	-
LA 12587	3990	1.4	9.8	+	+	-
LA 12587	3991	0.5	0.9	+	+	-
LA 12587	4000	1.8	13.0	+	+	-
LA 12587	4010	2	16.8	+	+	-
LA 12587	4023	2.9	28.8	+	+	rodent feces
LA 12587	4036	2.6	38.8	+	+	rodent feces
LA 12587	4037	2.6	26.1	+	+	-
LA 12587	4049	1.45	14.0	+	+	-
LA 12587	4074	2.2	17.9	+	+	1 u bone
LA 12587	4075	2.45	20.1	+	+	-
LA 12587	4079	2	24.6	+	+	-
LA 12587	4098	1.7	1.1	+	+	-
LA 12587	4102	0.3	4.7	+	+	-
LA 12587	4114	1.4	9.2	+	+	2 * bones, 1 u bone
LA 12587	4131	1.65	18.6	+	+	-
LA 12587	4132	1.55	28.3	+	+	-
LA 12587	4138	0.75	7.4	+	+	-
LA 12587	4139	1	4.3	+	+	-
LA 12587	4197	0.25	1.3	+	+	-
LA 12587	4198	0.3	4.0	+	+	-
LA 12587	4211	0.45	2.8	+	+	-
LA 12587	4245	1	2.8	+	+	-

Site	FS	Volume (liters)	Weight (grams)	Roots	Insects	Other
LA 12587	5127	3.9	66.2	+	+	1 * bone, 11 u bones
LA 12587, Area 8	8876	2.5	32.7	+	+	-
LA 12587, Area 8	8877	2.6	34.4	+	+	-
LA 12587, Area 8	8888	1.95	36.3	+	+	-
LA 86637	270	2.6	218.4	+	+	-
LA 86637	271	2.95	324.8	+	+	-
LA 86637	272	1.8	95.9	+	+	-
LA 86637	273	2.5	204.9	+	+	-
LA 127625	67	4	168.9	+	+	-
LA 127625	68	3.25	103.7	+	+	rodent feces
LA 127631	15	2.6	166.0	+	+	-
LA 127631	17	2.5	46.1	+	+	-
LA 127631	28	2.9	46.2	+	+	-
LA 127631	29	2.8	49.6	+	+	-
LA 127631	32	3.7	123.2	+	+	-
LA 127631	42	3.25	35.9	+	+	-
LA 127631	51	3.5	38.1	+	+	-
LA 127631	53	2.9	49.4	+	+	-
LA 127631	55	3.4	71.5	+	+	-
LA 128803	9	2.75	27.5	+	+	-
LA 128803	14	2.3	20.1	+	+	-
LA 128803	16	1.75	16.9	+	+	-
LA 128803	18	2.5	21.2	+	+	-
LA 128803	21	2.7	21.8	+	+	-
LA 128803	24	2.9	26.1	+	+	-
LA 128803	25	3.1	28.2	+	+	-
LA 128803	28	2.2	17.2	+	+	-
LA 128803	29	2.55	140.9	+	+	-
LA 128803	30	1.7	35.0	+	+	-
LA 128803	32	2.5	22.2	+	+	-
LA 128803	33	1.8	11.6	+	+	-
LA 128804	213	2	25.6	+	+	-
LA 128804	215	2	21.3	+	+	-
LA 128804	219	2.7	28.7	+	+	-
LA 128804	222	2	38.8	+	+	-
LA 128805	161	2	48.8	+	+	-
LA 128805	162	2.7	51.5	+	+	rodent feces
LA 128805	176	2.4	65.8	+	+	-
LA 128805	185	3.25	111.8	+	+	-
LA 128805	199	3.25	136.8	+	+	-

Site	FS	Volume (liters)	Weight (grams)	Roots	Insects	Other
LA 128805	210	2.5	89.1	+	+	-
LA 128805	211	3.75	156.7	+	+	-
LA 128805	225	2.4	112.0	+	+	-
LA 128805	246	3	137.4	+	+	-
LA 128805	248	2.7	139.3	+	+	-
			Airport Tract			
LA 86534	916	1.90	11.4	+	+	-
LA 86534	925	2.40	20.1	+	+	-
LA 86534	1002	2.10	13.8	+	+	-
LA 86534	1170	1.40	12.6	+	+	-
LA 86534	1271	3.00	39.2	+	+	2 * bone
LA 86534	1272	4.50	49.7	+	+	rodent feces, 7 * bones
LA 86534	1273	2.65	42.2	+	+	-
LA 86534	1274	4.95	54.8	+	+	-
LA 86534	1291	3.45	23.6	+	+	-
LA 86534	1321	3.00	27.9	+	+	4 * bone, 1 u bone
LA 86534	1322	3.85	59.9	+	+	1 * bone
LA 86534	1323	3.30	22.6	+	+	rodent feces, 2 * bones
LA 86534	1324	3.00	34.3	+	+	rodent feces, 1 * bone, 1 u bone
LA 86534	1335	2.00	12.1	+	+	-
LA 86534	1353	1.90	27.7	+	+	-
LA 86534	1389	1.50	7.6	+	+	-
LA 86534	1402	3.20	49.7	+	+	1 u bone
LA 86534	1476	2.65	26.4	+	+	rodent feces
LA 86534	1509	3.20	36.1	+	+	-
LA 86534	1511	1.70	7.9	+	+	-
LA 86534	1512	2.75	27.5	+	+	rodent feces, 1 u bone, textile fragment
LA 86534	1578	2.00	7.0	+	+	-
LA 86534	1641	2.70	23.4	+	+	-
LA 86534	1650	3.80	38.9	+	+	rodent feces
LA 86534	1726	0.60	2.9	+	+	-
LA 86534	1752	3.50	13.9	+	+	-
LA 86534	1753	4.00	14.6	+	+	-
LA 86534	1761	3.35	13.3	+	+	2 u bones
LA 86534	1773	4.20	21.8	+	+	-
LA 86534	1777	2.80	14.0	+	+	-
LA 86534	1785	4.70	27.6	+	+	-
LA 86534	1860	2.10	16.3	+	+	rodent feces
LA 86534	1906	1.40	9.9	+	+	-
LA 86534	1966	2.00	7.3	+	+	-
LA 86534	1968	3.40	20.7	+	+	-

Site	FS	Volume (liters)	Weight (grams)	Roots	Insects	Other
LA 86534	1975	3.80	28.7	+	+	13 u bones
LA 86534	1990	2.80	31.1	+	+	-
LA 86534	1992	5.20	105.0	+	+	4 u bones
LA 86534	2142	5.00	75.6	+	+	2 u bones
LA 86534	2172	3.00	19.6	+	+	rodent feces
LA 86534	2176	3.00	89.8	+	+	1 u bone
LA 86534	2199	5.25	72.2	+	+	7 * bones, 6 u bones
LA 86534	2200	6.70	38.6	+	+	5 u bones
LA 86534	2201	3.20	12.6	+	+	-
LA 86534	2202	3.15	10.5	+	+	1 * bone
LA 86534	2203	3.30	9.4	+	+	-
LA 86534	2214	4.00	24.8	+	+	4 * bones
LA 86534	2215	5.30	43.2	+	+	2 * bones
LA 86534	2216	3.60	26.9	+	+	1 * bone
LA 86534	2217	3.80	15.9	+	+	-
LA 86534	2223	3.00	14.7	+	+	1 * bone
LA 86534	2226	1.60	24.6	+	+	17 u bones
LA 86534	2234	5.30	74.2	+	+	5 * bones, 4 u bones
LA 135290	985	2.0	15.8	+	+	-
LA 135290	1067	1.9	11.1	+	+	1 bone
LA 135290	1083	1.9	18.2	+	+	-
LA 135290	1096	2.15	7.2	+	+	-
LA 135290	1098	1.8	10.6	+	+	rodent feces
LA 135290	1131	2.0	9.0	+	+	-
LA 135290	1163	1.8	11.6	+	+	rodent feces
LA 135290	1179	1.95	5.9	+	+	-
LA 135290	1271	2.0	129.9	+	+	-
LA 135290	1277	2.0	9.0	+	+	-
LA 135290	1302	2.0	15.9	+	+	-
LA 135290	1329	1.4	6.5	+	+	-
LA 135290	1417	1.9	38.1	+	+	rodent feces
LA 135290	1430	1.9	14.4	+	+	-
LA 135290	1458	1.9	13.3	+	+	rodent feces
LA 135290	1589	2.1	20.0	+	+	-
LA 135290	1705	1.4	13.2	+	+	rodent feces
LA 135290	1720	2.0	9.6	+	+	-
LA 135290	1758	1.8	25.9	+	+	-
LA 135290	1797	1.9	27.7	+	+	-
LA 135290	1837	2.2	4.0	+	+	-
LA 135290	1851	2.1	3.3	+	+	-
LA 135290	1871	1.5	6.4	+	+	-
LA 135290	1878	2.0	0.2	+	-	-
LA 135290	1890	1.5	5.4	+	+	-

Site	FS	Volume (liters)	Weight (grams)	Roots	Insects	Other
LA 135290	1896	2.0	7.8	+	+	-
LA 135290	1897	2.2	19.8	+	+	rodent feces
LA 135290	1898	2.0	14.7	+	+	-
LA 135290	1999	2.1	8.0	+	+	-
LA 135290	2023	2.0	14.4	+	+	-
LA 135290	2027	2.1	10.1	+	+	rodent feces, some *
LA 135290	2034	2.4	21.7	+	+	rodent feces, 1 * tooth
LA 135290	2057	1.9	20.1	+	+	-
LA 135290	2069	2.2	9.8	+	+	rodent feces
LA 135290	2070	1.8	11.2	+	+	rodent feces
LA 135290	2083	2.0	25.8	+	+	rodent feces
LA 135290	2099	2.0	31.8	+	+	rodent feces
LA 135290	2133	1.7	17.2	+	+	-
LA 135290	2138	1.7	64.3	+	+	rodent feces, 3 u bones
LA 135290	2150	2.0	14.7	+	+	-
LA 135290	2188	1.0	0.7	+	+	-
LA 135290	2219	1.4	4.6	+	+	-
LA 135290	2232	2.0	9.9	+	+	-
LA 135290	2253	2.3	9.6	+	+	rodent feces
LA 135290	2254	2.8	17.5	+	+	rodent feces
LA 135290	2255	2.5	30.0	+	+	rodent feces, 1 u bone
LA 135290	2256	2.5	15.4	+	+	rodent feces
LA 135290	2257	2.8	16.1	+	+	rodent feces
LA 135290	2258	2.7	17.1	+	+	-
LA 135290	2299	2.3	28.7	+	+	-
LA 135290	2315	2.0	23.8	+	+	-
LA 135290	2326	2.0	21.4	+	+	rodent feces
LA 135290	2330	2.25	18.5	+	+	rodent feces
LA 135290	2331	2.0	13.7	+	+	rodent feces
LA 135290	2332	1.2	7.8	+	+	rodent feces
LA 135290	2350	2.5	17.9	+	+	-
LA 135290	2376	.20	1.8	+	+	rodent feces
LA 135290	2378	.50	4.2	+	+	rodent feces
LA 135290	2420	1.7	11.9	+	+	-
LA 135290	2471	1.9	8.7	+	+	-
LA 135290	2472	1.8	10.7	+	+	-
LA 135290	2473	1.9	21.5	+	+	-
LA 135290	2474	3.0	16.4	+	+	1 * bone
LA 135290	2475	3.0	25.0	+	+	-
LA 135290	2477	1.5	10.7	+	+	-
LA 135290	2488	3.0	20.1	+	+	-
LA 135290	2489	2.5	13.0	+	+	-

Site	**FS**	**Volume (liters)**	**Weight (grams)**	**Roots**	**Insects**	**Other**
LA 135290	2490	2.7	19.1	+	+	-
LA 135290	2491	2.0	9.2	+	+	-
LA 135290	2492	2.6	22.0	+	+	-
LA 135290	2496	1.3	3.1	+	+	rodent feces
LA 135290	2526	1.9	4.9	+	+	-
LA 135290	2528	2.8	23.2	+	+	-
LA 135290	2549	2.7	18.5	+	+	rodent feces
LA 135290	2556	2.2	4.1	+	+	-
LA 135290	2561	2.2	3.3	+	+	2 * bones
LA 135290	2563	2.2	23.2	+	+	rodent feces
LA 135290	2564	2.1	7.6	+	+	-
LA 135290	2584	1.9	1.9	+	-	-
LA 139418	318	1.75	10.5	+	+	-
LA 139418	341	1.75	11.8	+	+	-
LA 139418	363	2.0	0.7	+	-	-
LA 139418	364	1.7	3.8	+	-	-
LA 139418	365	1.6	2.6	+	-	-
LA 139418	367	1.75	14.5	+	+	-
LA 141505	22	2.2	32.8	+	+	rodent feces
LA 141505	74	1.8	19.9	+	+	-
LA 141505	82	2.0	17.2	+	+	-
Rendija Tract						
LA 15116	31	2	104.6	+	+	-
LA 15116	59	2	99.1	+	+	-
LA 15116	60	2	128.5	+	+	-
LA 70025	21	2	15.7	+	+	-
LA 70025	24	2	14.6	+	+	-
LA 70025	43	1.75	14.7	+	+	-
LA 85403	18	3	23.1	+	+	-
LA 85403	23	2.25	9.6	+	+	-
LA 85403	24	2	8	+	+	-
LA 85403	27	2.75	13.7	+	+	-
LA 85403	49	2.25	14	+	+	-
LA 85403	53	3	25	+	+	-
LA 85404	68	1.9	21.4	+	+	-
LA 85404	72	1.75	27.9	+	+	-
LA 85404	93	1.5	20.6	+	+	-
LA 85404	94	1.75	12.2	-	+	-
LA 85404	106	1.25	12.8	+	+	-
LA 85407	269	2.0	58.6	+	+	rodent feces
LA 85407	298	2.0	65.7	+	+	rodent feces
LA 85407	301	2.0	52.6	+	+	rodent feces*
LA 85407	331	2.0	77.7	+	+	rodent feces

Site	FS	Volume (liters)	Weight (grams)	Roots	Insects	Other
LA 85407	352	2.0	93.7	+	+	rodent feces
LA 85407	357	2.0	3.9	+	+	-
LA 85407	408	2.0	37.3	+	+	-
LA 85407	499	2.0	55.8	+	+	rodent feces
LA 85408	41	2.0	65.7	+	+	-
LA 85408	42	2.0	186.6	+	+	-
LA 85408	57	2.5	103	+	+	-
LA 85411	76	2.0	13.3	+	+	-
LA 85411	77	2.0	22.8	-	+	-
LA 85411	78	2.0	11	-	+	-
LA 85411	111	1.75	21.2	-	+	-
LA 85411	112	1.75	12	+	+	-
LA 85411	118	1.75	19.8	-	+	-
LA 85411	136	1.5	8.7	+	+	-
LA 85411	137	2.0	40.2	+	+	-
LA 85411	138	1.25	13	-	+	-
LA 85411	178	1.8	21.3	+	+	-
LA 85413	149	2.0	44.7	+	+	-
LA 85413	224	2.0	20.7	+	+	-
LA 85414	57	2.0	38.8	+	+	-
LA 85414	58	2.0	48.1	+	+	-
LA 85417	71	2.0	5.3	+	+	-
LA 85417	72	2.0	2.5	+	+	-
LA 85417	114	2.0	26	+	+	-
LA 85417	141	2.0	24.1	+	+	-
LA 85417	142	2.0	38.3	+	+	-
LA 85859	108	2.0	26.9	+	+	-
LA 85859	123	1.75	81.6	+	+	-
LA 85859	136	1.5	118.4	+	-	-
LA 85859	143	2.0	64.4	+	-	-
LA 85859	308	2.0	37.1	+	+	-
LA 85859	310	2.0	121.6	+	+	-
LA 85859	311	1.5	70.7	+	+	-
LA 85859	312	2.0	56.1	+	-	-
LA 85859	313	2.0	63.7	+	+	-
LA 85859	314	2.0	25.8	+	+	-
LA 85859	315	1.25	63.6	+	+	-
LA 85859	346	2.0	8.1	+	-	-
LA 85859	348	2.3	43.9	+	+	-
LA 85859	349	2.1	86.8	+	-	-
LA 85859	350	2.0	58.6	+	-	-
LA 85859	351	1.75	73.5	+	-	-
LA 85859	352	1.65	88.5	+	-	-

Site	FS	Volume (liters)	Weight (grams)	Roots	Insects	Other
LA 85859	353	1.75	39.7	+	+	-
LA 85859	354	2.0	99.5	+	-	-
LA 85859	355	1.75	41.4	+	+	-
LA 85861	191	2.0	62.6	-	+	-
LA 85861	192	2.0	43.4	+	+	-
LA 85861	193	2.0	129.8	+	+	-
LA 85861	194	2.0	33.8	+	+	-
LA 85864	4	2.5	42.3	+	+	-
LA 85864	5	2.2	44.2	+	+	-
LA 85864	6	1.25	17.1	+	+	-
LA 85864	10	2.4	114.6	+	+	-
LA 85864	14	2.2	24.2	+	+	-
LA 85867	78	2.5	7.9	+	+	-
LA 85867	79	2.5	10.3	+	+	-
LA 85869	272	1.0	25.6	+	+	-
LA 85869	283	2.0	22.6	+	+	-
LA 85869	288	1.8	40.8	+	+	-
LA 85869	295	1.0	10.8	+	+	-
LA 85869	296	2.8	58.7	+	+	-
LA 85869	297	3.0	60.3	+	+	rodent feces
LA 85869	318	1.2	25.4	+	+	-
LA 86605	77	2	11.7	+	+	-
LA 86605	94	2	7.3	+	+	-
LA 86605	107	1.5	50.6	+	+	-
LA 86606	85	2.0	14.7	+	+	-
LA 86606	91	2.0	18	+	+	-
LA 86606	92	2.0	19.7	+	+	-
LA 86607	9	2.0	7.3	+	+	-
LA 87403	26	1.75	12	+	+	-
LA 87403	122	1.75	14.6	+	+	-
LA 87403	138	1.75	6.3	+	+	-
LA 87403	139	2	9.3	+	+	-
LA 87403	143	1.75	18.7	+	+	-
LA 87403	170	2	15.3	+	+	-
LA 87403	171	2	16.7	+	+	-
LA 87403	172	1.75	27.4	+	+	+
LA 87403	173	1.25	8.8	+	+	-
LA 87403	175	1.75	6.9	+	+	+
LA 87403	176	1.75	12.5	+	+	-
LA 87403	177	2	15	+	+	-
LA 99396	438	1.6	12.3	+	+	-
LA 99396	493	1.9	29.0	+	+	-
LA 99396	608	2.5	42.9	+	+	-

Site	FS	Volume (liters)	Weight (grams)	Roots	Insects	Other
LA 99396	712	2.2	15.1	+	+	-
LA 99396	753	1.6	2.5	+	+	-
LA 99396	758	1.6	3.7	+	+	-
LA 99397	301	1.1	15.1	+	+	rodent feces
LA 99397	302	1.4	17.3	+	+	-
LA 99397	313	1.5	16.0	+	+	-
LA 99397	314	1.3	29.6	+	+	-
LA 99397	315	1.8	13.2	+	+	-
LA 99397	316	1.2	0.6	+	+	-
LA 99397	331	1.5	7.4	+	+	-
LA 127627	9	1	15.9	+	+	-
LA 127627	31	2	18.8	+	+	-
LA 127627	52	1.75	30.5	+	+	-
LA 127633	4	3	183.6	+	+	-
LA 127633	6	2	66.4	+	+	-
LA 127633	10	2	32.7	+	+	-
LA 127633	14	2	88.3	+	+	-
LA 127634	39	1.8	148.8	+	+	-
LA 127634	84	1.75	106.3	+	+	-
LA 127634	105	2	29.1	+	+	-
LA 127634	106	2	37.3	+	+	-
LA 127634	107	2	46.8	+	+	-
LA 127634	108	2	35.8	+	+	-
LA 127634	109	2.1	43.9	+	+	-
LA 127634	110	2	27.8	+	+	-
LA 127634	111	1.5	13.6	+	+	-
LA 127634	112	2	21.4	+	+	-
LA 127634	117	2	38.7	+	+	-
LA 127634	120	2	41.8	+	+	-
LA 127634	121	3	44.3	+	+	-
LA 127634	122	2	47	+	+	-
LA 127635	45	2.75	62.8	+	+	-
LA 127635	53	1.75	62.1	+	+	-
LA 127635	105	3.25	48.2	+	+	-
LA 127635	116	2	46.8	+	+	-
LA 127635	123	1.75	16.7	+	+	-
LA 127635	124	1.5	11.6	+	+	-
LA 127635	125	2	23.9	+	+	+
LA 127635	126	1.6	11.1	+	+	-
LA 127635	135	1.75	25.6	+	+	-
LA 127635	141	2	27.9	+	+	-
LA 135291	30	2	26.2	+	+	+
LA 135291	32	2	21.5	+	+	+

Site	FS	Volume (liters)	Weight (grams)	Roots	Insects	Other
LA 135291	58	3.0	32.9	+	+	rodent feces
LA 135291	59	2.75	24.7	+	+	rodent feces
LA 135291	61	2.75	9.7	+	+	-
LA 135291	69	1.25	10.0	+	+	-
LA 135292	77	1.75	3.3	+	+	-
LA 135292	83	2	5.4	+	+	-
LA 135292	87	2	3.5	+	+	-
Testing TA-74						
LA 21596B	13	1.1	17.1	+	+	-
LA 21596B	14	1.3	12.3	+	+	-
LA 21596B	23	1.5	11.6	+	+	-
LA 21596B	28	1.5	10.9	+	+	-
LA 21596B	31	1.8	15.7	+	+	rodent feces
LA 21596B	32	2.0	15.2	+	+	rodent feces
LA 21596C	16	2.0	7.6	+	+	-
LA 21596C	17	1.9	13.4	+	+	-
LA 21596C	21	2.0	195.9	+	+	rodent feces
LA 21596C	22	1.4	22.8	+	+	-
LA 21596C	25	2.0	52.5	+	+	-
LA 21596C	26	1.7	23.3	+	+	-
LA 86528	7	1.1	4.9	+	+	-
LA 86531	1	2.4	24.9	+	+	-
LA 86531	6	2.2	36.5	+	+	-
LA 110126	13	2.0	11.0	+	+	-
LA 110126	14	2.1	9.4	+	+	rodent feces
LA 110130	11	1.5	4.4	+	+	-
LA 110130	13	1.4	3.2	+	+	-
LA 110130	15	1.6	4.7	+	+	-
LA 110130	17	1.8	5.2	+	+	-
LA 110130	26	1.3	10.9	+	+	-
White Rock Y						
LA 61034	28	1.5	1.7	+	+	-
LA 61034	29	0.7	2.0	+	+	-
LA 61035	56	2.4	17.2	+	+	-
LA 61035	58	2.2	21.6	+	+	-

APPENDIX T
C&T FLOTATION RESULTS

Table T.1. C&T flotation results.

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	632	*Artemisia tridentata*	Big sagebrush	Leaf	Positive	Uncharred	0	0	1-10/liter
12587	632	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	632	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	632	*Helianthus*	Sunflower	Achene	Positive	Uncharred	0	0	1-10/liter
12587	632	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	632	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	632	*Pinus*	Pine	Female cone	Positive	Uncharred	0	0	1-10/liter
12587	632	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
12587	632	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
12587	632	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
12587	632	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
12587	632	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	632	*PlatyOpuntia*	Prickly pear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	632	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	632	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	632	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	2(0)	0	N/A
12587	632	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	0	N/A
12587	632	*Zea mays*	Maize	Embryo	Positive	Charred	2(1)	0	N/A
12587	632	*Zea mays*	Maize	Kernel	Positive	Charred	10(10)	0	N/A
12587	641	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
12587	641	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	641	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	641	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	641	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
12587	641	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	641	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	641	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	641	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	641	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
12587	641	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	656	*Artemisia tridentata*	Big sagebrush	Leaf	Positive	Uncharred	0	0	1-10/liter
12587	656	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	656	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	656	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	656	*Juniperus*	Juniper	Seed	Positive	Charred	1(0)	0	N/A
12587	656	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	656	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	656	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	656	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	656	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	656	*Zea mays*	Maize	Kernel	Fairly certain	Charred	4(0)	0	N/A
12587	695	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	695	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	695	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
12587	695	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	695	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
12587	695	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
12587	695	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	695	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	695	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	695	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	695	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	695	*Zea mays*	Maize	Cupule	Positive	Charred	2(1)	0	N/A
12587	695	*Zea mays*	Maize	Kernel	Positive	Charred	2(0)	0	N/A
12587	708	*Artemisia tridentata*	Big sagebrush	Leaf	Positive	Uncharred	0	0	1-10/liter
12587	708	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	708	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	708	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	708	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	708	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	708	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	708	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
12587	708	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0	N/A
12587	758	*Atriplex/*	Saltbush/	Wood	Positive	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
		Sarcobatus	greasewood						
12587	758	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	758	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	758	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	758	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	758	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	758	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	758	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
12587	758	*Zea mays*	Maize	Kernel	Resembles taxon	Charred	2(0)	0	N/A
12587	881	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	881	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	881	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
12587	881	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	881	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	881	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
12587	881	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	881	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	881	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	881	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	881	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	881	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	881	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	881	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
12587	881	*Zea mays*	Maize	Kernel	Resembles taxon	Charred	1(0)	0	N/A
12587	956	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A
12587	956	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	956	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	956	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	956	*Juniperus*	Juniper	Wood	Positive	Charred	10	0.1	N/A
12587	956	*Pinus*	Pine	Wood	Positive	Charred	3	<0.1	N/A
12587	956	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	956	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	956	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	956	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	956	*Zea mays*	Maize	Embryo	Positive	Charred	7(2)	0	N/A
12587	956	*Zea mays*	Maize	Kernel	Positive	Charred	17(1)	0	N/A
12587	957	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	957	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	957	*Chrysothamnus*	Rabbitbrush	Wood	Fairly certain	Charred	4	<0.1	N/A
12587	957	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	957	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.1	N/A
12587	957	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	957	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	957	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.1	N/A
12587	957	*Oenothera*	Evening primrose	Seed	Positive	Uncharred	0	0	1-10/liter
12587	957	*Physalis*	Groundcherry	Seed	Positive	Charred	1(1)	0	N/A
12587	957	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	957	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	957	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
12587	957	*PlatyOpuntia*	Prickly pear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	957	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	957	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	957	*Zea mays*	Maize	Cupule	Positive	Charred	8(1)	0	N/A
12587	957	*Zea mays*	Maize	Embryo	Positive	Part. Charred	5(1)	0	N/A
12587	957	*Zea mays*	Maize	Kernel	Positive	Charred	25(2)	0	N/A
12587	1000	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	1000	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	1000	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1	N/A
12587	1000	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1000	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1000	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
12587	1000	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1000	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
12587	1000	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	1000	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	1000	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	1000	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	<0.1	N/A
12587	1000	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	1000	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1000	*Zea mays*	Maize	Cupule	Positive	Charred	10(0)	0	N/A
12587	1000	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0	N/A
12587	1000	*Zea mays*	Maize	Embryo	Positive	Part. Charred	2(0)	0	N/A
12587	1000	*Zea mays*	Maize	Kernel	Positive	Charred	13(1)	0	N/A
12587	1064	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	1064	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	1064	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1064	*Cucurbita*	Squash/ coyote gourd	Rind	Resembles taxon	Charred	0	0	1-10/liter
12587	1064	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1	N/A
12587	1064	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	1064	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1064	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.1	N/A
12587	1064	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	1064	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	1064	*Portulaca*	Purslane	Seed	Positive	Charred	2(2)	0	N/A
12587	1064	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1064	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	1064	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1064	*Zea mays*	Maize	Cupule	Positive	Charred	2(1)	0	N/A
12587	1064	*Zea mays*	Maize	Kernel	Positive	Charred	1(0)	0	N/A
12587	1092	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	1092	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	1092	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	1092	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1092	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1092	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	1092	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1092	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	1092	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	1092	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	1092	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	1092	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1092	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1092	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	1092	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
12587	1092	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
12587	1092	*Zea mays*	Maize	Kernel	Fairly certain	Charred	5(0)	0	N/A
12587	1200	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	1200	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	1200	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1200	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1200	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
12587	1200	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
12587	1200	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	1200	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	1200	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1200	Rosaceae	Rose family	Wood	Positive	Charred	1	<0.1	N/A
12587	1200	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	1200	*Zea mays*	Maize	Cupule	Positive	Charred	6(0)	0	N/A
12587	1200	*Zea mays*	Maize	Embryo	Positive	Part. Charred	2(0)	0	N/A
12587	1200	*Zea mays*	Maize	Kernel	Positive	Charred	8(0)	0	N/A
12587	1280	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1280	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1280	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	1280	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1280	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	1280	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
12587	1280	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
12587	1280	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
12587	1280	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	1280	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1280	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
12587	1485	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	1485	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	1485	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
12587	1485	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1485	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.1	N/A
12587	1485	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	1485	*Juniperus*	Juniper	Wood	Positive	Charred	8	0.1	N/A
12587	1485	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	1485	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	1485	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.1	N/A
12587	1485	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
12587	1485	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1	N/A
12587	1485	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1485	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1	N/A
12587	1485	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1485	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1485	*Zea mays*	Maize	Cupule	Positive	Charred	10(0)	0	N/A
12587	1485	*Zea mays*	Maize	Kernel	Positive	Charred	5(3)	0	N/A
12587	1493	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	1493	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1493	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1493	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	1493	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1493	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	1493	*Juniperus*	Juniper	Wood	Positive	Charred	6	0.1	N/A
12587	1493	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
12587	1493	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	1493	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	1493	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	1493	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1493	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1493	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	1493	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	1493	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
12587	1493	*Zea mays*	Maize	Embryo	Positive	Charred	1(0)	0	N/A
12587	1579	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1579	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1579	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
12587	1579	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1579	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
12587	1579	*Physalis*	Groundcherry	Seed	Positive	Charred	1(1)	0	N/A
12587	1579	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	1579	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	1579	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	1579	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1579	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1579	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	1579	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
12587	1579	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
12587	1579	*Zea mays*	Maize	Kernel	Fairly certain	Charred	6(0)	0	N/A
12587	1593	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	1593	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	1593	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1593	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1593	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	1593	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	1593	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
12587	1593	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	1593	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1593	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1593	*Zea mays*	Maize	Cupule	Positive	Charred	8(2)	0	N/A
12587	1699	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	1699	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	1699	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1699	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(0)	0	N/A
12587	1699	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	1699	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	1699	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1699	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	1699	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
12587	1699	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
12587	1699	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
12587	1699	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	1699	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	1699	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1699	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
12587	1726	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	1726	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1726	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
12587	1726	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1726	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	<0.1	N/A
12587	1726	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	1726	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
12587	1726	*Physalis*	Groundcherry	Seed	Positive	Charred	1(1)	0	N/A
12587	1726	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	1726	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	1726	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	1726	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	1726	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	<0.1	N/A
12587	1726	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1726	*Zea mays*	Maize	Cupule	Positive	Charred	6(1)	0	N/A
12587	1886	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	1886	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	1886	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1886	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1886	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	1886	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.1	N/A
12587	1886	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	1886	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1	N/A
12587	1886	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	1886	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	1886	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
12587	1891	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	1891	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	1891	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1891	*Juniperus*	Juniper	Wood	Positive	Charred	9	0.2	N/A
12587	1891	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	1891	*Pinus edulis*	Piñon	Wood	Positive	Charred	8	0.1	N/A
12587	1891	*Zea mays*	Maize	Cupule	Positive	Charred	7(2)	0	N/A
12587	1891	*Zea mays*	Maize	Kernel	Resembles taxon	Charred	2(0)	0	N/A
12587	1917	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	1917	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	1917	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	1917	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1917	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1917	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	1917	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	1917	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
12587	1917	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	1917	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	1917	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	1917	*Zea mays*	Maize	Cupule	Positive	Charred	8(2)	0	N/A
12587	2040	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2040	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2040	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2040	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2040	*Juniperus*	Juniper	Wood	Positive	Charred	5	0.1	N/A
12587	2040	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2040	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2040	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1	N/A
12587	2040	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	2040	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2040	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2040	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
12587	2080	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
12587	2080	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	2080	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	2080	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	2080	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2080	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2080	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
12587	2080	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	2080	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.1	N/A
12587	2080	*Pinus*	Pine	Cone scale	Positive	Charred	1(0)	0	N/A
12587	2080	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2080	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	3	<0.1	N/A
12587	2080	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	5	0.1	N/A
12587	2080	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2080	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	3	<0.1	N/A
12587	2080	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	1(1)	0	N/A
12587	2080	*Zea mays*	Maize	Cupule	Positive	Charred	16(2)	0	N/A
12587	2080	*Zea mays*	Maize	Embryo	Positive	Charred	4(0)	0	N/A
12587	2080	Zea mays	Maize	Kernel	Fairly certain	Charred	14(0)	0	N/A
12587	2107	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	3	<0.1	N/A
12587	2107	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	2107	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2107	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2107	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
12587	2107	*Juniperus*	Juniper	Wood	Positive	Charred	8	0.1	N/A
12587	2107	*Pinus*	Pine	Wood	Positive	Charred	2	0.1	N/A
12587	2107	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2107	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	2107	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	2107	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	<0.1	N/A
12587	2107	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2107	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	2107	*Zea mays*	Maize	Cupule	Positive	Charred	36(13)	0	N/A
12587	2107	*Zea mays*	Maize	Embryo	Positive	Charred	17(10)	0	N/A
12587	2107	*Zea mays*	Maize	Kernel	Positive	Charred	475(124)	0	N/A
12587	2248	*Artemisia*	Sagebrush	Wood	Positive	Charred	2	<0.1	N/A
12587	2248	*Atriplex canescens*	Four-wing saltbush	Fruit	Positive	Charred	1(0)	0	N/A
12587	2248	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2248	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2248	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2248	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	2248	*Juniperus*	Juniper	Wood	Positive	Charred	6	<0.1	N/A
12587	2248	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	2248	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	2248	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2248	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	2248	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	2248	*Zea mays*	Maize	Cupule	Positive	Charred	14(2)	0	N/A
12587	2397	*Amaranthus*	Pigweed	Seed	Positive	Charred	2(2)	0	N/A
12587	2397	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2397	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
12587	2397	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
12587	2397	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	2397	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2397	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
12587	2397	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	3(3)	0	N/A
12587	2397	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
12587	2551	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(0)	0	N/A
12587	2551	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2551	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2551	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.1	N/A
12587	2551	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2551	*Juniperus*	Juniper	Wood	Positive	Charred	6	0.1	N/A
12587	2551	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2551	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2551	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly	Charred	3	0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
					certain				
12587	2551	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2551	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2551	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1	N/A
12587	2551	Rosaceae	Rose family	Wood	Positive	Charred	1	<0.1	N/A
12587	2551	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	2(2)	0	N/A
12587	2551	*Zea mays*	Maize	Cupule	Fairly certain	Part. Charred	2(0)	0	N/A
12587	2551	*Zea mays*	Maize	Cupule	Positive	Charred	24(2)	0	N/A
12587	2551	*Zea mays*	Maize	Cupule segment	Positive	Charred	7(7)	0	N/A
12587	2551	*Zea mays*	Maize	Embryo	Positive	Part. Charred	15(7)	0	N/A
12587	2551	*Zea mays*	Maize	Kernel	Positive	Charred	115(18)	0	N/A
12587	2555	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	2555	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2555	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2555	*Foresteria*	Desert olive	Wood	Positive	Charred	5	0.2	N/A
12587	2555	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.1	N/A
12587	2555	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2555	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.1	N/A
12587	2555	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2555	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2555	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	5	0.1	N/A
12587	2555	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2555	*Rhus*	Sumac	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	2555	*Zea mays*	Maize	Cob	Positive	Charred	2(0)	0	N/A
12587	2555	*Zea mays*	Maize	Cupule	Positive	Charred	138(128)	0	N/A
12587	2555	*Zea mays*	Maize	Cupule segment	Positive	Charred	34(34)	0	N/A
12587	2555	*Zea mays*	Maize	Embryo	Positive	Charred	30(26)	0	N/A
12587	2555	*Zea mays*	Maize	Kernel	Positive	Charred	938(350)	0	N/A
12587	2564	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	2564	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2564	*Gymnospermae*	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
12587	2564	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	2564	*Juniperus*	Juniper	Wood	Positive	Charred	9	0.2	N/A
12587	2564	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	2564	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2564	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2564	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	2564	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.1	N/A
12587	2564	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1	N/A
12587	2564	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2564	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2564	*Zea mays*	Maize	Cupule	Positive	Charred	7(1)	0	N/A
12587	2564	*Zea mays*	Maize	Kernel	Positive	Part. Charred	2(0)	0	N/A
12587	2571	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2571	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2571	*Juniperus*	Juniper	Wood	Positive	Charred	8	0.1	N/A
12587	2571	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2571	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	<0.1	N/A
12587	2571	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	1	<0.1	N/A
12587	2571	Unknown # 1	Unknown # 1	Unknown	Positive	Charred	1(0)	0	N/A
12587	2571	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	2571	*Zea mays*	Maize	Cupule	Positive	Charred	11(0)	0	N/A
12587	2592	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1	N/A
12587	2592	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2592	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	3(3)	0	N/A
12587	2592	*Descurainia/ Sisymbrium*	Mustard	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2592	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2592	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.1	N/A
12587	2592	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2592	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.1	N/A
12587	2592	*Oryzopsis hymenoides*	Ricegrass	Caryopsis	Positive	Charred	1(1)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2592	*Oryzopsis hymenoides*	Ricegrass	Wood	Positive	Charred	4	0.3	N/A
12587	2592	*Pinus*	Pine	Wood	Positive	Charred	4	0.3	N/A
12587	2592	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2592	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2592	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	3	0.1	N/A
12587	2592	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2592	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	2592	Unknown # 3	Unknown # 3	Unknown	Positive	Charred	1(0)	0	N/A
12587	2592	*Zea mays*	Maize	Cupule	Positive	Charred	40(25)	0	N/A
12587	2592	*Zea mays*	Maize	Cupule segment	Positive	Charred	9(9)	0	N/A
12587	2592	*Zea mays*	Maize	Embryo	Positive	Charred	5(2)	0	N/A
12587	2592	*Zea mays*	Maize	Kernel	Positive	Charred	179(83)	0	N/A
12587	2630	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	2630	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2630	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	2630	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2630	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2630	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
12587	2630	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2630	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.1	N/A
12587	2630	*Nicotiana*	Tobacco	Seed	Positive	Charred	1(1)	0	N/A
12587	2630	*Pinus*	Pine	Wood	Positive	Charred	3	<0.1	N/A
12587	2630	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2630	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	2630	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	2	<0.1	N/A
12587	2630	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	2630	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2630	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	2630	*Zea mays*	Maize	Cupule	Positive	Charred	7(3)	0	N/A
12587	2632	*Atriplex canescens*	Four-wing saltbush	Fruit	Positive	Charred	1(0)	0	N/A
12587	2632	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2632	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2632	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	2632	*Juniperus*	Juniper	Wood	Positive	Charred	13	0.2	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2632	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
12587	2632	*Pinus*	Pine	Wood	Positive	Charred	5	<0.1	N/A
12587	2632	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	2632	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2632	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	2632	*PlatyOpuntia*	Pricklypear cactus	Seed	Fairly certain	Charred	1(0)	0	N/A
12587	2632	*Portulaca*	Purslane	Seed	Fairly certain	Charred	1(1)	0	N/A
12587	2632	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2632	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2632	Unidentifiable	Unidentifiable	Seed	Positive	Charred	1(1)	0	N/A
12587	2632	*Zea mays*	Maize	Cupule	Positive	Charred	14(2)	0	N/A
12587	2632	*Zea mays*	Maize	Kernel	Positive	Charred	5(0)	0	N/A
12587	2635	*Corispermum*	Bugseed	Seed	Positive	Charred	1(1)	0	N/A
12587	2635	Gramineae	Grass family	Caryopsis	Positive	Charred	2(2)	0	N/A
12587	2635	*Juniperus*	Juniper	Wood	Positive	Charred	11	0.3	N/A
12587	2635	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	2635	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.2	N/A
12587	2635	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	3	0.1	N/A
12587	2635	*Portulaca*	Purslane	Seed	Positive	Charred	4(4)	0	N/A
12587	2635	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2635	Unidentifiable	Unidentifiable	Seed	Positive	Charred	1(1)	0	N/A
12587	2635	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	0	N/A
12587	2635	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0	N/A
12587	2644	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2644	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	2644	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2644	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	2(2)	0	N/A
12587	2644	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2644	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.1	N/A
12587	2644	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
12587	2644	Labiatae	Mint family	Seed	Positive	Part.	1(1)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
						Charred			
12587	2644	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	4	<0.1	N/A
12587	2644	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2644	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	10	0.3	N/A
12587	2644	*Portulaca*	Purslane	Seed	Positive	Charred	2(2)	0	N/A
12587	2644	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2644	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2644	*Sporobolus*	Dropseed grass	Caryopsis	Fairly certain	Charred	1(1)	0	N/A
12587	2644	*Zea mays*	Maize	Cupule	Positive	Charred	18(1)	0	N/A
12587	2644	*Zea mays*	Maize	Embryo	Positive	Charred	3(3)	0	N/A
12587	2644	*Zea mays*	Maize	Embryo	Positive	Part. Charred	1(1)	0	N/A
12587	2644	*Zea mays*	Maize	Kernel	Positive	Charred	182(42)	0	N/A
12587	2645	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2645	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2645	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2645	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2645	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
12587	2645	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2645	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
12587	2645	*Pinus*	Pine	Wood	Positive	Charred	6	<0.1	N/A
12587	2645	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
12587	2645	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2645	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	0.1	N/A
12587	2645	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
12587	2645	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2645	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	2(2)	0	N/A
12587	2645	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	2645	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
12587	2645	*Zea mays*	Maize	Embryo	Positive	Charred	3(0)	0	N/A
12587	2645	*Zea mays*	Maize	Kernel	Positive	Charred	82(10)	0	N/A
12587	2646	*Artemisia*	Sagebrush	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	2646	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2646	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2646	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Part. Charred	1(1)	0	N/A
12587	2646	*Echinocereus*	Hedgehog cactus	Seed	Positive	Charred	1(1)	0	N/A
12587	2646	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2646	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.1	N/A
12587	2646	*Juniperus*	Juniper	Wood	Positive	Charred	3	<0.1	N/A
12587	2646	Labiatae	Mint family	Seed	Positive	Charred	1(1)	0	N/A
12587	2646	*Physalis*	Groundcherry	Seed	Positive	Charred	1(1)	0	N/A
12587	2646	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	2646	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	0.1	N/A
12587	2646	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2646	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1	N/A
12587	2646	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2646	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	4(4)	0	N/A
12587	2646	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	2646	*Zea mays*	Maize	Cupule	Positive	Charred	9(4)	0	N/A
12587	2646	*Zea mays*	Maize	Embryo	Positive	Charred	5(2)	0	N/A
12587	2646	*Zea mays*	Maize	Embryo	Positive	Part. Charred	1(0)	0	N/A
12587	2646	*Zea mays*	Maize	Kernel	Positive	Charred	24(0)	0	N/A
12587	2666	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2666	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2666	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	2666	*Juniperus*	Juniper	Wood	Positive	Charred	5	0.1	N/A
12587	2666	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	2666	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2666	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2666	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	4(4)	0	N/A
12587	2666	*Zea mays*	Maize	Cupule	Positive	Charred	7(1)	0	N/A
12587	2666	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0	N/A
12587	2666	*Zea mays*	Maize	Kernel	Positive	Charred	16(2)	0	N/A
12587	2667	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	2667	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2667	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2667	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.2	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2667	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	2667	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2667	*Pinus edulis*	Piñon	Wood	Positive	Charred	10	0.3	N/A
12587	2667	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	<0.1	N/A
12587	2667	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2667	*Portulaca*	Purslane	Seed	Positive	Charred	2(2)	0	N/A
12587	2667	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2667	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	1(1)	0	N/A
12587	2667	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	2667	*Zea mays*	Maize	Cupule	Positive	Charred	8(2)	0	N/A
12587	2667	*Zea mays*	Maize	Embryo	Positive	Part. Charred	2(0)	0	N/A
12587	2667	*Zea mays*	Maize	Kernel	Positive	Charred	25(4)	0	N/A
12587	2668	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2668	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A
12587	2668	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2668	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2668	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2668	*Juniperus*	Juniper	Wood	Positive	Charred	6	0.1	N/A
12587	2668	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
12587	2668	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2668	*Pinus edulis*	Piñon	Wood	Positive	Charred	10	0.3	N/A
12587	2668	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2668	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2668	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	2668	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
12587	2668	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	0	N/A
12587	2668	*Zea mays*	Maize	Embryo	Positive	Part. Charred	2(0)	0	N/A
12587	2668	*Zea mays*	Maize	Glume	Positive	Charred	1(1)	0	N/A
12587	2668	*Zea mays*	Maize	Kernel	Positive	Charred	22(4)	0	N/A
12587	2673	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2673	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2673	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	2673	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2680	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2680	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(0)	0	N/A
12587	2680	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2680	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2680	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1	N/A
12587	2680	*Juniperus*	Juniper	Wood	Positive	Charred	8	0.1	N/A
12587	2680	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	2680	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	2680	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	2680	*Zea mays*	Maize	Cupule	Positive	Charred	6(2)	0	N/A
12587	2697	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2697	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
12587	2697	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2697	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2697	*Juniperus*	Juniper	Wood	Positive	Charred	10	0.3	N/A
12587	2697	Labiatae	Mint family	Seed	Positive	Charred	1(1)	0	N/A
12587	2697	*Pinus*	Pine	Wood	Positive	Charred	3	0.1	N/A
12587	2697	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2697	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	0.3	N/A
12587	2697	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2697	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2697	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	2697	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	2697	Unidentifiable	Unidentifiable	Unknown	Positive	Part. Charred	1(0)	0	N/A
12587	2697	*Zea mays*	Maize	Cupule	Positive	Charred	20(5)	0	N/A
12587	2697	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	0	N/A
12587	2697	*Zea mays*	Maize	Kernel	Positive	Charred	35(7)	0	N/A
12587	2697	*Zea mays*	Maize	Kernel	Positive	Part. Charred	1(1)	0	N/A
12587	2698	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	2698	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2698	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2698	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2698	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1	N/A
12587	2698	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2698	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
12587	2698	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2698	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A
12587	2698	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	2698	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2698	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2698	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	2698	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	2698	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
12587	2698	*Zea mays*	Maize	Kernel	Positive	Charred	12(2)	0	N/A
12587	2711	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	2711	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	2711	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2711	*Echinocereus*	Hedgehog cactus	Seed	Positive	Charred	1(1)	0	N/A
12587	2711	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2711	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	2711	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
12587	2711	*Physalis*	Groundcherry	Seed	Positive	Charred	1(1)	0	N/A
12587	2711	*Pinus*	Pine	Wood	Positive	Charred	1	0.1	N/A
12587	2711	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	2711	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	2711	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2711	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	10(10)	0	N/A
12587	2711	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	2711	*Zea mays*	Maize	Cupule	Positive	Charred	10(2)	0	N/A
12587	2711	*Zea mays*	Maize	Embryo	Positive	Charred	1(0)	0	N/A
12587	2711	*Zea mays*	Maize	Embryo	Positive	Part. Charred	1(0)	0	N/A
12587	2711	*Zea mays*	Maize	Glume	Positive	Charred	17(17)	0	N/A
12587	2711	*Zea mays*	Maize	Kernel	Positive	Charred	17(0)	0	N/A
12587	2714	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
12587	2714	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2714	*Artemisia*	Sagebrush	Wood	Positive	Charred	2	<0.1	N/A
12587	2714	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2714	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2714	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2714	Gymnospermae	Unknown conifer	Wood	Positive	Charred	8	0.1	N/A
12587	2714	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2714	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
12587	2714	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2714	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	4	0.2	N/A
12587	2714	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2714	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1	N/A
12587	2714	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2714	*Zea mays*	Maize	Cupule	Positive	Charred	15(6)	0	N/A
12587	2714	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0	N/A
12587	2714	*Zea mays*	Maize	Glume	Positive	Charred	1(1)	0	N/A
12587	2714	*Zea mays*	Maize	Kernel	Positive	Charred	57(13)	0	N/A
12587	2745	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	2745	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2745	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2745	*Juniperus*	Juniper	Wood	Positive	Charred	5	<0.1	N/A
12587	2745	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	0	N/A
12587	2831	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	6	0.2	N/A
12587	2831	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2831	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
12587	2831	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2831	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	2831	*Juniperus*	Juniper	Wood	Fairly certain	Charred	1	0.1	N/A
12587	2831	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2831	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1	N/A
12587	2831	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	8	2.9	N/A
12587	2831	*Quercus*	Oak	Wood	Positive	Charred	1	0.1	N/A
12587	2831	Rosaceae	Rose family	Wood	Positive	Charred	1	<0.1	N/A
12587	2831	*Zea mays*	Maize	Cob	Positive	Charred	5(4)	0	N/A
12587	2831	*Zea mays*	Maize	Cupule	Positive	Charred	77(59)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2831	*Zea mays*	Maize	Cupule segment	Positive	Charred	17(17)	0	N/A
12587	2831	*Zea mays*	Maize	Embryo	Positive	Charred	30(25)	0	N/A
12587	2831	*Zea mays*	Maize	Kernel	Positive	Charred	388(242)	0	N/A
12587	2832	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
12587	2832	*Artemisia*	Sagebrush	Wood	Positive	Charred	2	0.1	N/A
12587	2832	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2832	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2832	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
12587	2832	*Juniperus*	Juniper	Wood	Positive	Charred	5	1.0	N/A
12587	2832	*Oryzopsis hymenoides*	Ricegrass	Caryopsis	Fairly certain	Charred	1(1)	0	N/A
12587	2832	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	2832	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2832	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	7	0.2	N/A
12587	2832	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2832	*Quercus*	Oak	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	2832	*Zea mays*	Maize	Cob	Positive	Charred	2(0)	0	N/A
12587	2832	*Zea mays*	Maize	Cupule	Positive	Charred	39(33)	0	N/A
12587	2832	*Zea mays*	Maize	Cupule segment	Positive	Charred	13(13)	0	N/A
12587	2832	*Zea mays*	Maize	Embryo	Positive	Charred	20(12)	0	N/A
12587	2832	*Zea mays*	Maize	Kernel	Positive	Charred	626(356)	0	N/A
12587	2876	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2876	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2876	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2876	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	2876	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2876	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	2876	*Juniperus*	Juniper	Wood	Positive	Charred	5	<0.1	N/A
12587	2876	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	2876	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2876	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2876	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	12	0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2876	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2876	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	2876	*Zea mays*	Maize	Cupule	Positive	Charred	3(3)	0	N/A
12587	2905	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2905	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
12587	2924	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	2924	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2924	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	2924	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	2924	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
12587	2932	*Atriplex canescens*	Four-wing saltbush	Fruit	Positive	Charred	1(1)	0	N/A
12587	2932	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2932	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
12587	2932	*Juniperus*	Juniper	Wood	Positive	Charred	12	0.1	N/A
12587	2932	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2932	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
12587	2932	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1	N/A
12587	2932	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2932	*Zea mays*	Maize	Cupule	Positive	Charred	10(3)	0	N/A
12587	2932	*Zea mays*	Maize	Kernel	Fairly certain	Charred	2(0)	0	N/A
12587	2962	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	2962	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	2962	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2962	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Fairly certain	Charred	1(0)	0	N/A
12587	2962	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Part. Charred	1(1)	0	N/A
12587	2962	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2962	Gramineae	Grass family	Culm	Positive	Charred	0	0	1-10/liter
12587	2962	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2962	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	2962	*Juniperus*	Juniper	Wood	Positive	Charred	7	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2962	*Physalis*	Groundcherry	Seed	Positive	Charred	1(1)	0	N/A
12587	2962	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	2962	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	2962	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	2962	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2962	*Zea mays*	Maize	Cupule	Positive	Charred	14(1)	0	N/A
12587	2962	*Zea mays*	Maize	Kernel	Resembles taxon	Charred	1(0)	0	N/A
12587	2989	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	2989	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	2989	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2989	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2989	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.1	N/A
12587	2989	*Juniperus*	Juniper	Wood	Positive	Charred	9	0.3	N/A
12587	2989	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
12587	2989	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	2989	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.1	N/A
12587	2989	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1	N/A
12587	2989	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2989	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2989	*Zea mays*	Maize	Cupule	Positive	Charred	11(2)	0	N/A
12587	2989	*Zea mays*	Maize	Embryo	Positive	Part. Charred	1(1)	0	N/A
12587	2989	*Zea mays*	Maize	Kernel	Positive	Charred	55(20)	0	N/A
12587	2989	*Zea mays*	Maize	Kernel	Positive	Part. Charred	3(1)	0	N/A
12587	2994	Amaranthus	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2994	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	2994	Chenopodium	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2994	Chenopodium/ Amaranthus	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
12587	2994	Corispermum	Bugseed	Seed	Fairly certain	Charred	1(1)	0	N/A
12587	2994	Euphorbia	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2994	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.1	N/A
12587	2994	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	2994	*Juniperus*	Juniper	Wood	Positive	Charred	12	0.1	N/A
12587	2994	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	2994	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	2994	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	2994	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2994	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	2994	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	2994	*Zea mays*	Maize	Cupule	Positive	Charred	11(3)	0	N/A
12587	2994	*Zea mays*	Maize	Kernel	Positive	Charred	40(7)	0	N/A
12587	3000	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	3000	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3000	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3000	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3000	*Juniperus*	Juniper	Wood	Positive	Charred	3	<0.1	N/A
12587	3000	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3000	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	<0.1	N/A
12587	3000	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3000	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3000	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	0.1	N/A
12587	3000	*Zea mays*	Maize	Cupule	Positive	Charred	7(1)	0	N/A
12587	3000	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0	N/A
12587	3049	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3049	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3049	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3049	*Juniperus*	Juniper	Wood	Positive	Charred	3	<0.1	N/A
12587	3049	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3049	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	3049	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
12587	3081	*Amaranthus*	Pigweed	Seed	Positive	Charred	5(5)	0	N/A
12587	3081	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	3081	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	4	0.5	N/A
12587	3081	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	3081	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3081	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	9(7)	0	N/A
12587	3081	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Part. Charred	4(4)	0	N/A
12587	3081	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3081	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.1	N/A
12587	3081	*Juniperus*	Juniper	Wood	Positive	Charred	11	0.6	N/A
12587	3081	Monocotyledonae	Monocot	Stem	Fairly certain	Charred	0	0	1-10/liter
12587	3081	*Physalis*	Groundcherry	Seed	Positive	Charred	1(0)	0	N/A
12587	3081	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	3081	*Pinus edulis*	Piñon	Nutshell	Fairly certain	Charred	0	0	1-10/liter
12587	3081	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.1	N/A
12587	3081	*Portulaca*	Purslane	Seed	Positive	Charred	3(3)	0	N/A
12587	3081	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3081	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	3081	*Zea mays*	Maize	Cupule	Positive	Charred	32(7)	0	N/A
12587	3081	*Zea mays*	Maize	Cupule segment	Positive	Charred	2(2)	0	N/A
12587	3081	*Zea mays*	Maize	Kernel	Positive	Charred	16(6)	0	N/A
12587	3256	*Amaranthus*	Pigweed	Seed	Positive	Charred	2(2)	0	N/A
12587	3256	*Artemisia*	Sagebrush	Wood	Positive	Charred	2	<0.1	N/A
12587	3256	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	3256	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3256	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
12587	3256	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3256	*Juniperus*	Juniper	Wood	Positive	Charred	12	0.2	N/A
12587	3256	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	3256	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3256	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
12587	3256	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3256	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	3256	*Zea mays*	Maize	Cupule	Positive	Charred	26(6)	0	N/A
12587	3273	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3273	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	3273	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3273	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
12587	3273	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3273	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3273	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3273	*Nicotiana*	Tobacco	Seed	Positive	Charred	1(1)	0	N/A
12587	3273	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3273	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3273	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	18	0.5	N/A
12587	3273	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	3273	*Zea mays*	Maize	Cupule	Positive	Charred	7(0)	0	N/A
12587	3273	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0	N/A
12587	3274	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	3274	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	3274	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	<0.1	N/A
12587	3274	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3274	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
12587	3274	*Pinus*	Pine	Wood	Positive	Charred	5	0.2	N/A
12587	3274	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	3274	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3274	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	3274	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
12587	3274	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	4	0.1	N/A
12587	3274	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	3274	*Zea mays*	Maize	Cupule	Positive	Charred	8(0)	0	N/A
12587	3274	*Zea mays*	Maize	Kernel	Positive	Charred	3(0)	0	N/A
12587	3275	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	3275	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3275	*Corispermum*	Bugseed	Seed	Positive	Charred	1(1)	0	N/A
12587	3275	Gramineae	Grass family	Caryopsis	Positive	Charred	1(1)	0	N/A
12587	3275	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3275	*Juniperus*	Juniper	Wood	Positive	Charred	17	0.4	N/A
12587	3275	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3275	*Portulaca*	Purslane	Seed	Positive	Charred	2(2)	0	N/A
12587	3275	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3275	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	3275	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3275	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	1(1)	0	N/A
12587	3275	*Zea mays*	Maize	Cupule	Positive	Charred	4(1)	0	N/A
12587	3275	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0	N/A
12587	3275	*Zea mays*	Maize	Kernel	Positive	Charred	1(0)	0	N/A
12587	3276	*Artemisia*	Sagebrush	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	3276	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3276	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(0)	0	N/A
12587	3276	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	3276	*Nicotiana*	Tobacco	Seed	Positive	Charred	1(1)	0	N/A
12587	3276	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	3276	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	3276	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	16	0.4	N/A
12587	3276	*Zea mays*	Maize	Cupule	Positive	Charred	7(1)	0	N/A
12587	3277	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	0.1	N/A
12587	3277	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3277	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3277	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	3277	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	3277	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3277	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	1	<0.1	N/A
12587	3277	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	17	0.8	N/A
12587	3277	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
12587	3278	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3278	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3278	*Echinocereus*	Hedgehog cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3278	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3278	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	3278	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3278	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3278	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
12587	3278	*Pinus*	Pine	Wood	Positive	Charred	2	0.2	N/A
12587	3278	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3278	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3278	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.1	N/A
12587	3278	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3278	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3278	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	11	0.6	N/A
12587	3278	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
12587	3279	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3279	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3279	Gymnospermae	Unknown conifer	Wood	Positive	Charred	7	0.1	N/A
12587	3279	*Nicotiana*	Tobacco	Seed	Positive	Charred	1(1)	0	N/A
12587	3279	*Oenothera*	Evening primrose	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3279	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	3279	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3279	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.3	N/A
12587	3279	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	3279	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	10	0.7	N/A
12587	3280	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3280	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	0.1	N/A
12587	3280	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3280	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3280	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3280	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	11	0.5	N/A
12587	3281	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	3281	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3281	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3281	Gymnospermae	Unknown conifer	Wood	Positive	Charred	8	0.2	N/A
12587	3281	*Phaseolus*	Bean	Cotyledon	Positive	Charred	1(1)	0	N/A
12587	3281	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
12587	3281	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3281	*Pinus edulis*	Piñon	Wood	Positive	Charred	7	0.5	N/A
12587	3281	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	11-25/liter
12587	3281	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3281	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	4	0.6	N/A
12587	3281	*Zea mays*	Maize	Cupule	Positive	Charred	2(1)	0	N/A
12587	3282	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	<0.1	N/A
12587	3282	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3282	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	0	N/A
12587	3299	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3299	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
12587	3299	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	3299	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3299	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
12587	3308	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
12587	3308	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	3308	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3308	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
12587	3308	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3308	*Juniperus*	Juniper	Wood	Positive	Charred	9	0.1	N/A
12587	3308	*Oenothera*	Evening primrose	Seed	Fairly certain	Uncharred	0	0	1-10/liter
12587	3308	*Pinus*	Pine	Wood	Positive	Charred	4	<0.1	N/A
12587	3308	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	3308	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3308	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3308	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3308	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	3308	*Quercus*	Oak	Wood	Fairly certain	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3308	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3308	*Zea mays*	Maize	Cupule	Positive	Charred	18(2)	0	N/A
12587	3308	*Zea mays*	Maize	Kernel	Positive	Charred	3(0)	0	N/A
12587	3309	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3309	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	<0.1	N/A
12587	3309	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3309	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3309	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
12587	3309	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
12587	3309	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3309	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3309	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3309	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3309	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	0	N/A
12587	3319	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
12587	3319	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	3319	*Atriplex canescens*	Four-wing saltbush	Fruit	Positive	Charred	1(0)	0	N/A
12587	3319	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	3319	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(0)	0	N/A
12587	3319	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3319	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3319	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1	N/A
12587	3319	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
12587	3319	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3319	*Juniperus*	Juniper	Twig	Positive	Charred	0	0	1-10/liter
12587	3319	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.1	N/A
12587	3319	*Pinus*	Pine	Wood	Positive	Charred	7	0.1	N/A
12587	3319	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3319	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3319	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
12587	3319	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3319	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	2	<0.1	N/A
12587	3319	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3319	*Sporobolus*	Dropseed grass	Caryopsis	Fairly certain	Charred	1(0)	0	N/A
12587	3319	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	3319	*Zea mays*	Maize	Cupule	Positive	Charred	7(0)	0	N/A
12587	3319	*Zea mays*	Maize	Kernel	Positive	Charred	2(0)	0	N/A
12587	3320	*Artemisia*	Sagebrush	Wood	Positive	Charred	2	<0.1	N/A
12587	3320	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	5	0.2	N/A
12587	3320	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3320	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3320	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
12587	3320	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	11-25/liter
12587	3320	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3320	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
12587	3320	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3320	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3320	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	3320	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3320	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	1	<0.1	N/A
12587	3320	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3320	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	4	0.1	N/A
12587	3320	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3320	Unidentifiable	Unidentifiable	Embryo	Positive	Charred	1(1)	0	N/A
12587	3320	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	2(0)	0	N/A
12587	3320	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	3320	*Zea mays*	Maize	Cupule	Positive	Charred	7(1)	0	N/A
12587	3320	*Zea mays*	Maize	Embryo	Positive	Part. Charred	1(0)	0	N/A
12587	3321	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	3321	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	5	0.1	N/A
12587	3321	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(0)	0	N/A
12587	3321	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3321	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3321	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3321	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.1	N/A
12587	3321	*Phaseolus*	Bean	Cotyledon	Resembles taxon	Charred	3(0)	0	N/A
12587	3321	*Pinus*	Pine	Wood	Positive	Charred	4	0.2	N/A
12587	3321	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3321	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3321	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	3321	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3321	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
12587	3321	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3321	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	3	0.1	N/A
12587	3321	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	3321	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3321	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	3321	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
12587	3321	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	3321	*Zea mays*	Maize	Cupule	Positive	Charred	7(0)	0	N/A
12587	3322	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3322	Gymnospermae	Unknown conifer	Wood	Positive	Charred	7	<0.1	N/A
12587	3322	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3322	*Juniperus*	Juniper	Wood	Positive	Charred	5	<0.1	N/A
12587	3322	*Pinus*	Pine	Wood	Positive	Charred	6	0.2	N/A
12587	3322	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3322	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A
12587	3322	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3322	*Zea mays*	Maize	Cupule	Positive	Charred	5(0)	0	N/A
12587	3323	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3323	*Corispermum*	Bugseed	Seed	Positive	Charred	2(2)	0	N/A
12587	3323	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	0.2	N/A
12587	3323	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3323	*Juniperus*	Juniper	Wood	Positive	Charred	6	0.1	N/A
12587	3323	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
12587	3323	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3323	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	0.2	N/A
12587	3323	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3323	*Zea mays*	Maize	Cupule	Positive	Charred	8(0)	0	N/A
12587	3324	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3324	*Gymnospermae*	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
12587	3324	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3324	*Physalis*	Groundcherry	Seed	Positive	Charred	1(1)	0	N/A
12587	3324	*Pinus*	Pine	Wood	Positive	Charred	4	<0.1	N/A
12587	3324	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	5	0.7	N/A
12587	3324	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	8	0.2	N/A
12587	3324	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3324	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3324	*Zea mays*	Maize	Cupule	Positive	Charred	5(0)	0	N/A
12587	3324	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	0	N/A
12587	3368	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
12587	3368	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3368	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	3368	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	3368	*Chenopodium*	Goosefoot	Seed	Positive	Charred	5(5)	0	N/A
12587	3368	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3368	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	3(3)	0	N/A
12587	3368	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3368	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.1	N/A
12587	3368	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3368	*Juniperus*	Juniper	Wood	Positive	Charred	10	0.2	N/A
12587	3368	*Physalis*	Groundcherry	Seed	Positive	Charred	1(1)	0	N/A
12587	3368	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
12587	3368	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	3368	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3368	*Rosaceae*	Rose family	Wood	Positive	Charred	1	<0.1	N/A
12587	3368	*Zea mays*	Maize	Cupule	Positive	Charred	13(1)	0	N/A
12587	3368	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0	N/A
12587	3368	*Zea mays*	Maize	Kernel	Positive	Charred	11(4)	0	N/A
12587	3471	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3471	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3471	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	3472	no data	No data	No data	No data	No data	0	0	N/A
12587	3496	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Part. Charred	1(1)	0	N/A
12587	3496	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3496	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3496	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3496	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
12587	3497	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	3497	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	3497	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3497	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3497	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.1	N/A
12587	3497	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3497	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3497	*Juniperus*	Juniper	Wood	Positive	Charred	10	0.2	N/A
12587	3497	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
12587	3497	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3497	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3497	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	3497	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	<0.1	N/A
12587	3497	*Zea mays*	Maize	Cupule	Positive	Charred	17(4)	0	N/A
12587	3500	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	3500	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
12587	3500	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	3500	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3500	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
12587	3500	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3500	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	0.1	N/A
12587	3500	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3500	Rosaceae	Rose family	Wood	Positive	Charred	3	<0.1	N/A
12587	3500	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	3500	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3501	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	3501	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3501	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.1	N/A
12587	3501	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	3501	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3501	*Pinus edulis*	Piñon	Nutshell	Fairly certain	Charred	0	0	1-10/liter
12587	3501	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	<0.1	N/A
12587	3501	*Populus/Salix*	Cottonwood/willow	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	3501	Rosaceae	Rose family	Wood	Positive	Charred	2	<0.1	N/A
12587	3501	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	1(1)	0	N/A
12587	3501	*Zea mays*	Maize	Cupule	Positive	Charred	5(0)	0	N/A
12587	3501	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	0	N/A
12587	3544	*Foresteria*	Desert olive	Wood	Positive	Charred	1	0.1	N/A
12587	3544	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
12587	3544	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3544	*Quercus*	Oak	Wood	Positive	Charred	1	0.1	N/A
12587	3557	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3557	*Euphorbia*	Spurge	Root	Positive	Uncharred	0	0	1-10/liter
12587	3557	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3557	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3557	*Portulaca*	Purslane	Root	Positive	Uncharred	0	0	1-10/liter
12587	3557	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
12587	3557	*Zea mays*	Maize	Kernel	Fairly certain	Charred	2(0)	0	N/A
12587	3558	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3558	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3558	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3558	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
12587	3558	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3558	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3558	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3558	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
12587	3558	*Zea mays*	Maize	Kernel	Fairly	Charred	1(0)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
					certain				
12587	3560	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
12587	3560	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	3560	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3560	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
12587	3560	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3560	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3560	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
12587	3560	*Zea mays*	Maize	Kernel	Positive	Charred	4(0)	0	N/A
12587	3709	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3709	*Gramineae*	Grass family	Caryopsis	Positive	Charred	1(0)	0	N/A
12587	3709	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3709	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3709	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	3709	*Zea mays*	Maize	Cupule	Fairly certain	Charred	2(0)	0	N/A
12587	3730	*Juniperus*	Juniper	Twig	Positive	Charred	0	0	1-10/liter
12587	3730	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
12587	3730	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	3730	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3761	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3761	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3761	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	3761	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3761	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	11-25/liter
12587	3761	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3761	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3796	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3796	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3796	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
12587	3796	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3796	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3796	*Zea mays*	Maize	Cupule	Fairly certain	Charred	2(0)	0	N/A
12587	3873	Cactaceae	Cactus family	Areola	Fairly certain	Uncharred	0	0	1-10/liter
12587	3873	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3873	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3873	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	3873	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3873	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
12587	3873	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3873	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3873	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3873	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3873	*Zea mays*	Maize	Cupule	Positive	Charred	4(1)	0	N/A
12587	3888	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3888	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3888	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3888	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
12587	3888	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3888	*Zea mays*	Maize	Cupule	Positive	Charred	5(0)	0	N/A
12587	3983	*Amaranthus*	Pigweed	Seed	Positive	Charred	2(1)	0	N/A
12587	3983	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	3983	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3983	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Fairly certain	Charred	1(0)	0	N/A
12587	3983	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3983	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
12587	3983	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3983	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3983	*Juniperus*	Juniper	Wood	Positive	Charred	3	<0.1	N/A
12587	3983	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3983	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3983	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	3983	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	3983	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
12587	3984	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	3984	Cactaceae	Cactus family	Areola	Fairly certain	Uncharred	0	0	1-10/liter
12587	3984	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3984	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3984	Gramineae	Grass family	Culm	Fairly certain	Charred	0	0	1-10/liter
12587	3984	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	0.3	N/A
12587	3984	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3984	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3984	*Juniperus*	Juniper	Wood	Positive	Charred	9	0.2	N/A
12587	3984	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
12587	3984	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3984	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3984	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3984	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3984	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3984	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	3984	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3984	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	3984	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	3984	*Zea mays*	Maize	Cupule	Positive	Charred	7(0)	0	N/A
12587	3985	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
12587	3985	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	3985	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3985	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3985	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1	N/A
12587	3985	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	3985	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3985	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3985	*Juniperus*	Juniper	Wood	Positive	Charred	6	<0.1	N/A
12587	3985	*Physalis*	Groundcherry	Seed	Positive	Charred	1(1)	0	N/A
12587	3985	*Pinus*	Pine	Wood	Positive	Charred	4	0.1	N/A
12587	3985	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3985	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	3985	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	<0.1	N/A
12587	3985	*PlatyOpuntia*	Pricklypear cactus	Embryo	Fairly certain	Part. Charred	1(0)	0	N/A
12587	3985	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Charred	1(0)	0	N/A
12587	3985	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	11-25/liter
12587	3985	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3985	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	3990	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3990	*Artemisia*	Sagebrush	Wood	Fairly certain	Charred	2	<0.1	N/A
12587	3990	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	3990	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	3990	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3990	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3990	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	3990	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3990	*Juniperus*	Juniper	Wood	Positive	Charred	3	<0.1	N/A
12587	3990	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	3990	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	3990	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	3990	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	3990	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3990	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1	N/A
12587	3990	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3990	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
12587	3991	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3991	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	3991	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1	N/A
12587	3991	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	3991	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
12587	4000	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	4000	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4000	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
12587	4000	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	4000	*Zea mays*	Maize	Cupule	Fairly certain	Charred	2(0)	0	N/A
12587	4010	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4010	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	0.1	N/A
12587	4010	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4010	*Juniperus*	Juniper	Wood	Positive	Charred	6	0.1	N/A
12587	4010	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	4010	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	4010	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1	N/A
12587	4010	Rosaceae	Rose family	Wood	Positive	Charred	1	<0.1	N/A
12587	4010	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4010	*Zea mays*	Maize	Cupule	Positive	Charred	11(0)	0	N/A
12587	4023	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	4023	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4023	Compositae	Sunflower family	Achene	Positive	Part. Charred	1(1)	0	N/A
12587	4023	*Corispermum*	Bugseed	Seed	Fairly certain	Charred	2(0)	0	N/A
12587	4023	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4023	Gramineae	Grass family	Caryopsis	Positive	Charred	1(1)	0	N/A
12587	4023	*Helianthus*	Sunflower	Achene	Positive	Charred	2(2)	0	N/A
12587	4023	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4023	*Juniperus*	Juniper	Wood	Positive	Charred	8	0.1	N/A
12587	4023	Labiatae	Mint family	Seed	Positive	Part. Charred	1(1)	0	N/A
12587	4023	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	4023	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	4023	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	4023	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4023	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4023	Unknown # 1	Unknown # 1	Embryo	Positive	Charred	1(1)	0	N/A
12587	4023	*Zea mays*	Maize	Cupule	Positive	Charred	5(0)	0	N/A
12587	4023	*Zea mays*	Maize	Kernel	Positive	Charred	5(0)	0	N/A
12587	4036	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4036	*Elaeagnus angustifolia*	Russian olive	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4036	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4036	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
12587	4036	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4036	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	11-25/liter
12587	4036	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
12587	4036	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	4036	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4036	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
12587	4036	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
12587	4037	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4037	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4037	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
12587	4037	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
12587	4037	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4037	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	4037	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	4037	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
12587	4049	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
12587	4049	*Cleome*	Beeweed	Seed	Resembles taxon	Part. Charred	1(0)	0	N/A
12587	4049	*Corispermum*	Bugseed	Seed	Positive	Charred	3(3)	0	N/A
12587	4049	*Corispermum*	Bugseed	Seed	Positive	Part. Charred	1(1)	0	N/A
12587	4049	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4049	Gramineae	Grass family	Caryopsis	Positive	Charred	7(7)	0	N/A
12587	4049	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4049	*Juniperus*	Juniper	Wood	Positive	Charred	3	<0.1	N/A
12587	4049	*Pinus*	Pine	Wood	Positive	Charred	5	0.1	N/A
12587	4049	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	4049	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	4049	*Portulaca*	Purslane	Seed	Positive	Charred	2(2)	0	N/A
12587	4049	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4049	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
12587	4074	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
12587	4074	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1	N/A
12587	4074	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	4074	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4074	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	4074	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1	N/A
12587	4074	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	4074	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4074	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4074	*Juniperus*	Juniper	Wood	Positive	Charred	12	0.2	N/A
12587	4074	*Physalis*	Groundcherry	Seed	Positive	Charred	1(1)	0	N/A
12587	4074	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4074	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	4074	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	4074	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	4074	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4074	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	1	<0.1	N/A
12587	4074	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
12587	4074	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4074	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	4074	*Solanum rostratum*	Buffalo burr	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4074	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	4074	*Zea mays*	Maize	Cupule	Positive	Charred	11(2)	0	N/A
12587	4075	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
12587	4075	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4075	*Cucurbita*	Squash/coyote gourd	Rind	Fairly certain	Charred	0	0	1-10/liter
12587	4075	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4075	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	<0.1	N/A
12587	4075	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4075	*Juniperus*	Juniper	Wood	Positive	Charred	7	<0.1	N/A
12587	4075	*Pinus*	Pine	Wood	Positive	Charred	3	<0.1	N/A
12587	4075	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	4075	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4075	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4075	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	4075	*Zea mays*	Maize	Cupule	Positive	Charred	10(0)	0	N/A
12587	4075	*Zea mays*	Maize	Kernel	Fairly certain	Charred	2(0)	0	N/A
12587	4079	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	4079	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4079	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
12587	4098	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	4098	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
12587	4102	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	4102	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(0)	0	N/A
12587	4102	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4102	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	4102	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4102	*Juniperus*	Juniper	Wood	Positive	Charred	8	0.1	N/A
12587	4102	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	<0.1	N/A
12587	4102	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1	N/A
12587	4102	*Zea mays*	Maize	Cupule	Positive	Charred	2(1)	0	N/A
12587	4114	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
12587	4114	*Chenopodium berlandieri*	Pitseed goosefoot	Seed	Uncharred	Positive			1-10/liter
12587	4114	*Portulaca*	Purslane	Seed	Uncharred	Positive			1-10/liter
12587	4114	*Solanum rostratum*	Buffalo burr	Seed	Uncharred	Positive			1-10/liter
12587	4114	*Juniperus*	Juniper	Twig	Uncharred	Positive			1-10/liter
12587	4114	*Pinus edulis*	Piñon	Needle	Uncharred	Positive			1-10/liter
12587	4114	*Artemisia*	Sagebrush	Wood	Charred	Fairly certain	1	<0.1	N/A
12587	4114	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Charred	Positive	1	<0.1	N/A
12587	4114	*Quercus*	Oak	Wood	Charred	Positive	1	<0.1	N/A
12587	4114	*Zea mays*	Maize	Cupule	Charred	Positive	11(3)		N/A
12587	4114	*Pinus edulis*	Piñon	Wood	Charred	Positive	2	<0.1	N/A
12587	4114	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Charred	Positive	2(2)		N/A
12587	4114	Gymnospermae	Unknown conifer	Wood	Charred	Positive	3	<0.1	N/A
12587	4114	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Fairly certain	3	<0.1	N/A
12587	4114	*Juniperus*	Juniper	Wood	Charred	Positive	5	<0.1	N/A
12587	4131	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4131	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
12587	4131	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	4131	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4131	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
12587	4131	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
12587	4131	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
12587	4131	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
12587	4131	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	4131	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
12587	4132	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4132	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	4132	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4132	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4132	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
12587	4132	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4132	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	11-25/liter
12587	4132	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
12587	4132	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
12587	4132	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
12587	4132	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
12587	4132	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
12587	4132	*Pinus ponderosa*	Ponderosa pine	Bark scale	Positive	Uncharred	0	0	1-10/liter
12587	4132	Unidentifiable	Unidentifiable	Seed	Positive	Charred	1(0)	0	N/A
12587	4138	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	4138	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4138	*Cucurbita*	Squash/ coyote gourd	Rind	Resembles taxon	Charred	0	0	1-10/liter
12587	4138	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4138	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587	4138	*Juniperus*	Juniper	Wood	Positive	Charred	7	<0.1	N/A
12587	4138	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
12587	4138	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
12587	4138	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4138	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	4138	*Sporobolus*	Dropseed grass	Caryopsis	Fairly certain	Charred	1(1)	0	N/A
12587	4138	*Zea mays*	Maize	Cupule	Positive	Charred	6(2)	0	N/A
12587	4138	*Zea mays*	Maize	Kernel	Positive	Charred	13(4)	0	N/A
12587	4139	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
12587	4139	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	4139	*Cercocarpus*	Mountain mahogany	Wood	Fairly certain	Charred	1	<0.1	N/A
12587	4139	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4139	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4139	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
12587	4139	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	4139	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	4139	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	2(0)	0	N/A
12587	4139	*Zea mays*	Maize	Cupule	Positive	Charred	5(0)	0	N/A
12587	4139	*Zea mays*	Maize	Kernel	Positive	Charred	11(2)	0	N/A
12587	4197	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587	4197	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4197	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
12587	4197	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
12587	4197	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4197	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	2(0)	0	N/A
12587	4197	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
12587	4197	*Zea mays*	Maize	Embryo	Positive	Charred	1(0)	0	N/A
12587	4198	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4198	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	4198	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
12587	4198	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
12587	4198	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
12587	4198	*Zea mays*	Maize	Glume	Positive	Charred	1(1)	0	N/A
12587	4198	*Zea mays*	Maize	Kernel	Positive	Charred	10(0)	0	N/A
12587	4211	*Cucurbita*	Squash/ coyote gourd	Rind	Positive	Charred	0	0	1-10/liter
12587	4211	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
12587	4211	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
12587	4211	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587	4211	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	4211	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
12587	4211	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
12587	4211	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
12587	4245	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
12587	5127	*Amaranthus*	Pigweed	Seed	Positive	Charred	2(2)	0	N/A
12587	5127	*Artemisia*	Sagebrush	Wood	Positive	Charred	2	<0.1	N/A
12587	5127	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
12587	5127	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(0)	0	N/A
12587	5127	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	2(2)	0	N/A
12587	5127	*Echinocereus*	Hedgehog cactus	Seed	Positive	Charred	1(0)	0	N/A
12587	5127	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587	5127	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	0.1	N/A
12587	5127	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587	5127	*Juniperus*	Juniper	Wood	Positive	Charred	10	0.1	N/A
12587	5127	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
12587	5127	*Pinus edulis*	Piñon	Nutshell	Fairly certain	Charred	0	0	1-10/liter
12587	5127	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
12587	5127	*Portulaca*	Purslane	Seed	Positive	Charred	1(0)	0	N/A
12587	5127	*Zea mays*	Maize	Cupule	Positive	Charred	27(4)	0	N/A
12587	5127	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0	N/A
12587, Area 8	8876	*Chenopodium*	Goosefoot	Seed	Positive	Charred	3(3)	0	N/A
12587, Area 8	8876	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
12587, Area 8	8876	*Chenopodium berlandieri*	Pitseed goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587, Area 8	8876	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
12587, Area 8	8877	*Chenopodium*	Goosefoot	Seed	Positive	Charred	3(3)	0	N/A
12587, Area 8	8877	*Chenopodium berlandieri*	Pitseed goosefoot	Seed	Positive	Charred	1(1)	0	N/A
12587, Area 8	8877	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587, Area 8	8877	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
12587, Area 8	8877	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587, Area 8	8877	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
12587, Area 8	8888	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
12587, Area 8	8888	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
12587, Area 8	8888	**Juniperus**	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
12587, Area 8	8888	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
12587, Area 8	8888	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
12587, Area 8	8888	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86637	270	**Juniperus**	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86637	270	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
86637	270	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86637	270	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
86637	271	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
86637	271	**Juniperus**	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86637	271	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	1-10/liter
86637	271	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86637	272	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
86637	272	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86637	272	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
86637	272	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86637	273	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86637	273	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
127625	67	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
127625	67	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
127625	67	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
127625	67	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
127625	68	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
127625	68	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
127625	68	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
127625	68	**Juniperus**	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
127625	68	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
127625	68	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
127631	15	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
127631	15	*CylindrOpuntia*	Cholla	Seed	Positive	Uncharred	0	0	1-10/liter
127631	15	*Elaeagnus angustifolia*	Russian olive	Seed	Positive	Uncharred	0	0	1-10/liter
127631	15	*Euphorbia*	Spurge	Fruit	Positive	Uncharred	0	0	1-10/liter
127631	15	Gramineae	Grass family	Whole plant	Positive	Uncharred	0	0	1-10/liter
127631	15	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
127631	15	**Helianthus**	Sunflower	Achene	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
127631	15	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
127631	15	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	25-100/liter
127631	15	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	25-100/liter
127631	15	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	>100/liter
127631	15	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
127631	15	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
127631	15	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
127631	15	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	11-25/liter
127631	15	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
127631	15	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
127631	17	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
127631	17	*Euphorbia*	Spurge	Fruit	Positive	Uncharred	0	0	1-10/liter
127631	17	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
127631	17	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
127631	17	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
127631	17	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	25-100/liter
127631	17	*Madia glomerata*	Tarweed	Achene	Fairly certain	Uncharred	0	0	1-10/liter
127631	17	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	1-10/liter
127631	17	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
127631	17	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
127631	17	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
127631	17	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
127631	28	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
127631	28	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
127631	28	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
127631	28	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
127631	28	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	1-10/liter
127631	28	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
127631	28	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
127631	28	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
127631	28	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
127631	29	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
127631	29	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	11-25/liter
127631	29	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	25-100/liter
127631	29	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
127631	29	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
127631	32	*Amaranthus*	Pigweed	Seed	Fairly certain	Uncharred	0	0	1-10/liter
127631	32	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
127631	32	*Cucurbita*	Squash/ coyote gourd	Rind	Resembles taxon	Charred	0	0	1-10/liter
127631	32	*Euphorbia*	Spurge	Fruit	Positive	Uncharred	0	0	1-10/liter
127631	32	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
127631	32	*Juniperus*	Juniper	Wood	Positive	Charred	8	0.1	N/A
127631	32	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	>100/liter
127631	32	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
127631	32	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
127631	32	*Zea mays*	Maize	Cupule	Positive	Charred	6(0)	0	N/A
127631	32	*Zea mays*	Maize	Embryo	Positive	Part. Charred	1(0)	0	N/A
127631	42	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
127631	42	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
127631	42	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
127631	51	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
127631	51	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
127631	51	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
127631	53	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
127631	53	*Chenopodium berlandieri*	Pitseed goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
127631	53	*Euphorbia*	Spurge	Fruit	Positive	Uncharred	0	0	1-10/liter
127631	53	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
127631	53	*Helianthus*	Sunflower	Achene	Positive	Uncharred	0	0	1-10/liter
127631	53	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
127631	53	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	25-100/liter
127631	53	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	25-100/liter
127631	53	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	25-100/liter
127631	53	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
127631	53	*Rubus*	Raspberry/ thimbleberry	Seed	Positive	Uncharred	0	0	1-10/liter
127631	55	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
127631	55	*Chenopodium berlandieri*	Pitseed goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
127631	55	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
127631	55	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
127631	55	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
127631	55	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
127631	55	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
127631	55	*Rhus*	Sumac	Seed	Fairly certain	Uncharred	0	0	1-10/liter
128803	9	*Euphorbia*	Spurge	Fruit	Positive	Uncharred	0	0	1-10/liter
128803	9	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128803	9	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	1-10/liter
128803	9	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
128803	9	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128803	9	*Pinus edulis*	Piñon	Nut	Positive	Uncharred	0	0	1-10/liter
128803	14	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128803	14	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128803	14	*Zea mays*	Maize	Cupule	Resembles taxon	Charred	1(0)	0	N/A
128803	16	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128803	18	Gramineae	Grass family	Floret	Positive	Uncharred	0	0	1-10/liter
128803	18	Gramineae	Grass family	Leaf	Positive	Uncharred	0	0	1-10/liter
128803	18	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128803	18	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128803	18	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
128803	18	Unknown # 1	Unknown # 1	Seed	Positive	Uncharred	0	0	1-10/liter
128803	21	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
128803	21	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
128803	21	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128803	21	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
128803	21	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128803	21	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
128803	24	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(0)	0	N/A
128803	24	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter
128803	24	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
128803	24	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
128803	24	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
128803	24	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128803	24	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128803	24	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
128803	24	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
128803	24	Rosaceae	Rose family	Wood	Positive	Charred	2	<0.1	N/A
128803	24	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
128803	25	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
128803	25	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
128803	25	*Euphorbia*	Spurge	Fruit	Positive	Uncharred	0	0	1-10/liter
128803	25	Gramineae	Grass family	Leaf	Positive	Uncharred	0	0	1-10/liter
128803	25	*Helianthus*	Sunflower	Achene	Positive	Uncharred	0	0	1-10/liter
128803	25	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
128803	25	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128803	25	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
128803	25	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
128803	25	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
128803	25	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128803	25	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
128803	25	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
128803	25	*Quercus*	Oak	Wood	Fairly certain	Charred	2	<0.1	N/A
128803	25	*Zea mays*	Maize	Cupule	Fairly certain	Charred	1(0)	0	N/A
128803	28	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
128803	28	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
128803	28	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128803	28	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
128803	28	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
128803	28	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128803	28	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
128803	29	Gramineae	Grass family	Floret	Positive	Uncharred	0	0	1-10/liter
128803	29	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
128803	29	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
128803	29	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	25-100/liter
128803	29	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
128803	29	*Pinus*	Pine	Cone scale	Positive	Uncharred	0	0	1-10/liter
128803	29	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
128803	29	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
128803	29	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
128803	29	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
128803	29	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	25-100/liter
128803	29	*Pinus edulis*	Piñon	Nut	Positive	Uncharred	0	0	1-10/liter
128803	29	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
128803	30	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
128803	30	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
128803	30	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
128803	30	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	11-25/liter
128803	30	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
128803	30	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
128803	30	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
128803	30	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
128803	30	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
128803	32	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
128803	32	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
128803	32	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	25-100/liter
128803	32	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
128803	32	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
128803	32	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
128803	33	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
128803	33	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
128803	33	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
128803	33	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128803	33	*Pinus edulis*	Piñon	Twig	Positive	Uncharred	0	0	1-10/liter
128803	33	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
128803	33	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
128804	213	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
128804	213	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128804	213	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128804	215	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
128804	215	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128804	215	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128804	219	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128804	219	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128804	222	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128805	161	Gramineae	Grass family	Culm	Positive	Uncharred	0	0	1-10/liter
128805	161	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	11-25/liter
128805	161	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
128805	161	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
128805	162	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
128805	162	Dicotyledonae	Dicot	Leaf	Positive	Uncharred	0	0	1-10/liter
128805	162	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
128805	162	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128805	162	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
128805	162	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128805	162	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.1	N/A
128805	162	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
128805	176	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
128805	176	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
128805	176	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
128805	176	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
128805	176	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128805	176	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
128805	176	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
128805	176	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
128805	176	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
128805	176	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
128805	185	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
128805	185	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
128805	185	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
128805	185	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
128805	185	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	25-100/liter
128805	185	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128805	185	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
128805	185	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
128805	199	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
128805	199	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
128805	199	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
128805	199	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
128805	199	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128805	199	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
128805	199	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128805	199	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
128805	210	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
128805	210	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128805	210	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
128805	210	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128805	210	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
128805	211	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
128805	211	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
128805	211	*Chenopodium berlandieri*	Pitseed goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
128805	211	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
128805	211	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
128805	211	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128805	211	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	1-10/liter
128805	211	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
128805	211	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	<0.1	N/A
128805	211	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
128805	211	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
128805	211	*Zea mays*	Maize	Glume	Resembles taxon	Charred	1(1)	0	N/A
128805	225	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
128805	225	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128805	225	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	1-10/liter
128805	225	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
128805	225	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
128805	225	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0	N/A
128805	246	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
128805	246	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
128805	246	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
128805	246	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
128805	246	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128805	246	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	1-10/liter
128805	246	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128805	246	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
128805	248	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1	N/A
128805	248	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
128805	248	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
128805	248	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
128805	248	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
128805	248	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
128805	248	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
86534	916	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	916	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
86534	916	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
86534	916	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
86534	916	Sporobolus	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	916	Gymnospermae	Unknown conifer	Wood	Positive	Charred	10	<0.1	N/A
86534	916	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
86534	916	*Pinus*	Pine	Wood	Positive	Charred	3	<0.1	N/A
86534	916	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	925	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	925	*Helianthus*	Sunflower	Achene	Positive	Uncharred	0	0	1-10/liter
86534	925	*Rosaceae*	Rose family	Wood	Positive	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	925	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
86534	925	*Zea mays*	Maize	Cupule	Positive	Charred	4(1)	0	N/A
86534	925	*Cercocarpus*	Mountain mahogany	Wood	Fairly certain	Charred	4	<0.1	N/A
86534	925	Gymnospermae	Unknown conifer	Wood	Positive	Charred	14	0.1	N/A
86534	925	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
86534	925	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	925	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	1002	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A
86534	1002	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1002	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
86534	1002	*Zea mays*	Maize	Cupule	Positive	Charred	9(0)	0	N/A
86534	1002	Gymnospermae	Unknown conifer	Wood	Positive	Charred	16	0.2	N/A
86534	1002	*Juniperus*	Juniper	Female cone	Fairly certain	Charred	1(0)	0	N/A
86534	1002	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
86534	1002	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86534	1002	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
86534	1002	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
86534	1002	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1002	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1002	*Quercus*	Oak	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	1170	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
86534	1170	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1170	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1170	*Oenothera*	Evening primrose	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1170	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
86534	1170	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1170	Gramineae	Grass family	Leaf	Positive	Uncharred	0	0	1-10/liter
86534	1170	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
86534	1170	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
86534	1170	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1170	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86534	1170	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1170	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
86534	1170	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	1170	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	1170	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
86534	1271	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1271	*Euphorbia marginata*	Snow on the mountain	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1271	*Helianthus*	Sunflower	Achene	Positive	Uncharred	0	0	11-25/liter
86534	1271	Polygonaceae	Knotweed family	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1271	*Zea mays*	Maize	Cupule	Positive	Charred	7(0)	0	N/A
86534	1271	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1271	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
86534	1271	Gymnospermae	Unknown conifer	Wood	Positive	Charred	16	0.4	N/A
86534	1271	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86534	1271	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
86534	1271	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1271	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	11-25/liter
86534	1271	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	0.3	N/A
86534	1272	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1272	*Euphorbia marginata*	Snow on the mountain	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1272	*Helianthus*	Sunflower	Achene	Positive	Uncharred	0	0	1-10/liter
86534	1272	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
86534	1272	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1272	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
86534	1272	*Atriplex/ Sarcobatus*	Saltbush/ Greasewood	Wood	Positive	Charred	1	<0.1	N/A
86534	1272	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	<0.1	N/A
86534	1272	Gymnospermae	Unknown conifer	Wood	Positive	Charred	8	0.1	N/A
86534	1272	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1272	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
86534	1272	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1272	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	11-25/liter
86534	1272	*Pinus edulis*	Piñon	Wood	Positive	Charred	8	0.5	N/A
86534	1272	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	1272	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
86534	1273	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	1273	*Helianthus*	Sunflower	Achene	Positive	Uncharred	0	0	1-10/liter
86534	1273	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
86534	1273	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1273	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
86534	1273	*Atriplex/ Sarcobatus*	Saltbush/ Greasewood	Wood	Positive	Charred	1	<0.1	N/A
86534	1273	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	0.2	N/A
86534	1273	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	1-10/liter
86534	1273	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
86534	1273	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1273	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	11-25/liter
86534	1273	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	0.1	N/A
86534	1273	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	1273	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1	N/A
86534	1274	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1274	*Helianthus*	Sunflower	Achene	Positive	Uncharred	0	0	1-10/liter
86534	1274	Polygonaceae	Knotweed family	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1274	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
86534	1274	*Zea mays*	Maize	Embryo	Fairly certain	Charred	1(0)	0	N/A
86534	1274	*Zea mays*	Maize	Glume	Positive	Charred	2(2)	0	N/A
86534	1274	*Zea mays*	Maize	Kernel	Resembles taxon	Charred	1(0)	0	N/A
86534	1274	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1274	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	<0.1	N/A
86534	1274	Gymnospermae	Unknown conifer	Wood	Positive	Charred	8	0.1	N/A
86534	1274	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	1274	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
86534	1274	*Pinus*	Pine	Wood	Positive	Charred	8	0.5	N/A
86534	1274	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
86534	1274	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.1	N/A
86534	1291	*Chenopodium*	Goosefoot	Seed	Positive	Charred	5(2)	0	N/A
86534	1291	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1291	*Zea mays*	Maize	Cupule	Positive	Charred	11(0)	0	N/A
86534	1291	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1291	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	<0.1	N/A
86534	1291	*Pinus*	Pine	Needle	Positive	Charred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	1291	*Pinus*	Pine	Wood	Positive	Charred	6	<0.1	N/A
86534	1291	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1291	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	1321	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
86534	1321	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1321	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Part. Charred	1(0)	0	N/A
86534	1321	*Zea mays*	Maize	Cupule	Positive	Charred	7(1)	0	N/A
86534	1321	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0	N/A
86534	1321	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1321	*Atriplex/ Sarcobatus*	Saltbush/ Greasewood	Wood	Positive	Charred	1	<0.1	N/A
86534	1321	Gymnospermae	Unknown conifer	Wood	Positive	Charred	8	0.1	N/A
86534	1321	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86534	1321	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	1321	*Pinus*	Pine	Wood	Positive	Charred	2	0.2	N/A
86534	1321	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1321	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.1	N/A
86534	1321	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	3	<0.1	N/A
86534	1321	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
86534	1322	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(0)	0	N/A
86534	1322	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1322	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter
86534	1322	*Zea mays*	Maize	Cupule	Positive	Charred	9(1)	0	N/A
86534	1322	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1322	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	0.1	N/A
86534	1322	*Gymnospermae*	Unknown conifer	Wood	Positive	Charred	12	0.4	N/A
86534	1322	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86534	1322	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	11-25/liter
86534	1322	*Pinus*	Pine	Female cone	Positive	Uncharred	0	0	1-10/liter
86534	1322	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
86534	1322	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1322	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.2	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	1322	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
86534	1322	*Robinia*	New Mexico locust	Wood	Fairly certain	Charred	4	<0.1	N/A
86534	1323	*Chenopodium*	Goosefoot	Seed	Positive	Charred	3(2)	0	N/A
86534	1323	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1323	*Nicotiana*	Tobacco	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1323	*Zea mays*	Maize	Cupule	Positive	Charred	8(2)	0	N/A
86534	1323	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1323	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	0.2	N/A
86534	1323	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
86534	1323	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86534	1323	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	1323	*Pinus*	Pine	Umbo	Positive	Charred	0	0	1-10/liter
86534	1323	*Pinus*	Pine	Wood	Positive	Charred	7	0.2	N/A
86534	1323	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1323	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
86534	1323	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	2	0.2	N/A
86534	1323	*Robinia*	New Mexico locust	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	1324	*Chenopodium*	Goosefoot	Seed	Positive	Charred	5(3)	0	N/A
86534	1324	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1324	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1324	*Zea mays*	Maize	Cupule	Positive	Charred	7(2)	0	N/A
86534	1324	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1324	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
86534	1324	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	0.1	N/A
86534	1324	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
86534	1324	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1324	*Juniperus*	Juniper	Twig	Positive	Charred	0	0	1-10/liter
86534	1324	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86534	1324	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	1324	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
86534	1324	*Pinus*	Pine	Wood	Positive	Charred	7	0.2	N/A
86534	1324	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1324	*Pinus edulis*	Piñon	Nutshell	Positive	Charred	0	0	1-10/liter
86534	1324	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	0.3	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	1324	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1335	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
86534	1335	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1335	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	6(6)	0	N/A
86534	1335	*Euphorbia marginata*	Snow on the mountain	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1335	*Helianthus*	Sunflower	Achene	Positive	Uncharred	0	0	1-10/liter
86534	1335	*Portulaca*	Purslane	Seed	Positive	Charred	2(2)	0	N/A
86534	1335	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1335	Chenopodiaceae	Goosefoot family	Seed	Positive	Charred	1(1)	0	N/A
86534	1335	*Oenothera*	Evening primrose	Seed	Positive	Charred	8(7)	0	N/A
86534	1335	Gramineae	Grass family	Caryopsis	Positive	Charred	7(6)	0	N/A
86534	1335	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1335	Gymnospermae	Unknown conifer	Wood	Positive	Charred	7	<0.1	N/A
86534	1335	*Juniperus*	Juniper	Wood	Positive	Charred	3	<0.1	N/A
86534	1335	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1335	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
86534	1335	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	1353	*Chenopodium*	Goosefoot	Seed	Positive	Charred	3(0)	0	N/A
86534	1353	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1353	Fabaceae	Bean family	Seed	Fairly certain	Uncharred	0	0	1-10/liter
86534	1353	*Oenothera*	Evening primrose	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1353	*Zea mays*	Maize	Cupule	Positive	Charred	6(0)	0	N/A
86534	1353	*Zea mays*	Maize	Kernel	Resembles taxon	Charred	1(0)	0	N/A
86534	1353	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1353	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1	N/A
86534	1353	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	<0.1	N/A
86534	1353	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1353	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
86534	1353	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	2	<0.1	N/A
86534	1353	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly	Charred	2	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
					certain				
86534	1389	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1389	*Zea mays*	Maize	Cupule	Positive	Charred	13(0)	0	N/A
86534	1389	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1389	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	0.1	N/A
86534	1389	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
86534	1389	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
86534	1389	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A
86534	1389	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	4	0.1	N/A
86534	1389	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
86534	1402	*Chenopodium*	Goosefoot	Seed	Positive	Charred	9(3)	0	N/A
86534	1402	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1402	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1402	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1402	*Zea mays*	Maize	Cupule	Positive	Charred	11(1)	0	N/A
86534	1402	Unknown # 1	Unknown # 1	Unknown	Positive	Charred	1(1)	0	N/A
86534	1402	Gymnospermae	Unknown conifer	Wood	Positive	Charred	10	0.1	N/A
86534	1402	*Pinus*	Pine	Umbo	Positive	Charred	0	0	1-10/liter
86534	1402	*Pinus*	Pine	Wood	Positive	Charred	7	0.1	N/A
86534	1402	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1402	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1402	*Pinus edulis*	Piñon	Nutshell	Fairly certain	Charred	0	0	1-10/liter
86534	1402	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
86534	1402	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.1	N/A
86534	1476	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A
86534	1476	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1476	*Nicotiana*	Tobacco	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1476	Chenopodiaceae	Goosefoot family	Seed	Positive	Charred	1(0)	0	N/A
86534	1476	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1476	*Zea mays*	Maize	Cupule	Positive	Charred	6(1)	0	N/A
86534	1476	Unknown # 1	Unknown # 1	Unknown	Positive	Charred	1(1)	0	N/A
86534	1476	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	0.1	N/A
86534	1476	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1476	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
86534	1476	*Pinus*	Pine	Wood	Positive	Charred	5	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	1476	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1476	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1476	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
86534	1476	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
86534	1476	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	1476	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	2	<0.1	N/A
86534	1476	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1476	*Cucurbita*	Squash/coyote gourd	Rind	Resembles taxon	Charred	4(0)	0	N/A
86534	1509	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(1)	0	N/A
86534	1509	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
86534	1509	*Nicotiana*	Tobacco	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1509	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1509	*Zea mays*	Maize	Cupule	Positive	Charred	8(0)	0	N/A
86534	1509	*Atriplex/ Sarcobatus*	Saltbush/ Greasewood	Wood	Positive	Charred	1	<0.1	N/A
86534	1509	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	0.1	N/A
86534	1509	*Pinus*	Pine	Wood	Positive	Charred	4	<0.1	N/A
86534	1509	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1509	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
86534	1511	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A
86534	1511	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1511	*Portulaca*	Purslane	Seed	Positive	Charred	2(2)	0	N/A
86534	1511	*Zea mays*	Maize	Cupule	Positive	Charred	9(0)	0	N/A
86534	1511	Unknown # 1	Unknown # 1	Stem	Positive	Charred	0	0	1-10/liter
86534	1511	*Atriplex/ Sarcobatus*	Saltbush/ Greasewood	Wood	Positive	Charred	2	<0.1	N/A
86534	1511	Gymnospermae	Unknown conifer	Wood	Positive	Charred	13	0.1	N/A
86534	1511	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
86534	1511	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
86534	1511	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1511	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
86534	1511	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A
86534	1512	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1512	*Franseria acanticarpa*	Bursage	Achene	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	1512	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1512	Fabaceae	Bean family	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1512	*Zea mays*	Maize	Cupule	Positive	Charred	5(0)	0	N/A
86534	1512	*Zea mays*	Maize	Fruit	Positive	Charred	1(1)	0	N/A
86534	1512	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1512	*Atriplex/ Sarcobatus*	Saltbush/ Greasewood	Wood	Positive	Charred	1	<0.1	N/A
86534	1512	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	<0.1	N/A
86534	1512	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1512	*Pinus*	Pine	Wood	Positive	Charred	3	<0.1	N/A
86534	1512	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1512	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
86534	1512	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	5	<0.1	N/A
86534	1578	*Chenopodium*	Goosefoot	Seed	Fairly certain	Charred	1(0)	0	N/A
86534	1578	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1578	*Zea mays*	Maize	Cupule	Positive	Charred	11(1)	0	N/A
86534	1578	Unidentifiable	Unidentifiable	Seed	Positive	Charred	2(0)	0	N/A
86534	1578	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	9	0.1	N/A
86534	1578	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.1	N/A
86534	1578	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86534	1578	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
86534	1578	*Pinus*	Pine	Wood	Positive	Charred	5	0.1	N/A
86534	1578	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1578	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1578	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	1641	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
86534	1641	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1641	*Zea mays*	Maize	Cupule	Positive	Charred	6(0)	0	N/A
86534	1641	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	<0.1	N/A
86534	1641	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
86534	1641	*Pinus*	Pine	Wood	Positive	Charred	6	0.1	N/A
86534	1641	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1641	*Pinus edulis*	Piñon	Nutshell	Fairly certain	Charred	0	0	1-10/liter
86534	1641	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	7	0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	1641	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1	N/A
86534	1650	*Chenopodium*	Goosefoot	Seed	Positive	Charred	5(2)	0	N/A
86534	1650	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1650	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1650	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1650	*Zea mays*	Maize	Cupule	Positive	Charred	8(1)	0	N/A
86534	1650	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1650	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	0.1	N/A
86534	1650	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1650	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
86534	1650	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
86534	1650	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
86534	1650	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1650	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1650	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	11-25/liter
86534	1650	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
86534	1650	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	3	0.1	N/A
86534	1650	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
86534	1650	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1650	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
86534	1726	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
86534	1726	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	<0.1	N/A
86534	1726	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
86534	1726	*Pinus*	Pine	Wood	Positive	Charred	6	0.1	N/A
86534	1726	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1752	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
86534	1752	*Zea mays*	Maize	Cupule	Positive	Charred	8(1)	0	N/A
86534	1752	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1752	*Atriplex/ Sarcobatus*	Saltbush/ Greasewood	Wood	Positive	Charred	1	<0.1	N/A
86534	1752	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	0.1	N/A
86534	1752	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
86534	1752	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	6	<0.1	N/A
86534	1753	*Amaranthus*	Pigweed	Seed	Fairly certain	Charred	1(1)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	1753	*Chenopodium*	Goosefoot	Seed	Positive	Charred	4(3)	0	N/A
86534	1753	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1753	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1753	*Zea mays*	Maize	Cupule	Positive	Charred	16(1)	0	N/A
86534	1753	Monocotyledonae	Monocot	Stem	Positive	Charred	0	0	1-10/liter
86534	1753	Unidentifiable	Unidentifiable	Seed	Positive	Charred	1(0)	0	N/A
86534	1753	*Atriplex canescens*	Four-wing saltbush	Fruit	Positive	Charred	1(0)	0	N/A
86534	1753	Gymnospermae	Unknown conifer	Wood	Positive	Charred	12	0.1	N/A
86534	1753	*Pinus*	Pine	Wood	Positive	Charred	4	<0.1	N/A
86534	1753	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1753	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	1753	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	2	0.1	N/A
86534	1753	*Quercus*	Oak	Wood	Fairly certain	Charred	2	<0.1	N/A
86534	1761	*Chenopodium*	Goosefoot	Seed	Positive	Charred	12(4)	0	N/A
86534	1761	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1761	*Nicotiana*	Tobacco	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1761	*Portulaca*	Purslane	Seed	Positive	Charred	2(1)	0	N/A
86534	1761	*Zea mays*	Maize	Cupule	Positive	Charred	25(4)	0	N/A
86534	1761	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1761	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1	N/A
86534	1761	*Echinocereus*	Hedgehog cactus	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1761	Gymnospermae	Unknown conifer	Wood	Positive	Charred	8	0.2	N/A
86534	1761	*Pinus*	Pine	Wood	Positive	Charred	5	0.1	N/A
86534	1761	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1761	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1761	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	6	0.1	N/A
86534	1761	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
86534	1773	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
86534	1773	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1773	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1773	*Zea mays*	Maize	Cupule	Positive	Charred	5(0)	0	N/A
86534	1773	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
86534	1773	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
86534	1773	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	1773	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	5	<0.1	N/A
86534	1777	*Amaranthus*	Pigweed	Seed	Fairly certain	Charred	1(1)	0	N/A
86534	1777	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1777	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Part. Charred	1(1)	0	N/A
86534	1777	*Zea mays*	Maize	Cupule	Positive	Charred	7(2)	0	N/A
86534	1777	Gymnospermae	Unknown conifer	Wood	Positive	Charred	8	<0.1	N/A
86534	1777	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
86534	1777	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
86534	1777	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1777	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1777	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
86534	1777	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	1777	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	2	<0.1	N/A
86534	1777	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1785	*Chenopodium*	Goosefoot	Seed	Fairly certain	Charred	1(0)	0	N/A
86534	1785	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1785	*Zea mays*	Maize	Cupule	Positive	Charred	16(0)	0	N/A
86534	1785	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1	N/A
86534	1785	Gymnospermae	Unknown conifer	Wood	Positive	Charred	13	0.2	N/A
86534	1785	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
86534	1785	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	0.1	N/A
86534	1785	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	1860	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1860	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1860	*Oenothera*	Evening primrose	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1860	*Zea mays*	Maize	Cupule	Positive	Charred	8(0)	0	N/A
86534	1860	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1860	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1860	*Atriplex canescens*	Four-wing saltbush	Fruit	Positive	Charred	1(0)	0	N/A
86534	1860	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.1	N/A
86534	1860	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	1860	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
86534	1860	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1860	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1860	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
86534	1860	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	1860	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	1860	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
86534	1860	*Quercus*	Oak	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	1906	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1906	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
86534	1906	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
86534	1906	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1906	*Pinus*	Pine	Wood	Positive	Charred	8	0.3	N/A
86534	1906	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
86534	1906	*Quercus*	Oak	Wood	Positive	Charred	8	0.1	N/A
86534	1966	*Nicotiana*	Tobacco	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1966	*Zea mays*	Maize	Cupule	Positive	Charred	4(1)	0	N/A
86534	1966	*Atriplex/ Sarcobatus*	Saltbush/ Greasewood	Wood	Positive	Charred	2	<0.1	N/A
86534	1966	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
86534	1966	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
86534	1966	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	1966	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	5	<0.1	N/A
86534	1968	*Amaranthus*	Pigweed	Seed	Positive	Charred	2(2)	0	N/A
86534	1968	*Chenopodium*	Goosefoot	Seed	Positive	Charred	20(14)	0	N/A
86534	1968	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1968	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	2(2)	0	N/A
86534	1968	*Nicotiana*	Tobacco	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1968	*Portulaca*	Purslane	Seed	Positive	Charred	5(5)	0	N/A
86534	1968	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1968	Compositae	Sunflower family	Achene	Fairly certain	Charred	1(1)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	1968	*Zea mays*	Maize	Cupule	Positive	Charred	28(2)	0	N/A
86534	1968	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	1968	*Atriplex/ Sarcobatus*	Saltbush/ Greasewood	Wood	Positive	Charred	1	<0.1	N/A
86534	1968	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	<0.1	N/A
86534	1968	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.1	N/A
86534	1968	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
86534	1968	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1968	*Pinus edulis*	Piñon	Nutshell	Fairly certain	Charred	0	0	1-10/liter
86534	1968	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.2	N/A
86534	1968	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	1968	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	6	0.4	N/A
86534	1975	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A
86534	1975	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1975	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
86534	1975	*Zea mays*	Maize	Cupule	Positive	Charred	13(2)	0	N/A
86534	1975	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	<0.1	N/A
86534	1975	Gymnospermae	Unknown conifer	Wood	Positive	Charred	12	<0.1	N/A
86534	1975	*Pinus*	Pine	Umbo	Positive	Charred	0	0	1-10/liter
86534	1975	*Pinus*	Pine	Wood	Positive	Charred	3	<0.1	N/A
86534	1975	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A
86534	1975	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
86534	1990	*Chenopodium*	Goosefoot	Seed	Fairly certain	Charred	1(1)	0	N/A
86534	1990	*Chenopodium*	Goosefoot	Seed	Positive	Charred	11(8)	0	N/A
86534	1990	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1990	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Part. Charred	1(1)	0	N/A
86534	1990	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1990	*Oenothera*	Evening primrose	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1990	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1990	*Zea mays*	Maize	Cupule	Positive	Charred	18(4)	0	N/A
86534	1990	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1	N/A
86534	1990	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.1	N/A
86534	1990	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter

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86534	1990	*Pinus*	Pine	Wood	Positive	Charred	6	0.3	N/A
86534	1990	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1990	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	8	0.1	N/A
86534	1990	*Quercus*	Oak	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	1992	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1992	*Zea mays*	Maize	Cupule	Positive	Charred	16(4)	0	N/A
86534	1992	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
86534	1992	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
86534	1992	*Pinus*	Pine	Umbo	Positive	Charred	0	0	1-10/liter
86534	1992	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	1992	*Pinus edulis*	Piñon	Nutshell	Fairly certain	Charred	0	0	1-10/liter
86534	1992	*Pinus edulis*	Piñon	Wood	Positive	Charred	7	0.4	N/A
86534	1992	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	1992	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	10	0.2	N/A
86534	1992	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2142	*Chenopodium*	Goosefoot	Seed	Positive	Charred	8(6)	0	N/A
86534	2142	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2142	*Nicotiana*	Tobacco	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2142	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2142	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2142	*Zea mays*	Maize	Cupule	Positive	Charred	19(2)	0	N/A
86534	2142	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.1	N/A
86534	2142	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2142	*Pinus*	Pine	Wood	Positive	Charred	3	0.1	N/A
86534	2142	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	2142	*Pinus edulis*	Piñon	Nutshell	Positive	Charred	0	0	1-10/liter
86534	2142	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	2142	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	11	0.4	N/A
86534	2142	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2142	*Quercus*	Oak	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	2172	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2172	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	2(2)	0	N/A
86534	2172	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	2172	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2172	*Oenothera*	Evening primrose	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2172	*Zea mays*	Maize	Cupule	Positive	Charred	17(0)	0	N/A
86534	2172	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	2172	Gymnosperma*e*	Unknown conifer	Wood	Positive	Charred	11	0.3	N/A
86534	2172	*Juniperus*	Juniper	Wood	Positive	Charred	3	<0.1	N/A
86534	2172	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
86534	2172	*Pinus*	Pine	Wood	Positive	Charred	4	0.2	N/A
86534	2172	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	2172	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
86534	2172	*Pinus edulis*	Piñon	Nutshell	Fairly certain	Charred	0	0	1-10/liter
86534	2172	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	2172	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
86534	2172	*Quercus*	Oak	Wood	Fairly certain	Charred	1	<0.1	N/A
86534	2176	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
86534	2176	*Chenopodium*	Goosefoot	Seed	Positive	Charred	6(3)	0	N/A
86534	2176	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	11-25/liter
86534	2176	*Nicotiana*	Tobacco	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2176	*Portulaca*	Purslane	Seed	Positive	Charred	1(0)	0	N/A
86534	2200	*Atriplex canescens*	Four-wing saltbush	Seed	Positive	Charred	1(1)	0	N/A
86534	2200	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.2	N/A
86534	2200	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	2200	*Pinus*	Pine	Umbo	Positive	Charred	0	0	1-10/liter
86534	2200	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
86534	2200	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	2200	*Pinus edulis*	Piñon	Twig	Positive	Charred	0	0	1-10/liter
86534	2200	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	0.2	N/A
86534	2200	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	11-25/liter
86534	2200	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	9	0.4	N/A
86534	2200	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
86534	2200	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
86534	2201	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	2201	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
86534	2201	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
86534	2201	*Juniperus*	Juniper	Wood	Positive	Charred	5	0.1	N/A
86534	2201	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	2201	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
86534	2201	*Pinus edulis*	Piñon	Wood	Positive	Charred	11	0.6	N/A
86534	2201	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	2201	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.1	N/A
86534	2202	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2202	*Nicotiana*	Tobacco	Seed	Positive	Part. Charred	1(1)	0	N/A
86534	2202	*Zea mays*	Maize	Kernel	Positive	Charred	1(0)	0	N/A
86534	2202	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	<0.1	N/A
86534	2202	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
86534	2202	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	2202	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	2202	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.3	N/A
86534	2202	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	2202	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	14	0.2	N/A
86534	2203	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
86534	2203	*Zea mays*	Maize	Kernel	Resembles taxon	Charred	1(0)	0	N/A
86534	2203	Gymnospermae	Unknown conifer	Wood	Positive	Charred	12	0.1	N/A
86534	2203	*Pinus*	Pine	Wood	Positive	Charred	3	0.2	N/A
86534	2203	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	2203	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	2203	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	5	0.1	N/A
86534	2214	*Chenopodium*	Goosefoot	Seed	Positive	Charred	5(3)	0	N/A
86534	2214	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2214	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
86534	2214	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2214	*Zea mays*	Maize	Cupule	Fairly certain	Charred	1(0)	0	N/A
86534	2214	*Zea mays*	Maize	Cupule	Positive	Charred	20(1)	0	N/A
86534	2214	*Zea mays*	Maize	Kernel	Fairly certain	Charred	2(0)	0	N/A
86534	2214	*Atriplex canescens*	Four-wing saltbush	Fruit	Positive	Charred	1(0)	0	N/A

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86534	2214	Gymnospermae	Unknown conifer	Wood	Positive	Charred	7	0.1	N/A
86534	2214	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	2214	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
86534	2214	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	2214	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	2214	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	11	0.2	N/A
86534	2215	*Amaranthus*	Pigweed	Seed	Positive	Charred	3(1)	0	N/A
86534	2215	*Chenopodium*	Goosefoot	Seed	Positive	Charred	14(10)	0	N/A
86534	2215	*Chenopodium*	Goosefoot	Seed	Positive	Part. Charred	1(1)	0	N/A
86534	2215	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	4(3)	0	N/A
86534	2215	*Nicotiana*	Tobacco	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2215	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
86534	2215	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2215	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2215	Labiatae	Mint family	Seed	Fairly certain	Charred	1(1)	0	N/A
86534	2215	*Zea mays*	Maize	Cupule	Positive	Charred	20(1)	0	N/A
86534	2215	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0	N/A
86534	2215	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
86534	2215	*Atriplex canescens*	Four-wing saltbush	Fruit	Positive	Charred	1(1)	0	N/A
86534	2215	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	0.3	N/A
86534	2215	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	2215	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
86534	2215	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	2215	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
86534	2215	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	2215	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	9	0.4	N/A
86534	2216	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
86534	2216	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
86534	2216	Gymnospermae	Unknown conifer	Wood	Positive	Charred	7	0.1	N/A
86534	2216	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	2216	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.3	N/A
86534	2216	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	2216	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	8	0.3	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	2217	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
86534	2217	*Juniperus*	Juniper	Wood	Positive	Charred	1	0.1	N/A
86534	2217	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	2217	*Pinus*	Pine	Wood	Positive	Charred	6	0.2	N/A
86534	2217	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A
86534	2217	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	9	0.3	N/A
86534	2217	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
86534	2223	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A
86534	2223	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.1	N/A
86534	2223	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.1	N/A
86534	2223	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	2223	*Pinus*	Pine	Wood	Positive	Charred	9	0.2	N/A
86534	2223	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
86534	2223	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	2223	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.1	N/A
86534	2223	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	3(0)	0	N/A
86534	2223	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
86534	2226	*Chenopodium*	Goosefoot	Seed	Positive	Charred	42(34)	0	N/A
86534	2226	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2226	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	0.1	N/A
86534	2226	*Pinus*	Pine	Wood	Positive	Charred	3	<0.1	N/A
86534	2226	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.1	N/A
86534	2226	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	2226	*Portulaca*	Purslane	Seed	Positive	Charred	2(1)	0	N/A
86534	2226	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
86534	2226	Unknown # 1	Unknown # 1	Unknown	Positive	Charred	1(0)	0	N/A
86534	2226	*Zea mays*	Maize	Cupule	Positive	Charred	9(0)	0	N/A
86534	2234	*Atriplex canescens*	Four-wing saltbush	Fruit	Positive	Charred	1(0)	0	N/A
86534	2234	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1	N/A
86534	2234	*Chenopodium*	Goosefoot	Seed	Positive	Charred	3(1)	0	N/A
86534	2234	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.1	N/A
86534	2234	*Nicotiana*	Tobacco	Seed	Positive	Uncharred	0	0	1-10/liter
86534	2234	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
86534	2234	*Pinus*	Pine	Wood	Positive	Charred	6	<0.1	N/A
86534	2234	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
86534	2234	*Pinus edulis*	Piñon	Nutshell	Fairly certain	Charred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86534	2234	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
86534	2234	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	8	0.2	N/A
86534	2234	*Quercus*	Oak	Wood	Positive	Charred	3	<0.1	N/A
86534	2234	Unknown # 1	Unknown # 1	Unknown	Positive	Part. Charred	1(0)	0	N/A
86534	2234	*Zea mays*	Maize	Cupule	Positive	Charred	31(2)	0	N/A
86534	2234	*Zea mays*	Maize	Kernel	Fairly certain	Charred	3(0)	0	N/A
135290	985	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1067	*Amsinckia*	Fiddlehead	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1067	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	25-100/liter
135290	1067	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
135290	1067	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1067	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1067	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
135290	1067	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1067	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	1067	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A
135290	1067	*Quercus*	Oak	Wood	Fairly certain	Charred	1	0.1	N/A
135290	1067	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	1067	*Zea mays*	Maize	Cupule	Resembles taxon	Charred	2(0)	0	N/A
135290	1083	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	2	0.1	N/A
135290	1083	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1083	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1083	*Pinus*	Pine	Wood	Positive	Charred	4	<0.1	N/A
135290	1096	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1096	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	1096	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1096	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	3(0)	0	N/A
135290	1096	*Zea mays*	Maize	Cupule	Fairly certain	Charred	1(0)	0	N/A
135290	1098	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	25-100/liter
135290	1098	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	1098	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1098	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	1098	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	2	<0.1	N/A
135290	1098	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	1098	*Zea mays*	Maize	Cupule	Resembles taxon	Charred	1(0)	0	N/A
135290	1131	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1131	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
135290	1131	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	1131	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	4	0.1	N/A
135290	1131	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	5	0.2	N/A
135290	1131	*Zea mays*	Maize	Cupule	Positive	Charred	2(1)	0	N/A
135290	1131	*Zea mays*	Maize	Kernel	Fairly certain	Charred	7(0)	0	N/A
135290	1163	*Chenopodium*	Goosefoot	Seed	Positive	Charred	4(4)	0	N/A
135290	1163	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1163	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(0)	0	N/A
135290	1163	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
135290	1163	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1163	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1163	*Pinus edulis*	Piñon	Wood	Positive	Charred	7	0.5	N/A
135290	1163	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	1163	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	4	0.1	N/A
135290	1163	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
135290	1163	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0	N/A
135290	1179	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(0)	0	N/A
135290	1179	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(0)	0	N/A
135290	1179	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
135290	1179	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1179	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly	Charred	4	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
					certain				
135290	1179	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	0	N/A
135290	1271	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1271	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1271	*Lappula*	Stickseed	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1271	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	1-10/liter
135290	1271	*Pinus*	Pine	Female cone	Positive	Uncharred	0	0	1-10/liter
135290	1271	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
135290	1271	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
135290	1271	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	25-100/liter
135290	1271	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	11-25/liter
135290	1271	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	>100/liter
135290	1271	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	1271	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	<0.1	N/A
135290	1271	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	11-25/liter
135290	1271	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
135290	1271	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1	N/A
135290	1271	Portulacaceae	Purslane family	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1271	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	5(0)	0	N/A
135290	1271	*Zea mays*	Maize	Cupule	Fairly certain	Charred	1(0)	0	N/A
135290	1277	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1	N/A
135290	1277	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1277	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
135290	1277	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	4	0.1	N/A
135290	1277	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1	N/A
135290	1277	*Zea mays*	Maize	Cupule	Positive	Charred	12(1)	0	N/A
135290	1277	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	0	N/A
135290	1277	*Zea mays*	Maize	Glume	Positive	Charred	14(14)	0	N/A
135290	1302	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	11-25/liter
135290	1302	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	1302	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1302	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	2(0)	0	N/A
135290	1329	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1329	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	1329	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1329	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	1	<0.1	N/A
135290	1329	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1329	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
135290	1329	*Zea mays*	Maize	Cupule	Positive	Charred	5(1)	0	N/A
135290	1329	*Zea mays*	Maize	Glume	Positive	Charred	1(1)	0	N/A
135290	1329	*Zea mays*	Maize	Kernel	Positive	Charred	8(1)	0	N/A
135290	1417	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1417	*Juniperus*	Juniper	Wood	Fairly certain	Charred	1	<0.1	N/A
135290	1417	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1417	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
135290	1417	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1417	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
135290	1417	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	1417	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
135290	1417	*Zea mays*	Maize	Kernel	Fairly certain	Charred	3(0)	0	N/A
135290	1430	*Chenopodium*	Goosefoot	Seed	Positive	Charred	7(3)	0	N/A
135290	1430	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	11-25/liter
135290	1430	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
135290	1430	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1430	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1430	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
135290	1430	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	1430	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
135290	1430	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A
135290	1430	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	11	0.2	N/A
135290	1430	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	1430	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	1430	*Quercus*	Oak	Wood	Positive	Charred	2	0.1	N/A
135290	1430	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	1430	*Zea mays*	Maize	Cupule	Positive	Charred	8(2)	0	N/A
135290	1430	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0	N/A
135290	1430	*Zea mays*	Maize	Kernel	Positive	Charred	2(0)	0	N/A
135290	1458	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1458	*Echinocereus*	Hedgehog cactus	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1458	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
135290	1458	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1458	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	1458	*Zea mays*	Maize	Cupule	Fairly certain	Charred	2(0)	0	N/A
135290	1458	*Zea mays*	Maize	Kernel	Positive	Charred	1(0)	0	N/A
135290	1589	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1589	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	1589	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	2	0.1	N/A
135290	1589	*Pseudotsuga menziesii*	Douglas fir	Wood	Resembles taxon	Charred	9	0.5	N/A
135290	1589	*Quercus*	Oak	Wood	Positive	Charred	9	0.5	N/A
135290	1589	*Zea mays*	Maize	Cupule	Positive	Charred	2(1)	0	N/A
135290	1705	*Chenopodium*	Goosefoot	Seed	Positive	Charred	9(5)	0	N/A
135290	1705	*Chenopodium*	Goosefoot	Seed	Positive	Partially Charred	1(1)	0	N/A
135290	1705	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1705	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	14(14)	0	N/A
135290	1705	*Cucurbita*	Squash/coyote gourd	Rind	Positive	Charred	0	0	1-10/liter
135290	1705	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.1	N/A
135290	1705	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1705	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1705	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.5	N/A
135290	1705	*Mammillaria*	Pincushion cactus	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1705	*Phaseolus*	Bean	Cotyledon	Resembles taxon	Charred	3(0)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	1705	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1705	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	1705	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	11	0.3	N/A
135290	1705	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	1705	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1	N/A
135290	1705	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
135290	1705	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	1705	*Zea mays*	Maize	Cupule	Positive	Charred	9(0)	0	N/A
135290	1705	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	0	N/A
135290	1705	*Zea mays*	Maize	Glume	Positive	Charred	1(1)	0	N/A
135290	1705	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	0	N/A
135290	1720	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
135290	1720	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1720	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(0)	0	N/A
135290	1720	Gramineae	Grass family	Culm	Positive	Charred	0	0	1-10/liter
135290	1720	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	1720	*Pinus ponderosa*	Ponderosa pine	Bark scale	Positive	Uncharred	0	0	1-10/liter
135290	1720	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(1)	0	N/A
135290	1720	*Zea mays*	Maize	Cupule	Fairly certain	Charred	2(0)	0	N/A
135290	1720	*Zea mays*	Maize	Kernel	Fairly certain	Charred	2(0)	0	N/A
135290	1758	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1758	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1758	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	3(3)	0	N/A
135290135290	1758	Gramineae	Grass family	Caryopsis	Positive	Charred	1(1)	0	N/A
135290	1758	*Juniperus*	Juniper	Female cone	Positive	Charred	1(1)	0	N/A
135290	1758	*Juniperus*	Juniper	Seed	Positive	Charred	3(1)	0	N/A
135290	1758	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1758	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
135290	1758	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	1758	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.7	N/A
135290	1758	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	15	1.1	N/A
135290	1758	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	1758	*Zea mays*	Maize	Cupule	Positive	Charred	48(20)	0	N/A
135290	1758	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0	N/A
135290	1758	*Zea mays*	Maize	Kernel	Fairly certain	Charred	2(0)	0	N/A
135290	1758	*Zea mays*	Maize	Kernel	Fairly certain	Partially Charred	1(1)	0	N/A
135290	1797	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
135290	1797	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1797	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter
135290	1797	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.3	N/A
135290	1797	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1797	*Pinus*	Pine	Wood	Positive	Charred	2	0.2	N/A
135290	1797	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	1797	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1797	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.1	N/A
135290	1797	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	11	0.6	N/A
135290	1797	Portulacaceae	Purslane family	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1797	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	3(0)	0	N/A
135290	1797	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1	N/A
135290	1797	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
135290	1797	*Zea mays*	Maize	Glume	Positive	Charred	1(1)	0	N/A
135290	1837	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(0)	0	N/A
135290	1837	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
135290	1837	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1837	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1837	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
135290	1837	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1837	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	1837	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	7	0.1	N/A
135290	1837	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1837	*Zea mays*	Maize	Cupule	Positive	Charred	7(1)	0	N/A
135290	1837	*Zea mays*	Maize	Kernel	Positive	Charred	7(2)	0	N/A
135290	1851	*Amaranthus*	Pigweed	Seed	Positive	Charred	2(1)	0	N/A
135290	1851	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	1851	*Juniperus*	Juniper	Seed	Fairly certain	Charred	2(0)	0	N/A
135290	1851	*Juniperus*	Juniper	Wood	Fairly certain	Charred	1	<0.1	N/A
135290	1851	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1	N/A
135290	1851	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1871	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1871	*Juniperus*	Juniper	Wood	Positive	Charred	13	0.6	N/A
135290	1871	*Pinus*	Pine	Wood	Positive	Charred	7	0.1	N/A
135290	1871	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	1871	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1871	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	0	N/A
135290	1878	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1890	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1890	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	22(22)	0	N/A
135290	1890	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1890	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1890	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	4(4)	0	N/A
135290	1890	Unidentifiable	Unidentifiable	Embryo	Positive	Charred	1(1)	0	N/A
135290	1890	Unidentifiable	Unidentifiable	Seed	Positive	Charred	2(0)	0	N/A
135290	1896	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
135290	1896	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A
135290	1896	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1896	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1896	*Juniperus*	Juniper	Twig	Positive	Charred	0	0	1-10/liter
135290	1896	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1896	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
135290	1896	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	1896	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1896	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	1896	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	0.1	N/A
135290	1896	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	0.2	N/A
135290	1896	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	1896	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1896	*Quercus*	Oak	Wood	Positive	Charred	1	0	N/A
135290	1896	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	1896	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0	N/A
135290	1897	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
135290	1897	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1897	*Cleome*	Beeweed	Embryo	Fairly certain	Charred	1(1)	0	N/A
135290	1897	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	1897	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
135290	1897	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1897	*Phaseolus*	Bean	Cotyledon	Fairly certain	Charred	5(0)	0	N/A
135290	1897	*Physalis*	Groundcherry	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	1897	*Pinus*	Pine	Umbo	Positive	Charred	0	0	1-10/liter
135290	1897	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	1897	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1897	*Pinus edulis*	Piñon	Nutshell	Fairly certain	Charred	0	0	1-10/liter
135290	1897	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	1897	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	7	0.5	N/A
135290	1897	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	5	<0.1	N/A
135290	1897	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
135290	1897	*Quercus*	Oak	Wood	Positive	Charred	5	0.3	N/A
135290	1897	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	5(0)	0	N/A
135290	1897	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	1897	*Zea mays*	Maize	Cupule	Positive	Charred	23(3)	0	N/A
135290	1897	*Zea mays*	Maize	Glume	Positive	Charred	1(1)	0	N/A
135290	1898	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1898	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.2	N/A
135290	1898	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1898	*Juniperus*	Juniper	Wood	Positive	Charred	1	0.1	N/A
135290	1898	*Lappula*	Stickseed	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1898	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	1898	*Pinus edulis*	Piñon	Wood	Positive	Charred	7	0.7	N/A
135290	1898	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	1898	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	6	0.4	N/A
135290	1898	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	1898	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	0.2	N/A
135290	1898	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
135290	1898	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1	N/A
135290	1898	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	5(0)	0	N/A
135290	1898	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	0	N/A
135290	1898	*Zea mays*	Maize	Cupule	Positive	Charred	36(12)	0	N/A
135290	1898	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0	N/A
135290	1999	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A
135290	1999	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	1999	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
135290	1999	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	1999	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
135290	1999	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1999	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
135290	1999	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	3	<0.1	N/A
135290	1999	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	2(0)	0	N/A
135290	1999	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
135290	2023	*Amaranthus*	Pigweed	Seed	Positive	Charred	3(2)	0	N/A
135290	2023	*Chenopodium*	Goosefoot	Seed	Positive	Charred	11(11)	0	N/A
135290	2023	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2023	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	6(3)	0	N/A
135290	2023	Compositae	Sunflower family	Achene	Fairly certain	Charred	23(23)	0	N/A
135290	2023	Gramineae	Grass family	Caryopsis	Positive	Charred	1(1)	0	N/A
135290	2023	Gramineae	Grass family	Culm	Positive	Charred	0	0	1-10/liter
135290	2023	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.2	N/A
135290	2023	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	17	0.5	N/A
135290	2023	Polygonaceae	Knotweed family	Seed	Positive	Charred	1(1)	0	N/A
135290	2023	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	27(27)	0	N/A
135290	2023	Unknown # 1	Unknown # 1	Seed	Positive	Charred	1(1)	0	N/A
135290	2023	*Zea mays*	Maize	Glume	Positive	Charred	1(1)	0	N/A
135290	2023	*Zea mays*	Maize	Kernel	Fairly certain	Charred	4(0)	0	N/A
135290	2027	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2027	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1	N/A
135290	2027	*Chenopodium*	Goosefoot	Seed	Positive	Charred	28(23)	0	N/A
135290	2027	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	12(12)	0	N/A
135290	2027	Compositae	Sunflower family	Achene	Fairly certain	Charred	5(5)	0	N/A
135290	2027	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
135290	2027	Labiatae	Mint family	Seed	Positive	Charred	1(1)	0	N/A
135290	2027	*Mammillaria*	Pincushion cactus	Seed	Positive	Charred	1(1)	0	N/A
135290	2027	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	13	0.2	N/A
135290	2027	*Portulaca*	Purslane	Seed	Positive	Charred	6(5)	0	N/A
135290	2027	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	3(3)	0	N/A
135290	2027	Unidentifiable	Unidentifiable	Seed	Positive	Charred	3(3)	0	N/A
135290	2027	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	17(0)	0	N/A
135290	2027	Unknown # 2	Unknown # 2	Seed	Positive	Charred	2(1)	0	N/A
135290	2027	*Zea mays*	Maize	Cupule	Positive	Charred	5(0)	0	N/A
135290	2027	*Zea mays*	Maize	Kernel	Resembles taxon	Charred	1(0)	0	N/A
135290	2034	*Chenopodium*	Goosefoot	Seed	Positive	Charred	8(7)	0	N/A
135290	2034	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2034	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
135290	2034	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.3	N/A
135290	2034	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2034	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2034	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
135290	2034	*Lappula*	Stickseed	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2034	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2034	*Pinus*	Pine	Wood	Positive	Charred	4	0.2	N/A
135290	2034	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	2034	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2034	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.2	N/A
135290	2034	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2034	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	5	<0.1	N/A
135290	2034	*Plantago*	Plantain	Seed	Positive	Charred	1(1)	0	N/A
135290	2034	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2034	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
135290	2034	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2034	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2034	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	1(1)	0	N/A
135290	2034	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	2034	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	0.1	N/A
135290	2034	*Zea mays*	Maize	Cupule	Positive	Charred	22(4)	0	N/A
135290	2034	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0	N/A
135290	2034	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0	N/A
135290	2057	*Amaranthus*	Pigweed	Seed	Positive	Charred	3(3)	0	N/A
135290	2057	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	0.1	N/A
135290	2057	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1	N/A
135290	2057	*Chenopodium*	Goosefoot	Seed	Positive	Charred	5(4)	0	N/A
135290	2057	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	3(2)	0	N/A
135290	2057	*Cucurbita*	Squash/coyote gourd	Rind	Fairly certain	Charred	0	0	1-10/liter
135290	2057	*Juniperus*	Juniper	Twigscale	Positive	Charred	0	0	1-10/liter
135290	2057	*Mammillaria*	Pincushion cactus	Seed	Positive	Charred	1(1)	0	N/A
135290	2057	*Pinus*	Pine	Wood	Positive	Charred	2	0.1	N/A
135290	2057	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	0.6	N/A
135290	2057	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2057	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	4	0.3	N/A
135290	2057	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	4	0.1	N/A
135290	2057	*Portulaca*	Purslane	Seed	Positive	Charred	2(2)	0	N/A
135290	2057	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1	N/A
135290	2057	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	8(8)	0	N/A
135290	2057	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	0	N/A
135290	2057	*Zea mays*	Maize	Embryo	Positive	Charred	1(0)	0	N/A
135290	2057	*Zea mays*	Maize	Glume	Positive	Charred	3(3)	0	N/A
135290	2069	*Amaranthus*	Pigweed	Seed	Positive	Charred	7(7)	0	N/A
135290	2069	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2069	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	3	0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2069	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(0)	0	N/A
135290	2069	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2069	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	13(12)	0	N/A
135290	2069	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.1	N/A
135290	2069	Labiatae	Mint family	Seed	Positive	Charred	2(0)	0	N/A
135290	2069	*Phaseolus*	Bean	Cotyledon	Fairly certain	Charred	4(0)	0	N/A
135290	2069	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
135290	2069	*Pinus*	Pine	Umbo	Positive	Charred	0	0	1-10/liter
135290	2069	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	2069	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	2069	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.1	N/A
135290	2069	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2069	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	13	0.3	N/A
135290	2069	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
135290	2069	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2069	*Zea mays*	Maize	Cupule	Positive	Charred	20(5)	0	N/A
135290	2069	*Zea mays*	Maize	Glume	Positive	Charred	1(1)	0	N/A
135290	2069	*Zea mays*	Maize	Kernel	Positive	Charred	6(0)	0	N/A
135290	2070	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2070	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2070	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2070	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	<0.1	N/A
135290	2070	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
135290	2083	*Amaranthus*	Pigweed	Seed	Positive	Charred	3(3)	0	N/A
135290	2083	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2083	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1	N/A
135290	2083	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
135290	2083	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2083	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	2083	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
135290	2083	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2083	Labiatae	Mint family	Seed	Positive	Charred	2(1)	0	N/A
135290	2083	*Lappula*	Stickseed	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2083	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	2083	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2083	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.2	N/A
135290	2083	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2083	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	12	0.7	N/A
135290	2083	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2083	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2083	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2083	*Zea mays*	Maize	Cupule	Positive	Charred	22(5)	0	N/A
135290	2083	*Zea mays*	Maize	Cupule segment	Positive	Charred	2(2)	0	N/A
135290	2083	*Zea mays*	Maize	Kernel	Positive	Charred	12(2)	0	N/A
135290	2099	*Amaranthus*	Pigweed	Seed	Positive	Charred	2(2)	0	N/A
135290	2099	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2099	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1	N/A
135290	2099	*Chenopodium*	Goosefoot	Seed	Positive	Charred	5(4)	0	N/A
135290	2099	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2099	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	2(2)	0	N/A
135290	2099	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	2099	Gramineae	Grass family	Culm	Positive	Charred	0	0	1-10/liter
135290	2099	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2099	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2099	Labiatae	Mint family	Seed	Positive	Charred	1(1)	0	N/A
135290	2099	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
135290	2099	*Pinus*	Pine	Umbo	Positive	Charred	0	0	1-10/liter
135290	2099	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
135290	2099	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	2099	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2099	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.2	N/A
135290	2099	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2099	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	10	0.7	N/A
135290	2099	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	<0.1	N/A
135290	2099	*Portulaca*	Purslane	Seed	Positive	Charred	4(4)	0	N/A
135290	2099	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2099	*Quercus*	Oak	Wood	Positive	Charred	2	0.1	N/A
135290	2099	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	0	N/A
135290	2099	*Zea mays*	Maize	Cupule	Positive	Charred	96(57)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2099	*Zea mays*	Maize	Cupule segment	Positive	Charred	18(18)	0	N/A
135290	2099	*Zea mays*	Maize	Embryo	Positive	Charred	2(2)	0	N/A
135290	2099	*Zea mays*	Maize	Kernel	Positive	Charred	9(1)	0	N/A
135290	2099	*Zea mays*	Maize	Shank	Fairly certain	Charred	0	0	1-10/liter
135290	2133	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
135290	2133	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
135290	2133	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2133	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
135290	2133	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.1	N/A
135290	2133	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2133	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2133	Labiatae	Mint family	Seed	Positive	Charred	1(1)	0	N/A
135290	2133	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
135290	2133	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2133	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	7	0.2	N/A
135290	2133	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	2133	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
135290	2138	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2138	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1	N/A
135290	2138	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	<0.1	N/A
135290	2138	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2138	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	2(2)	0	N/A
135290	2138	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter
135290	2138	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	2138	Gramineae	Grass family	Culm	Fairly certain	Charred	0	0	1-10/liter
135290	2138	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.1	N/A
135290	2138	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
135290	2138	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2138	*Juniperus*	Juniper	Twig	Positive	Charred	0	0	1-10/liter
135290	2138	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2138	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
135290	2138	Labiatae	Mint family	Seed	Positive	Charred	2(2)	0	N/A
135290	2138	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
135290	2138	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	2138	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2138	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.3	N/A
135290	2138	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2138	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	5	0.1	N/A
135290	2138	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2138	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	3	<0.1	N/A
135290	2138	*Portulaca*	Purslane	Seed	Positive	Charred	2(2)	0	N/A
135290	2138	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2138	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	2138	Unidentifiable	Unidentifiable	Seed	Positive	Charred	1(0)	0	N/A
135290	2138	*Zea mays*	Maize	Cupule	Positive	Charred	40(18)	0	N/A
135290	2138	*Zea mays*	Maize	Cupule segment	Positive	Charred	3(3)	0	N/A
135290	2138	*Zea mays*	Maize	Glume	Positive	Charred	1(1)	0	N/A
135290	2138	*Zea mays*	Maize	Kernel	Positive	Charred	6(0)	0	N/A
135290	2150	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1	N/A
135290	2150	*Chenopodium*	Goosefoot	Seed	Positive	Charred	5(4)	0	N/A
135290	2150	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
135290	2150	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2150	Labiatae	Mint family	Seed	Positive	Charred	1(1)	0	N/A
135290	2150	*Pinus*	Pine	Wood	Positive	Charred	5	0.5	N/A
135290	2150	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	2150	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.6	N/A
135290	2150	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	9	0.7	N/A
135290	2150	Portulaca	Purslane	Seed	Positive	Charred	2(2)	0	N/A
135290	2150	Unidentifiable	Unidentifiable	Seed	Positive	Charred	1(0)	0	N/A
135290	2150	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
135290	2150	*Zea mays*	Maize	Kernel	Positive	Charred	2(1)	0	N/A
135290	2188	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2188	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2188	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2188	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2188	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2188	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1	N/A
135290	2219	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
135290	2219	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A
135290	2219	Gramineae	Grass family	Culm	Fairly certain	Charred	0	0	1-10/liter
135290	2219	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
135290	2219	Labiatae	Mint family	Seed	Fairly certain	Partially Charred	1(1)	0	N/A
135290	2219	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	2219	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	5	<0.1	N/A
135290	2219	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
135290	2232	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2232	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2232	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2232	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	2232	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	2232	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2232	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2253	*Chenopodium*	Goosefoot	Seed	Positive	Charred	4(4)	0	N/A
135290	2253	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2253	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	3(2)	0	N/A
135290	2253	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
135290	2253	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2253	*Juniperus*	Juniper	Twig	Positive	Charred	0	0	1-10/liter
135290	2253	*Lappula*	Stickseed	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2253	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	2253	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	2253	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	0.1	N/A
135290	2253	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2253	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	10	0.2	N/A
135290	2253	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2253	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
135290	2253	Portulacaceae	Purslane family	Seed	Positive	Charred	1(1)	0	N/A
135290	2253	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1	N/A
135290	2253	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2253	*Zea mays*	Maize	Cupule	Positive	Charred	8(3)	0	N/A
135290	2253	*Zea mays*	Maize	Kernel	Fairly certain	Charred	3(0)	0	N/A
135290	2254	*Chenopodium*	Goosefoot	Seed	Positive	Charred	4(3)	0	N/A
135290	2254	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2254	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	2(2)	0	N/A
135290	2254	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.3	N/A
135290	2254	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2254	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.2	N/A
135290	2254	Labiatae	Mint family	Seed	Positive	Charred	1(1)	0	N/A
135290	2254	*Nicotiana*	Tobacco	Seed	Positive	Charred	2(2)	0	N/A
135290	2254	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2254	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
135290	2254	*Pinus*	Pine	Wood	Positive	Charred	4	0.3	N/A
135290	2254	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	2254	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2254	*Pinus edulis*	Piñon	Wood	Positive	Charred	9	0.4	N/A
135290	2254	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2254	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
135290	2254	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2254	*Portulaca*	Purslane	Seed	Positive	Charred	2(2)	0	N/A
135290	2254	*Zea mays*	Maize	Cupule	Positive	Charred	9(2)	0	N/A
135290	2254	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0	N/A
135290	2255	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2255	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
135290	2255	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2255	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
135290	2255	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2255	*Pinus*	Pine	Wood	Positive	Charred	5	0.5	N/A
135290	2255	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2255	*Pinus edulis*	Piñon	Wood	Positive	Charred	10	0.4	N/A
135290	2255	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2255	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	3	0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2255	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2255	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)	0	N/A
135290	2255	*Zea mays*	Maize	Kernel	Fairly certain	Charred	3(0)	0	N/A
135290	2256	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	<0.1	N/A
135290	2256	*Chenopodium*	Goosefoot	Seed	Positive	Charred	4(4)	0	N/A
135290	2256	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2256	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	2(1)	0	N/A
135290	2256	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter
135290	2256	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2256	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2256	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2256	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2256	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
135290	2256	Labiatae	Mint family	Seed	Fairly certain	Charred	1(0)	0	N/A
135290	2256	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2256	*Pinus edulis*	Piñon	Wood	Positive	Charred	8	0.1	N/A
135290	2256	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	7	0.1	N/A
135290	2256	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2256	*Portulaca*	Purslane	Seed	Positive	Charred	3(3)	0	N/A
135290	2256	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2256	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	1(1)	0	N/A
135290	2256	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	2(0)	0	N/A
135290	2256	*Zea mays*	Maize	Cupule	Positive	Charred	8(2)	0	N/A
135290	2257	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A
135290	2257	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2257	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2257	Gramineae	Grass family	Caryopsis	Positive	Charred	1(1)	0	N/A
135290	2257	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.1	N/A
135290	2257	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2257	*Nicotiana*	Tobacco	Seed	Positive	Charred	1(1)	0	N/A
135290	2257	*Phaseolus*	Bean	Cotyledon	Positive	Charred	1(0)	0	N/A
135290	2257	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	0.3	N/A
135290	2257	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	8	0.1	N/A
135290	2257	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2257	*Portulaca*	Purslane	Seed	Positive	Charred	2(2)	0	N/A
135290	2257	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2257	*Zea mays*	Maize	Cupule	Positive	Charred	10(5)	0	N/A
135290	2257	*Zea mays*	Maize	Glume	Positive	Charred	5(3)	0	N/A
135290	2257	*Zea mays*	Maize	Kernel	Positive	Charred	6(0)	0	N/A
135290	2258	*Chenopodium*	Goosefoot	Seed	Positive	Charred	3(1)	0	N/A
135290	2258	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2258	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
135290	2258	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2258	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2258	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.1	N/A
135290	2258	*Pinus*	Pine	Wood	Positive	Charred	3	0.1	N/A
135290	2258	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2258	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.1	N/A
135290	2258	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2258	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	4	0.6	N/A
135290	2258	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2258	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1	N/A
135290	2258	*Portulaca*	Purslane	Seed	Positive	Charred	8(8)	0	N/A
135290	2258	*Quercus*	Oak	Wood	Positive	Charred	2	0.1	N/A
135290	2258	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	2258	Unidentifiable	Unidentifiable	Seed	Positive	Charred	2(2)	0	N/A
135290	2258	*Zea mays*	Maize	Cupule	Positive	Charred	35(31)	0	N/A
135290	2258	*Zea mays*	Maize	Glume	Positive	Charred	8(8)	0	N/A
135290	2258	*Zea mays*	Maize	Kernel	Positive	Charred	6(0)	0	N/A
135290	2299	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	25-100/liter
135290	2299	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2299	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2299	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
135290	2299	*Pinus*	Pine	Wood	Positive	Charred	2	0.1	N/A
135290	2299	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	2299	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2299	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	<0.1	N/A
135290	2299	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2299	*Zea mays*	Maize	Cupule	Positive	Charred	2(1)	0	N/A
135290	2315	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2315	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
135290	2315	*Echinocereus*	Hedgehog cactus	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2315	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
135290	2315	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
135290	2315	*Pinus*	Pine	Wood	Positive	Charred	3	<0.1	N/A
135290	2315	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
135290	2315	*Zea mays*	Maize	Glume	Positive	Charred	1(1)	0	N/A
135290	2315	*Zea mays*	Maize	Kernel	Fairly certain	Charred	3(0)	0	N/A
135290	2326	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	5	0.1	N/A
135290	2326	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
135290	2326	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	11-25/liter
135290	2326	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2326	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2326	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
135290	2326	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
135290	2326	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2326	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1	N/A
135290	2326	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2326	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	0	N/A
135290	2330	*Chenopodium*	Goosefoot	Seed	Positive	Charred	4(4)	0	N/A
135290	2330	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2330	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Partially Charred	2(2)	0	N/A
135290	2330	*Cycloloma*	Winged pigweed	Seed	Fairly certain	Charred	1(1)	0	N/A
135290	2330	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2330	*Juniperus*	Juniper	Wood	Positive	Charred	9	0.8	N/A
135290	2330	*Nicotiana*	Tobacco	Seed	Positive	Charred	1(1)	0	N/A
135290	2330	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2330	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
135290	2330	*Pinus*	Pine	Wood	Positive	Charred	3	0.1	N/A
135290	2330	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	2330	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.1	N/A
135290	2330	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly	Charred	3	0.2	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
					certain				
135290	2330	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2330	*Portulaca*	Purslane	Seed	Fairly certain	Charred	1(1)	0	N/A
135290	2330	*Quercus*	Oak	Wood	Positive	Charred	2	0.2	N/A
135290	2330	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
135290	2331	*Chenopodium*	Goosefoot	Seed	Positive	Charred	11(10)	0	N/A
135290	2331	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2331	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	9(8)	0	N/A
135290	2331	Gramineae	Grass family	Caryopsis	Positive	Charred	1(1)	0	N/A
135290	2331	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.2	N/A
135290	2331	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2331	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.1	N/A
135290	2331	*Nicotiana*	Tobacco	Seed	Positive	Charred	1(1)	0	N/A
135290	2331	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2331	*Pinus*	Pine	Wood	Positive	Charred	3	<0.1	N/A
135290	2331	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.1	N/A
135290	2331	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2331	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	<0.1	N/A
135290	2331	*Portulaca*	Purslane	Seed	Positive	Charred	6(6)	0	N/A
135290	2331	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
135290	2331	*Zea mays*	Maize	Kernel	Positive	Charred	4(1)	0	N/A
135290	2332	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
135290	2332	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2332	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	4(4)	0	N/A
135290	2332	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2332	*Juniperus*	Juniper	Wood	Positive	Charred	5	0.1	N/A
135290	2332	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
135290	2332	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2332	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
135290	2332	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	9	0.1	N/A
135290	2332	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2332	Portulacaceae	Purslane family	Seed	Positive	Charred	1(1)	0	N/A
135290	2332	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1	N/A
135290	2332	*Zea mays*	Maize	Cupule	Positive	Charred	6(0)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2332	*Zea mays*	Maize	Kernel	Positive	Charred	1(0)	0	N/A
135290	2350	*Chenopodium*	Goosefoot	Seed	Positive	Charred	4(4)	0	N/A
135290	2350	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2350	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	13(12)	0	N/A
135290	2350	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Partially Charred	1(1)	0	N/A
135290	2350	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.1	N/A
135290	2350	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2350	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.1	N/A
135290	2350	*Nicotiana*	Tobacco	Seed	Positive	Charred	3(3)	0	N/A
135290	2350	*Nicotiana*	Tobacco	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2350	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2350	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
135290	2350	*Pinus edulis*	Piñon	Wood	Positive	Charred	10	0.4	N/A
135290	2350	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	5	0.1	N/A
135290	2350	*Portulaca*	Purslane	Seed	Positive	Charred	13(13)	0	N/A
135290	2350	Unidentifiable	Unidentifiable	Seed	Positive	Charred	3(2)	0	N/A
135290	2350	*Zea mays*	Maize	Cupule	Positive	Charred	7(1)	0	N/A
135290	2350	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	0	N/A
135290	2376	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2376	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2376	*Zea mays*	Maize	Cupule	Fairly certain	Charred	1(0)	0	N/A
135290	2378	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2378	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2378	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2378	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2378	*Lappula*	Stickseed	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2378	*Pinus*	Pine	Umbo	Fairly certain	Charred	0	0	1-10/liter
135290	2378	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
135290	2378	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2378	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	0	N/A
135290	2420	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2420	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2420	*Juniperus*	Juniper	Wood	Positive	Charred	12	0.4	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2420	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	2420	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2420	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2420	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	8	0.2	N/A
135290	2420	Portulacaceae	Purslane family	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2420	*Zea mays*	Maize	Cupule	Positive	Charred	3(1)	0	N/A
135290	2471	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
135290	2471	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
135290	2471	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	17	0.3	N/A
135290	2471	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
135290	2471	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2471	*Zea mays*	Maize	Cupule	Positive	Charred	8(0)	0	N/A
135290	2472	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)	0	N/A
135290	2472	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2472	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
135290	2472	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2472	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
135290	2472	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	2472	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	18	0.2	N/A
135290	2472	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2472	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	2472	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	0	N/A
135290	2473	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
135290	2473	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2473	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.1	N/A
135290	2473	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
135290	2473	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.1	N/A
135290	2473	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	11-25/liter
135290	2473	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	15	0.4	N/A
135290	2473	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	2473	*Zea mays*	Maize	Kernel	Positive	Charred	2(2)	0	N/A
135290	2474	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2474	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
135290	2474	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.1	N/A
135290	2474	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2474	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2474	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
135290	2474	*Pinus edulis*	Piñon	Wood	Positive	Charred	8	0.3	N/A
135290	2474	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2474	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	0.1	N/A
135290	2474	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	3	<0.1	N/A
135290	2474	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2474	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2474	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	2474	*Zea mays*	Maize	Cupule	Fairly certain	Charred	1(0)	0	N/A
135290	2474	*Zea mays*	Maize	Glume	Positive	Charred	1(1)	0	N/A
135290	2475	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1	N/A
135290	2475	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2475	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.1	N/A
135290	2475	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2475	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
135290	2475	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.1	N/A
135290	2475	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2475	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	0.1	N/A
135290	2475	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	6	<0.1	N/A
135290	2475	*Zea mays*	Maize	Cupule	Positive	Charred	5(2)	0	N/A
135290	2475	*Zea mays*	Maize	Kernel	Positive	Charred	5(0)	0	N/A
135290	2477	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	6	0.1	N/A
135290	2477	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2477	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
135290	2477	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
135290	2477	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	1	<0.1	N/A
135290	2477	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2488	*Chenopodium*	Goosefoot	Seed	Positive	Charred	7(7)	0	N/A
135290	2488	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2488	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	5(4)	0	N/A
135290	2488	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2488	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2488	*Pinus edulis*	Piñon	Wood	Positive	Charred	9	0.2	N/A
135290	2488	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2488	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	0.1	N/A
135290	2488	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	1	<0.1	N/A
135290	2488	*Portulaca*	Purslane	Seed	Positive	Charred	2(2)	0	N/A
135290	2488	Portulacaceae	Purslane family	Seed	Fairly certain	Uncharred	0	0	1-10/liter
135290	2488	Unidentifiable	Unidentifiable	Seed	Positive	Charred	1(0)	0	N/A
135290	2488	*Zea mays*	Maize	Cupule	Positive	Charred	3(1)	0	N/A
135290	2488	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	0	N/A
135290	2489	*Chenopodium*	Goosefoot	Seed	Positive	Charred	22	0	N/A
135290	2489	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2489	*Juniperus*	Juniper	Wood	Positive	Charred	3	<0.1	N/A
135290	2489	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
135290	2489	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2489	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	<0.1	N/A
135290	2489	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2489	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	3	<0.1	N/A
135290	2490	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2490	*Juniperus*	Juniper	Wood	Positive	Charred	4	<0.1	N/A
135290	2490	*Pinus*	Pine	Wood	Positive	Charred	4	0.2	N/A
135290	2490	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.4	N/A
135290	2490	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2490	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	5	0.2	N/A
135290	2490	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	1	<0.1	N/A
135290	2490	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2490	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
135290	2491	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2491	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2491	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
135290	2491	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2492	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(0)	0	N/A
135290	2492	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2492	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2492	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	1(1)	0	N/A
135290	2492	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
135290	2492	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2492	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	2	0.1	N/A
135290	2492	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2492	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	0.1	N/A
135290	2492	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	8	0.1	N/A
135290	2492	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1	N/A
135290	2492	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	<0.1	N/A
135290	2496	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2496	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2496	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	2496	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
135290	2496	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2496	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
135290	2496	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	0	N/A
135290	2526	*Chenopodium*	Goosefoot	Seed	Positive	Partially Charred	1(1)	0	N/A
135290	2526	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2526	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	9(8)	0	N/A
135290	2526	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Partially Charred	1(1)	0	N/A
135290	2526	Compositae	Sunflower family	Achene	Fairly certain	Charred	6(6)	0	N/A
135290	2526	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2526	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2526	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2526	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
135290	2526	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	<0.1	N/A
135290	2526	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	9(9)	0	N/A
135290	2528	*Chenopodium*	Goosefoot	Seed	Positive	Charred	18(18)	0	N/A
135290	2528	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2528	*Chenopodium/Amaranthus*	Cheno-am	Seed	Positive	Charred	4(4)	0	N/A
135290	2528	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2528	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.2	N/A
135290	2528	*Pinus*	Pine	Wood	Positive	Charred	1	0.1	N/A
135290	2528	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	2528	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	2528	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.2	N/A
135290	2528	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	10	0.2	N/A
135290	2528	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2528	*Zea mays*	Maize	Cupule	Positive	Charred	27(4)	0	N/A
135290	2549	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2549	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter
135290	2549	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	2549	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2549	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2549	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2549	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2549	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
135290	2549	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	2549	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.9	N/A
135290	2549	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2549	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	5	<0.1	N/A
135290	2549	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2549	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
135290	2549	*Zea mays*	Maize	Cupule	Positive	Charred	4(0)	0	N/A
135290	2556	*Chenopodium*	Goosefoot	Seed	Positive	Charred	12(12)	0	N/A
135290	2556	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2556	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	3(3)	0	N/A
135290	2556	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
135290	2556	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	2561	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(0)	0	N/A
135290	2561	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(2)	0	N/A
135290	2561	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Charred	10(10)	0	N/A
135290	2561	Compositae	Sunflower family	Achene	Fairly certain	Charred	13(13)	0	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135290	2561	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
135290	2561	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	4	0.1	N/A
135290	2561	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
135290	2561	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Charred	19(19)	0	N/A
135290	2561	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0	N/A
135290	2563	*Chenopodium*	Goosefoot	Seed	Positive	Charred	2(1)	0	N/A
135290	2563	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2563	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
135290	2563	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2563	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.6	N/A
135290	2563	*Nicotiana*	Tobacco	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2563	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2563	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	0.1	N/A
135290	2563	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2563	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	4	<0.1	N/A
135290	2563	*PlatyOpuntia*	Pricklypear cactus	Embryo	Positive	Uncharred	0	0	1-10/liter
135290	2563	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2563	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2563	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
135290	2563	*Zea mays*	Maize	Cupule	Positive	Charred	7(0)	0	N/A
135290	2564	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2564	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1	N/A
135290	2564	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2564	*Pinus edulis*	Piñon	Needle	Fairly certain	Charred	0	0	1-10/liter
135290	2564	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	<0.1	N/A
135290	2564	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
135290	2564	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	10	0.2	N/A
135290	2564	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
135290	2564	*Zea mays*	Maize	Cupule	Positive	Charred	9(2)	0	N/A
135290	2584	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
135290	2584	Compositae	Sunflower family	Achene	Fairly certain	Charred	1(1)	0	N/A
135290	2584	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
135290	2584	*Oenothera*	Evening primrose	Seed	Positive	Charred	1(1)	0	N/A

Site	**FS No.**	**Scientific Name**	**Common Name**	**Plant part**	**Confidence**	**Condition**	**Count**	**Weight**	**Abundance**
139418	318	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
139418	318	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
139418	318	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
139418	318	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
139418	318	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
139418	318	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
139418	341	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
139418	341	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
139418	341	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
139418	341	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
139418	341	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
139418	341	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
139418	341	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
139418	363	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
139418	364	no data	No data	No data	No data	No data	0	0	N/A
139418	365	no data	No data	No data	No data	No data	0	0	N/A
139418	367	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
139418	367	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
139418	367	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
139418	367	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
139418	367	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
139418	367	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
139418	367	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
139418	367	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
141505	22	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
141505	74	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	14	0.4	N/A
141505	74	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
141505	74	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
141505	74	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
141505	74	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
141505	74	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	6	<0.1	N/A
141505	82	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
141505	82	Portulacaceae	Purslane family	Seed	Fairly certain	Uncharred	0	0	1-10/liter
141505	82	*Zea mays*	Maize	Cupule	Resembles taxon	Charred	1(0)	<0.1	N/A

Site	**FS No.**	**Scientific Name**	**Common Name**	**Plant part**	**Confidence**	**Condition**	**Count**	**Weight**	**Abundance**
141505	82	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	<0.1	N/A
141505	82	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
141505	82	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A
141505	82	Pinus edulis	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
15116	31	Compositae	Sunflower family	Achene	Uncharred	Positive			1-10/liter
15116	31	Gramineae	Grass family	Floret	Uncharred	Positive			1-10/liter
15116	31	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
15116	31	*Pinus edulis*	Piñon	Needle	Uncharred	Positive			1-10/liter
15116	31	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
15116	31	*Rumex*	Dock	Seed	Uncharred	Fairly certain			1-10/liter
15116	31	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
15116	31	Indeterminate	Indeterminate	Unknown	Charred	Positive	1(0)		N/A
15116	31	Gramineae	Grass family	Caryopsis	Charred	Fairly certain	1(1)		N/A
15116	31	*Rumex*	Dock	Seed	Charred	Fairly certain	1(1)		N/A
15116	31	*Pinus edulis*	Piñon	Wood	Charred	Positive	3	0.1	N/A
15116	31	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	4	0.1	N/A
15116	59	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
15116	59	*Rumex*	Dock	Seed	Uncharred	Fairly certain			1-10/liter
15116	59	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
15116	59	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	2	<0.1	N/A
15116	59	Gymnospermae	Unknown conifer	Wood	Charred	Positive	3	<0.1	N/A
15116	60	*Pinus edulis*	Piñon	Needle	Uncharred	Positive			1-10/liter
15116	60	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
15116	60	*Rumex*	Dock	Seed	Uncharred	Fairly certain			1-10/liter
15116	60	Indeterminate	Indeterminate	Unknown	Charred	Positive	1(0)		N/A
15116	60	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	2	<0.1	N/A
15116	60	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	3	<0.1	N/A
70025	21	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	8	0.1	N/A
70025	24	Gramineae	Grass family	Culm	Charred	Positive			1-10/liter
70025	24	Gymnospermae	Unknown conifer	Wood	Charred	Positive	2	<0.1	N/A
70025	24	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	4	0.1	N/A
70025	24	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	8	0.5	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
70025	43	Gramineae	Grass family	Caryopsis	Uncharred	Positive			1-10/liter
70025	43	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
70025	43	*Helianthus*	Sunflower	Achene	Uncharred	Positive			1-10/liter
70025	43	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Fairly certain	1	<0.1	N/A
70025	43	Gymnospermae	Unknown conifer	Wood	Charred	Positive	3	0.1	N/A
85403	18	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
85403	18	*Portulaca*	Purslane	Seed	Uncharred	Positive			1-10/liter
85403	18	*Rumex*	Dock	Seed	Uncharred	Fairly certain			1-10/liter
85403	18	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
85403	23	Gymnospermae	Unknown conifer	Wood	Charred	Positive	1	<0.1	N/A
85403	23	*Chenopodium*	Goosefoot	Seed	Charred	Fairly certain	1(0)		N/A
85403	23	*Portulaca*	Purslane	Seed	Charred	Positive	1(1)		N/A
85403	24	Gymnospermae	Unknown conifer	Wood	Charred	Positive	1	<0.1	N/A
85403	24	*Quercus*	Oak	Wood	Charred	Fairly certain	1	<0.1	N/A
85403	24	*Zea mays*	Maize	Cupule	Charred	Fairly certain	1(0)		N/A
85403	27	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
85403	27	Compositae	Sunflower family	Achene	Uncharred	Positive			1-10/liter
85403	27	*Euphorbia*	Spurge	Seed	Uncharred	Positive			1-10/liter
85403	27	Gramineae	Grass family	Caryopsis	Uncharred	Positive			1-10/liter
85403	27	*Sporobolus*	Dropseed grass	Caryopsis	Uncharred	Positive			1-10/liter
85403	27	*Pinus*	Pine	Bark scale	Charred	Positive			1-10/liter
85403	27	*Pinus ponderosa*	Ponderosa pine	Fascicle	Uncharred	Positive			1-10/liter
85403	27	*Rumex*	Dock	Seed	Uncharred	Fairly certain			1-10/liter
85403	27	*Pinus*	Pine	Seed	Uncharred	Positive			1-10/liter
85403	27	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			11-25/liter
85403	27	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	1	<0.1	N/A
85403	27	*Quercus*	Oak	Wood	Charred	Positive	3	0.1	N/A
85403	49	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	3	0.1	N/A
85403	53	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
85403	53	*Physalis*	Groundcherry	Seed	Uncharred	Positive			1-10/liter
85403	53	*Echinocereus*	Hedgehog cactus	Seed	Uncharred	Positive			1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85403	53	Indeterminate	Indeterminate	Unknown	Charred	Positive	1(0)		N/A
85403	53	Gymnospermae	Unknown conifer	Wood	Charred	Positive	4	0.1	N/A
85403	53	*Zea mays*	Maize	Cupule	Charred	Positive	5(0)		N/A
85403	53	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	6	0.1	N/A
85404	68	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
85404	68	*Pinus ponderosa*	Ponderosa pine	Fascicle	Charred	Positive			1-10/liter
85404	68	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
85404	68	*Pinus*	Pine	Wood	Charred	Fairly certain	2	0.3	N/A
85404	68	*Zea mays*	Maize	Cupule	Charred	Positive	2(0)		N/A
85404	68	Gymnospermae	Unknown conifer	Wood	Charred	Positive	3	0.1	N/A
85404	68	*Pinus edulis*	Piñon	Wood	Charred	Positive	6	0.3	N/A
85404	68	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	9	0.3	N/A
85404	72	*Pinus*	Pine	Bark scale	Charred	Positive			1-10/liter
85404	72	*Pinus*	Pine	Seed	Uncharred	Fairly certain			1-10/liter
85404	72	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
85404	72	*Pinus ponderosa*	Ponderosa pine	Fascicle	Charred	Positive			1-10/liter
85404	72	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
85404	72	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
85404	72	*Pinus*	Pine	Umbo	Charred	Positive			1-10/liter
85404	72	*Artemisia*	Sagebrush	Wood	Charred	Fairly certain	1	<0.1	N/A
85404	72	*Pinus edulis*	Piñon	Wood	Charred	Positive	1	<0.1	N/A
85404	72	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	11	0.6	N/A
85404	72	*Pinus*	Pine	Wood	Charred	Positive	2	0.1	N/A
85404	72	Gymnospermae	Unknown conifer	Wood	Charred	Positive	5	<0.1	N/A
85404	93	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
85404	93	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
85404	93	*Nicotiana*	Tobacco	Seed	Uncharred	Positive			1-10/liter
85404	93	*Quercus*	Oak	Wood	Charred	Positive	2	0.2	N/A
85404	93	Gymnospermae	Unknown conifer	Wood	Charred	Positive	5	0.1	N/A
85404	93	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	5	0.7	N/A
85404	93	*Pseudotsuga menziesii*	Douglas fir	Wood	Charred	Resembles taxon	8	0.6	N/A
85404	94	*Nicotiana*	Tobacco	Seed	Uncharred	Positive			1-10/liter
85404	94	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85404	94	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
85404	94	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
85404	94	*Artemisia*	Sagebrush	Wood	Charred	Positive	1	<0.1	N/A
85404	94	*Physalis*	Groundcherry	Seed	Charred	Positive	1(0)		N/A
85404	94	*Pinus*	Pine	Wood	Charred	Positive	3	0.2	N/A
85404	94	*Chenopodium*	Goosefoot	Seed	Charred	Positive	3(3)		N/A
85404	94	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	4	0.1	N/A
85404	94	Gymnospermae	Unknown conifer	Wood	Charred	Positive	4	<0.1	N/A
85404	94	*Pinus edulis*	Piñon	Wood	Charred	Fairly certain	8	0.2	N/A
85404	106	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
85404	106	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
85404	106	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
85404	106	Gymnospermae	Unknown conifer	Wood	Charred	Positive	17	1.2	N/A
85404	106	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	3	0.3	N/A
85407	269	*Amaranthus*	Pigweed	Seed	Positive	Uncharred			11-25/liter
85407	269	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			25-100/liter
85407	269	*Cleome*	Beeweed	Seed	Fairly Certain	Charred	1(1)		N/A
85407	269	*Cleome*	Beeweed	Seed	Positive	Uncharred			1-10/liter
85407	269	*Helianthus*	Sunflower	Achene	Positive	Uncharred			1-10/liter
85407	269	*Lappula*	Stickseed	Seed	Positive	Uncharred			1-10/liter
85407	269	*Portulaca*	Purslane	Seed	Positive	Uncharred			25-100/liter
85407	269	Compositae	Sunflower Family	Achene	Positive	Uncharred			1-10/liter
85407	269	*Croton*	Doveweed	Seed	Positive	Uncharred			1-10/liter
85407	269	*Physalis*	Groundcherry	Seed	Positive	Uncharred			1-10/liter
85407	269	*Salvia*	Sage	Seed	Positive	Uncharred			1-10/liter
85407	269	*Verbena*	Vervain	Seed	Positive	Uncharred			1-10/liter
85407	269	*Zea mays*	Maize	Cupule	Positive	Charred	2(1)		N/A
85407	269	Gramineae	Grass Family	Caryopsis	Positive	Part. Charred	1(1)		N/A
85407	269	Gramineae	Grass Family	Caryopsis	Positive	Uncharred			1-10/liter
85407	269	*Sporobolus*	Dropseed Grass	Caryopsis	Positive	Uncharred			1-10/liter
85407	269	*Pinus*	Pine	Bark Scale	Positive	Charred			1-10/liter
85407	269	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred			1-10/liter
85407	269	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Uncharred			1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85407	269	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	19	1.7	N/A
85407	269	Unknown non-conifer	Unknown Non-Conifer	Wood	Positive	Charred	1	0.1	N/A
85407	298	*Amaranthus*	Pigweed	Seed	Positive	Charred	2(2)		N/A
85407	298	*Amaranthus*	Pigweed	Seed	Positive	Uncharred			1-10/liter
85407	298	*Chenopodium*	Goosefoot	Seed	Positive	Charred	68(67)		N/A
85407	298	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			25-100/liter
85407	298	*Cleome*	Beeweed	Seed	Positive	Charred	4(4)		N/A
85407	298	*Cleome*	Beeweed	Seed	Positive	Uncharred			1-10/liter
85407	298	*Helianthus*	Sunflower	Achene	Positive	Uncharred			1-10/liter
85407	298	*Portulaca*	Purslane	Seed	Positive	Uncharred			25-100/liter
85407	298	Compositae	Sunflower Family	Achene	Positive	Uncharred			1-10/liter
85407	298	*Croton*	Doveweed	Seed	Positive	Uncharred			1-10/liter
85407	298	*Physalis*	Groundcherry	Seed	Positive	Uncharred			1-10/liter
85407	298	*Salvia*	Sage	Seed	Positive	Charred	4(4)		N/A
85407	298	*Salvia*	Sage	Seed	Positive	Part. Charred	3(2)		N/A
85407	298	*Salvia*	Sage	Seed	Positive	Uncharred			1-10/liter
85407	298	*Verbena*	Vervain	Seed	Positive	Charred	3(3)		N/A
85407	298	*Verbena*	Vervain	Seed	Positive	Uncharred			1-10/liter
85407	298	*Vitis*	Grape	Seed	Positive	Charred	1(1)		N/A
85407	298	*Vitis*	Grape	Seed	Positive	Uncharred	1(0)		N/A
85407	298	*Zea mays*	Maize	Cupule	Positive	Charred	3(0)		N/A
85407	298	Gramineae	Grass Family	Caryopsis	Positive	Charred	1(1)		N/A
85407	298	Gramineae	Grass Family	Caryopsis	Positive	Uncharred			1-10/liter
85407	298	Gramineae	Grass Family	Culm	Positive	Charred			1-10/liter
85407	298	*Sporobolus*	Dropseed Grass	Caryopsis	Positive	Uncharred			1-10/liter
85407	298	Indeterminate	Indeterminate	Seed	Positive	Charred	1(0)		N/A
85407	298	Cyperaceae	Sedge Family	Seed	Positive	Charred	1(1)		N/A
85407	298	*Pinus*	Pine	Bark Scale	Positive	Charred			1-10/liter
85407	298	*Pinus*	Pine	Needle	Positive	Charred			1-10/liter
85407	298	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	20	1.3	N/A
85407	298	*Sphaeralcea*	Globemallow	Seed	Positive	Uncharred			1-10/liter
85407	298	*Mentzelia pumila*	Stickleaf	Seed	Positive	Uncharred			1-10/liter
85407	301	*Amaranthus*	Pigweed	Seed	Positive	Uncharred			1-10/liter
85407	301	*Chenopodium*	Goosefoot	Seed	Positive	Charred	31(31)		N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85407	301	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			25-100/liter
85407	301	*Cleome*	Beeweed	Seed	Positive	Uncharred			1-10/liter
85407	301	*Helianthus*	Sunflower	Achene	Positive	Uncharred			1-10/liter
85407	301	*Lappula*	Stickseed	Seed	Positive	Charred	1(1)		N/A
85407	301	*Lappula*	Stickseed	Seed	Positive	Uncharred			1-10/liter
85407	301	*Portulaca*	Purslane	Seed	Positive	Uncharred			1-10/liter
85407	301	Compositae	Sunflower Family	Achene	Positive	Uncharred			1-10/liter
85407	301	*Physalis*	Groundcherry	Seed	Positive	Charred	1(1)		N/A
85407	301	*Physalis*	Groundcherry	Seed	Positive	Uncharred			1-10/liter
85407	301	*Salvia*	Sage	Seed	Positive	Uncharred			1-10/liter
85407	301	Gramineae	Grass Family	Caryopsis	Positive	Charred	2(2)		N/A
85407	301	Gramineae	Grass Family	Caryopsis	Positive	Uncharred			1-10/liter
85407	301	*Sporobolus*	Dropseed Grass	Caryopsis	Positive	Uncharred			1-10/liter
85407	301	*Echinocereus*	Hedgehog Cactus	Seed	Positive	Uncharred			1-10/liter
85407	301	*Juniperus*	Juniper	Twig	Positive	Part. Charred			1-10/liter
85407	301	*Pinus*	Pine	Bark Scale	Positive	Charred			1-10/liter
85407	301	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	20	2.9	N/A
85407	301	*Sphaeralcea*	Globemallow	Seed	Positive	Uncharred			1-10/liter
85407	301	*Mentzelia pumila*	Stickleaf	Seed	Positive	Uncharred			1-10/liter
85407	331	*Amaranthus*	Pigweed	Seed	Positive	Uncharred			25-100/liter
85407	331	*Chenopodium*	Goosefoot	Seed	Positive	Charred	143(143)		N/A
85407	331	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			>100/liter
85407	331	*Cleome*	Beeweed	Seed	Positive	Uncharred			1-10/liter
85407	331	*Kochia scoparia*	Summer Cypress	Seed	Fairly Certain	Charred	19(19)		N/A
85407	331	*Lappula*	Stickseed	Seed	Positive	Uncharred			1-10/liter
85407	331	*Portulaca*	Purslane	Seed	Positive	Uncharred			>100/liter
85407	331	Compositae	Sunflower Family	Achene	Positive	Uncharred			>100/liter
85407	331	*Physalis*	Groundcherry	Seed	Positive	Uncharred			1-10/liter
85407	331	Portulacaceae	Purslane Family	Seed	Positive	Uncharred			1-10/liter
85407	331	Gramineae	Grass Family	Caryopsis	Positive	Uncharred			1-10/liter
85407	331	S*porobolus*	Dropseed Grass	Caryopsis	Positive	Charred	1(1)		N/A
85407	331	*Sporobolus*	Dropseed Grass	Caryopsis	Positive	Uncharred			1-10/liter
85407	331	Unknown # 1	Unknown # 1	Seed	Positive	Uncharred			1-10/liter
85407	331	*Juniperus*	Juniper	Seed	Positive	Uncharred			1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85407	331	*Pinus*	Pine	Male Cone	Positive	Uncharred			1-10/liter
85407	331	*Pinus edulis*	Piñon	Needle	Positive	Charred			1-10/liter
85407	331	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
85407	331	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred			1-10/liter
85407	331	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85407	331	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Uncharred			1-10/liter
85407	331	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	8	0.5	N/A
85407	331	*Scirpus*	Bulrush	Seed	Positive	Uncharred			1-10/liter
85407	352	*Amaranthus*	Pigweed	Seed	Positive	Uncharred			11-25/liter
85407	352	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)		N/A
85407	352	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			25-100/liter
85407	352	*Cleome*	Beeweed	Seed	Positive	Uncharred			1-10/liter
85407	352	*Helianthus*	Sunflower	Achene	Positive	Uncharred			1-10/liter
85407	352	*Portulaca*	Purslane	Seed	Positive	Uncharred			25-100/liter
85407	352	Compositae	Sunflower Family	Achene	Positive	Uncharred			1-10/liter
85407	352	*Croton*	Doveweed	Seed	Positive	Uncharred			1-10/liter
85407	352	*Physalis*	Groundcherry	Seed	Positive	Uncharred			1-10/liter
85407	352	Polygonaceae	Knotweed Family	Seed	Positive	Uncharred			1-10/liter
85407	352	Gramineae	Grass Family	Caryopsis	Positive	Uncharred			1-10/liter
85407	352	*Sporobolus*	Dropseed Grass	Caryopsis	Positive	Uncharred			1-10/liter
85407	352	*Juniperus*	Juniper	Seed	Positive	Uncharred			1-10/liter
85407	352	*Pinus*	Pine	Umbo	Fairly Certain	Charred			1-10/liter
85407	352	*Pinus edulis*	Piñon	Needle	Positive	Charred			1-10/liter
85407	352	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
85407	352	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred			1-10/liter
85407	352	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85407	352	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Uncharred			1-10/liter
85407	352	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	1	0.1	N/A
85407	352	*Scirpus*	Bulrush	Seed	Positive	Uncharred			1-10/liter
85407	352	*Mentzelia pumila*	Stickleaf	Seed	Positive	Uncharred			1-10/liter
85407	357	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
85407	357	*Portulaca*	Purslane	Seed	Positive	Uncharred			1-10/liter
85407	357	*Physalis*	Groundcherry	Seed	Positive	Uncharred			1-10/liter
85407	357	*Sporobolus*	Dropseed Grass	Caryopsis	Positive	Uncharred			1-10/liter
85407	357	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85407	357	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	1	<0.1	N/A
85407	408	*Amaranthus*	Pigweed	Seed	Positive	Uncharred			1-10/liter
85407	408	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)		N/A
85407	408	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			25-100/liter
85407	408	*Helianthus*	Sunflower	Achene	Positive	Uncharred			1-10/liter
85407	408	*Portulaca*	Purslane	Seed	Positive	Uncharred			25-100/liter
85407	408	Compositae	Sunflower Family	Achene	Positive	Uncharred			1-10/liter
85407	408	*Physalis*	Groundcherry	Seed	Positive	Uncharred			1-10/liter
85407	408	*Salvia*	Sage	Seed	Positive	Uncharred			1-10/liter
85407	408	*Sporobolus*	Dropseed Grass	Caryopsis	Positive	Uncharred			1-10/liter
85407	408	Indeterminate	Indeterminate	Seed	Positive	Charred	1(0)		N/A
85407	408	*Juniperus*	Juniper	Wood	Positive	Charred	12	1.8	N/A
85407	408	*Pinus*	Pine	Bark Scale	Positive	Charred			1-10/liter
85407	408	*Pinus*	Pine	Wood	Positive	Charred	3	0.5	N/A
85407	408	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.8	N/A
85407	408	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	2	0.3	N/A
85407	499	*Amaranthus*	Pigweed	Seed	Positive	Uncharred			1-10/liter
85407	499	*Chenopodium*	Goosefoot	Seed	Positive	Charred	56(56)		N/A
85407	499	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			25-100/liter
85407	499	*Chenopodium/ Amaranth*	Cheno-Am	Seed	Positive	Charred	3(3)		N/A
85407	499	*Cleome*	Beeweed	Seed	Positive	Charred	2(2)		N/A
85407	499	*Cleome*	Beeweed	Seed	Positive	Part. Charred	1(0)		N/A
85407	499	*Cleome*	Beeweed	Seed	Positive	Uncharred			1-10/liter
85407	499	*Lappula*	Stickseed	Seed	Positive	Uncharred			1-10/liter
85407	499	*Portulaca*	Purslane	Seed	Positive	Uncharred			25-100/liter
85407	499	*Salsola kali*	Russian Thistle	Seed	Fairly Certain	Uncharred			1-10/liter
85407	499	*Croton*	Doveweed	Seed	Positive	Charred	1(1)		N/A
85407	499	*Croton*	Doveweed	Seed	Positive	Uncharred			1-10/liter
85407	499	*Physalis*	Groundcherry	Seed	Positive	Charred	2(2)		N/A
85407	499	*Physalis*	Groundcherry	Seed	Positive	Uncharred			1-10/liter
85407	499	Portulacaceae	Purslane Family	Seed	Positive	Uncharred			1-10/liter
85407	499	*Salvia*	Sage	Seed	Positive	Uncharred			1-10/liter
85407	499	Gramineae	Grass Family	Caryopsis	Positive	Uncharred			1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85407	499	*Sporobolus*	Dropseed Grass	Caryopsis	Positive	Uncharred			1-10/liter
85407	499	Indeterminate	Indeterminate	Embryo	Positive	Charred	11(11)		N/A
85407	499	Indeterminate	Indeterminate	Unknown	Positive	Charred	1(0)		N/A
85407	499	Cyperaceae	Sedge Family	Seed	Positive	Charred	3(3)		N/A
85407	499	*Echinocereus*	Hedgehog Cactus	Seed	Positive	Uncharred			1-10/liter
85407	499	*Juniperus*	Juniper	Female Cone	Positive	Uncharred			1-10/liter
85407	499	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.1	N/A
85407	499	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
85407	499	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred			1-10/liter
85407	499	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N/A
85407	499	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	15	0.2	N/A
85407	499	*Scirpus*	Bulrush	Seed	Positive	Uncharred			1-10/liter
85408	41	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	4	0.1	N\A
85408	41	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
85408	41	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85408	42	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85408	57	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
85408	57	Gramineae	Grass Family	Floret	Positive	Uncharred			1-10/liter
85408	57	*Carex*	Sedge	Seed	Fairly Certain	Uncharred			1-10/liter
85408	57	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	<0.1		N\A
85408	57	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
85408	57	*Pinus edulis*	Piñon	Needle	Positive	Charred			1-10/liter
85408	57	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
85408	57	*Pinus edulis*	Piñon	Nutshell	Fairly Certain	Charred			1-10/liter
85408	57	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred			1-10/liter
85408	57	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85408	57	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Uncharred			1-10/liter
85408	57	*PlatyOpuntia*	Pricklypear Cactus	Seed	Positive	Uncharred			1-10/liter
85411	76	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
85411	76	Indeterminate	Indeterminate	Unknown	Positive	Charred	1(0)		N\A
85411	76	*Cercocarpus*	Mountain Mahogany	Wood	Positive	Charred	1	<0.1	N\A
85411	76	*Pinus edulis*	Piñon	Needle	Positive	Charred			1-10/liter
85411	76	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85411	76	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	3	0.1	N\A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85411	76	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N\A
85411	77	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85411	77	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N\A
85411	78	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)		N\A
85411	78	*Zea mays*	Maize	Cupule	Resembles Taxon	Charred	2(0)		N\A
85411	78	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	2	<0.1	N\A
85411	78	*Pinus*	Pine	Needle	Positive	Charred			1-10/liter
85411	78	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	1	<0.1	N\A
85411	78	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N\A
85411	111	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
85411	111	Compositae	Sunflower Family	Achene	Positive	Uncharred			1-10/liter
85411	111	*Euphorbia*	Spurge	Seed	Positive	Uncharred			1-10/liter
85411	111	Indeterminate	Indeterminate	Unknown	Positive	Charred	1(0)		N\A
85411	111	*Cercocarpus*	Mountain Mahogany	Wood	Positive	Charred	1	<0.1	N\A
85411	111	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	2	0.3	N\A
85411	111	*Pinus edulis*	Piñon	Needle	Positive	Charred			1-10/liter
85411	111	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
85411	111	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85411	111	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	2	<0.1	N\A
85411	112	*Cercocarpus*	Mountain Mahogany	Wood	Positive	Charred	12	0.3	N\A
85411	112	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	2	<0.1	N\A
85411	112	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85411	112	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	1	<0.1	N\A
85411	118	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
85411	118	*Zea mays*	Maize	Kernel	Fairly Certain	Charred	1(0)		N\A
85411	118	Gramineae	Grass Family	Floret	Positive	Uncharred			1-10/liter
85411	118	*Cercocarpus*	Mountain Mahogany	Wood	Positive	Charred	2	0.1	N\A
85411	118	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	4	0.2	N\A
85411	118	*Pinus*	Pine	Wood	Positive	Charred	10	0.3	N\A
85411	118	*Pinus edulis*	Piñon	Needle	Positive	Charred			1-10/liter
85411	118	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
85411	136	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)		N\A
85411	136	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)		N\A
85411	136	Indeterminate	Indeterminate	Unknown	Positive	Charred	1(0)		N\A
85411	136	*Cercocarpus*	Mountain Mahogany	Wood	Positive	Charred	1	<0.1	N\A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85411	136	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85411	136	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	1	<0.1	N\A
85411	137	*Nicotiana*	Tobacco	Seed	Positive	Charred	1(1)		N\A
85411	137	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)		N\A
85411	137	*Portulaca*	Purslane	Seed	Positive	Uncharred			1-10/liter
85411	137	Indeterminate	Indeterminate	Unknown	Positive	Charred	1(0)		N\A
85411	137	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	3	0.1	N\A
85411	137	*Pinus*	Pine	Umbo	Positive	Charred			1-10/liter
85411	137	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85411	137	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	2	0.1	N\A
85411	138	*Cercocarpus*	Mountain Mahogany	Wood	Positive	Charred	1	<0.1	N\A
85411	138	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
85411	138	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85411	138	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	8	0.1	N\A
85411	138	*Quercus*	Oak	Wood	Positive	Charred	4	0.1	N\A
85411	178	Gramineae	Grass Family	Floret	Positive	Uncharred			1-10/liter
85411	178	Indeterminate	Indeterminate	Unknown	Positive	Charred	1(0)		N\A
85411	178	*Cercocarpus*	Mountain Mahogany	Wood	Positive	Charred	4	<0.1	N\A
85411	178	*Pinus*	Pine	Umbo	Positive	Charred			1-10/liter
85411	178	*Pinus edulis*	Piñon	Needle	Positive	Charred			1-10/liter
85411	178	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85411	178	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Uncharred			1-10/liter
85411	178	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	7	0.3	N\A
85411	178	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N\A
85413	149	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
85413	149	*Zea mays*	Maize	Cupule	Fairly Certain	Charred	1(0)		N\A
85413	149	Indeterminate	Indeterminate	Unknown	Positive	Charred	1(0)		N\A
85413	149	*Cercocarpus*	Mountain Mahogany	Wood	Positive	Charred	8	0.2	N\A
85413	149	*Juniperus*	Juniper	Seed	Positive	Uncharred			1-10/liter
85413	149	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
85413	149	*Pinus*	Pine	Wood	Positive	Charred	11	0.4	N\A
85413	149	*Pinus edulis*	Piñon	Needle	Positive	Charred			1-10/liter
85413	149	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
85413	149	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred			1-10/liter
85413	149	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85413	149	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	1	<0.1	N\A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85413	224	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)		N\A
85413	224	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
85413	224	Indeterminate	Indeterminate	Unknown	Positive	Charred	1(0)		N\A
85413	224	Indeterminate	Indeterminate	Unknown	Positive	Part. Charred	1(0)		N\A
85413	224	*Cercocarpus*	Mountain Mahogany	Wood	Positive	Charred	1	<0.1	N\A
85413	224	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	3	<0.1	N\A
85413	224	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
85413	224	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	0.1	N\A
85413	224	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85413	224	*Quercus*	Oak	Wood	Positive	Charred	4	0.2	N\A
85414	57	Gramineae	Grass Family	Floret	Positive	Uncharred			1-10/liter
85414	57	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
85414	57	*Pinus*	Pine	Wood	Positive	Charred	5	0.1	N\A
85414	57	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
85414	57	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Uncharred			1-10/liter
85414	58	Gramineae	Grass Family	Floret	Positive	Uncharred			1-10/liter
85414	58	*Pinus edulis*	Piñon	Needle	Positive	Charred			1-10/liter
85417	71	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
85417	71	*Chenopodium/ Amaranth*	Cheno-Am	Seed	Positive	Charred	1(1)		N\A
85417	71	*Portulaca*	Purslane	Seed	Positive	Uncharred			1-10/liter
85417	71	Indeterminate	Indeterminate	Unknown	Positive	Charred	3(0)		N\A
85417	71	*Echinocereus*	Hedgehog Cactus	Seed	Positive	Uncharred			1-10/liter
85417	71	*Juniperus*	Juniper	Female Cone	Fairly Certain	Charred	1(0)		N\A
85417	71	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N\A
85417	71	*Pinus edulis*	Piñon	Seed	Fairly Certain	Charred	2(2)		N\A
85417	71	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Uncharred			1-10/liter
85417	72	*Portulaca*	Purslane	Seed	Positive	Uncharred			1-10/liter
85417	72	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N\A
85417	72	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	2	<0.1	N\A
85417	114	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
85417	114	*Portulaca*	Purslane	Seed	Positive	Uncharred			1-10/liter
85417	114	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	3	0.1	N\A
85417	114	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	1	<0.1	N\A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85417	141	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	2	<0.1	N\A
85417	141	*Pinus*	Pine	Wood	Positive	Charred	3	0.3	N\A
85417	141	*Pinus ponderosa*	Ponderosa Pine	Wood	Fairly Certain	Charred	15	1.8	N\A
85417	142	*Chenopodium/ Amaranthus*	Cheno-Am	Seed	Positive	Charred	1(1)		N\A
85417	142	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	6	0.1	N\A
85417	142	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.2	N\A
85417	142	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
85417	142	*Pinus ponderosa*	Ponderosa Pine	Wood	Fairly Certain	Charred	12	1.3	N\A
85859	108	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
85859	108	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Partially Charred	0	0	1-10/liter
85859	108	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
85859	123	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
85859	123	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
85859	123	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
85859	136	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
85859	136	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
85859	143	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(0)	0	N/A
85859	308	no data	No data	No data	No data	No data	0	0	N/A
85859	310	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
85859	310	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter
85859	310	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
85859	310	Fabaceae	Bean family	Seed	Positive	Uncharred	0	0	1-10/liter
85859	310	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
85859	310	*Juniperus*	Juniper	Twig	Positive	Charred	0	0	1-10/liter
85859	310	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
85859	310	*Pinus*	Pine	Male cone	Resembles taxon	Charred	0	0	1-10/liter
85859	310	*Pinus*	Pine	Umbo	Positive	Charred	0	0	1-10/liter
85859	310	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
85859	310	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
85859	310	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	1	<0.1	N/A
85859	310	*Pinus edulis*	Piñon	Wood	Fairly	Partially	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
					certain	Charred			
85859	310	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
85859	310	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	11-25/liter
85859	311	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
85859	311	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
85859	311	*Pinus*	Pine	Umbo	Positive	Charred	0	0	1-10/liter
85859	311	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
85859	311	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
85859	312	no data	No data	No data	No data	No data	0	0	N/A
85859	313	no data	No data	No data	No data	No data	0	0	N/A
85859	314	no data	No data	No data	No data	No data	0	0	N/A
85859	315	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
85859	346	no data	No data	No data	No data	No data	0	0	N/A
85859	348	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
85859	348	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
85859	349	no data	No data	No data	No data	No data	0	0	N/A
85859	350	no data	No data	No data	No data	No data	0	0	N/A
85859	351	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
85859	352	no data	No data	No data	No data	No data	0	0	N/A
85859	353	Chenopodium	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
85859	353	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter
85859	353	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
85859	353	Polygonaceae	Knotweed family	Seed	Positive	Uncharred	0	0	1-10/liter
85859	353	*Pinus*	Pine	Umbo	Positive	Charred	0	0	1-10/liter
85859	353	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
85859	353	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
85859	353	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
85859	354	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
85859	355	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
85861	191	*Cleome*	Beeweed	Seed	Positive	Charred	3(3)		N\A
85861	191	*Cleome*	Beeweed	Seed	Positive	Part. Charred	2(2)		N\A
85861	191	Indeterminate	Indeterminate	Unknown	Positive	Charred	1(0)		N\A
85861	191	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	2	<0.1	N\A
85861	191	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N\A
85861	192	*Chenopodium/ Amaranthus*	Cheno-Am	Seed	Positive	Charred	1(0)		N\A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85861	192	*Cleome*	Beeweed	Seed	Positive	Charred	6(5)		N\A
85861	192	Labiatae	Mint Family	Seed	Fairly Certain	Charred	1(1)		N\A
85861	192	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	2	<0.1	N\A
85861	192	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N\A
85861	193	*Zea mays*	Maize	Cupule	Positive	Charred	2(2)		N\A
85861	193	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1	N\A
85861	194	*Pinus edulis*	Piñon	Needle	Positive	Charred			1-10/liter
85861	194	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
85861	194	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	1	<0.1	N\A
85864	4	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
85864	4	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
85864	4	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
85864	4	*Pinus*	Pine	Bark scale	Positive	Uncharred	0	0	1-10/liter
85864	4	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
85864	4	*Pinus edulis*	Piñon	Wood	Positive	Charred	20	0.5	N/A
85864	5	*Juniperus*	Juniper	Twig	Positive	Charred	0	0	1-10/liter
85864	5	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
85864	5	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1	N/A
85864	5	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
85864	5	*Pinus edulis*	Piñon	Wood	Positive	Charred	18	0.5	N/A
85864	5	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
85864	6	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
85864	6	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
85864	6	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
85864	6	*Pinus edulis*	Piñon	Wood	Positive	Charred	13	0.1	N/A
85864	10	*Triticum*	Wheat	Caryopsis	Resembles taxon	Charred	1(1)	0	N/A
85864	10	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.1	N/A
85864	10	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
85864	10	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.2	N/A
85864	10	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
85864	10	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
85864	10	*Pinus edulis*	Piñon	Wood	Positive	Charred	14	0.5	N/A
85864	14	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
85864	14	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
85864	14	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85867	78	*Echinocereus*	Hedgehog Cactus	Seed	Positive	Uncharred			1-10/liter
85867	78	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	8	0.1	N\A
85867	78	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85867	78	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	9	03	N\A
85867	79	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	4	<0.1	N\A
85867	79	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
85867	79	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	5	0.1	N\A
85869	272	*Chenopodium*	Goosefoot	Seed	Positive	Charred	1(1)	0	N/A
85869	272	*Melilotus*	Sweet clover	Seed	Positive	Uncharred	0	0	1-10/liter
85869	272	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.1	N/A
85869	272	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
85869	272	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
85869	272	*Pinus edulis*	Piñon	Wood	Positive	Charred	17	1.4	N/A
85869	283	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
85869	283	*Melilotus*	Sweet clover	Seed	Positive	Uncharred	0	0	1-10/liter
85869	283	Dicotyledonae	Dicot	Leaf	Positive	Uncharred	0	0	1-10/liter
85869	283	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
85869	283	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
85869	283	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
85869	283	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
85869	283	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
85869	283	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
85869	283	*Pinus edulis*	Piñon	Seed	Positive	Uncharred	0	0	1-10/liter
85869	288	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Positive	Uncharred	0	0	1-10/liter
85869	288	*Melilotus*	Sweet clover	Seed	Positive	Uncharred	0	0	1-10/liter
85869	288	Portulacaceae	Purslane family	Seed	Fairly certain	Uncharred	0	0	1-10/liter
85869	288	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
85869	295	*Echinocereus*	Hedgehog cactus	Seed	Positive	Uncharred	0	0	1-10/liter
85869	295	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
85869	295	*Juniperus*	Juniper	Twig	Positive	Charred	0	0	1-10/liter
85869	295	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
85869	295	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
85869	295	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
85869	295	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85869	295	*Pinus ponderosa*	Ponderosa pine	Needle	Fairly certain	Charred	0	0	1-10/liter
85869	296	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter
85869	296	*Melilotus*	Sweet clover	Seed	Positive	Uncharred	0	0	1-10/liter
85869	296	Portulacaceae	Purslane family	Seed	Fairly certain	Uncharred	0	0	1-10/liter
85869	296	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	2(0)	0	N/A
85869	296	*Echinocereus*	Hedgehog cactus	Seed	Positive	Uncharred	0	0	1-10/liter
85869	296	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
85869	296	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
85869	296	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
85869	296	*Juniperus*	Juniper	Twig	Positive	Charred	0	0	1-10/liter
85869	296	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
85869	296	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
85869	296	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
85869	296	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
85869	296	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	11-25/liter
85869	296	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A
85869	296	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
85869	297	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter
85869	297	*Euphorbia*	Spurge	Seed	Positive	Uncharred	0	0	1-10/liter
85869	297	Portulacaceae	Purslane family	Seed	Fairly certain	Uncharred	0	0	1-10/liter
85869	297	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
85869	297	*Echinocereus*	Hedgehog cactus	Seed	Positive	Uncharred	0	0	1-10/liter
85869	297	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1	N/A
85869	297	*Juniperus*	Juniper	Female cone	Positive	Uncharred	0	0	1-10/liter
85869	297	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
85869	297	*Juniperus*	Juniper	Twig	Positive	Charred	0	0	1-10/liter
85869	297	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	25-100/liter
85869	297	*Pinus*	Pine	Male cone	Positive	Uncharred	0	0	1-10/liter
85869	297	*Pinus*	Pine	Twig	Positive	Uncharred	0	0	1-10/liter
85869	297	*Pinus*	Pine	Umbo	Positive	Charred	0	0	1-10/liter
85869	297	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
85869	297	*Pinus*	Pine	Wood	Positive	Charred	3	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
85869	297	*Pinus edulis*	Piñon	Needle	Positive	Charred	0	0	1-10/liter
85869	297	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	25-100/liter
85869	297	*Pinus edulis*	Piñon	Needle spindle gall	Positive	Uncharred	0	0	1-10/liter
85869	297	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
85869	297	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
85869	297	*Rumex*	Dock	Seed	Positive	Uncharred	0	0	1-10/liter
85869	318	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
85869	318	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
85869	318	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	0	0	1-10/liter
85869	318	*Quercus*	Oak	Leaf	Positive	Uncharred	0	0	1-10/liter
86605	77	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
86605	77	*Portulacaceae*	Purslane family	Seed	Uncharred	Positive			1-10/liter
86605	77	*Echinocereus*	Hedgehog cactus	Seed	Uncharred	Positive			1-10/liter
86605	77	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
86605	77	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
86605	77	*Pinus edulis*	Piñon	Wood	Charred	Positive	1	0.2	N/A
86605	77	*Zea mays*	Maize	Cupule	Charred	Positive	1(0)		N/A
86605	77	Gymnospermae	Unknown conifer	Wood	Charred	Positive	14	0.3	N/A
86605	77	Indeterminate	Indeterminate	Unknown	Charred	Positive	2(0)		N/A
86605	77	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	5	0.2	N/A
86605	94	*Helianthus*	Sunflower	Achene	Uncharred	Positive			1-10/liter
86605	94	*Physalis*	Groundcherry	Seed	Uncharred	Positive			1-10/liter
86605	94	Gramineae	Grass family	Caryopsis	Uncharred	Positive			1-10/liter
86605	94	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
86605	94	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
86605	94	*Artemisia*	Sagebrush	Wood	Charred	Fairly certain	1	<0.1	N/A
86605	94	*Populus/Salix*	Cottonwood/willow	Wood	Charred	Positive	1	<0.1	N/A
86605	94	*Zea mays*	Maize	Cupule	Charred	Positive	1(0)		N/A
86605	94	Gramineae	Grass family	Caryopsis	Charred	Fairly certain	1(0)		N/A
86605	94	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	3	0.1	N/A
86605	94	Gymnospermae	Unknown conifer	Wood	Charred	Positive	3	<0.1	N/A
86605	94	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	4	0.1	N/A
86605	107	*Portulacaceae*	Purslane family	Seed	Uncharred	Positive			1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86605	107	*Echinocereus*	Hedgehog cactus	Seed	Uncharred	Positive			1-10/liter
86605	107	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Fairly certain	4	0.3	N/A
86606	85	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
86606	85	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)		N\A
86606	85	Gramineae	Grass Family	Culm	Positive	Charred			1-10/liter
86606	85	*Sporobolus*	Dropseed Grass	Caryopsis	Positive	Uncharred			1-10/liter
86606	85	Indeterminate	Indeterminate	Unknown	Positive	Charred	2(0)		N\A
86606	85	*Pinus*	Pine	Umbo	Positive	Charred			1-10/liter
86606	85	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
86606	85	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	20	0.8	N\A
86606	91	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
86606	91	*Cercocarpus*	Mountain Mahogany	Wood	Positive	Charred	10	0.6	N\A
86606	91	*Pinus edulis*	Piñon	Wood	Fairly Certain	Charred	2	0.2	N\A
86606	91	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
86606	91	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	7	0.6	N\A
86606	91	*Quercus*	Oak	Wood	Positive	Charred	1	0.1	N\A
86606	92	Indeterminate	Indeterminate	Unknown	Positive	Charred	1(0)		N\A
86606	92	*Cercocarpus*	Mountain Mahogany	Wood	Positive	Charred	12	0.2	N\A
86606	92	Gymnospermae	Unknown Conifer	Wood	Positive	Charred	4	0.1	N\A
86606	92	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N\A
86606	92	*Pinus ponderosa*	Ponderosa Pine	Needle	Positive	Charred			1-10/liter
86606	92	*Quercus*	Oak	Wood	Positive	Charred	3	0.1	N\A
86607	9	*Pinus ponderosa*	Ponderosa Pine	Wood	Positive	Charred	1	<0.1	N\A
87430	26	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
87430	26	Gramineae	Grass family	Caryopsis	Uncharred	Positive			1-10/liter
87430	26	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
87430	26	*Rumex*	Dock	Seed	Uncharred	Fairly certain			1-10/liter
87430	26	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
87430	26	Gymnospermae	Unknown conifer	Wood	Charred	Positive	1	0.1	N/A
87430	26	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	6	0.7	N/A
87430	122	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
87430	122	Monocotyledonae	Monocot	Stem	Charred	Fairly certain			1-10/liter
87430	122	*Quercus*	Oak	Wood	Charred	Positive	11	0.2	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
87430	138	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
87430	138	*Cleome*	Beeweed	Seed	Charred	Fairly certain	1(1)		N/A
87430	138	Gymnospermae	Unknown conifer	Wood	Charred	Positive	6	0.1	N/A
87430	139	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
87430	139	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
87430	139	*Zea mays*	Maize	Cupule	Charred	Positive	1(0)		N/A
87430	139	*Zea mays*	Maize	Kernel	Charred	Positive	1(1)		N/A
87430	139	Gymnospermae	Unknown conifer	Wood	Charred	Positive	2	<0.1	N/A
87430	139	*Pinus*	Pine	Wood	Charred	Positive	2	<0.1	N/A
87430	143	Gymnospermae	Unknown conifer	Wood	Charred	Positive	11	0.3	N/A
87430	143	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	2	1.3	N/A
87430	143	*Pinus edulis*	Piñon	Wood	Charred	Positive	4	0.3	N/A
87430	170	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
87430	170	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
87430	170	*Artemisia*	Sagebrush	Wood	Charred	Fairly certain	1	<0.1	N/A
87430	170	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	1	<0.1	N/A
87430	170	*Zea mays*	Maize	Kernel	Charred	Fairly certain	1(0)		N/A
87430	170	*Cleome*	Beeweed	Seed	Charred	Positive	1(1)		N/A
87430	170	Gymnospermae	Unknown conifer	Wood	Charred	Positive	6	0.7	N/A
87430	170	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Fairly certain	7	0.5	N/A
87430	171	*Zea mays*	Maize	Stalk	Charred	Resembles taxon			1-10/liter
87430	171	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
87430	171	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	2	<0.1	N/A
87430	171	*Pinus*	Pine	Wood	Charred	Positive	2	<0.1	N/A
87430	171	Gymnospermae	Unknown conifer	Wood	Charred	Positive	3	<0.1	N/A
87430	171	*Quercus*	Oak	Wood	Charred	Positive	4	<0.1	N/A
87430	171	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	9	0.2	N/A
87430	172	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
87430	172	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
87430	172	Gymnospermae	Unknown conifer	Wood	Charred	Positive	17	0.8	N/A
87430	172	*Portulaca*	Purslane	Seed	Charred	Positive	2(2)		N/A
87430	172	*Pinus*	Pine	Wood	Charred	Positive	3	0.2	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
87430	173	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
87430	173	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
87430	173	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
87430	173	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	1	<0.1	N/A
87430	173	*Pinus*	Pine	Wood	Charred	Positive	1	<0.1	N/A
87430	173	*Zea mays*	Maize	Cupule	Charred	Positive	1(0)		N/A
87430	173	Indeterminate	Indeterminate	Unknown	Charred	Positive	1(0)		N/A
87430	173	*Zea mays*	Maize	Kernel	Charred	Positive	1(0)		N/A
87430	173	Gymnospermae	Unknown conifer	Wood	Charred	Positive	14	0.5	N/A
87430	173	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	3	0.1	N/A
87430	175	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
87430	175	*Pseudotsuga menziesii*	Douglas fir	Needle	Charred	Fairly certain			1-10/liter
87430	175	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	1	<0.1	N/A
87430	175	*Portulaca*	Purslane	Seed	Charred	Positive	1(1)		N/A
87430	175	*Cleome*	Beeweed	Seed	Charred	Fairly certain	2(2)		N/A
87430	175	Indeterminate	Indeterminate	Unknown	Charred	Positive	4(0)		N/A
87430	175	Gymnospermae	Unknown conifer	Wood	Charred	Positive	6	0.1	N/A
87430	175	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	9	0.1	N/A
87430	176	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
87430	176	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
87430	176	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
87430	176	*Pseudotsuga menziesii*	Douglas fir	Needle	Charred	Fairly certain			1-10/liter
87430	176	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
87430	176	Indeterminate	Indeterminate	Seed	Charred	Positive		1(0)	N/A
87430	176	Gymnospermae	Unknown conifer	Wood	Charred	Positive	5	0.1	N/A
87430	176	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	8	0.2	N/A
87430	177	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
87430	177	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
87430	177	*Chenopodium*	Goosefoot	Seed	Charred	Positive	1(1)		N/A
87430	177	*Portulaca*	Purslane	Seed	Charred	Positive	1(1)		N/A
87430	177	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	13	0.4	N/A
87430	177	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	2	<0.1	N/A
99396	438	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
99396	438	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
99396	438	Portulacaceae	Purslane family	Seed	Fairly certain	Uncharred	0	0	1-10/liter
99396	438	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
99396	438	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
99396	493	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
99396	493	*Portulaca*	Purslane	Seed	Positive	Uncharred	0	0	1-10/liter
99396	493	Portulacaceae	Purslane family	Seed	Fairly certain	Uncharred	0	0	1-10/liter
99396	493	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	0	N/A
99396	493	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
99396	493	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.3	N/A
99396	608	*Amaranthus*	Pigweed	Seed	Positive	Uncharred	0	0	1-10/liter
99396	608	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
99396	608	*Portulaca*	Purslane	Seed	Positive	Charred	1(1)	0	N/A
99396	608	Gramineae	Grass family	Caryopsis	Positive	Uncharred	0	0	1-10/liter
99396	608	*Sporobolus*	Dropseed grass	Caryopsis	Positive	Uncharred	0	0	1-10/liter
99396	608	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	0.4	N/A
99396	608	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
99396	608	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
99396	608	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.1	N/A
99396	608	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
99396	608	*Pinus edulis*	Piñon	Wood	Positive	Charred	11	0.6	N/A
99396	712	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
99396	712	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter
99396	712	Gramineae	Grass family	Floret	Positive	Uncharred	0	0	1-10/liter
99396	712	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.1	N/A
99396	712	*Pinus*	Pine	Bark scale	Positive	Charred	0	0	1-10/liter
99396	712	*Pinus edulis*	Piñon	Wood	Positive	Charred	15	0.3	N/A
99396	753	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
99396	753	*Pinus edulis*	Piñon	Needle	Fairly certain	Charred	0	0	1-10/liter
99396	753	*Pinus edulis*	Piñon	Wood	Positive	Charred	7	0.1	N/A
99396	753	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
99396	753	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
99396	758	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.1	N/A
99396	758	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
99397	301	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
99397	301	*Portulacaceae*	Purslane family	Seed	Fairly certain	Uncharred	0	0	1-10/liter
99397	301	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
99397	301	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
99397	301	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
99397	302	*Echinocereus*	Hedgehog cactus	Seed	Positive	Uncharred	0	0	1-10/liter
99397	302	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A
99397	302	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
99397	313	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred	0	0	1-10/liter
99397	313	Compositae	Sunflower family	Achene	Positive	Uncharred	0	0	1-10/liter
99397	313	*Physalis*	Groundcherry	Seed	Positive	Uncharred	0	0	1-10/liter
99397	313	Gramineae	Grass family	Leaf	Positive	Uncharred	0	0	1-10/liter
99397	313	Dicotyledonae	Dicot	Leaf	Positive	Uncharred	0	0	1-10/liter
99397	313	*Echinocereus*	Hedgehog cactus	Seed	Positive	Uncharred	0	0	1-10/liter
99397	313	*Juniperus*	Juniper	Male cone	Positive	Uncharred	0	0	1-10/liter
99397	313	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0	1-10/liter
99397	313	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
99397	313	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0	1-10/liter
99397	313	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
99397	314	Gramineae	Grass family	Leaf	Positive	Uncharred	0	0	1-10/liter
99397	314	Gramineae	Grass family	Rhizome	Positive	Uncharred	0	0	1-10/liter
99397	314	*Echinocereus*	Hedgehog cactus	Seed	Positive	Uncharred	0	0	1-10/liter
99397	314	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
99397	314	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
99397	315	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
99397	316	Gramineae	Grass family	Leaf	Positive	Uncharred	0	0	1-10/liter
99397	316	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
99397	331	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0	1-10/liter
99397	331	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0	1-10/liter
99397	331	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred	0	0	1-10/liter
99397	331	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred	0	0	1-10/liter
127627	9	*Amaranthus*	Pigweed	Seed	Uncharred	Positive			1-10/liter
127627	9	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
127627	9	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127627	9	*Pinus*	Pine	Umbo	Charred	Positive			1-10/liter
127627	9	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Charred	Positive	1(0)		N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
127627	9	Indeterminate	Indeterminate	Seed	Charred	Positive	1(0)		N/A
127627	9	*Pinus*	Pine	Wood	Charred	Positive	2	<0.1	N/A
127627	9	*Zea mays*	Maize	Cupule	Charred	Positive	2(1)		N/A
127627	9	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	3	<0.1	N/A
127627	9	Gymnospermae	Unknown conifer	Wood	Charred	Positive	5	0.1	N/A
127627	9	Indeterminate	Indeterminate	Unknown	Charred	Positive	5(0)		N/A
127627	31	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127627	31	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127627	31	Indeterminate	Indeterminate	Seed	Charred	Positive	1(0)		N/A
127627	31	*Zea mays*	Maize	Cupule segment	Charred	Positive	1(1)		N/A
127627	31	Gymnospermae	Unknown conifer	Wood	Charred	Positive	2	<0.1	N/A
127627	31	*Quercus*	Oak	Wood	Charred	Positive	2	<0.1	N/A
127627	31	Indeterminate	Indeterminate	Unknown	Charred	Positive	2(0)		N/A
127627	31	*Zea mays*	Maize	Cupule	Charred	Positive	2(1)		N/A
127627	31	*Pinus*	Pine	Wood	Charred	Positive	3	0.1	N/A
127627	31	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	3	0.2	N/A
127627	52	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127627	52	*Portulaca*	Purslane	Seed	Uncharred	Positive			1-10/liter
127627	52	*Euphorbia*	Spurge	Seed	Uncharred	Positive			1-10/liter
127627	52	Gramineae	Grass family	Culm	Uncharred	Positive			1-10/liter
127627	52	Gramineae	Grass family	Floret	Uncharred	Positive			1-10/liter
127627	52	*Oryzopsis hymenoides*	Ricegrass	Caryopsis	Uncharred	Positive			1-10/liter
127627	52	*Juniperus*	Juniper	Twig	Charred	Positive			1-10/liter
127627	52	*Juniperus*	Juniper	Twig	Uncharred	Positive			1-10/liter
127627	52	*Pinus*	Pine	Bark scale	Charred	Positive			1-10/liter
127627	52	*Pinus*	Pine	Umbo	Charred	Positive			1-10/liter
127627	52	*Pinus*	Pine	Umbo	Uncharred	Positive			1-10/liter
127627	52	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
127627	52	*Pinus edulis*	Piñon	Needle	Uncharred	Positive			1-10/liter
127627	52	*Pinus ponderosa*	Ponderosa pine	Fascicle	Charred	Positive			1-10/liter
127627	52	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127627	52	*Pseudotsuga menziesii*	Douglas fir	Needle	Uncharred	Fairly certain			1-10/liter
127627	52	*Lactuca*	Wild lettuce	Achene	Uncharred	Fairly certain			1-10/liter
127627	52	*Pinus edulis*	Piñon	Seed	Uncharred	Positive			1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
127627	52	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			25-100/liter
127627	52	*Pinus*	Pine	Wood	Charred	Positive	1	0.4	N/A
127627	52	Gymnospermae	Unknown conifer	Wood	Charred	Positive	1	<0.1	N/A
127627	52	*Juniperus*	Juniper	Wood	Charred	Positive	1	<0.1	N/A
127627	52	*Zea mays*	Maize	Cupule	Charred	Positive	1(0)		N/A
127627	52	Unknown # 1	Unknown # 1	Seed	Charred	Positive	1(1)		N/A
127627	52	*Pinus*	Pine	Seed	Charred	Fairly certain	1(1)		N/A
127627	52	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	2	0.1	N/A
127627	52	Indeterminate	Indeterminate	Unknown	Charred	Positive	3(2)		N/A
127633	4	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127633	4	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127633	4	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	1	<0.1	N/A
127633	6	*Pinus ponderosa*	Ponderosa pine	Needle	Partially charred	Positive			1-10/liter
127633	6	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127633	6	*Chenopodium*	Goosefoot	Seed	Charred	Positive	1(1)		N/A
127633	6	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	4	0.1	N/A
127633	6	Indeterminate	Indeterminate	Unknown	Charred	Positive	4(0)		N/A
127633	10	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127633	10	Gymnospermae	Unknown conifer	Wood	Charred	Positive	1	<0.1	N/A
127633	10	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	1	<0.1	N/A
127633	14	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127633	14	Indeterminate	Indeterminate	Unknown	Charred	Positive	1(0)		N/A
127633	14	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	2	0.1	N/A
127634	39	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127634	39	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
127634	39	*Pinus edulis*	Piñon	Needle	Uncharred	Positive			1-10/liter
127634	39	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127634	39	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127634	39	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	13	0.6	N/A
127634	39	*Artemisia*	Sagebrush	Wood	Charred	Positive	2	0.1	N/A
127634	39	*Pinus*	Pine	Wood	Charred	Positive	2	0.2	N/A
127634	39	*Quercus*	Oak	Wood	Charred	Positive	3	<0.1	N/A
127634	39	*Zea mays*	Maize	Cupule	Charred	Positive	6(2)		N/A
127634	84	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127634	84	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
127634	84	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	1	<0.1	N/A
127634	84	Gymnospermae	Unknown conifer	Wood	Charred	Positive	1	<0.1	N/A
127634	84	*Populus/salix*	Cottonwood/willow	Wood	Charred	Fairly certain	1	<0.1	N/A
127634	84	*Zea mays*	Maize	Cupule	Charred	Fairly certain	1(0)		N/A
127634	84	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	11	0.7	N/A
127634	84	*Pinus*	Pine	Wood	Charred	Positive	3	<0.1	N/A
127634	105	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127634	105	*Zea mays*	Maize	Cupule	Charred	Positive	1(0)		N/A
127634	105	*Zea mays*	Maize	Embryo	Charred	Positive	1(1)		N/A
127634	105	*Pinus*	Pine	Wood	Charred	Positive	4	0.1	N/A
127634	105	*Quercus*	Oak	Wood	Charred	Positive	4	<0.1	N/A
127634	105	Gymnospermae	Unknown conifer	Wood	Charred	Positive	7	0.2	N/A
127634	106	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127634	106	*Pinus edulis*	Piñon	Needle	Uncharred	Positive			1-10/liter
127634	106	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127634	106	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127634	106	*Pinus*	Pine	Wood	Charred	Positive	1	<0.1	N/A
127634	106	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Fairly certain	1	<0.1	N/A
127634	106	*Cleome*	Beeweed	Seed	Charred	Fairly certain	1(1)		N/A
127634	106	*Zea mays*	Maize	Cupule	Charred	Positive	3(0)		N/A
127634	106	Gymnospermae	Unknown conifer	Wood	Charred	Positive	5	0.1	N/A
127634	106	*Phaseolus*	Bean	Cotyledon	Charred	Fairly certain	5(0)		N/A
127634	106	Indeterminate	Indeterminate	Unknown	Charred	Positive	2(0)		N/A
127634	107	*Juniperus*	Juniper	Twig	Uncharred	Positive			1-10/liter
127634	107	*Pinus edulis*	Piñon	Needle	Uncharred	Positive			1-10/liter
127634	107	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127634	107	Unknown non-conifer	Unknown non-conifer	Wood	Charred	Positive	2	<0.1	N/A
127634	107	Indeterminate	Indeterminate	Unknown	Charred	Positive	2(0)		N/A
127634	107	*Phaseolus*	Bean	Cotyledon	Charred	Positive	5(0)		N/A
127634	107	*Cleome*	Beeweed	Seed	Charred	Fairly certain	7(6)		N/A
127634	107	Gymnospermae	Unknown conifer	Wood	Charred	Positive	9	0.3	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
127634	108	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127634	108	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	1	<0.1	N/A
127634	108	*Pinus*	Pine	Wood	Charred	Positive	1	<0.1	N/A
127634	108	*Zea mays*	Maize	Embryo	Partially charred	Positive	1(0)		N/A
127634	108	*Nicotiana*	Tobacco	Seed	Charred	Positive	1(1)		N/A
127634	108	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Fairly certain	15	0.7	N/A
127634	108	*Zea mays*	Maize	Cupule	Charred	Positive	2(0)		N/A
127634	108	*Cleome*	Beeweed	Seed	Charred	Fairly certain	2(2)		N/A
127634	108	Gymnospermae	Unknown conifer	Wood	Charred	Positive	3	<0.1	N/A
127634	109	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127634	109	*Cleome*	Beeweed	Seed	Partially charred	Fairly certain	1(0)		N/A
127634	109	*Zea mays*	Maize	Cupule	Charred	Positive	1(0)		N/A
127634	109	*Zea mays*	Maize	Embryo	Partially charred	Fairly certain	2(0)		N/A
127634	109	Gymnospermae	Unknown conifer	Wood	Charred	Positive	5	0.1	N/A
127634	109	*Pinus*	Pine	Wood	Charred	Positive	6	0.1	N/A
127634	109	*Cleome*	Beeweed	Seed	Charred	Fairly certain	7(7)		N/A
127634	110	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127634	110	*Pinus*	Pine	Wood	Charred	Positive	1	<0.1	N/A
127634	110	Gymnospermae	Unknown conifer	Wood	Charred	Positive	2	<0.1	N/A
127634	110	*Cleome*	Beeweed	Seed	Charred	Fairly certain	3(0)		N/A
127634	110	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	5	0.4	N/A
127634	111	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127634	111	*Cleome*	Beeweed	Seed	Charred	Fairly certain	1(1)		N/A
127634	111	*Pinus*	Pine	Wood	Charred	Positive	3	0.2	N/A
127634	111	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	3	<0.1	N/A
127634	112	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
127634	112	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127634	112	*Cleome*	Beeweed	Seed	Charred	Positive	1(1)		N/A
127634	112	*Yucca baccata*	Banana yucca	Seed	Charred	Positive	1(1)		N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
127634	112	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	2	<0.1	N/A
127634	112	Gymnospermae	Unknown conifer	Wood	Charred	Positive	2	<0.1	N/A
127634	112	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Fairly certain	2	<0.1	N/A
127634	117	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127634	117	*Pinus edulis*	Piñon	Needle	Uncharred	Positive			1-10/liter
127634	117	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127634	117	*Quercus*	Oak	Wood	Charred	Fairly certain	1	<0.1	N/A
127634	117	*Chenopodium*	Goosefoot	Seed	Charred	Positive	1(1)		N/A
127634	117	Gymnospermae	Unknown conifer	Wood	Charred	Positive	2	<0.1	N/A
127634	117	*Artemisia*	Sagebrush	Wood	Charred	Positive	3	0.1	N/A
127634	117	*Pinus edulis*	Piñon	Wood	Charred	Positive	3	0.5	N/A
127634	117	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	5	0.2	N/A
127634	117	*Pinus*	Pine	Wood	Charred	Positive	6	0.6	N/A
127634	120	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
127634	120	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127634	120	*Pinus*	Pine	Bark scale	Charred	Positive			1-10/liter
127634	120	*Zea mays*	Maize	Kernel	Charred	Positive	1(0)		N/A
127634	120	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	16	1.4	N/A
127634	120	*Pinus edulis*	Piñon	Wood	Charred	Fairly certain	2	0.9	N/A
127634	120	*Quercus*	Oak	Wood	Charred	Positive	2	<0.1	N/A
127634	120	*Zea mays*	Maize	Cupule	Charred	Positive	2(0)		N/A
127634	121	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127634	121	*Juniperus*	Juniper	Twig	Charred	Positive			1-10/liter
127634	121	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
127634	121	*Pinus edulis*	Piñon	Needle	Uncharred	Positive			1-10/liter
127634	121	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127634	121	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127634	121	*Pinus*	Pine	Bark scale	Charred	Positive			1-10/liter
127634	121	*Zea mays*	Maize	Cupule	Charred	Positive	1(0)		N/A
127634	121	*Cleome*	Beeweed	Seed	Partially charred	Positive	1(1)		N/A
127634	121	*Corispermum*	Bugseed	Seed	Charred	Positive	1(1)		N/A
127634	121	*Pinus*	Pine	Wood	Charred	Positive	5	0.2	N/A
127634	121	Gymnospermae	Unknown conifer	Wood	Charred	Positive	7	0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
127634	121	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	8	0.1	N/A
127634	122	*Pinus*	Pine	Bark scale	Charred	Positive			1-10/liter
127634	122	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
127634	122	*Pinus edulis*	Piñon	Needle	Uncharred	Positive			1-10/liter
127634	122	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127634	122	*Cucurbita*	Squash/coyote gourd	Rind	Charred	Resembles taxon			1-10/liter
127634	122	*Zea mays*	Maize	Cupule	Charred	Positive	1(1)		N/A
127634	122	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	2	0.1	N/A
127634	122	Gymnospermae	Unknown conifer	Wood	Charred	Positive	3	<0.1	N/A
127635	45	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
127635	45	*Pinus edulis*	Piñon	Needle	Uncharred	Positive			1-10/liter
127635	45	*Pinus ponderosa*	Ponderosa pine	Fascicle	Charred	Positive			1-10/liter
127635	45	*Pinus ponderosa*	Ponderosa pine	Fascicle	Uncharred	Positive			1-10/liter
127635	45	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127635	45	*Pinus*	Pine	Bark scale	Charred	Positive			1-10/liter
127635	45	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			11-25/liter
127635	45	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			11-25/liter
127635	45	Gymnospermae	Unknown conifer	Wood	Charred	Positive	1	<0.1	N/A
127635	45	*Pinus*	Pine	Wood	Charred	Positive	3	0.1	N/A
127635	45	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	4	0.1	N/A
127635	53	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127635	53	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127635	53	*Cucurbita*	Squash/coyote gourd	Rind	Charred	Fairly certain			1-10/liter
127635	53	*Zea mays*	Maize	Cupule	Charred	Resembles taxon	1(0)		N/A
127635	53	*Zea mays*	Maize	Cupule	Charred	Positive	1(0)		N/A
127635	53	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	18	0.6	N/A
127635	53	Gymnospermae	Unknown conifer	Wood	Charred	Positive	2	0.1	N/A
127635	105	*Pinus*	Pine	Bark scale	Charred	Positive			1-10/liter
127635	105	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	1	<0.1	N/A
127635	105	*Zea mays*	Maize	Cupule	Charred	Fairly certain	1(0)		N/A
127635	105	*Nicotiana*	Tobacco	Seed	Charred	Positive	1(1)		N/A
127635	105	*Artemisia*	Sagebrush	Wood	Charred	Positive	2	<0.1	N/A
127635	105	*Chenopodium/*	Cheno-am	Seed	Charred	Positive	2(2)		N/A

Site	**FS No.**	**Scientific Name**	**Common Name**	**Plant part**	**Confidence**	**Condition**	**Count**	**Weight**	**Abundance**
		Amaranthus							
127635	105	*Zea mays*	Maize	Embryo	Charred	Positive	2(2)		N/A
127635	105	*Zea mays*	Maize	Kernel	Charred	Fairly certain	26(0)		N/A
127635	105	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	3	0.1	N/A
127635	105	Gymnospermae	Unknown conifer	Wood	Charred	Positive	3	<0.1	N/A
127635	105	*Cleome*	Beeweed	Seed	Charred	Fairly certain	3(1)		N/A
127635	105	*Zea mays*	Maize	Embryo	Partially charred	Positive	3(2)		N/A
127635	105	*Pinus edulis*	Piñon	Wood	Charred	Positive	4	0.1	N/A
127635	105	*Quercus*	Oak	Wood	Charred	Positive	4	<0.1	N/A
127635	116	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127635	116	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
127635	116	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127635	116	Indeterminate	Indeterminate	Unknown	Charred	Positive	1(0)		N/A
127635	116	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	2	<0.1	N/A
127635	116	*Pinus*	Pine	Wood	Charred	Positive	3	0.2	N/A
127635	116	Gymnospermae	Unknown conifer	Wood	Charred	Positive	7	0.3	N/A
127635	116	*Pinus edulis*	Piñon	Wood	Charred	Positive	8	0.4	N/A
127635	123	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127635	123	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127635	123	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127635	123	Gymnospermae	Unknown conifer	Wood	Charred	Positive	1	<0.1	N/A
127635	123	*Corispermum*	Bugseed	Seed	Charred	Fairly certain	1(0)		N/A
127635	123	*Zea mays*	Maize	Embryo	Charred	Positive	16(11)		N/A
127635	123	*Cleome*	Beeweed	Seed	Charred	Fairly certain	3(2)		N/A
127635	123	*Nicotiana*	Tobacco	Seed	Charred	Positive	5(5)		N/A
127635	123	*Zea mays*	Maize	Kernel	Charred	Positive	50(1)		N/A
127635	124	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127635	124	*Pinus edulis*	Piñon	Needle	Uncharred	Positive			1-10/liter
127635	124	*Pinus ponderosa*	Ponderosa pine	Needle	Partially charred	Positive			1-10/liter
127635	124	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127635	124	*Nicotiana*	Tobacco	Seed	Charred	Positive		6(6)	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
127635	124	*Cleome*	Beeweed	Seed	Partially charred	Positive	1(0)		N/A
127635	124	*Zea mays*	Maize	Kernel	Charred	Positive	16(0)		N/A
127635	124	Gymnospermae	Unknown conifer	Wood	Charred	Positive	2	<0.1	N/A
127635	124	*Cleome*	Beeweed	Seed	Charred	Positive	4(3)		N/A
127635	124	*Juniperus*	Juniper	Wood	Charred	Fairly certain	5	0.1	N/A
127635	124	*Zea mays*	Maize	Embryo	Charred	Positive	5(3)		N/A
127635	124	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	6	0.1	N/A
127635	124	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	7	<0.1	N/A
127635	125	*Pinus*	Pine	Bark scale	Charred	Positive			1-10/liter
127635	125	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127635	125	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127635	125	*Populus/salix*	Cottonwood/willow	Wood	Charred	Fairly certain	1	<0.1	N/A
127635	125	*Echinocereus*	Hedgehog cactus	Seed	Charred	Positive	1(0)		N/A
127635	125	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Charred	Positive	1(1)		N/A
127635	125	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	3	0.1	N/A
127635	125	*Nicotiana*	Tobacco	Seed	Charred	Positive	3(3)		N/A
127635	125	*Zea mays*	Maize	Kernel	Charred	Positive	37(0)		N/A
127635	125	Gymnospermae	Unknown conifer	Wood	Charred	Positive	4	<0.1	N/A
127635	125	*Cleome*	Beeweed	Seed	Charred	Positive	4(3)		N/A
127635	125	*Zea mays*	Maize	Embryo	Charred	Positive	5(3)		N/A
127635	126	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127635	126	*Juniperus*	Juniper	Wood	Charred	Fairly certain	1	<0.1	N/A
127635	126	*Pinus*	Pine	Wood	Charred	Positive	1	<0.1	N/A
127635	126	*Cleome*	Beeweed	Seed	Charred	Fairly certain	1(0)		N/A
127635	126	*Zea mays*	Maize	Cupule	Charred	Positive	1(0)		N/A
127635	126	*Cleome*	Beeweed	Seed	Charred	Positive	1(1)		N/A
127635	126	*Zea mays*	Maize	Kernel	Charred	Positive	17(0)		N/A
127635	126	Gymnospermae	Unknown conifer	Wood	Charred	Positive	2	<0.1	N/A
127635	126	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	2	<0.1	N/A
127635	126	*Quercus*	Oak	Wood	Charred	Positive	2	<0.1	N/A
127635	126	*Zea mays*	Maize	Embryo	Charred	Positive	5(4)		N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
127635	126	*Nicotiana*	Tobacco	Seed	Charred	Positive	5(5)		N/A
127635	135	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127635	135	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127635	141	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
127635	141	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
127635	141	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
127635	141	Indeterminate	Indeterminate	Unknown	Charred	Positive	1(0)		N/A
127635	141	*Zea mays*	Maize	Cupule	Charred	Positive	2(0)		N/A
127635	141	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	20	0.3	N/A
135291	30	*Amaranthus*	Pigweed	Seed	Uncharred	Positive			N/A
135291	30	*Portulaca*	Purslane	Seed	Uncharred	Positive			1-10/liter
135291	30	*Compositae*	Sunflower family	Achene	Uncharred	Positive			1-10/liter
135291	30	*Echinocereus*	Hedgehog cactus	Seed	Uncharred	Positive			1-10/liter
135291	30	*Juniperus*	Juniper	Twig	Charred	Positive			1-10/liter
135291	30	*Juniperus*	Juniper	Twig	Uncharred	Positive			1-10/liter
135291	30	*Pinus ponderosa*	Ponderosa pine	Fascicle	Charred	Positive			1-10/liter
135291	30	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
135291	30	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
135291	30	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			11-25/liter
135291	30	*Pinus*	Pine	Wood	Charred	Positive	1	<0.1	N/A
135291	30	Gymnospermae	Unknown conifer	Wood	Charred	Positive	5	0.1	N/A
135291	30	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	7	<0.1	N/A
135291	32	*Helianthus*	Sunflower	Achene	Uncharred	Positive			1-10/liter
135291	32	Compositae	Sunflower family	Achene	Uncharred	Positive			1-10/liter
135291	32	Fabaceae	Bean family	Seed	Uncharred	Positive			1-10/liter
135291	32	*Juniperus*	Juniper	Twig	Uncharred	Positive			1-10/liter
135291	32	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
135291	32	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
135291	32	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			11-25/liter
135291	32	*Portulaca*	Purslane	Seed	Uncharred	Positive			11-25/liter
135291	32	Gymnospermae	Unknown conifer	Wood	Charred	Positive	2	<0.1	N/A
135291	32	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	2	<0.1	N/A
135291	58	*Amaranthus*	Pigweed	Seed	Uncharred	Positive			1-10/liter
135291	58	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
135291	58	Compositae	Composite family	Achene	Uncharred	Positive			1-10/liter
135291	58	*Euphorbia*	Spurge	Seed	Uncharred	Positive			1-10/liter
135291	32	Gymnospermae	Unknown conifer	Wood	Charred	Positive	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135291	58	*Juniperus*	Juniper	Twig	Charred	Positive			1-10/liter
135291	58	*Juniperus*	Juniper	Twig	Uncharred	Positive			1-10/liter
135291	58	*Pinus edulis*	Piñon	Needle	Charred	Positive			1-10/liter
135291	58	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
135291	58	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
135291	58	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	1	<0.1	N/A
135291	58	Polygonaceae	Knotweed family	Seed	Uncharred	Positive			1-10/liter
135291	58	*Portulaca*	Purslane	Seed	Uncharred	Positive			1-10/liter
135291	59	*Amaranthus*	Pigweed	Seed	Uncharred	Positive			1-10/liter
135291	59	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
135291	59	Gymnospermae	Unknown conifer	Wood	Charred	Positive	3	<0.1	N/A
135291	59	*Juniperus*	Juniper	Twig	Charred	Positive			1-10/liter
135291	59	*Juniperus*	Juniper	Twig	Uncharred	Positive			1-10/liter
135291	59	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
135291	59	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
135291	61	*Cercocarpus*	Mountain mahogany	Wood	Charred	Fairly certain	9	0.3	N/A
135291	61	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
135291	61	Compositae	Composite family	Achene	Uncharred	Positive			1-10/liter
135291	61	*Juniperus*	Juniper	Twig	Uncharred	Positive			1-10/liter
135291	61	*Pinus*	Pine	Wood	Charred	Positive	6	0.2	N/A
135291	61	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
135291	61	*Pinus ponderosa*	Ponderosa pine	Needle	Uncharred	Positive			1-10/liter
135291	61	*Portulaca*	Purslane	Seed	Uncharred	Positive			1-10/liter
135291	61	*Pseudotsuga menzeseii*	Douglas fir	Wood	Charred	Fairly certain	1	<0.1	N/A
135291	61	*Quercus*	Oak	Wood	Charred	Fairly certain	4	0.2	N/A
135291	61	Unidentifiable	Unidentifiable	Plant part	Charred	Positive	3(0)		N/A
135291	61	*Zea mays*	Maize	Cupule	Charred	Positive	2(2)		N/A
135291	69	*Cercocarpus*	Mountain mahogany	Wood	Charred	Fairly certain	1	<0.1	N/A
135291	69	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
135291	69	Gymnospermae	Unknown conifer	Wood	Charred	Positive	13	0.7	N/A
135291	69	*Juniperus*	Juniper	Twig	Charred	Positive			1-10/liter
135291	69	*Juniperus*	Juniper	Twig	Uncharred	Positive			1-10/liter
135291	69	*Pinus*	Pine	Wood	Charred	Positive	1	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135291	69	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
135291	69	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Fairly certain	5	0.1	N/A
135291	69	*Portulaca*	Purslane	Seed	Uncharred	Positive			1-10/liter
135292	77	*Amaranthus*	Pigweed	Seed	Uncharred	Positive			1-10/liter
135292	77	*Portulaca*	Purslane	Seed	Uncharred	Positive			1-10/liter
135292	77	*Physalis*	Groundcherry	Seed	Uncharred	Positive			1-10/liter
135292	77	Gramineae	Grass family	Caryopsis	Uncharred	Positive			1-10/liter
135292	77	*Pinus ponderosa*	Ponderosa pine	Needle	Charred	Positive			1-10/liter
135292	77	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
135292	77	*Pinus*	Pine	Wood	Charred	Positive	1	<0.1	N/A
135292	77	*Zea mays*	Maize	Cupule	Charred	Fairly certain	1(0)		N/A
135292	77	*Chenopodium/ Amaranthus*	Cheno-am	Seed	Charred	Positive	1(1)		N/A
135292	77	*Juniperus*	Juniper	Wood	Charred	Positive	2	0.1	N/A
135292	77	Gymnospermae	Unknown conifer	Wood	Charred	Positive	2	<0.1	N/A
135292	77	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	3	<0.1	N/A
135292	83	*Amaranthus*	Pigweed	Seed	Uncharred	Positive			1-10/liter
135292	83	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
135292	83	*Helianthus*	Sunflower	Achene	Uncharred	Positive			1-10/liter
135292	83	*Oenothera*	Evening primrose	Seed	Uncharred	Positive			1-10/liter
135292	83	*Physalis*	Groundcherry	Seed	Uncharred	Positive			1-10/liter
135292	83	*Sporobolus*	Dropseed grass	Caryopsis	Uncharred	Positive			1-10/liter
135292	83	Gramineae	Grass family	Caryopsis	Uncharred	Positive			1-10/liter
135292	83	*Juniperus*	Juniper	Wood	Charred	Positive	1	<0.1	N/A
135292	83	*Pseudotsuga menziesii*	Douglas fir	Wood	Charred	Fairly certain	1	<0.1	N/A
135292	83	*Quercus*	Oak	Wood	Charred	Positive	1	<0.1	N/A
135292	83	Indeterminate	Indeterminate	Seed	Charred	Positive	1(0)		N/A
135292	83	Indeterminate	Indeterminate	Seed	Partially charred	Positive	1(1)		N/A
135292	83	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	10	0.2	N/A
135292	83	*Gymnospermae*	Unknown conifer	Wood	Charred	Positive	2	<0.1	N/A
135292	83	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Positive	5	0.1	N/A
135292	87	*Chenopodium*	Goosefoot	Seed	Uncharred	Positive			1-10/liter
135292	87	*Portulaca*	Purslane	Seed	Uncharred	Positive			1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
135292	87	*Physalis*	Groundcherry	Seed	Uncharred	Positive			1-10/liter
135292	87	Gramineae	Grass family	Caryopsis	Uncharred	Positive			1-10/liter
135292	87	*Amaranthus*	Pigweed	Seed	Uncharred	Positive			1-10/liter
135292	87	*Cercocarpus*	Mountain mahogany	Wood	Charred	Positive	1	<0.1	N/A
135292	87	Gymnospermae	Unknown conifer	Wood	Charred	Positive	1	<0.1	N/A
135292	87	*Pinus ponderosa*	Ponderosa pine	Wood	Charred	Fairly certain	8	0.4	N/A
21596B	13	*Juniperus*	Juniper	Female cone	Positive	Uncharred			1-10/liter
21596B	13	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
21596B	13	*Pinus*	Pine	Male cone	Positive	Uncharred			1-10/liter
21596B	13	*Pinus*	Pine	Umbo	Positive	Uncharred			1-10/liter
21596B	13	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			11-25/liter
21596B	14	*Portulaca*	Purslane	Seed	Positive	Uncharred			1-10/liter
21596B	14	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
21596B	14	*Sphaeralcea*	Globemallow	Seed	Positive	Uncharred			1-10/liter
21596B	14	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
21596B	23	*Juniperus*	Juniper	Twig	Positive	Uncharred			11-25/liter
21596B	23	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
21596B	23	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
21596B	28	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
21596B	28	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
21596B	31	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
21596B	31	*Pinus*	Pine	Male cone	Positive	Uncharred			1-10/liter
21596B	31	*Pinus*	Pine	Umbo	Positive	Uncharred			1-10/liter
21596B	31	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
21596B	31	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
21596B	32	*Portulaca*	Purslane	Seed	Positive	Uncharred			1-10/liter
21596B	32	*Juniperus*	Juniper	Female cone	Positive	Uncharred			1-10/liter
21596B	32	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
21596B	32	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
21596B	32	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.1	N/A
21596B	32	*Zea mays*	Maize	Cupule	Positive	Charred	5(0)		N/A
21596C	16	*Pinus*	Pine	Umbo	Positive	Uncharred			1-10/liter
21596C	16	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred			1-10/liter
21596C	17	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
21596C	17	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
21596C	17	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A
21596C	21	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			11-25/liter
21596C	21	*Portulaca*	Purslane	Seed	Positive	Uncharred			1-10/liter
21596C	21	*Gramineae*	Grass family	Caryopsis	Positive	Uncharred			1-10/liter
21596C	21	*Juniperus*	Juniper	Seed	Positive	Uncharred			1-10/liter
21596C	21	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
21596C	21	*Platyopuntia*	Pricklypear cactus	Seed	Positive	Uncharred			1-10/liter
21596C	21	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1	N/A
21596C	22	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
21596C	22	*Portulaca*	Purslane	Seed	Positive	Uncharred			1-10/liter
21596C	22	Dicotyledonae	Dicot	Leaf	Positive	Uncharred			1-10/liter
21596C	22	Unknown	Unknown	Bark	Positive	Charred			1-10/liter
21596C	22	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
21596C	22	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
21596C	22	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)		N/A
21596C	22	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.1	N/A
21596C	25	*Amaranthus*	Pigweed	Seed	Positive	Uncharred			1-10/liter
21596C	25	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
21596C	25	*Portulaca*	Purslane	Seed	Positive	Uncharred			1-10/liter
21596C	25	*Juniperus*	Juniper	Seed	Positive	Uncharred			1-10/liter
21596C	25	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
21596C	25	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
21596C	25	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred			1-10/liter
21596C	25	*Rhus*	Sumac	Seed	Positive	Uncharred			1-10/liter
21596C	26	*Chenopodium*	Goosefoot	Seed	Positive	Uncharred			1-10/liter
21596C	26	*Portulaca*	Purslane	Seed	Positive	Uncharred			1-10/liter
21596C	26	*Juniperus*	Juniper	Seed	Positive	Uncharred			1-10/liter
21596C	26	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
21596C	26	*Pinus*	Pine	Male cone	Positive	Uncharred			1-10/liter
21596C	26	*Pinus*	Pine	Umbo	Positive	Uncharred			1-10/liter
21596C	26	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
21596C	26	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred			1-10/liter
21596C	26	*Pinus edulis*	Piñon	Nutshell	Resembles taxon	Charred			1-10/liter
21596C	26	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred			1-10/liter
21596C	26	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1	N/A

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
86528	7	Gymnospermae	Unknown conifer	Bark	Positive	Charred			1-10/liter
86528	7	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred			1-10/liter
86528	7	*Juniperus*	Juniper	Seed	Fairly certain	Part. Charred	1(0)		N/A
86531	1	*Pinus*	Pine	Bark	Positive	Charred			1-10/liter
86531	1	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
86531	1	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Charred			1-10/liter
86531	1	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)		N/A
86531	1	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	3	0.1	N/A
86531	1	*Zea mays*	Maize	Kernel	Fairly certain	Charred	5(0)		N/A
86531	1	*Pinus edulis*	Piñon	Wood	Positive	Charred	8	0.1	N/A
86531	1	*Quercus*	Oak	Wood	Positive	Charred	9	0.3	N/A
86531	6	*Pinus*	Pine	Bark scale	Positive	Charred			1-10/liter
86531	6	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
86531	6	*Cercocarpus*	Mountain mahogany	Wood	Fairly certain	Charred	1	<0.1	N/A
86531	6	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1	N/A
86531	6	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1	N/A
86531	6	*Quercus*	Oak	Wood	Positive	Charred	3	0.1	N/A
110126	13	Gramineae	Grass family	Culm	Fairly certain	Charred			1-10/liter
110126	13	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
110126	13	*Pinus*	Pine	Bark scale	Positive	Charred			1-10/liter
110126	13	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
110126	13	*Cercocarpus*	Mountain mahogany	Wood	Fairly certain	Charred	1	<0.1	N/A
110126	13	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
110126	14	*Juniperus*	Juniper	Seed	Positive	Uncharred			1-10/liter
110126	14	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
110126	14	*Pinus*	Pine	Male cone	Positive	Uncharred			1-10/liter
110126	14	*Pinus*	Pine	Twig	Positive	Uncharred			1-10/liter
110126	14	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
110126	14	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred			1-10/liter
110126	14	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1	N/A
110130	11	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter

Site	FS No.	Scientific Name	Common Name	Plant part	Confidence	Condition	Count	Weight	Abundance
110130	11	*Pinus*	Pine	Needle spindle gall	Positive	Uncharred			1-10/liter
110130	11	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
110130	13	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
110130	13	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
110130	15	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
110130	15	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
110130	15	*Amaranthus*	Pigweed	Seed	Positive	Charred	1(1)		N/A
110130	17	*Juniperus*	Juniper	Twig	Positive	Uncharred			1-10/liter
110130	17	*Pinus*	Pine	Umbo	Positive	Uncharred			1-10/liter
110130	17	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
110130	17	*Pinus ponderosa*	Ponderosa pine	Needle	Positive	Uncharred			1-10/liter
110130	17	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1	N/A
110130	26	*Pinus edulis*	Piñon	Needle	Positive	Uncharred			1-10/liter
110130	26	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)		N/A
110130	26	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)		N/A
110130	26	*Artemisia*	Sagebrush	Wood	Positive	Charred	17	0.6	N/A
110130	26	Unknown non-conifer	Unknown non-conifer	Wood	Fairly certain	Charred	3	<0.1	N/A
61034	28	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
61035	56	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1		N/A
61035	56	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1	N/A
61035	56	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1	N/A

APPENDIX U
C&T VEGETAL SAMPLE RESULTS

Table U.1. C&T vegetal sample plant remains.

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	650	*Juniperus*	Juniper	Seed	Positive	Uncharred	1(1)	0.1
12587	650	Gymnospermae	Unknown conifer	Wood	Positive	Charred	10	0.3
12587	650	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.1
12587	650	*Zea mays*	Maize	Kernel	Positive	Charred	5(1)	0.2
12587	667	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.1
12587	671	*Atriplex/ Sarcobatus*	Saltbush/ Greasewood	Wood	Positive	Charred	1	0.1
12587	671	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1
12587	671	*Juniperus*	Juniper	Male cone	Positive	Uncharred	1(1)	<0.1
12587	671	*Juniperus*	Juniper	Wood	Positive	Charred	11	0.1
12587	671	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1
12587	671	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	<0.1
12587	671	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1
12587	671	*Zea mays*	Maize	Embryo	Positive	Charred	2(2)	0.1
12587	671	*Zea mays*	Maize	Cupule	Positive	Charred	2(2)	<0.1
12587	671	*Zea mays*	Maize	Kernel	Positive	Charred	21(0)	0.5
12587	671	*Pinus*	Pine	Wood	Positive	Charred	8	0.2
12587	671	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	0.2
12587	672	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
12587	672	*Zea mays*	Maize	Kernel	Positive	Charred	9(1)	0.3
12587	701	*Zea mays*	Maize	Kernel	Positive	Charred	13(3)	0.3
12587	701	*Zea mays*	Maize	Embryo	Positive	Charred	2(2)	<0.1
12587	702	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
12587	702	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
12587	702	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	0.2
12587	702	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1
12587	702	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	2	<0.1
12587	702	*Juniperus*	Juniper	Wood	Positive	Charred	5	<0.1
12587	702	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	<0.1
12587	702	*Zea mays*	Maize	Kernel	Positive	Charred	9(0)	0.1
12587	712	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	<0.1
12587	712	*Juniperus*	Juniper	Wood	Positive	Charred	15	0.3
12587	712	*Pinus*	Pine	Wood	Positive	Charred	2	0.1
12587	712	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.1
12587	712	*Zea mays*	Maize	Cupule	Positive	Charred	3(1)	<0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	712	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	4	0.1
12587	712	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.1
12587	712	*Zea mays*	Maize	Kernel	Positive	Charred	51(6)	1.5
12587	788	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
12587	818	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1
12587	818	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	818	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1
12587	818	*Zea mays*	Maize	Kernel	Positive	Charred	10(3)	0.3
12587	818	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	<0.1
12587	818	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.3
12587	818	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	8	0.1
12587	821	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1
12587	850	*Juniperus*	Juniper	Wood	Fairly certain	Partially Charred	1	0.1
12587	877	*Zea mays*	Maize	Cupule segment	Positive	Charred	1	<0.1
12587	877	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
12587	877	*Juniperus*	Juniper	Wood	Positive	Charred	13	0.2
12587	877	Gymnospermae	Unknown conifer	Wood	Positive	Charred	15	0.3
12587	877	*Zea mays*	Maize	Kernel	Positive	Charred	18(5)	0.6
12587	877	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	0.1
12587	877	*Pinus*	Pine	Wood	Positive	Charred	3	0.1
12587	877	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.1
12587	877	*Zea mays*	Maize	Cupule	Positive	Charred	3(1)	0.1
12587	910	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1
12587	910	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
12587	910	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0.1
12587	910	Gymnospermae	Unknown conifer	Wood	Positive	Charred	10	0.5
12587	910	*Juniperus*	Juniper	Wood	Positive	Charred	19	0.5
12587	910	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1
12587	910	*Zea mays*	Maize	Kernel	Positive	Charred	22(6)	0.4
12587	910	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	3	0.2
12587	910	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	3	<0.1
12587	910	*Pinus*	Pine	Wood	Positive	Charred	5	0.1
12587	910	*Zea mays*	Maize	Cupule	Positive	Charred	6(3)	0.1
12587	922	*Pseudotsuga menziesii*	Douglas fir	Wood	Resembles taxon	Charred	1	0.2

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	922	*Artemisia*	Sagebrush	Wood	Fairly certain	Charred	1	<0.1
12587	922	*Chrysothamnus*	Rabbitbrush	Wood	Fairly certain	Charred	1	<0.1
12587	922	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1
12587	922	*Zea mays*	Maize	Kernel	Positive	Charred	12(5)	0.3
12587	922	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	0.1
12587	922	*Pinus*	Pine	Wood	Positive	Charred	2	0.1
12587	922	*Zea mays*	Maize	Cupule	Positive	Charred	2(1)	<0.1
12587	922	*Quercus*	Oak	Wood	Positive	Charred	3	0.1
12587	922	*Juniperus*	Juniper	Wood	Positive	Charred	8	0.2
12587	929	*Pinus*	Pine	Twig	Fairly certain	Charred	1	<0.1
12587	945	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	<0.1
12587	945	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1
12587	945	*Juniperus*	Juniper	Wood	Positive	Charred	3	<0.1
12587	951	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
12587	951	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	<0.1
12587	951	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1
12587	951	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1
12587	965	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	1.2
12587	972	*Quercus*	Oak	Wood	Positive	Charred	1	0.1
12587	972	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1
12587	972	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1
12587	972	*Lycium*	Wolfberry	Wood	Fairly certain	Charred	1	<0.1
12587	972	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1
12587	972	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	<0.1
12587	972	Gymnospermae	Unknown conifer	Wood	Positive	Charred	13	0.3
12587	972	*Juniperus*	Juniper	Wood	Positive	Charred	13	0.4
12587	972	*Zea mays*	Maize	Cupule	Positive	Charred	3(1)	<0.1
12587	972	*Zea mays*	Maize	Kernel	Positive	Charred	32(16)	1.8
12587	972	*Pinus*	Pine	Wood	Positive	Charred	5	0.1
12587	972	*Pinus edulis*	Piñon	Wood	Positive	Charred	8	0.4
12587	985	*Zea mays*	Maize	Kernel	Positive	Charred	10(5)	0.3
12587	985	*Pinus*	Pine	Wood	Positive	Charred	5	0.1
12587	985	*Juniperus*	Juniper	Wood	Positive	Charred	6	0.1
12587	994	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	<0.1
12587	994	*Pinus*	Pine	Wood	Positive	Charred	10	0.4
12587	994	*Juniperus*	Juniper	Wood	Positive	Charred	14	0.5
12587	994	*Zea mays*	Maize	Kernel	Positive	Charred	14(2)	0.4

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	994	*Artemisia*	Sagebrush	Wood	Positive	Charred	2	<0.1
12587	994	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1
12587	994	*Zea mays*	Maize	Cupule	Positive	Charred	3(2)	<0.1
12587	994	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	5	0.2
12587	994	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	5	0.3
12587	994	Gymnospermae	Unknown conifer	Wood	Positive	Charred	8	0.2
12587	1003	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
12587	1003	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1
12587	1003	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
12587	1003	*Juniperus*	Juniper	Wood	Positive	Charred	12	0.4
12587	1003	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	0.1
12587	1003	*Quercus*	Oak	Wood	Positive	Charred	2	0.1
12587	1003	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	<0.1
12587	1003	*Zea mays*	Maize	Cupule segment	Positive	Charred	2(2)	0.2
12587	1003	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.2
12587	1003	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	0.1
12587	1003	*Zea mays*	Maize	Kernel	Positive	Charred	91(55)	4.3
12587	1007	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	1007	*Juniperus*	Juniper	Wood	Positive	Charred	13	0.4
12587	1007	*Zea mays*	Maize	Kernel	Positive	Charred	14(4)	0.5
12587	1007	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1
12587	1007	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.1
12587	1007	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	3	0.1
12587	1007	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	0.2
12587	1029	*Vitis*	Grape	Seed	Positive	Uncharred	1	<0.1
12587	1029	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
12587	1029	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1
12587	1029	*Zea mays*	Maize	Kernel	Positive	Charred	2(2)	0.1
12587	1089	*Foresteria*	Desert olive	Wood	Positive	Charred	1	0.1
12587	1089	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1
12587	1089	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1
12587	1089	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1
12587	1089	*Juniperus*	Juniper	Wood	Positive	Charred	6	0.2
12587	1089	*Zea mays*	Maize	Kernel	Positive	Charred	7(1)	0.1
12587	1094	*Zea mays*	Maize	Cob	Positive	Charred	1	0.7

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	1193	*Cercocarpus*	Mountain mahogany	Wood	Fairly certain	Charred	1	<0.1
12587	1193	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	<0.1
12587	1193	*Juniperus*	Juniper	Seed	Positive	Uncharred	1(1)	<0.1
12587	1193	*Artemisia*	Sagebrush	Wood	Positive	Charred	10	0.4
12587	1193	*Juniperus*	Juniper	Wood	Positive	Charred	14	0.4
12587	1193	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	0.2
12587	1193	*Zea mays*	Maize	Embryo	Positive	Charred	2(2)	<0.1
12587	1220	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
12587	1220	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1
12587	1220	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1
12587	1220	*Zea mays*	Maize	Kernel	Positive	Charred	2(0)	<0.1
12587	1225	Rosaceae	Rose family	Wood	Positive	Charred	1	<0.1
12587	1225	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
12587	1225	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1
12587	1225	*Robinia*	New Mexico locust	Wood	Resembles taxon	Charred	1	<0.1
12587	1225	*Zea mays*	Maize	Kernel	Positive	Charred	2(1)	0.1
12587	1225	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	4	<0.1
12587	1225	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1
12587	1225	*Juniperus*	Juniper	Wood	Positive	Charred	5	<0.1
12587	1225	*Artemisia*	Sagebrush	Wood	Positive	Charred	6	0.1
12587	1236	*Foresteria*	Desert olive	Wood	Fairly certain	Charred	1	<0.1
12587	1236	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
12587	1236	*Zea mays*	Maize	Kernel	Positive	Charred	189(83)	8.9
12587	1236	Rosaceae	Rose family	Wood	Positive	Charred	2	0.1
12587	1236	*Artemisia*	Sagebrush	Wood	Fairly certain	Charred	2	0.1
12587	1236	*Pinus*	Pine	Wood	Positive	Charred	20	0.9
12587	1236	*Juniperus*	Juniper	Wood	Positive	Charred	29	1.0
12587	1236	*Quercus*	Oak	Wood	Positive	Charred	3	0.1
12587	1236	*Zea mays*	Maize	Cupule	Positive	Charred	3(1)	0.1
12587	1236	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	4	0.3
12587	1236	*Zea mays*	Maize	Embryo	Positive	Charred	4(2)	0.1
12587	1236	*Zea mays*	Maize	Cupule segment	Positive	Charred	4(4)	0.2
12587	1236	Gymnospermae	Unknown conifer	Wood	Positive	Charred	41	1.4
12587	1236	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	6	0.2
12587	1236	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	7	0.2
12587	1236	*Atriplex/*	Saltbush/	Wood	Positive	Charred	7	0.4

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
		Sarcobatus	greasewood					
12587	1275	*Foresteria*	Desert olive	Wood	Fairly certain	Charred	1	<0.1
12587	1275	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1
12587	1275	*Robinia*	New Mexico locust	Wood	Resembles taxon	Charred	1	<0.1
12587	1275	Unidentifiable	Unidentifiable	Unknown	Positive	Charred	1(0)	<0.1
12587	1275	*Juniperus*	Juniper	Wood	Positive	Charred	16	0.3
12587	1275	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1
12587	1275	*Artemisia*	Sagebrush	Wood	Positive	Charred	3	0.1
12587	1275	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	3	0.1
12587	1275	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	4	0.1
12587	1275	*Zea mays*	Maize	Kernel	Positive	Charred	8(1)	0.2
12587	1306	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	0.2
12587	1306	*Zea mays*	Maize	Kernel	Positive	Charred	2(1)	<0.1
12587	1350	*Acer negundo*	Box elder	Wood	Fairly certain	Charred	1	<0.1
12587	1350	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
12587	1350	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	<0.1
12587	1350	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	<0.1
12587	1350	*Juniperus*	Juniper	Wood	Positive	Charred	33	0.9
12587	1350	*Quercus*	Oak	Wood	Positive	Charred	4	0.1
12587	1350	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	<0.1
12587	1350	*Zea mays*	Maize	Embryo	Positive	Charred	4(4)	0.1
12587	1350	*Zea mays*	Maize	Kernel	Positive	Charred	41(9)	1.6
12587	1350	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	8	0.3
12587	1400	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	1400	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
12587	1400	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1
12587	1400	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	15	1.8
12587	1400	*Quercus*	Oak	Wood	Positive	Charred	2	0.1
12587	1400	*Artemisia*	Sagebrush	Wood	Fairly certain	Charred	2	0.2
12587	1400	*Juniperus*	Juniper	Wood	Positive	Charred	22	1.3
12587	1400	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	4	0.2
12587	1400	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.2
12587	1400	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	0.4
12587	1400	*Zea mays*	Maize	Cupule	Positive	Charred	7(4)	0.1
12587	1400	*Zea mays*	Maize	Kernel	Positive	Charred	92(34)	4.2
12587	1401	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	1447	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	1447	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
12587	1447	*Zea mays*	Maize	Shank	Fairly certain	Charred	1(0)	0.1
12587	1447	*Pinus*	Pine	Umbo	Positive	Charred	1(0)	<0.1
12587	1447	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	<0.1
12587	1447	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	<0.1
12587	1447	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	0.7
12587	1447	*Juniperus*	Juniper	Wood	Positive	Charred	29	1.6
12587	1447	*Quercus*	Oak	Wood	Positive	Charred	3	0.1
12587	1447	*Pinus*	Pine	Wood	Positive	Charred	4	0.1
12587	1447	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.2
12587	1447	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	0.2
12587	1447	*Zea mays*	Maize	Kernel	Positive	Charred	60(24)	3.1
12587	1447	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	7	0.4
12587	1447	*Zea mays*	Maize	Cupule	Positive	Charred	9(3)	0.1
12587	1491	*Artemisia*	Sagebrush	Wood	Fairly certain	Charred	1	0.1
12587	1491	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1
12587	1491	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	1491	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
12587	1491	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	1	<0.1
12587	1491	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
12587	1491	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1
12587	1491	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1
12587	1491	*Juniperus*	Juniper	Wood	Positive	Charred	29	1.0
12587	1491	*Zea mays*	Maize	Kernel	Positive	Charred	4(0)	<0.1
12587	1491	Gymnospermae	Unknown conifer	Wood	Positive	Charred	7	0.1
12587	1500	*Cercocarpus*	Mountain mahogany	Wood	Fairly certain	Charred	1	<0.1
12587	1500	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	<0.1
12587	1500	*Zea mays*	Maize	Kernel	Positive	Charred	1(0)	<0.1
12587	1500	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.1
12587	1500	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	0.3
12587	1500	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	4	0.2
12587	1500	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.2

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	1508	*Quercus*	Oak	Wood	Positive	Charred	1	0.1
12587	1508	Unknown # 1	Unknown # 1	Unknown	Positive	Charred	1	<0.1
12587	1508	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1
12587	1508	*Pinus*	Pine	Bark scale	Positive	Charred	1	<0.1
12587	1508	*Zea mays*	Maize	Kernel	Positive	Charred	11(5)	0.7
12587	1508	*Juniperus*	Juniper	Wood	Positive	Charred	12	0.9
12587	1508	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	2	0.3
12587	1508	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	1.3
12587	1508	Gymnospermae	Unknown conifer	Wood	Positive	Charred	7	0.1
12587	1514	*Quercus*	Oak	Wood	Positive	Charred	1	0.2
12587	1514	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1
12587	1514	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
12587	1514	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	<0.1
12587	1514	*Zea mays*	Maize	Embryo	Positive	Charred	11(10)	0.2
12587	1514	*Zea mays*	Maize	Cupule	Positive	Charred	14(5)	0.1
12587	1514	*Zea mays*	Maize	Kernel	Positive	Charred	153(69)	9.8
12587	1514	*Pinus*	Pine	Wood	Positive	Charred	16	1.2
12587	1514	*Juniperus*	Juniper	Wood	Positive	Charred	23	0.6
12587	1514	Gymnospermae	Unknown conifer	Wood	Positive	Charred	28	1.2
12587	1514	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	3	0.1
12587	1514	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	3	0.1
12587	1514	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	4	0.1
12587	1514	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	0.1
12587	1514	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	9	0.2
12587	1567	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.1
12587	1567	*Foresteria*	Desert olive	Wood	Positive	Charred	1	0.1
12587	1567	*Pinus*	Pine	Wood	Positive	Charred	1	0.1
12587	1567	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	0.2
12587	1567	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	0.8
12587	1567	*Zea mays*	Maize	Cupule segment	Positive	Charred	11(11)	0.6
12587	1567	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	12	2.2
12587	1567	*Quercus*	Oak	Wood	Positive	Charred	2	0.1
12587	1567	Gymnospermae	Unknown conifer	Wood	Positive	Charred	23	1.6
12587	1567	*Juniperus*	Juniper	Wood	Positive	Charred	25	1.7
12587	1567	*Zea mays*	Maize	Kernel	Positive	Charred	275(143)	16.9
12587	1567	*Atriplex/*	Saltbush/	Wood	Positive	Charred	3	0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
		Sarcobatus	greasewood					
12587	1567	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	3	0.1
12587	1567	*Populus/Salix*	Cottonwood/ willow	Wood	Positive	Charred	6	0.7
12587	1567	*Zea mays*	Maize	Embryo	Positive	Charred	6(3)	0.1
12587	1567	*Zea mays*	Maize	Cupule	Positive	Charred	8(6)	0.1
12587	1592	*Cercocarpus*	Mountain mahogany	Wood	Fairly certain	Charred	1	0.1
12587	1592	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	0.1
12587	1592	*Lycium*	Wolfberry	Wood	Fairly certain	Charred	1	<0.1
12587	1592	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1
12587	1592	*Artemisia*	Sagebrush	Wood	Positive	Charred	3	0.1
12587	1592	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	3	0.1
12587	1592	*Zea mays*	Maize	Kernel	Positive	Charred	3(0)	<0.1
12587	1592	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.1
12587	1592	*Juniperus*	Juniper	Wood	Positive	Charred	6	0.1
12587	1610	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
12587	1610	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
12587	1610	*Artemisia*	Sagebrush	Wood	Positive	Charred	2	0.1
12587	1610	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.1
12587	1620	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	1620	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1
12587	1620	*Juniperus*	Juniper	Wood	Positive	Charred	12	0.4
12587	1620	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	0.1
12587	1620	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.2
12587	1620	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1
12587	1620	*Artemisia*	Sagebrush	Wood	Positive	Charred	4	0.2
12587	1620	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	0.2
12587	1682	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1
12587	1682	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
12587	1682	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.1
12587	1682	*Zea mays*	Maize	Kernel	Positive	Charred	2(0)	<0.1
12587	1682	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.1
12587	1682	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	4	0.1
12587	1701	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
12587	1742	Gymnospermae	Unknown conifer	Wood	Positive	Uncharred	2	0.2

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	1742	*Pinus edulis*	Piñon	Wood	Fairly certain	Uncharred	2	0.2
12587	1890	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
12587	1890	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.2
12587	1939	*Lycium*	Wolfberry	Wood	Fairly certain	Charred	1	<0.1
12587	1939	*Pinus edulis*	Piñon	Nutshell	Positive	Uncharred	1(0)	0.1
12587	1939	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	0.3
12587	1939	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	11	0.4
12587	1939	*Juniperus*	Juniper	Wood	Positive	Charred	11	0.9
12587	1939	*Pinus*	Pine	Wood	Positive	Charred	11	1.0
12587	1939	*Zea mays*	Maize	Cupule segment	Positive	Charred	13(13)	0.8
12587	1939	*Zea mays*	Maize	Cupule	Positive	Charred	13(7)	0.4
12587	1939	Gymnospermae	Unknown conifer	Wood	Positive	Charred	16	1.6
12587	1939	*Foresteria*	Desert olive	Wood	Positive	Charred	2	0.1
12587	1939	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	2	0.4
12587	1939	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1
12587	1939	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	3	0.2
12587	1939	*Zea mays*	Maize	Kernel	Positive	Charred	441(321)	27.1
12587	1939	*Zea mays*	Maize	Kernel	Positive	Charred	593(339)	33.6
12587	1939	*Zea mays*	Maize	Embryo	Positive	Charred	6(5)	0.2
12587	1939	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	7	0.7
12587	2044	*Foresteria*	Desert olive	Wood	Positive	Charred	1	<0.1
12587	2044	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1
12587	2044	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
12587	2044	*Juniperus*	Juniper	Wood	Positive	Charred	12	0.4
12587	2044	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	2	<0.1
12587	2044	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1
12587	2044	*Zea mays*	Maize	Cupule segment	Positive	Charred	2(2)	0.2
12587	2044	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	3	<0.1
12587	2044	*Zea mays*	Maize	Kernel	Positive	Charred	3(1)	0.1
12587	2044	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	0.1
12587	2044	Gymnospermae	Unknown conifer	Wood	Positive	Charred	8	0.1
12587	2119	*Juniperus*	Juniper	Wood	Positive	Charred	1	17.5
12587	2119	*Zea mays*	Maize	Kernel	Positive	Charred	1(0)	<0.1
12587	2133	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1
12587	2133	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.4
12587	2133	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	0.2
12587	2133	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	9	1.6

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	2169	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1
12587	2169	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
12587	2169	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1
12587	2169	*Zea mays*	Maize	Kernel	Positive	Charred	26(14)	1.4
12587	2169	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.1
12587	2169	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	4	0.2
12587	2200	*Zea mays*	Maize	Cupule segment	Positive	Charred	1	0.1
12587	2200	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.1
12587	2200	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.1
12587	2200	*Zea mays*	Maize	Cupule	Positive	Charred	1	<0.1
12587	2200	*Pseudotsuga menziesii*	Douglas fir	Wood	Resembles taxon	Charred	11	2.2
12587	2200	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	13	3.2
12587	2200	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	0.3
12587	2200	*Zea mays*	Maize	Cupule	Positive	Charred	2(2)	<0.1
12587	2200	*Juniperus*	Juniper	Wood	Positive	Charred	4	6.5
12587	2200	*Zea mays*	Maize	Kernel	Positive	Charred	450(345)	36.2
12587	2200	*Zea mays*	Maize	Kernel	Positive	Charred	650(546)	53.6
12587	2200	*Zea mays*	Maize	Cupule segment	Positive	Charred	7(7)	0.7
12587	2200	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	8	1.4
12587	2233	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	6	2.5
12587	2362	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	0.1
12587	2362	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
12587	2362	*Juniperus*	Juniper	Wood	Positive	Charred	10	0.6
12587	2362	*Zea mays*	Maize	Kernel	Positive	Charred	19(12)	1.0
12587	2362	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.1
12587	2362	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	0.2
12587	2362	Rosaceae	Rose family	Wood	Fairly certain	Charred	2	<0.1
12587	2362	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.1
12587	2362	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	4	0.3
12587	2362	*Quercus*	Oak	Wood	Fairly certain	Charred	4	0.3
12587	2492	*Zea mays*	Maize	Kernel	Positive	Partially Charred	30(20)	2.5
12587	2559	*Foresteria*	Desert olive	Wood	Positive	Charred	1	0.1
12587	2559	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	10	1.6
12587	2559	*Zea mays*	Maize	Cupule segment	Positive	Charred	2(2)	0.1
12587	2559	*Zea mays*	Maize	Cupule	Positive	Charred	2(2)	<0.1
12587	2559	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.1
12587	2559	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	3	0.2

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	2559	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.4
12587	2559	*Zea mays*	Maize	Kernel	Positive	Charred	75(41)	3.6
12587	2559	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	0.5
12587	2567	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1
12587	2567	*Pinus*	Pine	Wood	Positive	Charred	7	0.3
12587	2636	*Zea mays*	Maize	Fused kernel mass	Positive	Charred	0	4.1
12587	2636	*Lycium*	Wolfberry	Wood	Fairly certain	Charred	1	0.1
12587	2636	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.1
12587	2636	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
12587	2636	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	15	1.6
12587	2636	Gymnospermae	Unknown conifer	Wood	Positive	Charred	19	1.2
12587	2636	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	0.2
12587	2636	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	25	2.0
12587	2636	*Zea mays*	Maize	Kernel	Positive	Charred	545(343)	35.4
12587	2636	*Zea mays*	Maize	Embryo	Positive	Charred	8(6)	0.1
12587	2636	*Juniperus*	Juniper	Wood	Positive	Charred	9	3.3
12587	2639	*Quercus*	Oak	Wood	Positive	Charred	1	0.1
12587	2639	Gymnospermae	Unknown conifer	Wood	Positive	Charred	12	2.0
12587	2639	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.3
12587	2639	*Zea mays*	Maize	Cob	Positive	Charred	2(0)	0.7
12587	2639	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	23	5.5
12587	2639	*Zea mays*	Maize	Cupule	Positive	Charred	25(17)	0.5
12587	2639	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	28	3.7
12587	2639	*Pinus*	Pine	Wood	Positive	Charred	3	0.6
12587	2639	*Zea mays*	Maize	Cupule segment	Positive	Charred	31(31)	2.0
12587	2639	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	6	1.6
12587	2639	*Zea mays*	Maize	Kernel	Positive	Charred	765(461)	46.0
12587	2685	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.1
12587	2685	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
12587	2685	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1
12587	2685	*Pinus*	Pine	Wood	Positive	Charred	2	0.2
12587	2685	*Zea mays*	Maize	Kernel	Positive	Charred	22(14)	1.2
12587	2712	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.1
12587	2712	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	<0.1
12587	2712	*Zea mays*	Maize	Kernel	Positive	Charred	38(24)	1.9
12587	2712	*Juniperus*	Juniper	Wood	Positive	Charred	5	0.5
12587	2725	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	<0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	2725	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	10	0.8
12587	2725	*Zea mays*	Maize	Cupule segment	Positive	Charred	2(2)	0.2
12587	2725	*Pseudotsuga menziesii*	Douglas fir	Wood	Resembles taxon	Charred	3	0.4
12587	2725	*Quercus*	Oak	Wood	Positive	Charred	4	0.3
12587	2725	*Zea mays*	Maize	Kernel	Positive	Charred	547(376)	35.4
12587	2725	Gymnospermae	Unknown conifer	Wood	Positive	Charred	7	0.4
12587	2725	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.6
12587	2725	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	7	1.2
12587	2754	*Foresteria*	Desert olive	Wood	Positive	Charred	1	0.1
12587	2754	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	1	0.1
12587	2754	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.2
12587	2754	*Quercus*	Oak	Wood	Positive	Charred	1	0.2
12587	2754	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	2754	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	0.1
12587	2754	*Juniperus*	Juniper	Wood	Positive	Charred	10	0.4
12587	2754	*Pinus*	Pine	Wood	Positive	Charred	2	0.1
12587	2754	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	3	0.3
12587	2754	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	0.5
12587	2754	*Artemisia*	Sagebrush	Wood	Positive	Charred	8	0.3
12587	2754	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	0.4
12587	2806	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
12587	2806	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1
12587	2806	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
12587	2806	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.2
12587	2806	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1
12587	2888	*Zea mays*	Maize	Fused kernel mass	Positive	Charred	0	43.1
12587	2888	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	0.3
12587	2888	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	<0.1
12587	2888	*Zea mays*	Maize	Cupule segment	Positive	Charred	17(17)	2.7
12587	2888	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	0.4
12587	2888	*Zea mays*	Maize	Cob	Positive	Charred	2(0)	0.3
12587	2888	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	23	8.8
12587	2888	Gymnospermae	Unknown conifer	Wood	Positive	Charred	24	4.7
12587	2888	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.7
12587	2888	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	37	10.1
12587	2888	*Zea mays*	Maize	Cupule	Positive	Charred	5(1)	0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	2888	*Zea mays*	Maize	Kernel	Positive	Charred	539(420)	40.6
12587	2888	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	6	2.5
12587	2888	*Juniperus*	Juniper	Wood	Positive	Charred	7	1.4
12587	2904	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	1.2
12587	2992	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	0.1
12587	2992	*Zea mays*	Maize	Kernel	Positive	Charred	121(94)	7.5
12587	3055	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1
12587	3055	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	<0.1
12587	3055	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1
12587	3055	*Zea mays*	Maize	Kernel	Positive	Charred	2(1)	0.1
12587	3055	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1
12587	3055	*Artemisia*	Sagebrush	Wood	Positive	Charred	5	0.2
12587	3055	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.1
12587	3079	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.2
12587	3087	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
12587	3087	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.2
12587	3087	*Pinus*	Pine	Wood	Positive	Charred	4	0.2
12587	3113	*Pseudotsuga menziesii*	Douglas fir	Wood	Resembles taxon	Charred	1	0.5
12587	3198	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	0.1
12587	3198	*Juniperus*	Juniper	Wood	Positive	Charred	10	0.7
12587	3198	*Pinus*	Pine	Wood	Positive	Charred	2	0.1
12587	3198	*Artemisia*	Sagebrush	Wood	Positive	Charred	2	<0.1
12587	3198	*Zea mays*	Maize	Kernel	Positive	Charred	2(0)	0.1
12587	3198	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	3	0.1
12587	3198	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	<0.1
12587	3261	*Pinus*	Pine	Wood	Positive	Charred	1	0.1
12587	3261	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.1
12587	3261	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.5
12587	3321	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	0.1
12587	3321	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.3
12587	3321	*Zea mays*	Maize	Kernel	Positive	Charred	5(5)	0.5
12587	3353	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.1
12587	3353	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.1
12587	3353	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
12587	3353	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.1
12587	3353	*Atriplex/*	Saltbush/	Wood	Positive	Charred	2	0.2

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
		Sarcobatus	greasewood					
12587	3373	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
12587	3373	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	2	0.1
12587	3404	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	0.1
12587	3404	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
12587	3404	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1
12587	3404	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.3
12587	3410	*Pinus*	Pine	Wood	Positive	Charred	1	0.1
12587	3556	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
12587	3556	*Zea mays*	Maize	Embryo	Positive	Charred	1(1)	<0.1
12587	3556	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.1
12587	3556	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	0.1
12587	3556	*Pinus*	Pine	Wood	Positive	Charred	2	0.3
12587	3556	*Zea mays*	Maize	Kernel	Positive	Charred	85(78)	5.4
12587	3591	*Artemisia*	Sagebrush	Wood	Fairly certain	Charred	1	<0.1
12587	3591	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	3591	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	0.2
12587	3591	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.2
12587	3591	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.7
12587	3591	*Pinus*	Pine	Wood	Positive	Charred	9	0.7
12587	3600	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	<0.1
12587	3600	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	3600	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.3
12587	3600	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	3	0.2
12587	3600	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.2
12587	3600	*Pinus*	Pine	Wood	Positive	Charred	5	0.3
12587	3600	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.4
12587	3612	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.1
12587	3612	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	0.7
12587	3612	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.1
12587	3612	*Pinus*	Pine	Wood	Positive	Charred	2	0.2
12587	3621	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	0.1
12587	3621	*Juniperus*	Juniper	Wood	Positive	Charred	1	0.1
12587	3624	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	3	0.1
12587	3624	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	0.4
12587	3648	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	3648	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	3648	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
12587	3648	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
12587	3648	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.1
12587	3670	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.1
12587	3670	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1
12587	3670	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	<0.1
12587	3670	*Quercus*	Oak	Wood	Positive	Charred	2	0.1
12587	3670	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.1
12587	3677	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	0.1
12587	3677	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.1
12587	3677	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	0.1
12587	3691	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.1
12587	3691	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.2
12587	3691	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	2.8
12587	3691	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.5
12587	3691	*Pinus*	Pine	Wood	Positive	Charred	4	0.3
12587	3691	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	5	0.5
12587	3705	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.1
12587	3705	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
12587	3705	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
12587	3705	*Pinus*	Pine	Wood	Positive	Charred	2	0.2
12587	3720	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
12587	3720	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1
12587	3720	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1
12587	3720	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	5	0.2
12587	3721	*Pinus*	Pine	Wood	Positive	Charred	1	0.1
12587	3721	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.1
12587	3721	*Juniperus*	Juniper	Wood	Positive	Charred	1	0.2
12587	3721	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.1
12587	3721	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	2	0.8
12587	3733	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	0.2
12587	3733	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1
12587	3733	*Zea mays*	Maize	Kernel	Fairly certain	Charred	1(0)	0.1
12587	3733	*Juniperus*	Juniper	Wood	Positive	Charred	11	1.0

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	3733	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.2
12587	3733	*Pinus*	Pine	Wood	Positive	Charred	2	0.3
12587	3733	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	1.4
12587	3738	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	1	0.1
12587	3738	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.1
12587	3738	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.4
12587	3738	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	3	0.4
12587	3738	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.3
12587	3759	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
12587	3759	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1
12587	3759	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
12587	3759	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.3
12587	3759	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.2
12587	3790	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
12587	3790	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
12587	3790	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	0.1
12587	3790	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.2
12587	3790	*Juniperus*	Juniper	Wood	Positive	Charred	5	0.4
12587	3822	*Foresteria*	Desert olive	Wood	Positive	Charred	1	0.1
12587	3822	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	3822	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
12587	3822	*Juniperus*	Juniper	Wood	Positive	Charred	10	0.8
12587	3822	*Pinus edulis*	Piñon	Wood	Positive	Charred	11	3.0
12587	3822	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.1
12587	3822	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	0.1
12587	3847	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	0.1
12587	3847	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.1
12587	3847	*Lycium*	Wolfberry	Wood	Fairly certain	Charred	1	0.2
12587	3847	*Quercus*	Oak	Wood	Positive	Charred	2	0.2
12587	3847	*Juniperus*	Juniper	Wood	Positive	Charred	24	1.5
12587	3847	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	3	<0.1
12587	3847	*Zea mays*	Maize	Kernel	Positive	Charred	3(2)	0.1
12587	3847	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	4	0.2
12587	3847	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	8	0.4
12587	3847	*Pinus edulis*	Piñon	Wood	Positive	Charred	8	0.6
12587	3847	*Pinus*	Pine	Wood	Positive	Charred	9	0.6

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	3853	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
12587	3857	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.1
12587	3874	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	3960	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	10	0.5
12587	3960	*Foresteria*	New Mexico olive	Wood	Positive	Charred	1	<0.1
12587	3960	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.1
12587	3960	*Juniperus*	Juniper	Wood	Positive	Charred	15	0.8
12587	3960	*Pinus edulis*	Piñon pine	Wood	Positive	Charred	10	0.5
12587	3960	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	0.2
12587	3960	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
12587	3960	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
12587	4011	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	4011	*Pinus*	Pine	Umbo	Positive	Charred	1(0)	<0.1
12587	4011	*Juniperus*	Juniper	Wood	Positive	Charred	14	1.0
12587	4011	*Pinus edulis*	Piñon	Wood	Positive	Charred	17	1.9
12587	4011	*Acer negundo*	Box elder	Wood	Fairly certain	Charred	2	0.2
12587	4011	*Artemisia*	Sagebrush	Wood	Fairly certain	Charred	2	<0.1
12587	4011	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	<0.1
12587	4011	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	9	1.1
12587	4146	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
12587	4146	*Pinus*	Pine	Wood	Positive	Charred	2	0.1
12587	4146	*Zea mays*	Maize	Kernel	Positive	Charred	25(14)	1.0
12587	4146	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.1
12587	5129	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	0.1
12587	5129	*Foresteria*	Desert olive	Wood	Positive	Charred	1	0.1
12587	5129	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	0.2
12587	5129	*Zea mays*	Maize	Shank	Resembles taxon	Charred	1(0)	0.1
12587	5129	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.2
12587	5129	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.4
12587	5129	*Juniperus*	Juniper	Wood	Positive	Charred	8	0.7
12587	5141	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	0.6
12587	5168	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
12587	5168	*Juniperus*	Juniper	Wood	Positive	Charred	4	0.1
12587	5168	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.3
12587	8878	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.1
12587	8889	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.1
127631	19	Unknown # 1	Unknown # 1	Wood	Fairly certain	Uncharred	1	<0.1
127631	22	*Chrysothamnus*	Rabbitbrush	Wood	Fairly certain	Charred	1	0.4
127631	27	*Pinus*	Pine	Wood	Positive	Charred	2	0.4
127631	38	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.8
127631	44	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
127631	44	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
127631	44	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	2	0.2
127631	56	Gymnospermae	Unknown conifer	Wood	Positive	Uncharred	1	<0.1
128805	152	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	0.1
128805	153	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
128805	153	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.3
128805	155	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1
128805	155	*Zea mays*	Maize	Kernel	Resembles taxon	Charred	8(0)	<0.1
128805	160	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	<0.1
128805	160	*Chrysothamnus*	Rabbitbrush	Wood	Positive	Charred	2	0.1
128805	160	*Lycium*	Wolfberry	Wood	Fairly certain	Charred	2	0.4
128805	160	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	2	<0.1
128805	160	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	0.1
128805	164	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1
128805	164	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
128805	164	*Zea mays*	Maize	Cupule	Positive	Charred	1(0)	<0.1
128805	164	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	3	0.1
128805	164	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	0.1
128805	173	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	3	0.2
128805	178	*Chrysothamnus*	Rabbitbrush	Wood	Positive	Charred	1	<0.1
128805	178	*Zea mays*	Maize	Kernel	Resembles taxon	Charred	7(0)	<0.1
128805	189	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
128805	189	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
128805	189	*Chrysothamnus*	Rabbitbrush	Wood	Positive	Charred	6	0.7
128805	192	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
128805	195	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
128805	198	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1
128805	198	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
128805	198	*Pinus*	Pine	Wood	Positive	Charred	2	0.1
128805	198	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	<0.1
128805	198	*Chrysothamnus*	Rabbitbrush	Wood	Positive	Charred	5	0.2
128805	216	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.8
128805	220	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
128805	230	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
128805	230	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
128805	230	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
128805	230	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	<0.1
128805	230	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	3	0.1
128805	230	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	1.0
128805	233	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	0.1
128805	234	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.1
128805	238	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1
128805	238	*Pinus*	Pine	Wood	Positive	Charred	4	0.2
128805	241	*Pinus*	Pine	Wood	Positive	Charred	1	0.2
128805	249	*Pinus*	Pine	Wood	Positive	Charred	1	0.1
86534	597	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1
86534	597	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	.2
86534	597	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	4	.1
86534	597	Gymnospermae	Unknown conifer	Wood	Positive	Charred	8	.3
86534	597	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	9	.6
86534	794	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Partially charred	3	0.1
86534	820	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	.3
86534	820	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	.2
86534	820	*Pinus*	Pine	Wood	Positive	Charred	3	.3
86534	820	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	4	.2
86534	820	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	.5
86534	828	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.6
86534	836	Gymnospermae	Unknown conifer	Wood	Positive	Charred	10	.5
86534	836	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	11	1.3
86534	836	*Zea mays*	Maize	Cupule	Positive	Charred	11(2)	.4
86534	836	*Juniperus*	Juniper	Wood	Positive	Charred	2	.3
86534	836	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	.4

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
86534	836	*Pinus*	Pine	Wood	Positive	Charred	3	.3
86534	836	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	4	.2
86534	846	*Juniperus*	Juniper	Wood	Positive	Charred	1	.2
86534	846	*Quercus*	Oak	Wood	Positive	Charred	1	.2
86534	846	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	.1
86534	846	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	.2
86534	846	*Pinus edulis*	Piñon	Wood	Positive	Charred	8	.9
86534	855	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
86534	855	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	15	.7
86534	855	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	3	.3
86534	855	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	.2
86534	855	*Pinus*	Pine	Wood	Positive	Charred	4	.5
86534	855	*Quercus*	Oak	Wood	Positive	Charred	6	.3
86534	855	*Pinus edulis*	Piñon	Wood	Fairly certain	Partially charred	7	.3
86534	891	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1
86534	891	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
86534	891	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	12	2.2
86534	891	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	.2
86534	891	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	.5
86534	905	*Pseudotsuga menziesi*	Douglas fir	Wood	Fairly certain	Partially charred	1	.1
86534	905	*Juniperus*	Juniper	Wood	Positive	Charred	1	.2
86534	905	*Pinus*	Pine	Wood	Positive	Charred	10	.9
86534	905	*Pinus edulis*	Piñon	Wood	Positive	Charred	10	1.4
86534	905	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	12	.8
86534	905	Gymnospermae	Unknown conifer	Wood	Positive	Charred	18	1.3
86534	930	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	.6
86534	930	*Juniperus*	Juniper	Wood	Positive	Charred	2	.1
86534	930	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	.2
86534	930	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1
86534	930	*Pinus edulis*	Piñon	Wood	Positive	Charred	7	.7
86534	930	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	9	.5
86534	957	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	.2
86534	957	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1
86534	957	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	.2

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
86534	957	*Pseudotsuga menziesi*	Douglas fir	Wood	Positive	Charred	2	.2
86534	957	*Pinus*	Pine	Wood	Positive	Charred	3	.3
86534	957	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	.7
86534	961	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
86534	961	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.2
86534	961	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.2
86534	972	*Quercus*	Oak	Wood	Positive	Charred	1	.1
86534	972	*Rosaceae*	Rose family	Wood	Positive	Charred	1	<0.1
86534	972	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1
86534	972	*Pseudotsuga menziesi*	Douglas fir	Wood	Fairly certain	Partially charred	1	<0.1
86534	972	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
86534	972	Gymnospermae	Unknown conifer	Wood	Positive	Charred	10	1.3
86534	972	*Pinus*	Pine	Wood	Positive	Charred	10	1.5
86534	972	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	.2
86534	972	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	.5
86534	984	*Juniperus*	Juniper	Wood	Positive	Charred	1	.4
86534	984	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
86534	984	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	.3
86534	999	*Pseudotsuga menziesi*	Douglas fir	Wood	Fairly certain	Partially charred	1	0.1
86534	999	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
86534	999	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	4	.2
86534	999	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	.5
86534	999	*Pinus edulis*	Piñon	Wood	Positive	Charred	7	.6
86534	1064	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	.1
86534	1064	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	.1
86534	1064	*Juniperus*	Juniper	Wood	Positive	Charred	1	.2
86534	1064	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	.8
86534	1064	*Juniperus*	Juniper	Wood	Positive	Charred	1	3.5
86534	1064	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	.7
86534	1070	Gymnosperm*ae*	Unknown conifer	Wood	Positive	Charred	5	1.6
86534	1070	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	7	1.8
86534	1083	*Zea mays*	Maize	Cupule segment	Positive	Charred	1	<0.1
86534	1083	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	16	.7
86534	1083	*Pinus*	Pine	Wood	Positive	Charred	6	.7
86534	1083	Gymnospermae	Unknown conifer	Wood	Positive	Charred	7	.4
86534	1096	*CylindroOpuntia*	Cholla	Bud	Positive	Charred	1	.2
86534	1124	*Atriplex/*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
		Sarcobatus						
86534	1124	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
86534	1124	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	.2
86534	1124	*Quercus*	Oak	Wood	Positive	Charred	2	.2
86534	1124	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	3	.2
86534	1124	*Pinus*	Pine	Wood	Positive	Charred	3	.2
86534	1124	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	1.3
86534	1124	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	.4
86534	1219	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	.2
86534	1219	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	.1
86534	1219	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	1.6
86534	1219	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	8	1.0
86534	1235	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	.1
86534	1235	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	1.2
86534	1241	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	.1
86534	1241	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	.9
86534	1258	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	.1
86534	1258	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	.1
86534	1258	*Juniperus*	Juniper	Wood	Positive	Charred	3	.3
86534	1258	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	.7
86534	1262	*Zea mays*	Maize	Cupule segment	Positive	Charred	1	0.1
86534	1262	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
86534	1262	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
86534	1262	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	17	1.4
86534	1262	*Juniperus*	Juniper	Wood	Positive	Charred	2	.1
86534	1262	*Pinus*	Pine	Wood	Positive	Charred	7	.4
86534	1262	*Pinus edulis*	Piñon	Wood	Positive	Charred	8	.6
86534	1262	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	.7
86534	1285	*Zea mays*	Maize	Kernel	Positive	Charred	1(0)	<0.1
86534	1285	*Pinus*	Pine	Umbo	Positive	Charred	1(1)	.2
86534	1285	*Pinus*	Pine	Wood	Positive	Charred	11	.5
86534	1285	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	14	1.4
86534	1285	Gymnospermae	Unknown conifer	Wood	Positive	Charred	15	.8
86534	1285	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1
86534	1285	*Zea mays*	Maize	Cupule segment	Positive	Charred	2(2)	<0.1
86534	1285	*Pseudotsuga menziesi*	Douglas fir	Wood	Fairly certain	Partially charred	3	.2
86534	1285	*Zea mays*	Maize	Cupule	Positive	Charred	3(1)	<0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
86534	1285	*Juniperus*	Juniper	Wood	Positive	Charred	8	.4
86534	1285	*Pinus edulis*	Piñon	Wood	Positive	Charred	9	.8
86534	1290	*Rosaceae*	Rose family	Wood	Positive	Charred	1	.1
86534	1290	*Pseudotsuga menziesi*	Douglas fir	Wood	Resembles taxon	Uncharred	1	.1
86534	1290	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
86534	1290	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	10	.6
86534	1290	*Pinus edulis*	Piñon	Wood	Positive	Charred	13	.8
86534	1290	*Juniperus*	Juniper	Wood	Positive	Charred	3	.1
86534	1290	*Pinus*	Pine	Wood	Positive	Charred	6	.4
86534	1290	Gymnospermae	Unknown conifer	Wood	Positive	Charred	7	.3
86534	1333	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	1.2
86534	1381	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	.2
86534	1381	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
86534	1381	*Pinus edulis*	Piñon	Wood	Positive	Charred	14	2.5
86534	1381	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	.3
86534	1381	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	5	.7
86534	1393	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	12	5.2
86534	1393	*Juniperus*	Juniper	Wood	Fairly certain	Partially charred	2	.2
86534	1393	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	.5
86534	1393	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	3	.7
86534	1393	*Pinus edulis*	Piñon	Wood	Fairly certain	Partially charred	5	1.9
86534	1393	*Pseudotsuga menziesi*	Douglas fir	Wood	Resembles taxon	Uncharred	8	1.3
86534	1393	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	9	1.9
86534	1396	*Juniperus*	Juniper	Wood	Positive	Charred	1	.2
86534	1396	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	11	4.4
86534	1396	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	.2
86534	1396	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	.3
86534	1396	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	.7
86534	1412	*Juniperus*	Juniper	Wood	Positive	Charred	1	.1
86534	1412	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
86534	1412	*Pinus*	Pine	Umbo	Positive	Charred	1(1)	<0.1
86534	1412	*Pinus edulis*	Piñon	Wood	Positive	Charred	19	1.5
86534	1412	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	.1
86534	1412	*Pseudotsuga menziesi*	Douglas fir	Wood	Fairly certain	Partially charred	2	.1
86534	1412	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	20	1.4
86534	1412	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	.2
86534	1412	*Pinus*	Pine	Wood	Positive	Charred	8	.4

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
86534	1504	*Pinus*	Pine	Umbo	Positive	Charred	1	<0.1
86534	1504	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	13	1.6
86534	1504	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1
86534	1504	*Pinus*	Pine	Wood	Positive	Charred	4	.6
86534	1504	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	.5
86534	1504	Gymnospermae	Unknown conifer	Wood	Positive	Charred	7	.3
86534	1508	*Zea mays*	Maize	Cupule	Positive	Charred	10(0)	.1
86534	1508	*Zea mays*	Maize	Cupule segment	Positive	Charred	7(7)	.4
86534	1530	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
86534	1530	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
86534	1530	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	16	1.2
86534	1530	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	<0.1
86534	1530	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	.5
86534	1530	*Pinus*	Pine	Wood	Positive	Charred	8	.7
86534	1530	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	.6
86534	1532	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
86534	1532	*Pinus*	Pine	Wood	Positive	Charred	3	.1
86534	1543	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
86534	1543	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	.8
86534	1543	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	12	1.0
86534	1543	*Zea mays*	Maize	Cupule	Positive	Charred	2(0)	<0.1
86534	1543	*Zea mays*	Maize	Kernel	Positive	Charred	2(1)	0.1
86534	1543	*Pseudotsuga menziesi*	Douglas fir	Wood	Fairly certain	Partially charred	3	.2
86534	1543	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	5	.3
86534	1543	*Juniperus*	Juniper	Wood	Positive	Charred	5	.3
86534	1543	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	.3
86534	1543	*Pinus*	Pine	Wood	Positive	Charred	7	.5
86534	1569	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
86534	1569	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	19	1.9
86534	1569	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	.3
86534	1569	*Pinus*	Pine	Wood	Positive	Charred	5	.1
86534	1569	*Juniperus*	Juniper	Wood	Positive	Charred	5	1.6
86534	1569	Gymnospermae	Unknown conifer	Wood	Positive	Charred	7	.2
86534	1581	*Pinus edulis*	Piñon	Wood	Positive	Charred	11	1.0
86534	1581	Gymnospermae	Unknown conifer	Wood	Positive	Charred	13	.6
86534	1581	*Atriplex/*	Saltbush/greasewood	Wood	Positive	Charred	2	.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
		Sarcobatus						
86534	1581	*Juniperus*	Juniper	Wood	Positive	Charred	2	.1
86534	1581	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	<0.1
86534	1581	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	.6
86534	1581	*Pinus*	Pine	Wood	Positive	Charred	7	.4
86534	1655	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
86534	1655	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
86534	1655	*Quercus*	Oak	Wood	Positive	Charred	2	<0.1
86534	1655	*Juniperus*	Juniper	Wood	Positive	Charred	3	.2
86534	1655	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	3	1.0
86534	1655	*Pinus*	Pine	Wood	Positive	Charred	4	.3
86534	1655	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	4	.3
86534	1655	*Pinus edulis*	Piñon	Wood	Positive	Charred	8	1.2
86534	1655	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	.3
86534	1660	*Acer negundo*	Box elder	Wood	Positive	Charred	1	<0.1
86534	1660	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
86534	1660	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1
86534	1660	*Quercus*	Oak	Wood	Fairly certain	Partially charred	1	<0.1
86534	1660	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	.2
86534	1660	*Pinus*	Pine	Wood	Positive	Charred	5	.1
86534	1660	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	5	.1
86534	1663	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	.2
86534	1663	*Juniperus*	Juniper	Wood	Positive	Charred	3	.3
86534	1663	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	.3
86534	1663	*Pinus*	Pine	Wood	Positive	Charred	5	.5
86534	1663	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	9	.7
86534	1667	*Pseudotsuga menziesi*	Douglas fir	Wood	Fairly certain	Partially charred	1	.2
86534	1667	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
86534	1667	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
86534	1667	Gymnospermae	Unknown conifer	Wood	Positive	Charred	13	.8
86534	1667	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	16	.9
86534	1667	*Zea mays*	Maize	Cupule	Positive	Charred	2(2)	<0.1
86534	1667	*Juniperus*	Juniper	Wood	Positive	Charred	3	.1
86534	1667	*Pinus*	Pine	Wood	Positive	Charred	3	.2
86534	1667	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	.2
86534	1667	*Zea mays*	Maize	Cupule segment	Positive	Charred	4(4)	.2
86534	1668	*Juniperus*	Juniper	Wood	Positive	Charred	1	1.7

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
86534	1677	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	.3
86534	1700	*Cercocarpus*	Mountain mahogany	Wood	Fairly certain	Partially charred	1	.1
86534	1700	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	.2
86534	1700	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	<0.1
86534	1700	*Pseudotsuga menziesi*	Douglas fir	Wood	Resembles taxon	Uncharred	3	.1
86534	1760	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	12	.8
86534	1760	Gymnospermae	Unknown conifer	Wood	Positive	Charred	13	.6
86534	1760	*Juniperus*	Juniper	Wood	Positive	Charred	4	.2
86534	1760	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	.3
86534	1760	*Pinus*	Pine	Wood	Positive	Charred	9	.6
86534	1830	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	.2
86534	1847	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	2	<0.1
86534	1847	*Quercus*	Oak	Wood	Positive	Charred	3	.1
86534	1847	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	46	7.5
86534	1847	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	.5
86534	1847	*Pinus*	Pine	Wood	Positive	Charred	7	1.0
86534	1847	*Pinus edulis*	Piñon	Wood	Positive	Charred	8	1.4
86534	1858	*Pinus*	Pine	Wood	Positive	Charred	2	.4
86534	1858	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Partially charred	2	1.7
86534	1866	*Zea mays*	Maize	Cob	Positive	Charred	1(1)	.3
86534	1866	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	11	1.3
86534	1866	*Pinus edulis*	Piñon	Wood	Positive	Charred	15	2.7
86534	1866	*Pinus*	Pine	Twig	Positive	Charred	2	.2
86534	1866	*Zea mays*	Maize	Shank	Positive	Charred	2(0)	.5
86534	1866	*Zea mays*	Maize	Cupule	Positive	Charred	2(1)	<0.1
86534	1866	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	38	10.2
86534	1866	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	4	.3
86534	1866	*Quercus*	Oak	Wood	Positive	Charred	4	.5
86534	1866	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	5	.2
86534	1866	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	1.1
86534	1866	*Pinus*	Pine	Wood	Positive	Charred	5	2.1
86534	1866	*Zea mays*	Maize	Cupule segment	Positive	Charred	6(6)	.2
86534	1866	*Pseudotsuga menziesi*	Douglas fir	Wood	Resembles taxon	Uncharred	7	1.7
86534	1866	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	9	1.2
86534	1869	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	.2
86534	1869	*Zea mays*	Maize	Cob	Positive	Charred	3(0)	1.8

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
86534	1959	*Quercus*	Oak	Wood	Positive	Charred	1	.1
86534	1959	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	.8
86534	1959	*Pinus*	Pine	Wood	Positive	Charred	4	.2
86534	1959	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	4	.3
86534	1964	*Pinus*	Pine	Wood	Positive	Charred	1	.2
86534	1964	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1
86534	1964	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
86534	1964	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	.3
86534	1965	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Partially charred	1	<0.1
86534	1965	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	.2
86534	1965	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	.1
86534	1965	*Pinus*	Pine	Wood	Positive	Charred	5	.9
86534	1978	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
86534	1978	Gymnospermae	Unknown conifer	Wood	Positive	Charred	10	.4
86534	1978	*Pinus*	Pine	Wood	Positive	Charred	11	.9
86534	1978	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	.1
86534	1978	*Quercus*	Oak	Wood	Positive	Charred	2	.1
86534	1978	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	7	.4
86534	1988	*Juniperus*	Juniper	Wood	Positive	Charred	1	.2
86534	1988	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	.4
86534	1988	Gymnospermae	Unknown conifer	Wood	Positive	Charred	12	1.7
86534	1988	*Pinus edulis*	Piñon	Wood	Positive	Charred	18	5.0
86534	1988	*Pinus*	Pine	Wood	Positive	Charred	19	3.4
86534	1988	*Quercus*	Oak	Wood	Positive	Charred	3	.5
86534	1988	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	40	5.2
86534	1997	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
86534	1997	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Partially charred	2	.5
86534	2004	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	.1
86534	2004	*Pinus*	Pine	Wood	Positive	Charred	12	1.1
86534	2004	Gymnospermae	Unknown conifer	Wood	Positive	Charred	12	1.3
86534	2004	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	23	2.1
86534	2004	*Pinus edulis*	Piñon	Wood	Positive	Charred	8	1.2
86534	2009	*Lycium*	Wolfberry	Wood	Fairly certain	Partially charred	1	.8
86534	2009	*Pinus*	Pine	Wood	Positive	Charred	18	3.7
86534	2009	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	2	.2
86534	2009	*Pseudotsuga menziesi*	Douglas fir	Wood	Resembles taxon	Uncharred	3	.3

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
86534	2009	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	.2
86534	2009	*Juniperus*	Juniper	Wood	Positive	Charred	5	.4
86534	2009	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	63	11.1
86534	2009	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	7	1.0
86534	2009	*Pinus edulis*	Piñon	Wood	Positive	Charred	9	1.3
86534	2143	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	.1
86534	2143	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
86534	2143	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	.2
86534	2143	*Pinus edulis*	Piñon	Wood	Positive	Charred	20	3.5
86534	2143	*Quercus*	Oak	Wood	Positive	Charred	3	.6
86534	2143	*Pinus*	Pine	Wood	Positive	Charred	4	.9
86534	2143	*Juniperus*	Juniper	Wood	Positive	Charred	50	6.2
86534	2143	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	.8
86534	2143	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	8	1.2
86534	2170	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
86534	2170	*Pinus edulis*	Piñon	Wood	Fairly certain	Partially charred	1	<0.1
86534	2170	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	3	.2
86534	2185	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	<0.1
86534	2185	*Unidentifiable*	Unidentifiable	Unknown	Positive	Charred	1(1)	<0.1
86534	2185	*Pinus*	Pine	Wood	Positive	Charred	16	2.8
86534	2185	*Pinus edulis*	Piñon	Wood	Positive	Charred	17	2.6
86534	2185	Gymnospermae	Unknown conifer	Wood	Positive	Charred	18	1.7
86534	2185	*Juniperus*	Juniper	Wood	Positive	Charred	2	.3
86534	2185	*Quercus*	Oak	Wood	Positive	Charred	2	.5
86534	2185	*Pseudotsuga menziesi*	Douglas fir	Wood	Resembles taxon	Uncharred	5	.5
86534	2185	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	53	7.6
86534	2185	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	6	.6
86534	2213	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	.1
86534	2213	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	38	4.4
86534	2213	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	.4
86534	2213	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	.9
86534	2213	*Pinus*	Pine	Wood	Positive	Charred	7	2.1
86534	2224	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	15	3.2
86534	2224	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	.2
86534	2224	*Pinus*	Pine	Wood	Positive	Charred	4	.6
86534	2233	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	.2
86534	2233	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
86534	2233	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
86534	2233	*Zea mays*	Maize	Cupule segment	Positive	Charred	2(2)	.1
86534	2233	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	25	5.1
86534	2233	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	.3
86534	2233	*Pinus*	Pine	Wood	Positive	Charred	7	.4
86534	2233	*Quercus*	Oak	Wood	Positive	Charred	9	.6
135290	869	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.4
135290	869	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	30	5.8
135290	869	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	8	0.7
135290	869	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	4	0.4
135290	869	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	0.7
135290	869	*Zea mays*	Maize	Kernel	Positive	Charred	14(12)	1.1
135290	874	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	1.1
135290	874	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.3
135290	874	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	1.4
135290	874	*Zea mays*	Maize	Kernel	Positive	Charred	19(16)	1.2
135290	902	*Juniperus*	Juniper	Wood	Positive	Part. Charred	1	25.9
135290	912	*Zea mays*	Maize	Cob	Positive	Charred	2(0)	1.3
135290	912	*Zea mays*	Maize	Cupule segment	Positive	Charred	2(2)	0.7
135290	968	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.2
135290	968	*Pinus*	Pine	Wood	Positive	Charred	1	0.1
135290	968	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	16	1.1
135290	968	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.1
135290	968	*Zea mays*	Maize	Kernel	Positive	Charred	11(7)	0.8
135290	968	*Zea mays*	Maize	Cupule segment	Positive	Charred	2(2)	0.4
135290	970	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	5.6
135290	1047	*Pinus*	Pine	Wood	Positive	Part. Charred	1	0.3
135290	1047	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	51	12.7
135290	1047	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	13	2.0
135290	1047	*Quercus*	Oak	Wood	Positive	Charred	4	0.6
135290	1047	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	2.4
135290	1047	*Zea mays*	Maize	Kernel	Positive	Charred	49(41)	3.7
135290	1065	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	5.2
135290	1065	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	0.2
135290	1065	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	1	3.7
135290	1065	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	1.8
135290	1080	*Cercocarpus*	Mountain mahogany	Wood	Fairly certain	Charred	1	0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
135290	1080	*Juniperus*	Juniper	Wood	Positive	Charred	5	0.2
135290	1080	*Phaseolus*	Bean	Cotyledon	Positive	Charred	4(0)	<0.1
135290	1080	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	18	2.7
135290	1080	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	7	0.6
135290	1080	*Zea mays*	Maize	Kernel	Positive	Charred	1(0)	<0.1
135290	1095	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1
135290	1095	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	3	0.1
135290	1095	*Zea mays*	Maize	Kernel	Positive	Charred	2(1)	<0.1
135290	1102	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.2
135290	1130	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	4	0.2
135290	1130	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	0.6
135290	1130	*Phaseolus*	Bean	Cotyledon	Positive	Charred	2(2)	<0.1
135290	1130	*Pinus*	Pine	Wood	Positive	Charred	2	0.5
135290	1130	*Pinus edulis*	Piñon	Wood	Positive	Charred	11	5.4
135290	1130	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	41	6.8
135290	1130	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	4	0.1
135290	1130	*Quercus*	Oak	Wood	Positive	Charred	13	1.0
135290	1130	*Zea mays*	Maize	Kernel	Positive	Charred	41(18)	2.7
135290	1135	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	7	1.3
135290	1135	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.8
135290	1135	*Pinus*	Pine	Wood	Positive	Charred	6	1.4
135290	1135	*Pinus edulis*	Piñon	Wood	Positive	Charred	9	2.3
135290	1135	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	18	4.8
135290	1135	*Quercus*	Oak	Wood	Positive	Charred	1	0.2
135290	1161	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	3	17.9
135290	1167	*Juniperus*	Juniper	Wood	Positive	Charred	1	0.1
135290	1167	*Pinus*	Pine	Wood	Positive	Charred	2	0.3
135290	1167	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	4	0.7
135290	1201	*Phaseolus*	Bean	Seed	Positive	Charred	1(1)	0.1
135290	1289	*Juniperus*	Juniper	Wood	Positive	Charred	1	0.1
135290	1289	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	18	5.7
135290	1289	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Part. Charred	5	6.3
135290	1289	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.1
135290	1289	*Quercus*	Oak	Wood	Positive	Charred	1	1.8
135290	1289	*Zea mays*	Maize	Kernel	Positive	Charred	9(6)	0.7
135290	1303	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	0.9
135290	1303	*Zea mays*	Maize	Kernel	Positive	Charred	1(0)	0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
135290	1324	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	1.0
135290	1324	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0.1
135290	1326	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0.1
135290	1326	*Zea mays*	Maize	Cupule	Positive	Charred	2(1)	0.1
135290	1326	*Zea mays*	Maize	Kernel	Positive	Charred	55(34)	3.5
135290	1450	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	0.2
135290	1450	*Cleome*	Beeweed	Stem	Resembles taxon	Charred	1	0.2
135290	1450	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	1.3
135290	1450	*Pinus*	Pine	Wood	Positive	Charred	9	3.9
135290	1450	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	26	14.4
135290	1450	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	4	2.2
135290	1450	*Quercus*	Oak	Wood	Positive	Charred	1	0.6
135290	1450	*Zea mays*	Maize	Kernel	Positive	Charred	1(0)	<0.1
135290	1456	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.1
135290	1456	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.3
135290	1456	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1
135290	1456	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
135290	1456	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
135290	1456	*Zea mays*	Maize	Kernel	Positive	Charred	3(1)	0.1
135290	1465	Gymnospermae	Unknown conifer	Wood	Positive	Charred	15	2.5
135290	1465	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.8
135290	1465	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	35	7.4
135290	1465	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	33	6.7
135290	1471	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	5	1.3
135290	1471	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.1
135290	1471	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.3
135290	1471	*Phaseolus*	Bean	Cotyledon	Positive	Charred	2(0)	0.1
135290	1471	*Pinus*	Pine	Wood	Positive	Charred	3	1.7
135290	1471	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	3	0.5
135290	1471	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	37	16.7
135290	1471	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	7	1.4
135290	1471	*Quercus*	Oak	Wood	Positive	Charred	2	0.2
135290	1471	*Zea mays*	Maize	Kernel	Positive	Charred	28(14)	1.9
135290	1471	*Zea mays*	Maize	Fused kernel mass	Positive	Charred	3(3)	3.0
135290	1515	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.2
135290	1515	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	15	1.5
135290	1559	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	0.9

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
135290	1559	*Juniperus*	Juniper	Wood	Positive	Charred	1	0.2
135290	1559	*Pinus edulis*	Piñon	Wood	Positive	Charred	6	1.8
135290	1559	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	15	5.7
135290	1559	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	5	0.4
135290	1559	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	1	1.0
135290	1559	*Zea mays*	Maize	Shank	Fairly certain	Charred	1(0)	0.1
135290	1559	*Zea mays*	Maize	Cob	Positive	Charred	1(0)	0.7
135290	1559	*Zea mays*	Maize	Cupule segment	Positive	Charred	4(4)	0.1
135290	1559	*Zea mays*	Maize	Kernel	Positive	Charred	9(9)	0.8
135290	1585	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.2
135290	1585	*Phaseolus*	Bean	Cotyledon	Positive	Charred	1(1)	<0.1
135290	1585	*Pinus*	Pine	Wood	Positive	Charred	10	6.6
135290	1585	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	28	15.7
135290	1585	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.1
135290	1585	*Quercus*	Oak	Wood	Positive	Charred	7	1.9
135290	1585	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	<0.1
135290	1585	*Zea mays*	Maize	Kernel	Positive	Charred	17(12)	1.9
135290	1587	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Part. Charred	30	200.2
135290	1703	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	0.1
135290	1703	*Zea mays*	Maize	Cob	Positive	Charred	3(0)	1.4
135290	1741	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	0.1
135290	1741	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.6
135290	1741	*Pinus*	Pine	Wood	Positive	Charred	13	4.2
135290	1741	*Pinus edulis*	Piñon	Wood	Positive	Charred	10	4.0
135290	1741	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	36	11.3
135290	1741	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.1
135290	1741	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	0.1
135290	1752	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	1.6
135290	1752	*Pinus*	Pine	Wood	Positive	Charred	3	0.3
135290	1752	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	25	5.1
135290	1752	*Zea mays*	Maize	Cupule	Positive	Charred	10(9)	0.3
135290	1752	*Zea mays*	Maize	Cob	Positive	Charred	3	2.2
135290	1752	*Zea mays*	Maize	Cupule segment	Positive	Charred	8(8)	0.7
135290	1764	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.7
135290	1764	*Pinus*	Pine	Wood	Positive	Charred	6	2.0
135290	1764	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	4	6.7
135290	1764	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	10	3.6

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
135290	1764	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.1
135290	1764	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.2
135290	1764	*Zea mays*	Maize	Kernel	Positive	Charred	10(7)	0.7
135290	1786	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.2
135290	1786	*Pinus*	Pine	Wood	Positive	Charred	10	2.9
135290	1786	*Pinus edulis*	Piñon	Wood	Positive	Charred	15	6.4
135290	1786	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	36	11.2
135290	1786	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	3	0.4
135290	1786	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	2	1.3
135290	1786	*Quercus*	Oak	Wood	Positive	Charred	8	2.7
135290	1831	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	1	0.2
135290	1831	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	20	6.7
135290	1857	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.3
135290	1902	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	1.4
135290	1902	*Pinus*	Pine	Wood	Positive	Uncharred	1	0.7
135290	1902	*Pinus*	Pine	Wood	Positive	Charred	6	1.7
135290	1902	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	23	7.8
135290	1902	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	0.3
135290	1903	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	0.1
135290	1938	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	2	0.8
135290	1938	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	1.3
135290	1938	*Juniperus*	Juniper	Wood	Positive	Charred	1	0.1
135290	1938	*Pinus*	Pine	Wood	Positive	Charred	8	2.7
135290	1938	*Pinus edulis*	Piñon	Wood	Positive	Charred	4	1.0
135290	1938	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	40	15.4
135290	2046	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	0.3
135290	2046	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.9
135290	2046	*Juniperus*	Juniper	Wood	Positive	Charred	2	0.1
135290	2046	*Pinus*	Pine	Wood	Positive	Charred	4	0.5
135290	2046	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	13	2.4
135290	2046	*Quercus*	Oak	Wood	Positive	Charred	1	0.2
135290	2097	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	3	5.1
135290	2098	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	3	1.3
135290	2098	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.5
135290	2098	*Pinus*	Pine	Wood	Positive	Charred	3	0.5
135290	2098	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	17	3.5
135290	2098	*Quercus*	Oak	Wood	Positive	Charred	3	0.2

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
135290	2103	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	0.1
135290	2103	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	0.1
135290	2108	*Pinus*	Pine	Wood	Positive	Charred	5	1.7
135290	2108	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Part. Charred	1	11.9
135290	2108	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	22	4.1
135290	2108	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	22	4.2
135290	2118	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.3
135290	2118	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.2
135290	2118	*Zea mays*	Maize	Kernel	Positive	Charred	2(2)	0.2
135290	2132	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.7
135290	2145	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.4
135290	2145	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.7
135290	2148	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	1.7
135290	2148	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	0.4
135290	2148	*Zea mays*	Maize	Shank	Fairly certain	Charred	1	0.2
135290	2178	*Atriplex/ Sarcobatus*	Saltbush/ greasewood	Wood	Positive	Charred	1	<0.1
135290	2178	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.1
135290	2178	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	4	0.6
135290	2178	*Zea mays*	Maize	Kernel	Positive	Charred	2(2)	0.1
135290	2213	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	7	2.0
135290	2213	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	1	0.1
135290	2246	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.6
135290	2263	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Part. Charred	1	15.4
135290	2268	*Juniperus*	Juniper	Wood	Positive	Charred	2	1.7
135290	2268	*Pinus*	Pine	Wood	Positive	Charred	6	3.7
135290	2268	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	2.7
135290	2268	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	20	16.7
135290	2268	*Pseudotsuga menziesii*	Douglas fir	Wood	Fairly certain	Charred	7	2.2
135290	2268	*Quercus*	Oak	Wood	Positive	Charred	2	0.5
135290	2281	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	<0.1
135290	2281	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.2
135290	2281	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	9	1.8
135290	2281	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	0.1
135290	2281	*Zea mays*	Maize	Kernel	Positive	Charred	10(1)	0.7
135290	2303	*Phaseolus*	Bean	Cotyledon	Positive	Charred	1(0)	<0.1
135290	2303	*Pinus*	Pine	Wood	Positive	Charred	2	0.1
135290	2303	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	11	3.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
135290	2303	*Zea mays*	Maize	Kernel	Positive	Charred	4(0)	0.2
135290	2314	*Pinus*	Pine	Umbo	Positive	Uncharred	1(1)	0.1
135290	2314	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.2
135290	2333	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	0.1
135290	2345	*Pinus*	Pine	Wood	Positive	Charred	2	1.7
135290	2346	*Pinus*	Pine	Wood	Positive	Charred	4	1.9
135290	2346	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	4	0.9
135290	2353	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.8
135290	2353	*Phaseolus*	Bean	Cotyledon	Positive	Charred	1(1)	0.1
135290	2353	*Pinus*	Pine	Wood	Positive	Charred	8	3.3
135290	2353	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	2	1.7
135290	2353	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	29	10.0
135290	2353	*Zea mays*	Maize	Cupule segment	Positive	Charred	2(2)	0.3
135290	2481	*Atriplex/ Sarcobatus*	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1
135290	2481	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.1
135290	2481	*Pinus*	Pine	Wood	Positive	Charred	2	0.2
135290	2481	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1
135290	2481	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	4	1.9
135290	2481	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	2	0.1
135290	2481	*Zea mays*	Maize	Cupule segment	Positive	Charred	1(1)	<0.1
135290	2481	*Zea mays*	Maize	Kernel	Positive	Charred	35(22)	1.9
135290	2485	*Pinus*	Pine	Bark scale	Positive	Part. Charred	32	2.4
135290	2485	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.8
135290	2485	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	0.1
135290	2485	*Populus/Salix*	Cottonwood/willow	Wood	Positive	Charred	5	0.4
135290	2513	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
135290	2513	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
135290	2513	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	5	1.0
135290	2513	*Zea mays*	Maize	Kernel	Positive	Charred	1(1)	0.2
135290	2513	*Zea mays*	Maize	Cupule	Positive	Charred	1(1)	<0.1
135290	2555	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	1	0.5
135290	2591	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.6
135290	2591	*Pinus*	Pine	Wood	Positive	Charred	2	0.5
135290	2591	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.7
135290	2591	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	15	2.8
139418	325	Pinus ponderosa	Ponderosa pine	Wood	Fairly certain	Charred	3	0.8
139418	332	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.2

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
139418	332	Pinus ponderosa	Ponderosa pine	Wood	Fairly certain	Charred	3	0.5
139418	333	Pinus ponderosa	Ponderosa pine	Wood	Fairly certain	Charred	5	1.1
139418	334	Pinus edulis	Piñon	Wood	Fairly certain	Charred	3	0.3
139418	344	Atriplex/Sarcobatus	Saltbush/greasewood	Wood	Positive	Charred	1	<0.1
139418	344	Pinus	Pine	Wood	Positive	Charred	5	0.3
139418	347	Pinus	Pine	Wood	Positive	Part. Charred	3	9.3
139418	354	Pinus ponderosa	Ponderosa pine	Wood	Fairly certain	Charred	3	0.3
141505	44	Pinus edulis	Piñon	Seed	Positive	Uncharred	17(12)	2.5
141505	44	Juniperus	Juniper	Twig	Positive	Uncharred	2(0)	<0.1
141505	44	Pinus	Pine	Umbo	Positive	Uncharred	8(8)	0.2
141505	44	PlatyOpuntia	Pricklypear cactus	Seed	Positive	Uncharred	9(8)	<0.1
141505	44	Juniperus	Juniper	Seed	Positive	Uncharred	99(93)	2.3
141505	73	Cercocarpus	Mountain mahogany	Wood	Positive	Charred	3	0.2
141505	73	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	0.2
141505	77	Pseudotsuga menziesii	Douglas fir	Wood	Fairly certain	Charred	12	1.2
141505	77	Cercocarpus	Mountain mahogany	Wood	Positive	Charred	7	1.2
141505	77	Gymnospermae	Unknown conifer	Wood	Positive	Charred	9	1.1
141505	81	Pseudotsuga menziesii	Douglas fir	Wood	Fairly certain	Charred	6	0.6
85407	41	*Phaseolus*	Bean	Cotyledon	Fairly certain	Charred	1(0)	<0.1
85407	64	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	1	<0.1
85407	95	*Prunus persica*	Peach	Stone	Positive	Uncharred	2(0)	2.1
85411	85	*Pinus*	Pine	Umbo	Positive	Charred	1(1)	<0.1
85411	85	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	6	0.1
85859	138	*Pinus*	Pine	Wood	Positive	Charred	12	0.2
85859	361	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1
85859	362	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1
85859	363	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
85864	7	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
85864	7	*Pinus edulis*	Piñon	Wood	Positive	Charred	10	0.5
85864	7	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	3	<0.1
85864	9	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	4	0.3
85864	9	*Pinus edulis*	Piñon	Wood	Positive	Charred	50	4.8
85864	9	*Juniperus*	Juniper	Wood	Positive	Charred	7	0.5
85864	12	*Pinus edulis*	Piñon	Wood	Positive	Charred	19	1.5
85869	237	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1
85869	244	*Juniperus*	Juniper	Wood	Positive	Charred	2	<0.1
85869	247	*PlatyOpuntia*	Pricklypear cactus	Seed	Positive	Uncharred	1	<0.1

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
85869	278	*Juniperus*	Juniper	Seed	Positive	Uncharred	0	0
85869	278	*Juniperus*	Juniper	Twig	Positive	Uncharred	0	0
85869	278	*Pinus*	Pine	Umbo	Positive	Uncharred	0	0
85869	278	*Pinus edulis*	Piñon	Needle	Positive	Uncharred	0	0
99396	472	*Pinus*	Pine	Wood	Positive	Charred	20	3.5
99396	472	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.6
99396	472	*Cercocarpus*	Mountain mahogany	Wood	Positive	Charred	6	0.3
99396	472	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	77	46.3
99396	774	*Juniperus*	Juniper	Wood	Fairly certain	Charred	1	<0.1
99396	775	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
99397	211	*Pinus edulis*	Piñon	Wood	Positive	Charred	3	0.1
99397	214	*Pinus edulis*	Piñon	Wood	Fairly certain	Charred	30	4.0
99397	214	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.4
99397	282	*Pinus ponderosa*	Ponderosa pine	Wood	Resembles taxon	Charred	5	1.7
99397	283	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	3	3.8
99397	291	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.1
99397	292	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	1	0.7
86528	1	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.4
86528	1	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	4	0.6
86528	1	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	<0.1
86528	1	Unknown	Unknown	Plant part	Positive	Charred	1	<0.1
86528	2	*Pinus ponderosa*	Ponderosa pine	Wood	Fairly certain	Charred	2	0.7
86528	2	Gymnospermae	Unknown conifer	Wood	Positive	Charred	4	0.2
86528	1	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.4
86528	3	*Quercus*	Oak	Wood	Fairly certain	Charred	45	7.5
86528	3	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.5
86528	3	Gymnospermae	Unknown conifer	Wood	Positive	Charred	6	0.7
86528	3	*Pinus*	Pine	Wood	Positive	Charred	3	0.2
86528	4	*Pinus*	Pine	Wood	Positive	Charred	3	0.2
86528	4	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.3
86528	4	Gymnospermae	Unknown conifer	Wood	Positive	Charred	11	0.4
86528	4	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	3	0.5
86528	4	*Quercus*	Oak	Wood	Positive	Charred	4	0.3
86528	4	Gymnospermae	Unknown conifer	Wood	Positive	Partially charred	2	1.3
86528	4	*Artemisia*	Sagebrush	Wood	Positive	Charred	1	0.4
86531	8	*Quercus*	Oak	Wood	Positive	Charred	11	4.5
86531	8	*Pinus ponderosa*	Ponderosa pine	Wood	Positive	Charred	2	0.2

Site	FS No.	Scientific Name	Common Name	Plant Part	Confidence	Condition	Count	Weight
86531	8	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
86531	9	*Pinus*	Pine	Wood	Positive	Charred	3	0.2
86531	9	*Quercus*	Oak	Wood	Positive	Charred	14	2.1
86531	9	*Pinus edulis*	Piñon	Wood	Positive	Charred	5	0.6
86531	9	Gymnospermae	Unknown conifer	Wood	Positive	Charred	5	0.2
110126	6	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
110126	6	*Cercocarpus*	Mountain mahogany	Wood	Fairly certain	Charred	1	<0.1
110126	6	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
110126	7	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	2	<0.1
110126	7	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
110126	7	*Cercocarpus*	Mountain mahogany	Wood	Fairly certain	Charred	1	<0.1
110126	7	*Chrysothamnus*	Rabbitbrush	Wood	Fairly certain	Charred	5	0.1
110126	8	Unknown non-conifer	Unknown non-conifer	Wood	Positive	Charred	1	<0.1
110126	8	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.1
110126	8	*Cercocarpus*	Mountain mahogany	Wood	Fairly certain	Charred	1	0.1
110126	10	*Chrysothamnus*	Rabbitbrush	Wood	Fairly certain	Charred	30	1.4
110126	10	Gymnospermae	Unknown conifer	Wood	Positive	Charred	2	0.6
117883	8	*Quercus*	Oak	Wood	Positive	Charred	8	0.6
117883	8	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.1
117883	21	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.1
117883	21	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.3
117883	21	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
61034	10	*Quercus*	Oak	Wood	Positive	Charred	1	<0.1
61034	16	*Pinus*	Pine	Wood	Positive	Charred	2	<0.1
61034	19	*Pinus*	Pine	Wood	Positive	Charred	1	<0.1
61035	3	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	<0.1
61035	23	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	0.1
61035	23	*Pinus edulis*	Piñon	Wood	Positive	Charred	1	0.2
61035	23	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.5
61035	27	*Juniperus*	Juniper	Wood	Positive	Charred	3	0.1
61035	27	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1
61035	30	Gymnospermae	Unknown conifer	Wood	Positive	Charred	3	0.1
61035	30	*Juniperus*	Juniper	Wood	Positive	Charred	1	<0.1
61035	40	*Juniperus*	Juniper	Wood	Positive	Charred	6	0.7
61035	43	*Pinus edulis*	Piñon	Wood	Positive	Charred	2	0.2
61035	43	Gymnospermae	Unknown conifer	Wood	Positive	Charred	1	<0.1

APPENDIX V
MAIZE MORPHOMETRICS

Table V.1. C&T *Zea mays* kernel morphometrics.

Site	FS No.	Lacks Embryo?	Swollen?	Height	Width	Thickness
12587	1236	No	Yes	9.6	7.1	5.9
12587	1236	No	No	7.5	6.3	2.9
12587	1236	No	Yes	5.7	7.3	4.1
12587	1236	No	No	9.4	7.8	4.4
12587	1236	No	No	6.5	6.7	5.2
12587	1236	Yes	No	6.5	6.3	4.8
12587	1236	Yes	Yes	7.2	7.7	4.8
12587	1236	No	No	8.6	7.4	3.7
12587	1236	No	No	7.1	4.9	5.4
12587	1236	No	No	7.8	7.3	4.7
12587	1236	No	No	7.4	7.4	4.3
12587	1236	No	Yes	7.3	7.9	5.8
12587	1236	No	No	7.9	6.3	4.3
12587	1236	Yes	Yes	7	6.5	5.9
12587	1236	No	Yes	8.7	6.8	4.8
12587	1236	No	No	6.4	6.2	5.7
12587	1236	Yes	No	6.7	6.4	3
12587	1236	No	Yes	10.2	7.1	3.5
12587	1236	No	Yes	6.7	5.6	5.3
12587	1236	No	Yes	5.6	6.6	4.8
12587	1236	No	No	7.6	5.1	4.7
12587	1236	No	No	7.7	6.6	5.1
12587	1236	No	No	8.4	7.1	2.8
12587	1236	No	No	7.6	6.7	4.6
12587	1236	No	Yes	8.7	9.1	4.2
12587	1236	No	No	6.9	6.1	3.7
12587	1236	No	Yes	5.9	6.5	5.7
12587	1236	Yes	No	7.1	6.5	3.4
12587	1236	Yes	No	5.7	5.1	3.4
12587	1236	No	No	6.7	6	2.8
12587	1236	Yes	No	6.4	5.4	2.9
12587	1236	No	No	7.5	6.5	3.8
12587	1236	Yes	No	6.5	5.7	3
12587	1236	No	No	7.4	5.8	3.3
12587	1236	Yes	No	4.8	4.9	3.9
12587	1236	Yes	No	7.3	5.8	2.9
12587	1236	Yes	No	6.9	6.7	4.2
12587	1236	Yes	No	6.2	5.2	4
12587	1236	No	Yes	6	6	5.3

Site	FS No.	Lacks Embryo?	Swollen?	Height	Width	Thickness
12587	1236	Yes	No	5.5	5.6	3.2
12587	1236	Yes	No	5	5.3	2.5
12587	1236	Yes	No	7.4	6.4	3.7
12587	1236	No	Yes	5.2	6.3	5.2
12587	1236	Yes	Yes	5.3	6.8	5.2
12587	1236	Yes	No	6.6	5.4	4.1
12587	1236	No	No	7.9	7.3	3.8
12587	1236	No	No	7.5	6.3	3
12587	1236	Yes	No	5.9	6	3.1
12587	1236	No	No	4.2	4.4	3.6
12587	1236	No	No	7.5	6.2	3.1
12587	1236	Yes	No	5.7	5.1	4
12587	1236	No	No	6.6	6.5	4.3
12587	1508	Yes	Yes	5.1	6.9	3.9
12587	1508	No	No	8.4	8	4.3
12587	1508	No	No	8.2	5.3	3.8
12587	1508	No	No	7.1	5.5	3.9
12587	1514	Yes	No	8.1	5.5	3.8
12587	1514	Yes	No	5.8	4.9	4.9
12587	1514	Yes	No	7.8	5.4	4.5
12587	1514	No	Yes	6.3	6.7	4.7
12587	1514	No	Yes	7.7	7.8	6.6
12587	1514	Yes	No	8.6	7.4	3.6
12587	1514	No	No	8.6	5.3	4.6
12587	1514	No	Yes	5.9	6.7	5.5
12587	1514	No	No	7.4	5.8	3
12587	1514	Yes	Yes	7.2	8.3	3.7
12587	1514	No	No	6.2	5.4	3.6
12587	1514	No	No	9.4	8.2	4.3
12587	1514	No	No	6	5.9	4.9
12587	1514	No	No	6.7	4.9	2.4
12587	1514	Yes	No	4.9	5.4	2.8
12587	1514	Yes	No	7.8	6.4	4.3
12587	1514	No	Yes	6.8	7	4.1
12587	1514	Yes	No	4.9	5.8	4
12587	1514	No	Yes	6.2	5.2	6.2
12587	1514	No	No	6.1	5.4	3.4
12587	1514	No	No	3	3	2.8
12587	1567	No	No	7.1	6.5	3.8
12587	1567	No	No	7.2	5.8	3.6
12587	1567	No	No	7.9	7.3	3.5
12587	1567	Yes	Yes	7	7.6	4.2
12587	1567	No	No	6.6	5.9	3.3
12587	1567	No	No	8.6	5.3	3.5

Site	FS No.	Lacks Embryo?	Swollen?	Height	Width	Thickness
12587	1567	Yes	No	9.7	6.3	4.5
12587	1567	No	Yes	5.8	7.1	4.5
12587	1567	No	No	7	6.5	3.9
12587	1567	Yes	No	7.6	7.4	4.5
12587	1939	Yes	Yes	7.4	7.4	4
12587	1939	No	No	8.6	6.6	4.1
12587	1939	No	No	6	6	3.9
12587	1939	No	No	7	5.2	3.3
12587	1939	Yes	No	6.6	5.9	3.3
12587	1939	No	Yes	6.8	6.5	6.3
12587	1939	No	No	8.9	8.4	3.2
12587	1939	No	No	8.8	7	2.5
12587	1939	No	No	6.7	7.2	4
12587	1939	No	No	7.4	6.2	3.3
12587	1939	No	No	8.6	6.2	3.5
12587	1939	No	Yes	7.8	7.2	4.4
12587	1939	No	No	8.2	6.2	4.4
12587	1939	No	No	8.3	7.2	4
12587	1939	No	No	8.5	6.9	3
12587	1939	Yes	No	6.3	6.2	4.2
12587	1939	No	No	9.1	7.7	3.9
12587	1939	No	No	7.3	7.6	3.8
12587	1939	No	No	6.7	6.5	3.5
12587	1939	No	No	8.8	7.1	2.9
12587	1939	No	Yes	7.8	8	5.8
12587	2200	No	No	7.9	6.8	3.4
12587	2200	No	No	9.6	7.4	4
12587	2200	No	No	7.7	7.6	2.9
12587	2200	No	No	7.4	7.1	3.8
12587	2200	No	Yes	8.1	8	6
12587	2200	No	No	8.4	7.5	3.3
12587	2200	Yes	No	7.5	7.3	3
12587	2200	No	No	7.6	6.6	3.9
12587	2200	No	No	7.3	6.1	3.1
12587	2200	No	No	6.4	6.5	4
12587	2200	No	Yes	7.1	7.6	4.1
12587	2200	No	Yes	7.8	6.2	5.8
12587	2200	No	No	8	7.1	5.3
12587	2200	No	Yes	6.7	7.3	6.1
12587	2200	No	Yes	6.6	8	4.9
12587	2200	No	No	8.6	8.3	3
12587	2200	No	Yes	7.3	7	6.2
12587	2200	No	No	9	5.9	3.3
12587	2200	No	No	9.2	7.9	4.3

Site	FS No.	Lacks Embryo?	Swollen?	Height	Width	Thickness
12587	2200	Yes	No	8.2	6.2	3
12587	2559	No	No	6.7	6.6	4.8
12587	2559	No	Yes	6.9	6.2	5.9
12587	2559	No	No	7.7	6.7	4.3
12587	2559	Yes	Yes	6.3	7.4	3.7
12587	2559	Yes	No	7.3	6.7	3.2
12587	2559	Yes	Yes	6.8	6.8	4.5
12587	2559	No	Yes	7	6.9	4.7
12587	2559	Yes	No	6.4	6.3	4.5
12587	2559	Yes	Yes	6.8	8	4
12587	2559	No	No	6.8	7	3.9
12587	2725	No	No	9.2	6.6	3.3
12587	2725	No	No	9.3	6	3.1
12587	2725	No	Yes	8.7	6.1	5.6
12587	2725	No	Yes	9.1	8.2	5.6
12587	2725	No	No	7.8	7.9	4
12587	2725	No	No	7.1	6.4	3.5
12587	2725	Yes	Yes	6.7	7.5	3.3
12587	2725	No	No	8.2	7.8	4.1
12587	2725	No	No	9.5	8.1	4.3
12587	2725	Yes	No	7.3	7.6	3.7
12587	2888	No	No	11.5	7.6	4.6
12587	2888	No	No	8.1	6.2	5.3
12587	2888	No	No	7.8	5.8	4.7
12587	2888	No	No	8.7	7	4.1
12587	2888	No	No	8.6	8.1	4.3
12587	2888	No	No	8.4	7.9	4.2
12587	2888	No	No	8.9	5.3	4.4
12587	2888	No	No	7.9	7.6	4.6
12587	2888	No	No	7.6	8.1	3.2
12587	2888	Yes	No	7.1	6.5	3.2
12587	712	No	No	7.9	5	3.1
12587	712	Yes	No	5.1	5.1	3.5
12587	712	No	No	8	7.8	4
12587	712	Yes	No	7.4	6.5	3.6
12587	818	No	No	8.1	6.3	3
12587	877	Yes	No	6.8	5.1	4.6
12587	877	Yes	No	5.9	6	2.9
12587	910	No	No	7.9	6.3	3.7
12587	910	No	No	7.3	5.7	3.5
12587	910	Yes	No	6.7	6.7	3.6
12587	922	No	Yes	6.7	7.5	5.2
12587	922	Yes	No	5.5	3.7	3.2
12587	957	Yes	No	5.9	6.4	4.7

Site	FS No.	Lacks Embryo?	Swollen?	Height	Width	Thickness
12587	957	Yes	No	7.2	7.2	3.5
12587	972	No	No	7.7	6.8	3.4
12587	972	No	Yes	6.9	6.1	4.5
12587	972	No	No	7.8	7.2	3.6
12587	972	Yes	No	9.2	7.4	3.5
12587	972	Yes	No	5.3	5.6	3.7
12587	972	No	No	7.6	7.3	4.1
12587	972	No	No	8.2	6.2	4.4
12587	972	No	Yes	5.5	6.5	2.9
12587	972	Yes	No	7.4	6.2	3.5
12587	972	No	Yes	6.1	6.1	5.2
12587	985	Yes	Yes	7.4	7.9	5.6
12587	985	Yes	No	5.8	4.1	3
12587	985	No	No	5.9	5.1	3.1
12587	985	Yes	Yes	7.3	7.4	3.2
12587	985	Yes	No	5.3	3.6	4
12587	994	Yes	No	7	5.6	2.7
12587	994	Yes	No	7.8	6.9	3.2
12587	1003	No	No	9.2	7.6	3.3
12587	1003	No	No	8.7	6.6	3.2
12587	1003	Yes	No	6.8	6.4	4.3
12587	1003	No	No	5.8	5	4.3
12587	1003	Yes	No	8.2	6.4	3.4
12587	1003	No	Yes	7.1	7.9	4
12587	1003	No	No	6.2	6.1	3.8
12587	1003	No	No	10	6.3	3.5
12587	1003	No	No	8.9	6.2	3.4
12587	1003	Yes	No	7.6	7.1	3.8
12587	1003	No	No	8.5	8.5	3.9
12587	1003	No	No	8.3	6.8	4.5
12587	1003	Yes	No	6.3	5.7	3
12587	1003	No	Yes	6.4	6.9	5.8
12587	1003	Yes	Yes	6.2	7	3.7
12587	1003	No	No	8	7.2	4.2
12587	1003	Yes	No	8.1	6.4	3.5
12587	1003	No	No	8	6.5	3.6
12587	1003	Yes	No	7.5	8	2.9
12587	1003	Yes	No	6.7	5.4	2.5
12587	1003	No	Yes	6.2	6.7	4
12587	1007	Yes	No	6.9	5.4	3.6
12587	1007	No	No	7.4	5.6	3.6
12587	1029	Yes	No	5.9	5.5	3.7
12587	1029	Yes	Yes	4.9	5.9	4.2
12587	1089	No	No	7.3	7.1	3.9

Site	FS No.	Lacks Embryo?	Swollen?	Height	Width	Thickness
12587	1193	No	No	9.2	6.8	2.4
12587	1193	No	No	8.8	6.5	4.6
12587	1193	No	Yes	7.3	6.3	4.9
12587	1193	Yes	No	7.1	6	3.9
12587	1193	No	No	7.9	6.6	3.6
12587	1193	Yes	No	9.5	8.1	3.5
12587	1193	No	No	7.6	5.9	2.8
12587	1193	No	Yes	6.3	7.6	4.4
12587	1193	No	No	8.4	7.3	4.2
12587	1193	Yes	No	5.2	5.1	3.2
12587	1225	Yes	Yes	5.6	5.3	5
12587	1275	Yes	No	7.5	6.7	2.9
12587	1400	No	No	7.2	5.7	3.1
12587	1400	No	No	7.5	5.9	3.5
12587	1400	No	Yes	7.7	7.1	5.5
12587	1400	No	No	7.3	6.2	3.3
12587	1400	Yes	No	7.3	6.6	4.1
12587	1400	No	No	9	7.1	3.1
12587	1400	Yes	No	7.4	7.3	3.5
12587	1400	No	No	8.2	6	4.8
12587	1400	Yes	No	7.7	7.4	3.7
12587	1400	No	No	7.2	6.8	3.6
12587	1447	No	No	8.3	8	3.8
12587	1447	Yes	No	7	7.2	3.3
12587	1447	No	No	7.6	5.5	3.1
12587	1447	Yes	Yes	6.6	7.8	4.8
12587	1447	No	No	10	7.4	3.8
12587	1447	Yes	No	5.9	6.4	2.6
12587	1447	Yes	Yes	7.3	7.8	4.6
12587	1447	No	No	7.9	7.9	4.5
12587	1447	Yes	No	8.2	7.7	3.5
12587	1447	No	No	7.3	6.7	3
12587	2044	Yes	No	6.7	5.9	3.9
12587	2169	No	No	7.8	6.8	3.7
12587	2169	Yes	No	8	6.5	3.4
12587	2169	Yes	No	8.6	7.5	3.4
12587	2169	No	Yes	6.1	6.9	5.4
12587	2169	No	Yes	8.2	6.8	5.8
12587	2169	Yes	Yes	9.3	9.2	4
12587	2169	No	No	7.3	6.7	3.1
12587	2169	No	No	9.3	7.4	3.4
12587	2362	No	No	9.2	7.3	3.5
12587	2362	Yes	No	7.5	7.5	4.3
12587	2362	Yes	No	8.5	8.1	2.8

Site	FS No.	Lacks Embryo?	Swollen?	Height	Width	Thickness
12587	2362	No	No	8.4	7.3	3.8
12587	2362	Yes	No	7.7	7	4.5
12587	2362	No	No	6.3	6.4	3.8
12587	2362	Yes	Yes	6.3	7.1	3.6
12587	2362	No	No	7.5	5.3	3.6
12587	2362	Yes	No	6.4	5.8	2.5
12587	2362	No	No	8.1	6.4	3.8
12587	2362	No	Yes	7.4	7.4	3.6
12587	2362	No	No	8.1	7.4	4
12587	2362	No	No	6.7	6.6	3.6
12587	2362	No	Yes	6	6.6	4.7
12587	2362	Yes	No	7.8	6.7	3.3
12587	2362	No	No	7.9	6.1	5.1
12587	2362	No	No	8.4	6.1	4
12587	2639	No	No	8	6.2	3
12587	2639	No	No	9.2	7.9	3.5
12587	2639	No	Yes	7.8	7	4.5
12587	2639	No	Yes	7.1	7.9	4.5
12587	2639	No	No	10	7.3	3.7
12587	2639	No	No	9	6.3	2.9
12587	2639	No	No	7.8	5.9	4
12587	2639	No	No	7.8	6.3	3.8
12587	2639	No	No	8.2	7.1	3.4
12587	2639	No	No	8.1	6.6	3.6
12587	2551	Yes	No	6.3	6.5	3.1
12587	2551	Yes	No	7.5	7.4	3.3
12587	2551	Yes	No	7.3	7	3.4
12587	2551	Yes	Yes	6.4	6.8	4.6
12587	2551	Yes	No	6.8	6.5	4.9
12587	2551	Yes	Yes	5.7	6.3	4.5
12587	2664	No	No	7.3	6.5	3.2
12587	2664	No	No	8.7	6.6	2.8
12587	2664	Yes	No	6.9	6.5	3.4
12587	2664	No	No	7.8	6.4	3.8
12587	2664	Yes	Yes	6.9	7.7	2.7
12587	2664	Yes	Yes	5.7	5.8	6.5
12587	2664	Yes	Yes	5.2	6.1	4.5
12587	2664	Yes	Yes	7.5	7.9	3.3
12587	2664	Yes	Yes	5.5	5.7	3.7
12587	2664	No	No	9.9	7	2.7
12587	2645	Yes	Yes	6.1	7.1	3.5
12587	2645	Yes	No	6.9	6.5	3.1
12587	2645	No	Yes	8.3	8.5	3.1
12587	2645	Yes	No	6.4	5.9	4.2

Site	FS No.	Lacks Embryo?	Swollen?	Height	Width	Thickness
12587	2646	Yes	Yes	6.7	6.2	6
12587	2646	Yes	Yes	6.3	7.4	5.7
12587	2646	No	No	6.7	6.8	3
12587	2646	Yes	No	7.5	6.5	3.5
12587	2646	No	Yes	5.9	7.8	5.7
12587	2668	Yes	No	6	5	2.3
12587	2668	Yes	Yes	5.4	6	3.6
12587	2831	No	Yes	6.8	7.2	3.4
12587	2831	No	No	9	6.2	4.6
12587	2831	Yes	No	7.1	6.8	4.1
12587	2831	Yes	No	7	6.6	5
12587	2831	No	No	6.9	6.2	4.2
12587	2831	No	Yes	7.5	6.4	4.7
12587	2831	No	No	8.5	7.2	3.5
12587	2831	No	No	9.2	6.7	4.5
12587	2831	No	No	7.5	7.2	3.4
12587	2831	No	No	6.9	7.3	3.3
12587	2697	No	No	7.8	5.8	2.9
12587	2697	Yes	No	8.4	6.4	3.7
12587	2697	Yes	No	7.2	6.4	4.3
12587	2697	No	Yes	5.8	6.6	4.4
12587	3324	Yes	No	6.5	6.3	3.4
12587	4138	No	No	5.7	5.9	3.4
12587	4138	No	No	7.6	6.5	3.2
12587	4138	No	No	7.6	6.8	3
Averages	-	37% lack embryo	25% swollen	7.3	6.6	3.9
128805	152	Yes	Yes	6.7	7.5	5
128805	230	Yes	Yes	5.4	7.3	6.8
135290	869	Yes	No	5.4	5.1	3.6
135290	869	Yes	Yes	6.4	8.3	4.4
135290	869	Yes	No	6.8	7.1	3.5
135290	869	No	Yes	6.8	7.9	4.5
135290	869	No	Yes	7	8	3.8
135290	869	Yes	No	7.3	7	4.3
135290	869	No	No	7.5	6.7	4.4
135290	869	Yes	No	7.7	7.4	3.4
135290	869	Yes	No	8.6	7.6	4.7
135290	869	No	No	11.7	6.4	2.8
135290	869	No	No	12.7	7.5	4.7
135290	874	Yes	Yes	3.9	5.6	4.5
135290	874	Yes	No	5.4	5	5
135290	874	No	No	5.4	5.5	4.2
135290	874	Yes	No	6	5.7	4.7
135290	874	No	Yes	6.3	5.9	6.5

Site	FS No.	Lacks Embryo?	Swollen?	Height	Width	Thickness
135290	874	No	No	6.7	6.7	3.1
135290	874	No	Yes	6.8	5.2	5.8
135290	874	No	No	6.8	5.7	4.2
135290	874	No	Yes	6.8	8.6	5.6
135290	874	No	Yes	7.2	7.2	5
135290	874	No	No	7.6	6	4.8
135290	874	No	No	8.4	7.6	4.6
135290	874	No	Yes	8.6	8.1	4.9
135290	968	Yes	No	5.5	5.6	3.5
135290	968	Yes	Yes	6.7	7.5	3.3
135290	968	No	Yes	7.5	8	5.3
135290	968	Yes	No	7.6	6.7	4.1
135290	1047	No	Yes	5.8	7.1	3.3
135290	1047	No	No	6.2	7.2	3.8
135290	1047	Yes	No	7.3	7.5	3.8
135290	1047	No	Yes	7.4	7.3	5.1
135290	1047	No	No	7.4	8.2	3.6
135290	1047	Yes	No	7.5	6.7	3.8
135290	1047	No	No	7.5	6.7	5.5
135290	1047	No	Yes	7.5	7.7	6.1
135290	1047	Yes	Yes	7.5	8.6	4.1
135290	1047	No	Yes	7.7	8.1	4.3
135290	1047	Yes	No	7.8	5.9	3.5
135290	1047	No	No	7.8	7	4.7
135290	1047	No	Yes	7.8	8.6	4.2
135290	1047	No	Yes	7.9	9	4.2
135290	1047	Yes	No	8	8.2	3.9
135290	1047	Yes	Yes	8	9	5.3
135290	1047	No	Yes	8	9.1	3.5
135290	1047	No	No	8.1	6.9	4.4
135290	1047	No	No	8.2	6.6	3.9
135290	1047	No	Yes	8.2	7	5.8
135290	1047	Yes	No	8.2	7.8	5.2
135290	1047	Yes	No	8.2	8.5	5.4
135290	1047	Yes	No	8.3	6.5	4.5
135290	1047	No	No	8.6	6.4	3.8
135290	1047	No	No	8.6	8.3	4.4
135290	1047	No	Yes	8.6	9.4	4.8
135290	1047	No	No	8.7	7.5	3.3
135290	1047	Yes	No	8.8	7.8	3.8
135290	1047	No	No	8.9	7.4	4.2
135290	1047	No	No	9	7.4	5.6
135290	1047	No	No	9.5	7.3	4.7
135290	1047	No	No	10.3	7.2	4.1

Site	FS No.	Lacks Embryo?	Swollen?	Height	Width	Thickness
135290	1130	Yes	No	6	5.6	5
135290	1130	Yes	No	6.3	6.4	3.1
135290	1130	Yes	No	6.4	5.9	3.8
135290	1130	Yes	Yes	6.4	7.5	4
135290	1130	Yes	No	6.6	6.4	3.5
135290	1130	Yes	No	7	7.4	4.2
135290	1130	Yes	No	7.3	7.6	4.1
135290	1130	No	No	7.5	7	4.2
135290	1130	Yes	No	7.6	6.7	5
135290	1130	Yes	No	7.8	5.7	4.3
135290	1130	Yes	No	7.8	6.7	4.3
135290	1130	Yes	No	7.9	7.8	4.8
135290	1130	Yes	No	8	6.8	5.6
135290	1130	Yes	No	8.1	7.1	4.7
135290	1130	Yes	No	8.4	7.7	3.9
135290	1130	No	No	8.5	7.2	4.1
135290	1130	Yes	No	8.6	6.5	4.2
135290	1130	No	Yes	8.6	6.6	4.2
135290	1130	Yes	No	8.7	6.3	4.6
135290	1130	No	No	9	8.6	4
135290	1130	No	No	9.5	8.4	4.7
135290	1326	Yes	Yes	5.1	6.1	4.3
135290	1326	Yes	Yes	6.3	6.8	3.9
135290	1326	Yes	No	6.5	6.6	4.1
135290	1326	Yes	Yes	6.7	7	5.3
135290	1326	Yes	Yes	6.7	7.3	4
135290	1326	Yes	Yes	7.1	6.8	6.3
135290	1326	Yes	Yes	7.1	9.7	5.3
135290	1326	Yes	No	7.2	7.2	4.5
135290	1326	Yes	Yes	7.9	9.4	5.2
135290	1326	No	No	8.1	6.8	4.4
135290	1326	No	No	9	7.4	3.6
135290	1326	No	No	9.5	7.1	4.5
135290	1326	No	No	9.6	7.1	5.4
135290	1326	No	No	9.9	8.4	4.2
135290	1456	Yes	No	7.8	7.6	5.8
135290	1471	Yes	Yes	6.2	6.8	4.3
135290	1471	Yes	No	7	5.2	5.2
135290	1471	Yes	No	7.1	6.9	4.2
135290	1471	No	Yes	8	8.4	5.3
135290	1471	No	No	8.6	6.5	4.3
135290	1471	No	No	9.3	7.6	4.3
135290	1471	Yes	No	9.3	8	3
135290	1471	No	No	9.7	7.5	5.2

Site	FS No.	Lacks Embryo?	Swollen?	Height	Width	Thickness
135290	1559	No	No	7.2	7.1	4.3
135290	1559	Yes	No	7.5	7.6	4.3
135290	1559	No	No	8.1	8	4.5
135290	1559	No	No	9.1	6.6	3.4
135290	1559	No	No	9.2	7.4	4.4
135290	1559	No	No	9.2	8	4.5
135290	1559	No	No	9.3	8.2	4.1
135290	1837	Yes	No	5.2	5.2	3.6
135290	1837	Yes	No	5.8	4.8	3.7
135290	2083	No	No	7.6	6.5	3.6
135290	2099	No	No	6.2	6.9	4.2
135290	2103	No	Yes	8.9	8.9	4.4
135290	2150	Yes	Yes	5.9	6.9	3.8
135290	2331	No	Yes	6.5	7	4.6
135290	2333	No	Yes	7.5	7.6	4.3
135290	2473	No	No	0	5.5	4
135290	2473	Yes	No	6	5.9	4
135290	2488	No	No	8.2	6.8	3
127635	123	No	No	5.3	5.9	3.7
Airport #2		No	No	7.1	5.5	4.0
Airport #2		No	No	7.8	6.0	3.5
Airport #2		No	Yes	7.2	7.4	4.4
Airport #2		No	No	9.1	6.8	5.2
Airport #2		No	Yes	6.9	7.5	3.6
Airport #2		No	No	7.5	6.1	3.9
Airport #2		No	No	7.6	6.7	4.4
Airport #2		No	Yes	10.5	6.3	5.3
Airport #2		Yes	No	3.4	3.7	2.6
Airport #2		No	Yes	6.1	7.6	3.8
Airport #2		No	No	7.4	6.3	3.1
Airport #2		No	No	9.0	7.8	4.0
Airport #2		No	Yes	6.1	7.8	5.6
Airport #2		No	No	6.8	6.7	3.4
Airport #2		No	Yes	7.2	7.1	3.6
Airport #2		No	Yes	6.0	7.1	3.6
Airport #2		No	No	8.7	6.6	4.4
Airport #2		No	No	8.7	7.0	4.7
Airport #2		No	No	9.2	6.5	3.3
Airport #2		Yes	No	7.1	5.7	4.7
Airport #2		No	Yes	4.9	5.7	3.4
Airport #2		No	No	8.2	5.0	4.1
Airport #2		Yes	Yes	6.3	6.8	3.9
Airport #2		No	Yes	6.8	7.4	3.7
Airport #2		Yes	No	7.7	7.2	3.4

Site	FS No.	Lacks Embryo?	Swollen?	Height	Width	Thickness
Airport #2		No	No	6.5	6.0	3.4
Airport #2		No	No	9.6	5.4	4.0
Airport #2		No	Yes	7.4	7.6	4.5
Airport #2		No	No	7.4	6.6	5.0
Airport #2		No	Yes	4.8	7.5	4.4
Airport #2		No	No	8.4	7.6	4.5
Airport #2		Yes	No	6.5	6.3	3.9
Airport #2		No	Yes	6.7	6.7	4.3
Airport #2		No	Yes	6.4	6.3	4.9
Airport #2		No	Yes	5.4	5.3	4.2
Airport #2		No	No	10.2	7.8	4.4
Airport #2		No	No	8.7	5.0	3.7
Airport #2		No	No	8.1	5.9	5.0
Airport #2		No	Yes	6.6	6.9	5.0
Airport #2		No	No	6.9	5.1	4.3
Airport #2		No	No	7.4	5.8	4.0
Airport #2		No	No	9.1	7.0	3.9
Airport #2		No	No	7.3	7.3	3.6
Airport #2		No	No	10.3	6.8	3.8
Airport #2		No	No	7.2	6.6	4.5
Airport #2		No	No	9.1	8.5	5.2
Airport #2		No	Yes	6.7	7.4	4.2
Airport #2		No	Yes	6.1	7.1	3.7
Airport #2		No	No	8.2	6.5	4.3
Airport #2		No	No	7.7	6.4	3.4

APPENDIX W
INTENSIVE SCANNING MICROSCOPY (ISM) RESULTS

Table W.1. Intensive scanning microscopy (ISM) results.

Site Number	Specimen Number	Context	Sample Weight gm	Slides Scanned	Tracers	ISM Threshold Conc. gr/gm	Total Number Single Maize Grains	ISM Maize Concentration gr/gm	Maize on slide other than first slide	Total Number Cotton Grains
LA 12587	4051	Gardens	22.5	3	1681	0.56	7	4.0		1
LA 12587	4052	Gardens	21.2	2	1394	0.72	3	2.2	2	
LA 12587	4055	Gardens	23.0	7	1394	0.67		0.0		
LA 12587	4056	Gardens	24.9	3	1025	0.84	6	5.0		
LA 12587	4057	Gardens	22.3	2	1558	0.61	7	4.3		
LA 12587	4058	Gardens	24.3	2	1661	0.53	1	0.5	2	
LA 12587	4059	Gardens	26.7	3	902	0.89	6	5.3		
LA 12587	4060	Gardens	23.0	2	1189	0.78		0.0		
LA 12587	4061	Gardens	22.1	3	1230	0.79	3	2.4	2	
LA 12587	4062	Gardens	23.2	3	1203	0.77	5	3.8		
LA 12587	4063	Gardens	22.4	3	1353	0.70	1	0.7	3	
LA 12587	4064	Gardens	23.5	3	1169	0.78	6	4.7		
LA 12587	4065	Gardens	25.8	3	1435	0.58	1	0.6		
LA 12587	4066	Gardens	26.3	2	1271	0.64		0.0		
LA 12587	4067	Gardens	25.9	2	1599	0.52	3	1.5		
LA 12587	4097	Gardens	26.5	1	1025	0.79	4	3.1		
LA 12587	4154	Gardens	23.5	2	1476	0.62	1	0.6		
LA 12587	4155	Gardens	21.8	2	1640	0.60	5	3.0	2	
LA 128803	6	Gardens	23.7	2	1324	0.68		0.0		
LA 128803	7	Gardens	23.8	2	1451	0.62		0.0		
LA 128803	11	Gardens	23.4	2	1082	0.84	2	1.7		
LA 128803	12	Gardens	21.8	2	1123	0.87	2	1.7		

Site Number	Specimen Number	Context	Sample Weight gm	Slides Scanned	Tracers	ISM Threshold Conc. gr/gm	Total Number Single Maize Grains	ISM Maize Concentration gr/gm	Maize on slide other than first slide	Total Number Cotton Grains
LA 128803	15	Gardens	19.4	2	1654	0.67		0.0		1
LA 128803	17	Gardens	18.9	2	1620	0.70		0.0		
LA 128803	19	Gardens	20.3	2	1292	0.81	5	4.1		
LA 128803	20	Gardens	22.3	2	1353	0.71		0.0		
LA 128803	22	Gardens	25.3	1	1421	0.59	5	3.0		
LA 128803	23	Gardens	23.2	2	1132	0.81	1	0.8	2	
LA 128803	26	Gardens	24.1	1	1312	0.68		0.0		
LA 128803	27	Gardens	18.7	2	1298	0.88	1	0.9	2	
LA 128803	34	Gardens	17.8	2	1606	0.75	2	1.5		
LA 128803	35	Gardens	21.9	1	1435	0.68		0.0		
LA 128803	36	Gardens	21.2	11	984	1.02		0.0		
LA 128803	39	Gardens	20.0	3	1255	0.85		0.0		
LA 139418	379	Gardens	23.7	1	2050	0.44	1	0.4		
LA 139418	380	Gardens	25.6	1	1312	0.64	1	0.6		
LA 139418	381	Gardens	21.1	1	1784	0.57		0.0		
LA 139418	382	Gardens	23.4	2	1476	0.62		0.0		
LA 139418	383	Gardens	22.2	1	1353	0.71		0.0		
LA 139418	384	Gardens	22.1	1	1419	0.68		0.0		
LA 139418	390	Gardens	27.0	2	1271	0.62		0.0		
LA 139418	391	Gardens	22.0	1	1302	0.75		0.0		
LA 139418	392	Gardens	27.3	1	2030	0.39		0.0		
LA 139418	393	Gardens	24.6	1	1394	0.62		0.0		
LA 139418	394	Gardens	24.9	1	1271	0.67		0.0		
LA 139418	395	Gardens	21.6	1	1693	0.58		0.0		

Site Number	Specimen Number	Context	Sample Weight gm	Slides Scanned	Tracers	ISM Threshold Conc. gr/gm	Total Number Single Maize Grains	ISM Maize Concentration gr/gm	Maize on slide other than first slide	Total Number Cotton Grains
LA 139418	396	Gardens	19.6	3	1230	0.89		0.0		
LA 139418	405	Gardens	22.8	3	1061	0.88		0.0		
LA 139418	406	Gardens	23.7	1	1025	0.88		0.0		
LA 139418	407	Gardens	26.3	1	1205	0.67		0.0		
LA 139418	408	Gardens	24.3	2	1066	0.82		0.0		
LA 139418	410	Gardens	27.1	1	2337	0.34		0.0		
LA 87430	169	Gardens	19.0	3	1148	0.98		0.0		
LA 87430	178	Gardens	18.8	7	1107	1.03	10	10.3		
Otowi North	30.1	Gardens	28.4	2	738	1.02		0.0		
Otowi North	30.2	Gardens	27.4	3	697	1.12		0.0		
Otowi North	30.3	Gardens	26.2	2	820	0.99	2	2.0		
Otowi North	30.4	Gardens	30.1	1	697	1.02	0	0.0		
Otowi North	30.5	Gardens	31.0	1	738	0.93	3	2.8		
Otowi North	30.6	Gardens	27.4	1	1189	0.66		0.0		
Otowi North	31	Gardens	26.2	1	738	1.10		0.0		
Otowi North	32	Gardens	24.7	3	1312	0.66		0.0		
Otowi North	33	Gardens	22.3	1	1025	0.93		0.0		
Otowi North	34	Gardens	27.4	2	820	0.95		0.0		
Otowi North	35	Gardens	32.8	2	656	0.99		0.0		
LA 12587	2634		17.3	1	1927	0.64	4	2.6		
LA 12587	2715		25.4	3	1148	0.73	2	1.5		
LA 12587	3360		17.4	2	1394	0.88	1	0.9	2	
LA 12587	5123		28.9	9	943	0.78	4	3.1		

Site Number	Specimen Number	Context	Sample Weight gm	Slides Scanned	Tracers	ISM Threshold Conc. gr/gm	Total Number Single Maize Grains	ISM Maize Concentration gr/gm	Maize on slide other than first slide	Total Number Cotton Grains
LA 12587	4111		9.3	2	4428	0.90	5	2.6		
LA 12587	4112		4.2	10	4879	1.81	4	4.2		
LA 12587	5120		25.4	1	1312	1.12	2	1.3		
LA 12587	5122		25.6	2	1722	0.84	5	2.4		
LA 86534	1275		25.8	4	1203	0.69		0.0		
LA 86534	1325		25.6	2	779	1.07		0.0		
LA 86534	2219		16.8	3	1312	0.97		0.0		
LA 135290	2348		24.0	1	1353	0.66	5	3.3		
LA 135290	2579		28.2	1	1927	0.39	3	1.2		
LA 135290	2586		25.8	2	1804	0.46	1	0.5		
LA 135290	11		25.6	1	3280	0.25		0.0		
LA 135290	12		26.4	1	820	0.99		0.0		
LA 135290	109		19.7	4	1558	0.70		0.0		
LA 85417	123		18.6	1	2132	0.54		0.0		
LA 85411	173		23.7	1	1476	1.06		0.0		
LA 85411	174		18.3	1	1845	1.10		0.0		
LA 85411	180		19.7	1	2501	0.75		0.0		
LA 85861	195		8.3	3	3239	1.38		0.0		

APPENDIX X
POLLEN SAMPLE PROVENIENCE

Table X.1. Pollen samples provenience.

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Airport	Middle Coalition	Roomblock	86534	727	R wf	f	2	1	6.45		2	2	room fill & rubble wallfall
Airport	Middle Coalition	Roomblock	86534	769	R wf	f	2	2	7.46		2	2	room fill & rubble wallfall, outside room 2
Airport	Middle Coalition	Roomblock	86534	913	R wf	b	2	4	5.58		2	2	room fill & wallfall rubble
Airport	Middle Coalition	Roomblock	86534	921	R post fill	b	2	4	5.58		1	1	
Airport	Middle Coalition	Roomblock	86534	1000	R post fill	f	2	1	6.45		1	1	post-occupation fill
Airport	Middle Coalition	Roomblock	86534	1063	R post fill	b	2	3	6.4		1	1	post-occupation fill
Airport	Middle Coalition	Roomblock	86534	1275	R Hrth	f	2	1	6.45	4	9	2	remodeled hrth fill. hrth plaster-lined collared. Strat 9 AD 1170-1230; Strat 11 AD 1065-1265
Airport	Middle Coalition	Roomblock	86534	1297	R rf	f	2	5	8.05		6	2	rooffall low artifact density
Airport	Middle Coalition	Roomblock	86534	1303	R Flr ua	f	2	5	8.05		8	3	sample taken near doorway to back room under sherd
Airport	Middle Coalition	Roomblock	86534	1325	R Hrth	f	2	2	7.46	2	10	6	west wall, hrth
Airport	Middle Coalition	Roomblock	86534	1326	R Hrth	f	2	2	7.46	2	10	6	bottom
Airport	Middle Coalition	Roomblock	86534	1334	R Hrth	f	2	1	6.45	4	11	4	original hrth fill (hrth remodeled). Strat 11 AD 1065-1265
Airport	Middle Coalition	Roomblock	86534	1359	R Flr	f	2	2	7.46		8	3	sample taken from up against back wall
Airport	Middle Coalition	Roomblock	86534	1475	R Flr	b	2	4	5.58		8	3	

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Airport	Middle Coalition	Roomblock	86534	1510	R rf	b	2	4	5.58		6, 7	3	Strat 6 rooffall, Strat 7 loose fill below rooffall and above floor
Airport	Middle Coalition	Roomblock	86534	1522	R Flr	b	2	4	5.58		8	3	
Airport	Middle Coalition	Roomblock	86534	1597	R Flr ua	f	2	5	8.05		8	3	under sherd near center room
Airport	Middle Coalition	Roomblock	86534	1607	R Flr ua	f	2	5	8.05		8	3	under sherd. Room 5 largest room and had access into kiva
Airport	Middle Coalition	Roomblock	86534	1636	R Flr ua	f	2	2	7.46		8	5	under mano 1
Airport	Middle Coalition	Roomblock	86534	1637	R Flr ua	f	2	2	7.46		8	5	under mano 2
Airport	Middle Coalition	Roomblock	86534	1645	R Hrth	f	2	7	6.82	9	19	3	hrth fill in room 7
Airport	Middle Coalition	Roomblock	86534	1649	R Flr	f	2	2	7.46		8	4	
Airport	Middle Coalition	Roomblock	86534	1749	Kiva post fill	kiva	2	9	17.63		1	1	post-occupation fill
Airport	Middle Coalition	Roomblock	86534	1750	Kiva wf	kiva	2	9	17.63		2	2	room fill & wallfall rubble
Airport	Middle Coalition	Roomblock	86534	1751	Kiva rf	kiva	2	9	17.63		15	3	
Airport	Middle Coalition	Roomblock	86534	1762	Kiva rf	kiva	2	9	17.63		15	7	
Airport	Middle Coalition	Roomblock	86534	1772	Kiva post fill	kiva	2	9	17.63		1	1	post-occupation fill
Airport	Middle Coalition	Roomblock	86534	1778	R Flr	b	2	3	6.4		8	2	sample taken from up against back wall
Airport	Middle Coalition	Roomblock	86534	1786	Kiva wf	kiva	2	9	17.63		2	1	room fill & wallfall rubble

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m²	Feature No.	Strat	Level	Comments
Airport	Middle Coalition	Roomblock	86534	1788	R Flr	b	2	6	5.31		8	2	site report FS 1788 from Strat 8 (sample log = 1788 is Strat 6,7?)
Airport	Middle Coalition	Roomblock	86534	1905	R Flr	b	2	3	6.4		8		NE corner, intact plaster area
Airport	Middle Coalition	Roomblock	86534	1908	R Pit/Hrth?	b	2	6	5.31	12	14	4	under sherd
Airport	Middle Coalition	Roomblock	86534	1915	R Pit/Hrth?	b	2	6	5.31	12	14	4	under rock. Fea 14 in back room, shallow, plaster lined pit with ash. hrth-like?
Airport	Middle Coalition	Roomblock	86534	1922	R Flr	b	2	8	4.68		8	2	heavily impacted by hwy construction
Airport	Middle Coalition	Roomblock	86534	1960	R milling bin	b	2	6	5.31	13	16	4	milling bin
Airport	Middle Coalition	Roomblock	86534	1967	Kiva Flr	kiva	2	9	17.63		17	8	well preserved plaster floor
Airport	Middle Coalition	Roomblock	86534	1974	Kiva post fill & wf in entry way	kiva	2	9	17.63	15	1, 2	2	entry way between rooms 5 and 9
Airport	Middle Coalition	Roomblock	86534	1991	Kiva Flr	kiva	2	9	17.63		17	4	near center
Airport	Middle Coalition	Roomblock	86534	1993	Kiva Flr	kiva	2	9	17.63		17	3	
Airport	Middle Coalition	Roomblock	86534	2164	R Flr	f	2	7	6.82		8	3	room 7 clipped by highway construction
Airport	Middle Coalition	Roomblock	86534	2175	Kiva Flr	kiva	2	9	17.63		17	3	near center
Airport	Middle Coalition	Roomblock	86534	2204	Kiva Hrth	kiva	2	9	17.63	?	20	4	
Airport	Middle Coalition	Roomblock	86534	2205	Kiva Hrth	kiva	2	9	17.63	16	20	4	south 1/2 hrth, collared, plaster-lined

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Airport	Middle Coalition	Roomblock	86534	2219	Kiva Hrth	kiva	2	9	17.63	16	20	4	south 1/2, hrth
Airport	Middle Coalition	Roomblock	86534	2225	Kiva sipapu fill	kiva	2	9	17.63	18	22	4	subfloor in kiva 9, very sandy. Sipapu fill
Airport	Middle Coalition	Roomblock	86534	2229	Kiva Hrth ash pit	kiva	2	9	17.63	17	21	4	ash pit Fea. 17 kiva 9
Airport	Middle Coalition	Roomblock	86534	2232	Kiva ash pit	kiva	2	9	17.63	17	21	4	ash pit Fea. 17 kiva 10
Airport	Middle Coalition	Roomblock	135290	983	R post fill	b	1	5	4.83		2	2	post-occupation fill
Airport	Middle Coalition	Roomblock	135290	988	R wf S 3	b	1	5	4.83		3	3	room fill with adobe melt
Airport	Middle Coalition	Roomblock	135290	1068	R post fill	f	1	2	14.66		2	2	post-occupation fill
Airport	Middle Coalition	Roomblock	135290	1084	R post fill	b	1	6	3.06		2	2	post occupation fill
Airport	Middle Coalition	Roomblock	135290	1097	R wf S 3	b	1	6	3.06		3a	3	room fill with adobe melt
Airport	Middle Coalition	Roomblock	135290	1099	R wf S 4	f	1	2	14.66		4a	3	wall adobe melt and possible rooffall
Airport	Middle Coalition	Roomblock	135290	1132	R wf S 3	b	1	6	3.06		3b	5	room fill with adobe melt
Airport	Middle Coalition	Roomblock	135290	1164	R wf S 4	f	1	2	14.66		4b	6	wall adobe melt and possible rooffall
Airport	Middle Coalition	Roomblock	135290	1181	R wf S 4	b	1	4	3.89		4	5	fill with wallfall
Airport	Middle Coalition	Roomblock	135290	1196	R Flr	b	1	4	3.89		7	7	floor 1, room 4, most recent. Sample from eastern portion (best preserved floor)
Airport	Middle Coalition	Roomblock	135290	1272	R post fill (surf. soil)	f	1	1	13.3		1	1	surface soil, post-occupation fill
Airport	Middle	Roomblock	135290	1276	R wf S 3	b	1	7	5.89		3	5	room fill with adobe melt

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
	Coalition												
Airport	Middle Coalition	Roomblock	135290	1301	R post fill	f	1	1	13.3		2	2	post-occupation fill, deeper
Airport	Middle Coalition	Roomblock	135290	1330	R wf S 4	f	1	1	13.3		4a	4	fill with wallfall
Airport	Middle Coalition	Roomblock	135290	1416	R post fill	f	1	3	12.6		2	2	post-occupation fill
Airport	Middle Coalition	Roomblock	135290	1432	R Flr	b	1	6	3.06		8	7	ashy charcoal concentration on floor 3, room 6, oldest floor. 3-4 cm thick adobe
Airport	Middle Coalition	Roomblock	135290	1446	R wf S 4	f	1	1	13.3		4b	7	fill with wallfall, deeper
Airport	Middle Coalition	Roomblock	135290	1457	R wf S 4	f	1	3	12.6		4a	3	room fill with wallfall
Airport	Middle Coalition	Roomblock	135290	1479	R wf S 3	b	1	4	3.89		3	5	fill with adobe melt. Sample from ash concentration on floor 1
Airport	Middle Coalition	Roomblock	135290	1518	R Flr	b	1	4	3.89		7	7	floor 1, room 4, most recent. Sample from eastern portion (best preserved floor)
Airport	Middle Coalition	Roomblock	135290	1635	R wf S 3	f	1	3	12.6		3b	5	room fill with adobe melt (burned); above strat 4a, increased artifacts in strat 3b
Airport	Middle Coalition	Roomblock	135290	1645	R Flr	b	1	6	3.06		17	7	floor 2, room 6
Airport	Middle Coalition	Roomblock	135290	1649	R Flr	f	1	3	12.6		11	6	room 3 floor 1 surface; floor not plastered- compacted. Sample from northeastern portion of the room from best preserved floor sediments
Airport	Middle Coalition	Roomblock	135290	1661	R Flr	b	1	6	3.06		17	7	floor 2, room 6

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Airport	Middle Coalition	Roomblock	135290	1706	R Flr	f	1	1	13.3		9	7	room 1 floor 1 surface; only about 10% of floor plaster intact - heavy rodent activity. Sample taken from 98N/111E
Airport	Middle Coalition	Roomblock	135290	1719	R wf S 3	f	1	3	12.6		3b	5	room fill with adobe melt
Airport	Middle Coalition	Roomblock	135290	1772	R Flr	f	1	2	14.66		5	5	room 2 floor 1 surface
Airport	Middle Coalition	Roomblock	135290	1820	R posthole	b	1	6	3.06	2	14	7	fill from 2 of 3 clustered postholes
Airport	Middle Coalition	Roomblock	135290	1821	R posthole	b	1	6	3.06	2	14	8	fill from 2 of 3 clustered postholes
Airport	Middle Coalition	Roomblock	135290	1852	R Flr	b	1	6	3.06		15	8	floor 1, room 6, most recent floor
Airport	Middle Coalition	Roomblock	135290	1899	R Flr	b	1	6	3.06		8	9	floor 3, room 6, oldest floor. 3-4 cm thick adobe
Airport	Middle Coalition	Roomblock	135290	1920	R posthole	b	1	6	3.06	5	20	10	fill in posthole 1
Airport	Middle Coalition	Roomblock	135290	1923	R posthole	b	1	6	3.06	5	20	10	fill in posthole 4
Airport	Middle Coalition	Roomblock	135290	1991	R Flr	b	1	5	4.83		21	6	floor 1, room 5
Airport	Middle Coalition	Roomblock	135290	2028	R Pit	b	1	5	4.83	7	22	9	adobe lined pit on floor 2 & continued use on floor 1
Airport	Middle Coalition	Roomblock	135290	2043	R Flr	b	1	5	4.83		21	8	floor 1, room 5
Airport	Middle Coalition	Roomblock	135290	2051	R wf S 3	plaza room	1	8	11.45		3	99	room fill with adobe melt
Airport	Middle Coalition	Roomblock	135290	2068	R Pit	f	1	2	14.66	4	24	8,9	fill in adobe-lined pit (Feas 1, 3, 4, 6 are interconnected complex - collared hrth & 3 pits)
Airport	Middle Coalition	Roomblock	135290	2084	R Pit	f	1	2	14.66	3	25	7,8	fill in adobe-lined pit

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Airport	Middle Coalition	Roomblock	135290	2100	R Hrth	f	1	2	14.66	1	26	7	collared hrth; strat 26 equivalent to fill in hrth. No ash or charcoal in this feature
Airport	Middle Coalition	Roomblock	135290	2104	R posthole	b	1	5	4.83	8	27	9	fill in posthole 1
Airport	Middle Coalition	Roomblock	135290	2105	R posthole	b	1	5	4.83	8	27	9	fill in posthole 2
Airport	Middle Coalition	Roomblock	135290	2134	R Flr	plaza room	1	9B	3.96		4	5	room fill with wallfall
Airport	Middle Coalition	Roomblock	135290	2137	R Hrth	f	1	2	14.66	1	26	7	collared hrth; strat 26 equivalent to fill in hrth. No ash or charcoal in this feature
Airport	Middle Coalition	Roomblock	135290	2149	Midden (?)		4				13	4	possible midden area, southeast of roomblock
Airport	Middle Coalition	Roomblock	135290	2161	R Flr	b	1	4	3.89		29	9	floor 2 is the best preserved floor in Room 2 with 3-4 cm of adobe
Airport	Middle Coalition	Roomblock	135290	2179	R Flr	b	1	4	3.89		29	8	floor 2 is the best preserved floor in Room 2 with 3-4 cm of adobe
Airport	Middle Coalition	Roomblock	135290	2185	R Flr ua	f	1	2	14.66		5	7	floor 1 under vessel, floor preserved as patchy plaster; rodent burrows
Airport	Middle Coalition	Roomblock	135290	2186	R Flr ua	f	1	2	14.66		5	7	floor 1 under maul, floor preserved as patchy plaster; rodent burrows
Airport	Middle Coalition	Roomblock	135290	2231	R wf S 4	plaza room	1	8	11.45		4	3	room fill with wallfall
Airport	Middle Coalition	Roomblock	135290	2234	Special PW Mano	f	1	2	14.66		5	7	pollen wash, mano on floor 1
Airport	Middle	Roomblock	135290	2248	R posthole	b	1	4	3.89	10	30	10	fill in posthole 1

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
	Coalition												
Airport	Middle Coalition	Roomblock	135290	2249	R posthole	b	1	4	3.89	10	30	9	fill in posthole 2
Airport	Middle Coalition	Roomblock	135290	2251	R Hrth	f	1	2	14.66	11	32	8	hrth Features 11 & 16 adjacent, partially superimposed; pit fill is distinct from other pit feas. Sides are burned, fill ashy with adobe & charcoal mixed in. macro maize in pit
Airport	Middle Coalition	Roomblock	135290	2252	R Hrth	f	1	2	14.66	11	32	8	hrth Features 11 & 16 adjacent, partially superimposed
Airport	Middle Coalition	Roomblock	135290	2275	GEO		1	BH2			13		A
Airport	Middle Coalition	Roomblock	135290	2276	GEO		1	BH2			13		Bw
Airport	Middle Coalition	Roomblock	135290	2277	GEO		1	BH2			13		Bw1b1
Airport	Middle Coalition	Roomblock	135290	2278	GEO		1	BH2			13		
Airport	Middle Coalition	Roomblock	135290	2279	GEO		1	BH2			13		BtKb2
Airport	Middle Coalition	Roomblock	135290	2280	GEO		1	BH2			13		Qbt
Airport	Middle Coalition	Roomblock	135290	2298	R wf S 4	plaza room	1	9A	7.28		4	2	room fill with wallfall
Airport	Middle Coalition	Roomblock	135290	2316	R wf S 4	b	1	7	5.89		4	3	room fill with wallfall
Airport	Middle Coalition	Roomblock	135290	2325	R wf S 3	plaza room	1	9A	7.28		3	3	room fill with adobe melt
Airport	Middle Coalition	Roomblock	135290	2348	R Hrth	f	1	2	14.66	11	32	8	hrth Features 11 & 16 adjacent, partially superimposed

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Airport	Middle Coalition	Roomblock	135290	2398	R Flr ua	b	1	7	5.89		33	5	floor, not prepared. Disturbed (roots & rodents), compacted sediment - equal to floors 1 & 2, room 6. floor artifacts include metate & 2 manos
Airport	Middle Coalition	Roomblock	135290	2402	R Flr ua	b	1	7	5.89		33	6	floor, not prepared. Disturbed (roots & rodents), compacted sediment - equal to floors 1 & 2, room 6. floor artifacts include metate & 2 manos
Airport	Middle Coalition	Roomblock	135290	2419	R Flr	plaza room	1	9A	7.28		38	6	room 9A (north half room 9) living surface (charcoal concentration)
Airport	Middle Coalition	Roomblock	135290	2425	R Flr	plaza room	1	9A	7.28		38	6	room 9A living surface (ashy deposit northwestern corner)
Airport	Middle Coalition	Roomblock	135290	2449	R Flr	b	1	4	3.89		36	12	floor 3, room 4, oldest, first floor, most disturbed. Sample from eastern portion floor (best preserved)
Airport	Middle Coalition	Roomblock	135290	2460	R Flr	b	1	4	3.89		36	10	floor 3, room 4, oldest, first floor, most disturbed. Sample from eastern portion floor (best preserved)
Airport	Middle Coalition	Roomblock	135290	2482	Rock Cluster		3				13	1	beneath rock cluster, area east & north of Room 9
Airport	Middle Coalition	Roomblock	135290	2486	R Hrth	plaza room	1	8	11.45	9	37	4	hrth, adobe-lined pit
Airport	Middle Coalition	Roomblock	135290	2487	R Hrth	plaza room	1	8	11.45	9	37	4	hrth, adobe-lined pit
Airport	Middle Coalition	Roomblock	135290	2494	R Flr	plaza room	1	9B	3.96		39	6	room 9B living surface (ashy area northwestern portion room)

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Airport	Middle Coalition	Roomblock	135290	2498	R Flr	plaza room	1	8	11.45	14	23	3	floor 1, room 8
Airport	Middle Coalition	Roomblock	135290	2523	R Flr	b	1	5	4.83		42	8	floor 2, room 5, oldest floor (this floor contiguous with floor 3 room 4)
Airport	Middle Coalition	Roomblock	135290	2550	R Subfloor	f	1	2	14.66		43	9	subfloor strata, artificial fill brought in to level floor before plaster/adobe
Airport	Middle Coalition	Roomblock	135290	2558	Plaza Rock Alignment		2			15	13	3	under blocks in northern section Fea. 15 alignment
Airport	Middle Coalition	Roomblock	135290	2559	Plaza Rock Alignment		2			15	13	3	under blocks in northern section Fea. 15 alignment
Airport	Middle Coalition	Roomblock	135290	2562	R Flr	b	1	5	4.83		42	12	floor 2, room 5, oldest floor
Airport	Middle Coalition	Roomblock	135290	2579	R Hrth	f	1	2	14.66	16	45	10	hrth Features 11 & 16 adjacent, partially superimposed
Airport	Middle Coalition	Roomblock	135290	2586	R Hrth	plaza room	1	8	11.45	9	48	6	lower hrth base
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	379	Garden		1	1			1		grid garden, post-occupation fill
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	380	Garden		1	1			2		grid garden, cultural fill
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	381	Garden		1	1			3		grid garden, pre-occupation fill

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	382	Garden		1	2			1		grid garden, post-occupation fill
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	383	Garden		1	2			2		grid garden, cultural fill
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	384	Garden		1	2			3		grid garden, pre-occupation fill
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	390	Garden		1	2			1		grid garden, post-occupation fill
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	391	Garden		1	2			2		grid garden, cultural fill
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	392	Garden		1	2			3		grid garden, pre-occupation fill
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	393	Garden		1	2			5		grid garden
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	394	Garden		1	3			1		grid garden, post-occupation fill

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	395	Garden		1	3			2		grid garden, cultural fill
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	396	Garden		1	3			3		grid garden, pre-occupation fill
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	405	GEO		1				1		grid garden, post-occupation fill
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	406	GEO		1				3		grid garden, pre-occupation fill
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	407	GEO		1				5		grid garden
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	408	GEO		1				7		grid garden
Airport	Classic	Grid Garden and Lithic-Ceramic Scatter	139418	410	GEO		2				3		grid garden, pre-occupation fill
Airport	Classic	Fieldhouse	141505	21	FH post fill		1		3.75		2	2	
Airport	Classic	Fieldhouse	141505	38	FH Flr		1	2	3.16		6	4	room 2 floor

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Airport	Classic	Fieldhouse	141505	75	FH posthole		1	2	3.16		7	5	room 2 posthole
Airport	Classic	Fieldhouse	141505	79	FH Flr		1	1	3.75		4	5	room 1 floor beneath adobe chunk
Airport	Classic	Fieldhouse	141505	83	FH rock alignment		1			2	2	3	rock alignment (1.9 m long) 50 m east of room 2 entry
Airport	Classic	Fieldhouse	141505	84	FH rock pile		1			3	2		rock pile (1 m diameter, 0.2 m high) outside room 2. pollen sample from beneath rock, center of pile
Otowi N		Grid Garden	21592	30.1	Garden			30		grid			upslope edge and inside grid border, between rocks
Otowi N		Grid Garden	21592	30.2	Garden			30		grid			beneath grid cobble
Otowi N		Grid Garden	21592	30.3	Garden			30		grid			center
Otowi N		Grid Garden	21592	30.4	Garden			30		grid			center
Otowi N		Grid Garden	21592	30.5	Garden			30		grid			inside downslope border between rocks
Otowi N		Grid Garden	21592	30.6	Garden			30		grid			inside downslope border beneath rock
Otowi N		Grid Garden	21592	31	Garden			31		grid			center, silty soil with pea gravel
Otowi N		Grid Garden	21592	32	Garden			32		grid			center, soil more compacted due to caliche; pea gravel in grid center
Otowi N		Grid Garden	21592	33	Garden			33		grid			SE grid corner
Otowi N		Grid Garden	21592	34	Garden			34					surface control outside the grids
Otowi N		Grid Garden	21592	35	Garden			35					subsurface control, N-facing slope Bayo Canyon across streambed from grids
Rendija	Middle Classic	Fieldhouse	15116	18	FH Flr		1	1	4.75		3	3	living surface NW corner room under rock

Tract	**Chronology**	**Site Type**	**Site**	**Specimen**	**Context Code**	**Room front f or back b**	**Area**	**Room No.**	**Room Area m^2**	**Feature No.**	**Strat**	**Level**	**Comments**
Rendija	Middle Classic	Fieldhouse	15116	32	FH post fill		1		4.75		2	2	post occupation fill
Rendija	Middle Classic	Fieldhouse	15116	36	FH Flr		1	1	4.75		3	3	living surface SW corner room under rock
Rendija	Middle Classic	Fieldhouse	15116	39	FH Flr		1	1	4.75		3	3	living surface E central
Rendija	Early-Middle Classic	Fieldhouse	70025	22	FH post fill		1		4.5		2	2	
Rendija	Early-Middle Classic	Fieldhouse	70025	23	FH Flr inside pot		1		4.5				juncture post occupation fill and floor, utility ware bowl sitting on tuff block. Pollen sample from inside pot base
Rendija	Classic	Fieldhouse	85403	28	FH post fill		1	1	3.75		2	3	
Rendija	Classic	Fieldhouse	85403	35	FH Flr		1	1	3.75		2	5	approximate level of living surface, NW room corner
Rendija	Classic	Fieldhouse	85403	50	FH Flr		1	1	3.75		2	5	approximate level of living surface, NE room corner
Rendija	Classic	Fieldhouse	85403	51	FH posthole		1	1	3.75	2	3	6	posthole near pit
Rendija	Classic	Fieldhouse	85403	54	FH pit		1	1	3.75	1	2	7	pit (did not appear to be a hearth - no ash or charcoal)
Rendija	Early Middle Classic	Fieldhouse	85404	70	FH Flr		1	1	3.83		2	4	from around floor level in the NW room corner
Rendija	Early Middle Classic	Fieldhouse	85404	73	FH post fill		1	1	3.83		2	3	post occupation fill

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rendija	Early Middle Classic	Fieldhouse	85404	90	FH Flr		1	1	3.83		3	6	floor scrape
Rendija	Early Middle Classic	Fieldhouse	85404	95	FH Flr		1	1	3.83		2	4	on top burned surface north central part of room
Rendija	Early Middle Classic	Fieldhouse	85404	96	FH Flr		1	1	3.83		2	4	beneath dacite cobble on burned floor surface
Rendija	Historic	Homestead	85407	299	cabin		1	1			2		post-occupation fill in SW corner cabin room 1
Rendija	Historic	Homestead	85407	302	cabin		1	2			2		post-occupation fill S half of cabin room 2
Rendija	Historic	Homestead	85407	329	corral		6			3	2		test pit NW corner corral (Fea. 3)
Rendija	Historic	Homestead	85407	330	corral		6			3	2		test pit NW corner corral (Fea. 3)
Rendija	Historic	Homestead	85407	358	horno		3			1	2		near base of west-central portion of horno
Rendija	Historic	Homestead	85407	390	reservoir		7			4	2		10 cm below surface in second auger hole center of reservoir
Rendija	Historic	Homestead	85407	391	reservoir		7			4	2		20 cm below surface in second auger hole center of reservoir
Rendija	Historic	Homestead	85407	490	cabin		1				2		beneath upside down metate east of cabin in area of porch
Rendija	Middle Classic	Fieldhouse	85408	11	FH Flr		1	1	4.05		2		SE corner room 1 living surface
Rendija	Middle Classic	Fieldhouse	85408	66	FH Flr		1	1	4.05		2		NW corner room 1 living surface

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rendija	Middle Classic	Fieldhouse	85408	77	FH Flr		1	1	4.05		2		SW corner room 1 living surface
Rendija	Early-Middle Classic	Fieldhouse	85411	31	FH Flr		1	1	7.02		2		patch of floor E wall room 1
Rendija	Early-Middle Classic	Fieldhouse	85411	127	FH Flr		1	2	2.45		4		SE corner room 2 living surface
Rendija	Early-Middle Classic	Fieldhouse	85411	173	FH Hrth		1	2	2.45	2	5		room 2, base S half Fea. 2 plaster-lined hrth
Rendija	Early-Middle Classic	Fieldhouse	85411	174	FH Hrth		1	1	7.02	1	3		room 1, base S half Fea. 1 plaster-lined hrth
Rendija	Early-Middle Classic	Fieldhouse	85411	175	FH Flr		1	1	7.02		6		NE corner room 1 living surface - floor scrape
Rendija	Early-Middle Classic	Fieldhouse	85411	177	FH Flr		1	2	2.45		2		NE corner room 2 living surface
Rendija	Early-Middle Classic	Fieldhouse	85411	180	FH Hrth		1	1	7.02	1	3		
Rendija	Early Classic	Fieldhouse	85413	9	FH post fill		1	1	4.21		1		beneath rock near living surface (but Strat 1 is surface?)
Rendija	Early Classic	Fieldhouse	85413	61	FH post fill		1		4.21		2		beneath poss. pot drop (sherd conc.)
Rendija	Early Classic	Fieldhouse	85413	222	FH Flr		1	1	4.21		5		W corner room 1 living surface (scraped from burned floor)

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rendija	Early Classic	Fieldhouse	85413	223	FH Flr		1	1	4.21		5		E corner room 1 living surface
Rendija	Middle Classic	Fieldhouse	85414	43	FH Flr		1	1	2.87		4		SE corner room 1 at level of presumed living surface
Rendija	Middle Classic	Fieldhouse	85414	44	FH Flr		1	1	2.87		4		SW corner room 1 at level of presumed living surface
Rendija	Coalition	Fieldhouse	85417	123	FH Hrth		1		3.22	1	6		base ash pit (Fea. 1). Unprepared (not plastered) hearth
Rendija	Coalition	Fieldhouse	85417	148	FH Flr		1	1	3.22		5		NW corner room 1
Rendija	Coalition	Fieldhouse	85417	149	FH Flr		1	1	3.22		5		west-central area room 1
Rendija	Early Archaic	Lithic Scatter	85859	107	GEO		1				3a	3	Profile series 107-142; 180
Rendija	Early Archaic	Lithic Scatter	85859	122	GEO		1				3b	4	
Rendija	Early Archaic	Lithic Scatter	85859	135	GEO		1				3c	5	
Rendija	Early Archaic	Lithic Scatter	85859	142	GEO		1				3c	6	
Rendija	Early Archaic	Lithic Scatter	85859	180	Scatter		1				3c, 4	6	
Rendija	Early Archaic	Lithic Scatter	85859	329	Scatter		1				slu mp		
Rendija	Early Archaic	Lithic Scatter	85859	333	Scatter		1				1		profile series 333-337?
Rendija	Early Archaic	Lithic Scatter	85859	334	Scatter		1				2		
Rendija	Early Archaic	Lithic Scatter	85859	335	Scatter		1				3bc		

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rendija	Early Archaic	Lithic Scatter	85859	336	Scatter		1				4		control? Outside artifact strata
Rendija	Early Archaic	Lithic Scatter	85859	337	Scatter		1				san d		
Rendija	Early Archaic	Lithic Scatter	85859	338	GEO		1				3a		profile series 338-342
Rendija	Early Archaic	Lithic Scatter	85859	339	GEO		1				3b		
Rendija	Early Archaic	Lithic Scatter	85859	340	GEO		1				3c		
Rendija	Early Archaic	Lithic Scatter	85859	341	GEO		1				4		control? Outside artifact strata
Rendija	Early Archaic	Lithic Scatter	85859	342	GEO		1				5		control? Outside artifact strata
Rendija	Early Archaic	Lithic Scatter	85859	356	GEO		1				3a	3	profile series 356-358
Rendija	Early Archaic	Lithic Scatter	85859	357	GEO		1				3b	4	
Rendija	Early Archaic	Lithic Scatter	85859	358	GEO		1				3c	5	
Rendija	Late Coalition	Fieldhouse	85861	173	FH Flr		1	1	5.19		2		room 1 probable living surface
Rendija	Late Coalition	Fieldhouse	85861	184	FH post fill		1	1	5.19		2		NE corner room 1 around level of living surface
Rendija	Late Coalition	Fieldhouse	85861	195	FH Hrth		1	1	5.19	1	4		base hrth Fea. 1
Rendija	Apache	Rock Ring	85864	3	Apache		1			2	2	3	tipi ring; LA 85864 next to LA 85869 another Apache tipi site
Rendija	Apache	Rock Ring	85864	8	Apache		1			2	3	4	tipi ring; LA 85864 next to LA 85869 another Apache tipi site

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rendija	Early Classic	Fieldhouse	85867	66	FH Flr		1	1	2.84		2?		below masonry block on or near living surface
Rendija	Early Classic	Fieldhouse	85867	75	FH Flr		1	1	2.84		4		SW corner room 1 on living surface floor scrape
Rendija	Early Classic	Fieldhouse	85867	76	FH Flr		1	1	2.84		4		SE corner room 1 on living surface floor scrape
Rendija	Early Classic	Fieldhouse	85867	77	FH Flr		1	1	2.84		4		NE corner room 1 on living surface floor scrape
Rendija	Apache	Rock Ring	85869	249	post fill		3			3	2	2	
Rendija	Apache	Rock Ring	85869	252	modern dump ?		5			5	3	2	modern dump or push pile
Rendija	Apache	Rock Ring	85869	254	modern dump ?		5			5	3	2	modern dump or push pile
Rendija	Apache	Rock Ring	85869	263	tipi ring		4			4	6	3	
Rendija	Apache	Rock Ring	85869	271	tipi hearth		4			8	7	3	
Rendija	Apache	Rock Ring	85869	282	tipi ring		2			2	1	1	rock alignments, possible grid garden, but excavation did not confirm cultural origin
Rendija	Apache	Rock Ring	85869	287	tipi ring		2			2	2	2	
Rendija	Apache	Rock Ring	85869	294	unknown rock circle		5			6	1	1	12 small cobbles arranged in a rough circle
Rendija	Apache	Rock Ring	85869	307	natural ?		1			7	3	1	rock alignments, possible grid garden, but excavation did not confirm cultural origin
Rendija	Apache	Rock Ring	85869	308	natural ?		1			7	4	2	rock alignments, possible grid garden, but excavation did not confirm cultural origin
Rendija	Apache	Rock Ring	85869	314	natural ?		1			7	3	2	rock alignments, possible grid garden, but excavation did not confirm cultural origin

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rendija	Apache	Rock Ring	85869	320	posthole outside Fea. 2		2			10	9	3	
Rendija	Apache	Rock Ring	85869	329	unknown		4				3	2	
Rendija	Late Classic	Fieldhouse	86605	39	FH post fill		1		3.5		2	2	
Rendija	Late Classic	Fieldhouse	86605	44	FH Flr		1	1	3.5		3		under wallfall on upper floor
Rendija	Late Classic	Fieldhouse	86605	46	FH Flr		1	1	3.5		3		upper floor adjacent to S-N wall
Rendija	Late Classic	Fieldhouse	86605	93	FH post fill		1		3.5		2		
Rendija	Late Classic	Fieldhouse	86605	95	FH post fill		1		3.5		2		under rock
Rendija	Late Classic	Fieldhouse	86605	106	FH Flr		1	1	3.5		3		lower floor
Rendija	Coalition/ Classic	Fieldhouse	86606	14	FH Flr		1	1	3.79		2		SE corner room 1 approx. on living surface
Rendija	Coalition/ Classic	Fieldhouse	86606	16	FH post fill		1	1	3.79		2		SW corner room 1 just above living surface
Rendija	Coalition/ Classic	Fieldhouse	86606	41	FH Flr		1	1	3.79		2		NE corner room on living surface
Rendija	Coalition/ Classic	Fieldhouse	86606	60	FH Flr		1	1	3.79		2		NW corner room 1 approx. floor level
Rendija	Coalition	Fieldhouse	86607	3	FH post fill		1	1	3.78		2		SE corner room 1 near living surface
Rendija	Coalition	Fieldhouse	86607	10	FH Flr		1	1	3.78		2		NW corner room 1 on living surface
Rendija	Coalition	Fieldhouse	86607	15	FH Flr		1	1	3.78		3		SW corner room 1 on living surface

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rendija	Middle Classic	Fieldhouse	87430	25	FH post fill		1	1	3.89		2	3	post occupation fill
Rendija	Middle Classic	Fieldhouse	87430	33	FH Flr		1	1	3.89		2	4	SW corner room on living surface
Rendija	Middle Classic	Fieldhouse	87430	77	FH Flr		1	1	3.89		2	4	NW corner room on living surface
Rendija	Middle Classic	Fieldhouse	87430	169	FH extramural Hrth		1		3.89	1	5	5	extramural hearth east of fieldhouse
Rendija	Middle Classic	Fieldhouse	87430	178	FH extramural Hrth		1		3.89	1	5	5	extramural hearth east of fieldhouse
Rendija	Archaic and Coalition	Str.	99396	411	FH post fill		1		4.83		2	2	
Rendija	Archaic and Coalition	Str.	99396	439	FH surface		1		4.83	1	1	1	wall rock concentration of Fea 2
Rendija	Archaic and Coalition	Str.	99396	450	FH post fill		1		4.83	1	2	2	wall rock concentration of Fea 2
Rendija	Archaic and Coalition	Str.	99396	506	FH post fill		1		4.83	1	2	2	wall rock concentration of Fea 2
Rendija	Archaic and Coalition	Str.	99396	532	FH post fill		1		4.83	1	2	2	wall rock concentration of Fea 2
Rendija	Archaic and Coalition	Str.	99396	555	FH post fill		1		4.83		2	2	

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rendija	Archaic and Coalition	Str.	99396	562	FH post fill		1		4.83	2	11	3	Strat 11 fills portion of structure excavated into tuff bedrock
Rendija	Archaic and Coalition	Str.	99396	615	Hrth Extramura l		1		4.83	5	13, 14	2	extramural hearth north of Fea. 2
Rendija	Archaic and Coalition	Str.	99396	676	FH post fill		1		4.83	2	11	3	Strat 11 fills portion of structure excavated into tuff bedrock
Rendija	Archaic and Coalition	Str.	99396	769	FH Hrth		1		4.83	7	16	4	fill of Fea 2 interior hearth
Rendija	Late Archaic ?	lithic ceram. scatter	99397	294	Scatter		1				3	4	Bt1b1 soil horizon
Rendija	Late Archaic ?	lithic ceram. scatter	99397	299	Scatter		1				1	1	A to Av soil horizon
Rendija	Late Archaic ?	lithic ceram. scatter	99397	300	Scatter		1				2	2	Bw horizon
Rendija	Late Archaic ?	lithic ceram. scatter	99397	309	Scatter		1				1	1	A to Av soil horizon
Rendija	Late Archaic ?	lithic ceram. scatter	99397	310	Scatter		1				2	2	Bw horizon
Rendija	Late Archaic ?	lithic ceram. scatter	99397	311	Scatter		1				3	3	Bt1b1 soil horizon
Rendija	Late Archaic ?	lithic ceram. scatter	99397	312	Scatter		1				4	4	Bt2b1 soil horizon
Rendija	Late Archaic ?	lithic ceram. scatter	99397	317	Scatter		1				5	1	AC soil horizon
Rendija	Late Archaic ?	lithic ceram. scatter	99397	318	Scatter		1				1	2	A to Av soil horizon
Rendija	Late Archaic ?	lithic ceram. scatter	99397	319	Scatter		1				7	3	Bw horizon

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rendija	Late Archaic ?	lithic ceram. scatter	99397	320	Scatter		1				6	4	Cerro Toledo gravel
Rendija	Late Archaic ?	lithic ceram. scatter	99397	332	Scatter		1				9	5	Bw horizon
Rendija	Late Archaic ?	lithic ceram. scatter	99397	333	Scatter		1				8	2	Bw horizon
Rendija	Middle Classic	Fieldhouse	127627	8	FH post fill		1	1	3.1		2		
Rendija	Middle Classic	Fieldhouse	127627	66	FH post fill		1	1	3.1		2		
Rendija	Middle Classic	Fieldhouse	127627	67	FH post fill		1	1	3.1		2		
Rendija	Middle Classic	Fieldhouse	127627	69	FH post fill		1	1	3.1		2		
Rendija	Middle Classic	Fieldhouse	127627	71	FH post fill		1	1	3.1		2		
Rendija	Middle Classic	Fieldhouse	127627	89	FH Flr		1	1	3.1		3		floor northeastern area
Rendija	Ancestral Pueblo	Fieldhouse	127633	3	storage bin post fill		1				2	2	post occupation fill within storage bin
Rendija	Ancestral Pueblo	Fieldhouse	127633	7	storage bin post fill		1				2	3	
Rendija	Ancestral Pueblo	Fieldhouse	127633	11	storage bin		1			1	2	4	
Rendija	Ancestral Pueblo	Fieldhouse	127633	12	storage bin		1			1	2	4	
Rendija	Ancestral Pueblo	Fieldhouse	127633	13	storage bin		1			1	2	4	under tuff rubble, SE

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rendija	Middle Classic	Fieldhouse	127634	40	FH post fill		1	1	4.5		2	3	
Rendija	Middle Classic	Fieldhouse	127634	46	FH Flr		1	1	4.5		3	3	
Rendija	Middle Classic	Fieldhouse	127634	52	FH Flr ua		1	1	4.5		3	3	under rock on floor
Rendija	Middle Classic	Fieldhouse	127634	72	FH Flr ua				4.5	2			under ground stone metate fragment at or near floor level
Rendija	Middle Classic	Fieldhouse	127634	104	FH Hrth		1	1	4.5	2	5	4	slab-lined hearth
Rendija	Middle Classic	Fieldhouse	127634	116	FH posthole		1	1	4.5	3	6	5	
Rendija	Early Classic	Fieldhouse	127635	42	FH post fill		1		5.23		2	3	
Rendija	Early Classic	Fieldhouse	127635	109	FH Hrth		1	1	5.23	2	4	5	base of plastered hearth
Rendija	Early Classic	Fieldhouse	127635	117	FH Flr		1	1	5.23		3	6	floor, next to W wall
Rendija	Early Classic	Fieldhouse	127635	134	FH undefined feature. Rock conc.		1	1	5.23	1	2	5	concentration of tuff rock, sample from beneath tuff rock
Rendija	Early Classic	Fieldhouse	127635	136	FH Flr		1	1	5.23		3	3	floor, next to W wall
Rendija	Early Classic	Fieldhouse	135291	11	FH post fill		1		4.8		2	2	post occupation fill
Rendija	Early Classic	Fieldhouse	135291	31	FH post fill		1	1	4.8		2	3	post occupation fill

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rendija	Early Classic	Fieldhouse	135291	57	FH cobble concentrat ion		1	1	4.8	1			circular set of upright dacite cobbles
Rendija	Early Classic	Fieldhouse	135291	62	extramura l ash concentrat ion		1	1	4.8	2			ash concentration outside and east of the fieldhouse
Rendija	Early Classic	Fieldhouse	135292	78	FH post fill		1				2	3	northeast of the south and west walls
Rendija	Early Classic	Fieldhouse	135292	84	FH Flr		1				2	4	base of west wall
Rendija	Early Classic	Fieldhouse	135292	88	FH Flr		1				2	4	inside room at west wall
White Rock	Late Coalition	Roomblock	12587	631	R Control Surface	f	1	4/5	11.2		1	1	loose surface material
White Rock	Late Coalition	Roomblock	12587	642	R wf	f	1	4/5	11.2		10	2	column through wallfall
White Rock	Late Coalition	Roomblock	12587	657	R wf	f	1	4/5	11.2		10	3	column through wallfall
White Rock	Late Coalition	Roomblock	12587	694	R wf	f	1	4/5	11.2		10	4	column through wallfall
White Rock	Late Coalition	Roomblock	12587	707	R wf	f	1	4/5	11.2		10	5	column through wallfall
White Rock	Late Coalition	Roomblock	12587	880	R wf	b	1	6	7.9		10	4	wallfall with uncommon rooffall
White Rock	Late Coalition	Roomblock	12587	1038	R Fill abv flr	f	1	4/5	11.2		70	6	unconsolidated loose sandy fill directly above floor, few artifacts. Deposited before most of the room collapsed
White Rock	Late Coalition	Roomblock	12587	1063	R wf	f	1	4/5	11.2		10	6	column through wallfall

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
White Rock	Late Coalition	Roomblock	12587	1251	R wf	b	1	1	6.1		10	4	wallfall with uncommon rooffall
White Rock	Late Coalition	Roomblock	12587	1258	Special grind slick		1			13	200	4	bedrock grinding slick
White Rock	Late Coalition	Roomblock	12587	1484	R Special	b	1	1	6.1	2	210	3	pile of dacite cobbles (heavily coated with CO3) with ash & charcoal, capped by andesite "hatch cover". Possible warming bin.
White Rock	Late Coalition	Roomblock	12587	1486	R Special	b	1	1	6.1	2	210	3	pile of dacite cobbles (heavily coated with CO3) with ash & charcoal, capped by andesite "hatch cover". Possible warming bin.
White Rock	Late Coalition	Roomblock	12587	1492	FH wf	FH	1	3	3.2		20	2	Strat 20 same as 10; new number for analytical reasons. The wallfall of Room 3, the superimposed field house.
White Rock	Late Coalition	Roomblock	12587	1590	FH wf	FH	1	3	3.2		20	2	Strat 20 same as 10; new number for analytical reasons
White Rock	Late Coalition	Roomblock	12587	1591	FH wf	FH	1	3	3.2		20	2	Strat 20 same as 10; new number for analytical reasons
White Rock	Late Coalition	Roomblock	12587	1602	R Flr	b	1	6	7.9		126	4	probably from floor
White Rock	Late Coalition	Roomblock	12587	1698	R Fill abv flr	b	1	8	7.4		70	3	pre-wallfall fill. Fill just above the floor
White Rock	Late Coalition	Roomblock	12587	1725	R Flr	f	1	7	10 approx area Rm 7		127	4	floor surface
White Rock	Late Coalition	Roomblock	12587	1887	R wf	f	1	7	10		10	2	strat 10 post-occupation fill, wallfall, rooffall. "Reed?"-

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
													impressed adobe chunks.
White Rock	Late Coalition	Roomblock	12587	1915	R Special PW Flr	f	1	7	10		127	3	pollen wash from artifact (?) on floor
White Rock	Late Coalition	Roomblock	12587	1916	R Flr	f	1	7	10		127	3	floor
White Rock	Late Coalition	Roomblock	12587	1972	R Flr	f	1	7	10		127	4	floor
White Rock	Late Coalition	Roomblock	12587	1998	R Special Pipe	f	1	2	10.4		10	2	center scraped from clay pipe fragment recovered from wallfall
White Rock	Late Coalition	Roomblock	12587	2108	R Flr	f	1	2	10.4		122	3	
White Rock	Late Coalition	Roomblock	12587	2123	R Fill abv flr	f	1	2	10.4		70	3	immediately above floor; above bone tubes, below wood fragment
White Rock	Late Coalition	Roomblock	12587	2124	R Flr	f	1	2	10.4		122	4	
White Rock	Late Coalition	Roomblock	12587	2125	R Flr ua	f	1	2	10.4		122	4	beneath bone tubes. Bundle of 5 worked bone tubes, probably secured to roof. Roof burned in this room.
White Rock	Late Coalition	Roomblock	12587	2229	R wf	add - on	1	9	9.3		10	2	wallfall
White Rock	Late Coalition	Roomblock	12587	2247	R Flr	b	1	8	7.4		128	3	floor
White Rock	Late Coalition	Roomblock	12587	2563	R wf	f	1	4/5	11.2		14	6	wallfall in room, clear association. This is the wall that separated the original room into room 4/5
White Rock	Late Coalition	Roomblock	12587	2570	R Flr	add - on	1	9	9.3		129	3	floor
White	Late	Roomblock	12587	2631	R Hrth	f	1	4/5	11.2	1	250	7	upper fill hrth Fea. 1 room 4/5

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rock	Coalition												
White Rock	Late Coalition	Roomblock	12587	2634	R Hrth	f	1	4/5	11.2	1	251	8	lower fill hrth Fea. 1 room 4/5. This hrth was used before the room was divided.
White Rock	Late Coalition	Roomblock	12587	2648	R Hrth	f	1	2	10.4	4	260	4	hrth
White Rock	Late Coalition	Roomblock	12587	2674	R Control Surface	linear block	1	10	7.8		1	1	loose surface material (A horizon, 2-18 cm bgs)
White Rock	Late Coalition	Roomblock	12587	2679	R wf	b	1	8	7.4		10	3	wallfall beneath mano fragment
White Rock	Late Coalition	Roomblock	12587	2715	R Hrth	f	1	2	10.4	4	261	5	hrth
White Rock	Late Coalition	Roomblock	12587	2746	R B3 use surface	linear block	1	10	7.8		203	3	possible use surface room 10
White Rock	Late Coalition	Roomblock	12587	2793	R Flr ua	b	1	6	7.9		126	4	beneath ground stone
White Rock	Late Coalition	Roomblock	12587	2875	R Special	b	1	1	6.1	2	210	3	pile of dacite cobbles with ash & charcoal, capped by andesite "hatch cover". Possible warming bin. Sample from beneath rock
White Rock	Late Coalition	Roomblock	12587	2906	R B3 use surface	linear block	1	11	15.6		204	3	possible use surface room 11
White Rock	Late Coalition	Roomblock	12587	2923	Midden		7				60	4	midden
White Rock	Late Coalition	Roomblock	12587	2963	R B3 use surface	linear block	1	11	15.6		204	4	possible use surface room 11
White Rock	Late Coalition	Roomblock	12587	2988	R extra-mural cist	f	1	2	10.4	5	213	3	small (0.64x0.38 m) exterior storage pit (shallow only 0.20 m deep) attached to Room 2. pollen 1 replicates, beneath rock

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
White Rock	Late Coalition	Roomblock	12587	2993	R extramural cist	f	1	2	10.4	5	213	3	small (0.64x0.38 m) exterior storage pit (shallow only 0.20 m deep) attached to Room 2. pollen 1 replicates, beneath rock
White Rock	Late Coalition	Roomblock	12587	3003	R wall mortar	FH	1	3	3.2		21	5	wall & subwall mortar, room 3
White Rock	Late Coalition	Roomblock	12587	3050	Midden		7				60	3	midden
White Rock	Late Coalition	Roomblock	12587	3080	Midden		7				60	4	midden
White Rock	Late Coalition	Roomblock	12587	3083	Midden		7				60	4	midden, under mano
White Rock	Late Coalition	Roomblock	12587	3159	R Special PW Flr ua	f	1	7	10		127	4	pollen wash of ceramic fragment
White Rock	Late Coalition	Roomblock	12587	3217	R Flr	f	1	4/5	11.2		252	7	floor 2, youngest floor in room 4/5
White Rock	Late Coalition	Roomblock	12587	3258	R Flr	f	1	4/5	11.2		252	7	floor 2, youngest floor in room 4/5
White Rock	Late Coalition	Roomblock	12587	3310	R pit	b	1	6	7.9	7	290	7	shallow subfloor pit
White Rock	Late Coalition	Roomblock	12587	3334	R Posthole	f	1	4/5	11.2	16	256	8	Fea 16 arc of 4 postholes west of hrth Fea 1
White Rock	Late Coalition	Roomblock	12587	3335	R Posthole	f	1	4/5	11.2	16	256	8	Fea 16 arc of 4 postholes west of hrth Fea 2
White Rock	Late Coalition	Roomblock	12587	3358	R Hrth	f	1	7	10	6	270	7	hrth/ash box complex - upper stratum
White Rock	Late Coalition	Roomblock	12587	3360	R Hrth	f	1	7	10	6	271	8	hrth/ash box complex - lower ashy fill
White Rock	Late Coalition	Roomblock	12587	3369	R Posthole	f	1	2	10.4	10	262	7	posthole 1

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
White Rock	Late Coalition	Roomblock	12587	3370	R Posthole	f	1	2	10.4	10	262	7	posthole 2
White Rock	Late Coalition	Roomblock	12587	3394	R Posthole	f	1	2	10.4	11	263	4	posthole
White Rock	Late Coalition	Roomblock	12587	3441	R Posthole	f	1	7	10	12, 1	272	9	smallest posthole, interior plastered (but not bottom)
White Rock	Late Coalition	Roomblock	12587	3444	R Posthole	f	1	7	10	12, 4	272	9	Fea. 12, 4 postholes may define rectangular shape/str. Posthole interior plastered
White Rock	Late Coalition	Roomblock	12587	3466	R Flr plaster	f	1	7	10		273	11	floor 2 plaster matrix room 7
White Rock	Late Coalition	Roomblock	12587	3467	R Flr plaster	f	1	7	10		273	12	floor 2 plaster matrix room 7
White Rock	Late Coalition	Roomblock	12587	3473	R special PW ground stone	linear block	1	12	7.9		206 /20 7	1	pollen wash of ground stone
White Rock	Late Coalition	Roomblock	12587	3498	R Flr	b	1	8	7.4		128	flr	floor
White Rock	Late Coalition	Roomblock	12587	3499	R Subfloor	b	1	8	7.4		170	sub flr	subfloor, Roomblock 1
White Rock	Late Coalition	Roomblock	12587	3502	R Flr	add - on	1	9	9.3		129	flr	floor
White Rock	Late Coalition	Roomblock	12587	3503	R Subfloor	add - on	1	9	9.3		170	sub flr	subfloor
White Rock	Late Coalition	Roomblock	12587	3513	R Flr	f	1	2	10.4		265		floor 2A room 2, top of plaster
White Rock	Late Coalition	Roomblock	12587	3514	R Flr	f	1	2	10.4		265		floor 2A room 2
White Rock	Late Coalition	Roomblock	12587	3515	R Flr	f	1	2	10.4		266		floor 3A room 2
White Rock	Late Coalition	Roomblock	12587	3516	R Flr	f	1	2	10.4		266		floor 3A room 2

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
White Rock	Late Coalition	Roomblock	12587	3517	R Flr	f	1	2	10.4		264		floor 1A room 2
White Rock	Late Coalition	Roomblock	12587	3518	R Flr	f	1	2	10.4		264		floor 1A room 2
White Rock	Late Coalition	Roomblock	12587	3519	R Flr	f	1	2	10.4		267		floor 1B room 2
White Rock	Late Coalition	Roomblock	12587	3520	R Flr	f	1	2	10.4		268		floor 1C room 2
White Rock	Late Coalition	Roomblock	12587	3521	R Flr	f	1	2	10.4		269		floor 2C room 2
White Rock	Late Coalition	Roomblock	12587	3541	R B3 lower fill	linear block	1	10	7.8		208	4	lower fill Roomblock 3 rooms
White Rock	Late Coalition	Roomblock	12587	3650	R B3 lower fill	linear block	1	12	7.9		208	4	lower fill Roomblock 3 rooms
White Rock	Late Coalition	Roomblock	12587	3692	R B3 wf	linear block	1	14	9		201	2	upper fill Roomblock 3 rooms, beneath ground stone
White Rock	Late Coalition	Roomblock	12587	3710	R B3 wf	linear block	1	10	7.8		201	3	upper fill Roomblock 3 rooms
White Rock	Late Coalition	Roomblock	12587	3778	R B3 use surface	linear block	1	18	6.9		310	2	possible use surface room 18
White Rock	Late Coalition	Roomblock	12587	3798	R B3 use surface	linear block	1	18	6.9		310	2	possible use surface room 18
White Rock	Late Coalition	Roomblock	12587	3820	R B3 wf	linear block	1	16	12.4		201	2	upper fill Roomblock 3 rooms
White Rock	Late Coalition	Roomblock	12587	3860	R B3 wf	linear block	1	17	8.5		201	2	upper fill Roomblock 3 rooms, post occupation fill
White Rock	Late Coalition	Roomblock	12587	3872	R B3 lower fill	linear block	1	14	9		208	3	lower fill Roomblock 3 rooms
White Rock	Late Coalition	Roomblock	12587	3985	R Hrth	f	1	7	10	6	300	11	interior remodeled hrth
White Rock	Late Coalition	Roomblock	12587	4009	R B3 lower fill	linear block	1	16	12.4		208	3	lower fill Roomblock 3 rooms

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
White Rock	Late Coalition	Roomblock	12587	4024	R Hrth, sub-Hrthfill	f	1	4/5	11.2	1	305	21	fill below hrth Fea. 1 in room 4/5
White Rock	Late Coalition	Roomblock	12587	4051	Garden		2	21			280	2	outside the agricultural berms
White Rock	Late Coalition	Roomblock	12587	4052	Garden		2	21			280	3	outside the agricultural berms
White Rock	Late Coalition	Roomblock	12587	4055	Garden		2	21			280	2	inside agricultural berms
White Rock	Late Coalition	Roomblock	12587	4056	Garden		2	21			280	4	inside agricultural berms
White Rock	Late Coalition	Roomblock	12587	4057	Garden		2	21			280	4	inside agricultural berms
White Rock	Late Coalition	Roomblock	12587	4058	Garden		2	19			280	2	inside agricultural berms
White Rock	Late Coalition	Roomblock	12587	4059	Garden		2	19			280	3	inside agricultural berms
White Rock	Late Coalition	Roomblock	12587	4060	Garden		2	19			280	1	beneath agricultural berms
White Rock	Late Coalition	Roomblock	12587	4061	Garden		2	19			280	3	beneath agricultural berms
White Rock	Late Coalition	Roomblock	12587	4062	Garden		2	19			280	2	inside agricultural berms
White Rock	Late Coalition	Roomblock	12587	4063	Garden		2	19			280	4	inside agricultural berms
White Rock	Late Coalition	Roomblock	12587	4064	Garden		2	20			280	2	beneath agricultural berms
White Rock	Late Coalition	Roomblock	12587	4065	Garden		2	20			280	5	beneath agricultural berms
White Rock	Late Coalition	Roomblock	12587	4066	Garden		2	20			280	3	outside agricultural berms
White	Late	Roomblock	12587	4067	Garden		2	20			280	4	outside agricultural berms

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
Rock	Coalition												
White Rock	Late Coalition	Roomblock	12587	4073	R Hrth	f	1	7	10	6	307	20	fill ash box
White Rock	Late Coalition	Roomblock	12587	4097	Rock Pile		2			17	280	2	surface rock pile Feature 17 ca. 1 m diameter, 15 cm high, sample from beneath tuff rock
White Rock	Late Coalition	Roomblock	12587	4098	R Hrth	f	1	7	10	6	309	22	hrth plaster, original interior of hrth
White Rock	Late Coalition	Roomblock	12587	4100	R Hrth, sub-Hrthfill	f	1	7	10	6	308	21	fill below base of hrth approx equivalent to strat 175 subfloor above bedrock
White Rock	Late Coalition	Roomblock	12587	4111	Special Burial		7			15	60	2	Burial 3, under left scapula
White Rock	Late Coalition	Roomblock	12587	4112	Special Burial		7			15	60	2	Burial 3, under palate
White Rock	Late Coalition	Roomblock	12587	4122	R B3 Control Surface	linear block	1	11	15.6		1		loose surface material (A horizon)
White Rock	Late Coalition	Roomblock	12587	4123	R B3 wf	linear block	1	11	15.6		201		upper fill Roomblock 3 rooms (B horizon). In Roomblock 3, post-occupation fill could not be distinguished from wf - Strat 201
White Rock	Late Coalition	Roomblock	12587	4128	R B3 Control Surface	linear block	1	17	8.5		1	1	loose surface material (A horizon)
White Rock	Late Coalition	Roomblock	12587	4129	R B3 wf	linear block	1	17	8.5		201	2	upper fill Roomblock 3 rooms (B horizon)
White Rock	Late Coalition	Roomblock	12587	4130	R B3 wf	linear block	1	17	8.5		201	3	upper fill Roomblock 3 rooms (C horizon)
White Rock	Late Coalition	Roomblock	12587	4141	R Hrth	f	1	2	10.4	20	311	31	hrth below floor 1B foundation

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
White Rock	Late Coalition	Roomblock	12587	4154	Rock Pile		1			18	1	1	surface rock pile Feature 18 overlies E wall Rm 21 ca. 1 m south Fea. 17
White Rock	Late Coalition	Roomblock	12587	4155	Rock Pile		1			18	2	2	control for Fea. 18. Sample below 4154 and beneath rock pile
White Rock	Late Coalition	Roomblock	12587	5120	Special Burial		7			14	60	1	Burial 2, in skull
White Rock	Late Coalition	Roomblock	12587	5122	Special Burial		7			14	60	1	Burial 2, under skull
White Rock	Late Coalition	Roomblock	12587	5123	Special Burial		7			14	60	1	Burial
White Rock	L Archaic, L Coalition, E Classic	Lithic/Ceramic Scatter	86637	274	Scatter						3	2	
White Rock	L Archaic, L Coalition, E Classic	Lithic/Ceramic Scatter	86637	275	Scatter						2	2	
White Rock	L Archaic, L Coalition, E Classic	Lithic/Ceramic Scatter	86637	276	Scatter						1	2	
White Rock	Early Classic	Fieldhouse	127631	14	FH surface						1	1	
White Rock	Early Classic	Fieldhouse	127631	33	FH post fill			1			2	1	
White Rock	Early Classic	Fieldhouse	127631	41	FH post fill						2	2	
White Rock	Early Classic	Fieldhouse	127631	48	FH Flr			1			4	3	

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
White Rock	Early Classic	Fieldhouse	127631	50	FH outside structure						3	3	
White Rock	Early Classic	Fieldhouse	127631	52	FH Flr			1			4	3	
White Rock	Classic	Grid Garden	128803	6	Garden						1	1	Control; upslope, outside garden
White Rock	Classic	Grid Garden	128803	7	Garden						3	2	Control; upslope, outside garden
White Rock	Classic	Grid Garden	128803	11	Garden			west		grid	1	1	inside upslope border
White Rock	Classic	Grid Garden	128803	12	Garden			west		grid	1	1	inside upslope border
White Rock	Classic	Grid Garden	128803	15	Garden						3	1	Control, geomorph pit; downslope, outside walls, Test Pit 1
White Rock	Classic	Grid Garden	128803	17	Garden						4	1	Control, geomorph pit; downslope, outside walls, Test Pit 1
White Rock	Classic	Grid Garden	128803	19	Garden			west		grid	1	1	in center
White Rock	Classic	Grid Garden	128803	20	Garden			west		grid	1	1	in center
White Rock	Classic	Grid Garden	128803	22	Garden			west		grid	1	1	inside downslope border
White Rock	Classic	Grid Garden	128803	23	Garden			west		grid	2	2	inside downslope border
White Rock	Classic	Grid Garden	128803	26	Garden			west		grid	1	1	outside downslope border
White Rock	Classic	Grid Garden	128803	27	Garden			west		grid	2	2	outside downslope border

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
White Rock	Classic	Grid Garden	128803	34	Garden			east		grid	1	1	inside downslope border
White Rock	Classic	Grid Garden	128803	35	Garden			east		grid	1	1	inside grid, center and near FS 21
White Rock	Classic	Grid Garden	128803	36	Garden			east		grid	1	1	inside grid near FS 21
White Rock	Classic	Grid Garden	128803	39	Garden			east		grid	1	1	outside grid, but adjacent border
White Rock	Historic	Checkdam	128804	214	checkdam						1	1	upslope
White Rock	Historic	Checkdam	128804	216	checkdam						1	1	downslope
White Rock	Historic	Checkdam	128804	220	checkdam						1	2	downslope
White Rock	Historic	Checkdam	128804	223	checkdam						1	2	upslope
White Rock	Middle Classic	Fieldhouse	128805	165	FH post fill		1	1			2	2	
White Rock	Middle Classic	Fieldhouse	128805	181	FH post fill		1	1			2	2	
White Rock	Middle Classic	Fieldhouse	128805	182	FH post fill		1	1			2	2	
White Rock	Middle Classic	Fieldhouse	128805	200	FH post fill		1	1			2	2	
White Rock	Middle Classic	Fieldhouse	128805	205	FH post fill		1	1			2	2	
White Rock	Middle Classic	Fieldhouse	128805	222	FH post fill		1	1			2	2	

Tract	Chronology	Site Type	Site	Specimen	Context Code	Room front f or back b	Area	Room No.	Room Area m^2	Feature No.	Strat	Level	Comments
White Rock	Middle Classic	Fieldhouse	128805	226	FH Flr		1	1			4	4	prepared floor
White Rock	Middle Classic	Fieldhouse	128805	245	FH wf		1	1			3	3	room fill with wallfall

Context code: r = room, flr = floor, wf = wallfall, post fill = post-occupation fill, rf = rooffall, ua = under artifact, hrth = hearth, R B 3 = Roomblock 3, GEO = Geology Soil Pits

APPENDIX Y
POLLEN DATA RAW COUNTS

Table Y.1. Pollen counts from LA 86534.

Site Number LA	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	727	769	913	921	1000	1063	1275	1297	1303	1325	1326	1334	1359	1475
Sample Volume	15	20	20	20	10	20	20	20	17	20	20	20	20	20
Sample Weight	16.9	21.6	20.2	25.2	9.9	18.1	25.8	22	21.7	25.6	24.1	26.3	27.7	27.2
Tracers	112	50	38	92	172	50	56	18	84	54	28	18	110	28
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	229	201	283	205	240	222	237	206	252	224	224	237	219	242
Pollen Concentration gr/gm or gr/wash	2584.0	3975.0	7874.3	1888.5	3010.3	5239.2	3503.5	11110.5	2952.7	3460.8	7089.8	10692.5	1535.1	6786.5
Taxa Richness	9	7	16	12	8	8	11	11	10	11	12	10	14	9
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	0.001	0	0	0	0	0	0.001	1	0	0	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0.001	0	0	0	2	0
Opuntia (Platy)	0	0	3	0	0	0	0	0.001	0	0	0.001	2	2	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	6	0	1	0	0	0	20	0	0	0	2	0	4	8
cf. Helianthus	0	0	3	0	0	0	0	0	0	1	1	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	4	0	0	0	0	0
Solanaceae	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Rosaceae	1	0	0	1	0	0	0	0	0	0	2	3	1	6
Eriogonum	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number LA	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	727	769	913	921	1000	1063	1275	1297	1303	1325	1326	1334	1359	1475
Sample Volume	15	20	20	20	10	20	20	20	17	20	20	20	20	20
Sample Weight	16.9	21.6	20.2	25.2	9.9	18.1	25.8	22	21.7	25.6	24.1	26.3	27.7	27.2
Tracers	112	50	38	92	172	50	56	18	84	54	28	18	110	28
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	229	201	283	205	240	222	237	206	252	224	224	237	219	242
Pollen Concentration gr/gm or gr/wash	2584.0	3975.0	7874.3	1888.5	3010.3	5239.2	3503.5	11110.5	2952.7	3460.8	7089.8	10692.5	1535.1	6786.5
Taxa Richness	9	7	16	12	8	8	11	11	10	11	12	10	14	9
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	0	14	12	0	14	14	4	14	6	0	0	3	3	12
Large Poaceae	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	66	128	130	74	60	94	110	102	162	92	92	128	110	90
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	38	8	38	38	22	38	30	24	24	22	22	12	28	28
Ambrosia	0	0	6	2	4	0	4	2	2	0	2	0	2	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	1	0	0	0	2	10	0	0	0	0	1	0

Site Number LA	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	727	769	913	921	1000	1063	1275	1297	1303	1325	1326	1334	1359	1475
Sample Volume	15	20	20	20	10	20	20	20	17	20	20	20	20	20
Sample Weight	16.9	21.6	20.2	25.2	9.9	18.1	25.8	22	21.7	25.6	24.1	26.3	27.7	27.2
Tracers	112	50	38	92	172	50	56	18	84	54	28	18	110	28
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	229	201	283	205	240	222	237	206	252	224	224	237	219	242
Pollen Concentration gr/gm or gr/wash	2584.0	3975.0	7874.3	1888.5	3010.3	5239.2	3503.5	11110.5	2952.7	3460.8	7089.8	10692.5	1535.1	6786.5
Taxa Richness	9	7	16	12	8	8	11	11	10	11	12	10	14	9
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	10	0	7	0	0	0	3	2	0	3	0	0	3	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	2	0	0	0	0	0	1	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Pinus	0	2	10	4	30	2	6	2	6	28	24	10	2	8
Pinus edulis type	16	17	20	10	56	12	30	12	14	42	20	8	6	24
Juniperus	14	0	10	2	14	14	0	3	0	9	12	22	2	10
Quercus	0	0	1	2	0	2	0	0	0	0	0	0	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number LA	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	727	769	913	921	1000	1063	1275	1297	1303	1325	1326	1334	1359	1475
Sample Volume	15	20	20	20	10	20	20	20	17	20	20	20	20	20
Sample Weight	16.9	21.6	20.2	25.2	9.9	18.1	25.8	22	21.7	25.6	24.1	26.3	27.7	27.2
Tracers	112	50	38	92	172	50	56	18	84	54	28	18	110	28
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	229	201	283	205	240	222	237	206	252	224	224	237	219	242
Pollen Concentration gr/gm or gr/wash	2584.0	3975.0	7874.3	1888.5	3010.3	5239.2	3503.5	11110.5	2952.7	3460.8	7089.8	10692.5	1535.1	6786.5
Taxa Richness	9	7	16	12	8	8	11	11	10	11	12	10	14	9
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Artemisia	4	4	14	6	2	2	2	10	0	10	8	2	8	12
Unknown Small Artemisia	6	0	0	0	0	0	0	0	0	0	0	0	0	0
Sarcobatus	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	58	26	24	57	34	40	24	24	24	12	32	46	40	38
Unknown	10	0	1	3	4	4	1	0	8	1	6	1	5	5
Total Aggregates	0	0	1	0	0	0	0	1	0	0	0	0	0	1
Cheno-Am Aggregates	0	0	1(50+)	0	0	0	0	1(6)	0	0	0	0	X(200+)	1(10)
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	X(3)	0	0	0	0	0	X(4)	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number LA	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	727	769	913	921	1000	1063	1275	1297	1303	1325	1326	1334	1359	1475
Sample Volume	15	20	20	20	10	20	20	20	17	20	20	20	20	20
Sample Weight	16.9	21.6	20.2	25.2	9.9	18.1	25.8	22	21.7	25.6	24.1	26.3	27.7	27.2
Tracers	112	50	38	92	172	50	56	18	84	54	28	18	110	28
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	229	201	283	205	240	222	237	206	252	224	224	237	219	242
Pollen Concentration gr/gm or gr/wash	2584.0	3975.0	7874.3	1888.5	3010.3	5239.2	3503.5	11110.5	2952.7	3460.8	7089.8	10692.5	1535.1	6786.5
Taxa Richness	9	7	16	12	8	8	11	11	10	11	12	10	14	9
Aggregates														
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.1 (continued). Pollen counts from LA 86534.

Site Number	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	1510	1522	1597	1607	1636	1637	1645	1649	1749	1750	1751	1762	1772	1778
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	24.7	29.1	22.9	23.5	31.5	29.3	20.6	24.6	21.3	23.5	25.4	24.8	22.2	30.3
Tracers	56	54	60	58	64	72	54	58	24	52	68	50	49	76

Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	273	233	235	250	225	212	215	264	236	291	224	240	203	336
Pollen Concentration gr/gm or gr/wash	4215.4	3166.9	3652.9	3917.5	2383.7	2146.3	4128.0	3951.9	9860.1	5086.1	2769.9	4133.8	3985.7	3116.3
Taxa Richness	9	11	13	11	11	10	16	14	8	8	10	13	13	14
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	4	0	0	0	0	0.001	0	0	2	6	0.001	0.001	0
Opuntia (Cylindro)	0	0.001	0	0.001	2	0	2	0	0	0	0	0.001	0	0
Opuntia (Platy)	0	0	2	2	2	1	0.001	4	0	0	0	0.001	0.001	0.001
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	6	6	0	0	3	9	12	4	0	0	20	0	0	14
cf. Helianthus	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Liliaceae	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	13	0	0	0	0	2	0	0	0	0	0	0
Eriogonum	0	0	0	0	0	0	1	0	0	0	0	3	0	1
Brassicaceae	0	0	0	0	0	0	1	0	1	0	0	0	0	1
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	14	15	0	12	10	4	10	0	3	4	16	28	3	18
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	1510	1522	1597	1607	1636	1637	1645	1649	1749	1750	1751	1762	1772	1778
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	24.7	29.1	22.9	23.5	31.5	29.3	20.6	24.6	21.3	23.5	25.4	24.8	22.2	30.3
Tracers	56	54	60	58	64	72	54	58	24	52	68	50	49	76
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	273	233	235	250	225	212	215	264	236	291	224	240	203	336
Pollen Concentration gr/gm or gr/wash	4215.4	3166.9	3652.9	3917.5	2383.7	2146.3	4128.0	3951.9	9860.1	5086.1	2769.9	4133.8	3985.7	3116.3
Taxa Richness	9	11	13	11	11	10	16	14	8	8	10	13	13	14
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	168	98	28	132	102	124	122	106	164	144	90	96	117	84
Fabaceae	0	0	1	0	0	0	0	1	0	0	0	0	0	0
Asteraceae Hi-Spine type	30	30	12	24	34	32	14	24	25	32	20	42	12	40
Ambrosia	0	0	20	6	0	2	6	2	0	0	0	6	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	1	8	0	0	0	0	0	0
Liguliflorae	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	8	2	0	0	0	0	3	0	0	0	6	2	3	3
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Onagraceae	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0

Site Number	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	1510	1522	1597	1607	1636	1637	1645	1649	1749	1750	1751	1762	1772	1778
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	24.7	29.1	22.9	23.5	31.5	29.3	20.6	24.6	21.3	23.5	25.4	24.8	22.2	30.3
Tracers	56	54	60	58	64	72	54	58	24	52	68	50	49	76
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	273	233	235	250	225	212	215	264	236	291	224	240	203	336
Pollen Concentration gr/gm or gr/wash	4215.4	3166.9	3652.9	3917.5	2383.7	2146.3	4128.0	3951.9	9860.1	5086.1	2769.9	4133.8	3985.7	3116.3
Taxa Richness	9	11	13	11	11	10	16	14	8	8	10	13	13	14
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Abies	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinus	0	6	12	16	12	6	2	32	1	0	0	8	3	4
Pinus edulis type	6	20	96	28	24	12	4	58	0	2	6	18	3	66
Juniperus	2	0	6	16	6	0	2	4	0	4	8	0	6	35
Quercus	2	0	24	0	2	0	0	0	0	0	0	0	1	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	4	0	0	0	0	0	0	0	0	0	0	1	4
Artemisia	4	10	6	4	0	2	8	4	5	10	10	4	13	16
Unknown Small Artemisia	0	0	0	0	0	2	0	0	5	28	0	0	2	4
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	1510	1522	1597	1607	1636	1637	1645	1649	1749	1750	1751	1762	1772	1778
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	24.7	29.1	22.9	23.5	31.5	29.3	20.6	24.6	21.3	23.5	25.4	24.8	22.2	30.3
Tracers	56	54	60	58	64	72	54	58	24	52	68	50	49	76
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	273	233	235	250	225	212	215	264	236	291	224	240	203	336
Pollen Concentration gr/gm or gr/wash	4215.4	3166.9	3652.9	3917.5	2383.7	2146.3	4128.0	3951.9	9860.1	5086.1	2769.9	4133.8	3985.7	3116.3
Taxa Richness	9	11	13	11	11	10	16	14	8	8	10	13	13	14
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	32	38	14	8	24	14	16	12	25	60	38	28	36	46
Unknown	1	0	0	1	3	2	8	2	3	1	2	3	2	0
Total Aggregates	0	0	0	0	0	2	3	0	3	4	1	1	1	0
Cheno-Am Aggregates	0	0	X(500+)	X(500+)	0	2(8)	3(20+)	0	1(50+)	4(6)	1(6)	1(6)	1(20+)	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	2(50+)	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	X(12)	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	1510	1522	1597	1607	1636	1637	1645	1649	1749	1750	1751	1762	1772	1778
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	24.7	29.1	22.9	23.5	31.5	29.3	20.6	24.6	21.3	23.5	25.4	24.8	22.2	30.3
Tracers	56	54	60	58	64	72	54	58	24	52	68	50	49	76
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	273	233	235	250	225	212	215	264	236	291	224	240	203	336
Pollen Concentration gr/gm or gr/wash	4215.4	3166.9	3652.9	3917.5	2383.7	2146.3	4128.0	3951.9	9860.1	5086.1	2769.9	4133.8	3985.7	3116.3
Taxa Richness	9	11	13	11	11	10	16	14	8	8	10	13	13	14
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.1 (continued). Pollen counts from LA 86534.

Site Number	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	1786	1788	1905	1908	1915	1922	1960	1967	1974	1991	1993	2164	2175	2204
Sample Volume	20	20	20	8	20	20	20	20	20	20	20	20	20	20
Sample Weight	26.9	22.8	30.2	8.4	19.1	21.4	22	20	25.7	24.5	23.1	21.9	23.1	20.7
Tracers	32	78	72	92	52	264	136	78	58	22	24	42	16	12
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	259	259	229	224	242	231	207	214	218	221	259	264	277	1
Pollen Concentration gr/gm or gr/wash	6426.3	3110.5	2249.3	6190.7	5204.0	873.3	1477.6	2929.9	3123.6	8757.2	9977.9	6130.2	16006.9	86.0
Taxa Richness	12	12	13	12	13	12	12	9	10	12	14	11	11	0
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	1786	1788	1905	1908	1915	1922	1960	1967	1974	1991	1993	2164	2175	2204
Sample Volume	20	20	20	8	20	20	20	20	20	20	20	20	20	20
Sample Weight	26.9	22.8	30.2	8.4	19.1	21.4	22	20	25.7	24.5	23.1	21.9	23.1	20.7
Tracers	32	78	72	92	52	264	136	78	58	22	24	42	16	12
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	259	259	229	224	242	231	207	214	218	221	259	264	277	1
Pollen Concentration gr/gm or gr/wash	6426.3	3110.5	2249.3	6190.7	5204.0	873.3	1477.6	2929.9	3123.6	8757.2	9977.9	6130.2	16006.9	86.0
Taxa Richness	12	12	13	12	13	12	12	9	10	12	14	11	11	0
Cucurbita	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0
Zea mays	2	1	0	0	2	0	0	0	0	0	2	0	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	6	0	0	0	0	0	0
Opuntia (Platy)	0.001	0.001	0.001	0.001	0	4	1	0	0.001	2	1	4	2	0
Cactaceae	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0
Cleome	8	12	10	10	0	18	0	16	0	0	0	2	4	0
cf. Helianthus	0	0	0	0	0	0	3	0	0	4	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	2	0	1	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	1	2	0	0	0	0	0	0	0	0	0
Eriogonum	0	1	0	0	0	0	0	0	0	0	2	0	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	1786	1788	1905	1908	1915	1922	1960	1967	1974	1991	1993	2164	2175	2204
Sample Volume	20	20	20	8	20	20	20	20	20	20	20	20	20	20
Sample Weight	26.9	22.8	30.2	8.4	19.1	21.4	22	20	25.7	24.5	23.1	21.9	23.1	20.7
Tracers	32	78	72	92	52	264	136	78	58	22	24	42	16	12
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	259	259	229	224	242	231	207	214	218	221	259	264	277	1
Pollen Concentration gr/gm or gr/wash	6426.3	3110.5	2249.3	6190.7	5204.0	873.3	1477.6	2929.9	3123.6	8757.2	9977.9	6130.2	16006.9	86.0
Taxa Richness	12	12	13	12	13	12	12	9	10	12	14	11	11	0
Poaceae	2	18	14	12	6	7	2	18	10	5	16	3	2	0
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	148	120	64	96	72	30	86	68	104	70	56	128	152	0
Fabaceae	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	28	36	48	30	30	34	40	24	16	22	40	56	34	0
Ambrosia	0	2	0	0	12	5	0	0	0	0	0	2	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	2	0	0	0	0	3	0	10	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	2	0	4	2	0	7	8	0	0	0	3	0	0	0

Site Number	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	1786	1788	1905	1908	1915	1922	1960	1967	1974	1991	1993	2164	2175	2204
Sample Volume	20	20	20	8	20	20	20	20	20	20	20	20	20	20
Sample Weight	26.9	22.8	30.2	8.4	19.1	21.4	22	20	25.7	24.5	23.1	21.9	23.1	20.7
Tracers	32	78	72	92	52	264	136	78	58	22	24	42	16	12
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	259	259	229	224	242	231	207	214	218	221	259	264	277	1
Pollen Concentration gr/gm or gr/wash	6426.3	3110.5	2249.3	6190.7	5204.0	873.3	1477.6	2929.9	3123.6	8757.2	9977.9	6130.2	16006.9	86.0
Taxa Richness	12	12	13	12	13	12	12	9	10	12	14	11	11	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0.001	1	0	1	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	0	0	0	0	0	0	0	6	1	0	0	0	0
Pinus	2	2	6	2	26	4	4	4	22	28	34	0	12	0
Pinus edulis type	8	28	28	14	60	18	2	26	14	14	22	14	8	0
Juniperus	6	8	6	14	10	29	6	12	7	0	8	12	10	0
Quercus	4	0	0	0	2	0	2	0	0	2	4	0	3	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Artemisia	6	8	12	10	4	8	16	14	6	42	40	8	22	0
Unknown Small Artemisia	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	1786	1788	1905	1908	1915	1922	1960	1967	1974	1991	1993	2164	2175	2204
Sample Volume	20	20	20	8	20	20	20	20	20	20	20	20	20	20
Sample Weight	26.9	22.8	30.2	8.4	19.1	21.4	22	20	25.7	24.5	23.1	21.9	23.1	20.7
Tracers	32	78	72	92	52	264	136	78	58	22	24	42	16	12
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	259	259	229	224	242	231	207	214	218	221	259	264	277	1
Pollen Concentration gr/gm or gr/wash	6426.3	3110.5	2249.3	6190.7	5204.0	873.3	1477.6	2929.9	3123.6	8757.2	9977.9	6130.2	16006.9	86.0
Taxa Richness	12	12	13	12	13	12	12	9	10	12	14	11	11	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	42	22	32	28	12	66	30	26	32	22	28	22	20	1
Unknown	1	0	0	1	0	0	6	0	1	5	1	1	5	0
Total Aggregates	0	1	1	2	2	0	0	0	0	1	0	1	2	0
Cheno-Am Aggregates	0	1(8)	1(6)	2(10)	2(10)	0	0	0	0	0	0	0	2(10)	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	1(16)	0	0
Maize Aggregates	X(10+)	X(6)	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	X(20+)	0	0	0	0	0	0	1(20+)	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534	86534
Specimen Number	1786	1788	1905	1908	1915	1922	1960	1967	1974	1991	1993	2164	2175	2204
Sample Volume	20	20	20	8	20	20	20	20	20	20	20	20	20	20
Sample Weight	26.9	22.8	30.2	8.4	19.1	21.4	22	20	25.7	24.5	23.1	21.9	23.1	20.7
Tracers	32	78	72	92	52	264	136	78	58	22	24	42	16	12
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	259	259	229	224	242	231	207	214	218	221	259	264	277	1
Pollen Concentration gr/gm or gr/wash	6426.3	3110.5	2249.3	6190.7	5204.0	873.3	1477.6	2929.9	3123.6	8757.2	9977.9	6130.2	16006.9	86.0
Taxa Richness	12	12	13	12	13	12	12	9	10	12	14	11	11	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.2. Pollen counts from LA 86534 and LA 135290.

Site Number	86534	86534	86534	86534	86534	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2205	2219	2225	2229	2232	983	988	1068	1084	1097	1099	1132	1164	1181
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.4	16.8	25.7	21.5	18.7	25.2	24.7	26.6	26.8	26.4	22.1	22.2	21.6	26.7
Tracers	10	10	58	16	80	100	350	44	64	12	50	156	103	79
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	2	2	225	109	231	225	201	395	214	127	235	136	214	220
Pollen Concentration gr/gm or gr/wash	220.2	254.3	3223.9	6767.5	3297.9	1907.0	496.6	7208.1	2664.8	8562.1	4542.2	838.7	2054.4	2227.6
Taxa Richness	1	2	10	8	13	13	11	10	8	3	7	9	12	13
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	2	0	2	0	0	0	0	0	0	0	4	0.001
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Opuntia (Platy)	0	0	0	0	0	0	0.001	0	0	0	0	0	1	0.001
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	6	8	40	0	0	0	0	0	0	1	1	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	2	0	2	1	1	1	0	0	0	0	0
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	0	0	0	2	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86534	86534	86534	86534	86534	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2205	2219	2225	2229	2232	983	988	1068	1084	1097	1099	1132	1164	1181
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.4	16.8	25.7	21.5	18.7	25.2	24.7	26.6	26.8	26.4	22.1	22.2	21.6	26.7
Tracers	10	10	58	16	80	100	350	44	64	12	50	156	103	79
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	2	2	225	109	231	225	201	395	214	127	235	136	214	220
Pollen Concentration gr/gm or gr/wash	220.2	254.3	3223.9	6767.5	3297.9	1907.0	496.6	7208.1	2664.8	8562.1	4542.2	838.7	2054.4	2227.6
Taxa Richness	1	2	10	8	13	13	11	10	8	3	7	9	12	13
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	0	0	10	10	2	4	12	10	10	0	0	2	6	5
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	0	0	102	30	90	41	16	112	120	94	102	24	62	47
Fabaceae	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	0	0.001	18	14	30	36	22	42	24	2	24	34	21	36
Ambrosia	0	0.001	0	0	4	1	0	4	0	0	0	2	5	6
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86534	86534	86534	86534	86534	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2205	2219	2225	2229	2232	983	988	1068	1084	1097	1099	1132	1164	1181
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.4	16.8	25.7	21.5	18.7	25.2	24.7	26.6	26.8	26.4	22.1	22.2	21.6	26.7
Tracers	10	10	58	16	80	100	350	44	64	12	50	156	103	79
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	2	2	225	109	231	225	201	395	214	127	235	136	214	220
Pollen Concentration gr/gm or gr/wash	220.2	254.3	3223.9	6767.5	3297.9	1907.0	496.6	7208.1	2664.8	8562.1	4542.2	838.7	2054.4	2227.6
Taxa Richness	1	2	10	8	13	13	11	10	8	3	7	9	12	13
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	0	0	8	4	4	6	10	0	0	0	2	1	0	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Pinus	0.001	0	12	0	0	2	18	78	4	0	16	0	15	14
Pinus edulis type	0	0	28	8	10	24	32	52	3	0	26	0	16	23
Juniperus	0	0	4	0	4	17	6	34	5	0	4	4	6	18
Quercus	0	0	0	3	0	4	1	4	0	0	0	0	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86534	86534	86534	86534	86534	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2205	2219	2225	2229	2232	983	988	1068	1084	1097	1099	1132	1164	1181
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.4	16.8	25.7	21.5	18.7	25.2	24.7	26.6	26.8	26.4	22.1	22.2	21.6	26.7
Tracers	10	10	58	16	80	100	350	44	64	12	50	156	103	79
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	2	2	225	109	231	225	201	395	214	127	235	136	214	220
Pollen Concentration gr/gm or gr/wash	220.2	254.3	3223.9	6767.5	3297.9	1907.0	496.6	7208.1	2664.8	8562.1	4542.2	838.7	2054.4	2227.6
Taxa Richness	1	2	10	8	13	13	11	10	8	3	7	9	12	13
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Ephedra	0	0	0	0	2	2	0	0	0	0	0	0	0	0
Artemisia	0	0	10	0	4	14	26	28	14	16	16	18	20	33
Unknown Small Artemisia	0	0	0	0	0	0	0	0	0	0	0	8	0	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	2	2	24	30	26	66	57	28	32	14	44	42	54	32
Unknown	0	0	0	0	10	4	0	1	1	0	0	0	2	2
Total Aggregates	0	0	1	0	0	0	0	1	0	1	1	0	0	0
Cheno-Am Aggregates	0	0	1(6)	0	0	0	0	0	0	1(6)	1(20+)	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86534	86534	86534	86534	86534	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2205	2219	2225	2229	2232	983	988	1068	1084	1097	1099	1132	1164	1181
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.4	16.8	25.7	21.5	18.7	25.2	24.7	26.6	26.8	26.4	22.1	22.2	21.6	26.7
Tracers	10	10	58	16	80	100	350	44	64	12	50	156	103	79
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	2	2	225	109	231	225	201	395	214	127	235	136	214	220
Pollen Concentration gr/gm or gr/wash	220.2	254.3	3223.9	6767.5	3297.9	1907.0	496.6	7208.1	2664.8	8562.1	4542.2	838.7	2054.4	2227.6
Taxa Richness	1	2	10	8	13	13	11	10	8	3	7	9	12	13
Juniper Aggregates	0	0	0	0	0	0	0	1(10)	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.2 (continued). Pollen counts from LA 135290.

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	1196	1272	1276	1301	1330	1416	1432	1446	1457	1479	1518	1635	1645	1649
Sample Volume	20	20	20	20	20	20	20	20	18	20	20	8	20	9
Sample Weight	24.9	27.9	22.6	23.7	23.2	20.8	21.4	23	21.2	21.4	24.5	10.6	20.3	11.2

Tracers	84	6	24	30	208	16	22	14	106	76	172	10	194	116
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	238	240	105	154	348	238	93	259	271	260	168	2	252	316
Pollen Concentration gr/gm or gr/wash	2430.3	30620.8	4134.6	4626.1	1540.2	15274.1	4219.0	17179.3	2575.7	3414.3	851.5	403.0	1366.7	5194.8
Taxa Richness	9	12	12	7	11	8	12	9	10	12	14	3	11	11
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	0	2	0	1	1	0	0	0	1	0.001	11	0
Opuntia (Cylindro)	0	0.001	0	0	0	0	0	0	0	0	0.001	0	0	0
Opuntia (Platy)	0	0	0	0	1	0	0	0	0	2	0	0	6	2
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	0	0	1	0	0	0	0	0	2	0	3	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	3	0	0	0	0	1	2	0	0	0	0	0	2
Eriogonum	0	1	0	0	0	0	0	0	0	0	1	0	0	0
Brassicaceae	0	0	0	0	2	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	2	19	4	0	10	3	6	2	0	4	11	0	0	4
Large Poaceae	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	1196	1272	1276	1301	1330	1416	1432	1446	1457	1479	1518	1635	1645	1649
Sample Volume	20	20	20	20	20	20	20	20	18	20	20	8	20	9
Sample Weight	24.9	27.9	22.6	23.7	23.2	20.8	21.4	23	21.2	21.4	24.5	10.6	20.3	11.2
Tracers	84	6	24	30	208	16	22	14	106	76	172	10	194	116
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	238	240	105	154	348	238	93	259	271	260	168	2	252	316
Pollen Concentration gr/gm or gr/wash	2430.3	30620.8	4134.6	4626.1	1540.2	15274.1	4219.0	17179.3	2575.7	3414.3	851.5	403.0	1366.7	5194.8
Taxa Richness	9	12	12	7	11	8	12	9	10	12	14	3	11	11
Betula	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	94	44	26	66	76	52	15	138	66	30	42	0	56	36
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	22	5	6	21	48	12	16	10	46	52	39	0	34	32
Ambrosia	0	0	0	0	0	0	0	0	0	4	3	0	2	10
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	0	0	2	0	0	0	0	0	0	0	0	0	1	12
Scrophulariaceae	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	1196	1272	1276	1301	1330	1416	1432	1446	1457	1479	1518	1635	1645	1649
Sample Volume	20	20	20	20	20	20	20	20	18	20	20	8	20	9
Sample Weight	24.9	27.9	22.6	23.7	23.2	20.8	21.4	23	21.2	21.4	24.5	10.6	20.3	11.2
Tracers	84	6	24	30	208	16	22	14	106	76	172	10	194	116
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	238	240	105	154	348	238	93	259	271	260	168	2	252	316
Pollen Concentration gr/gm or gr/wash	2430.3	30620.8	4134.6	4626.1	1540.2	15274.1	4219.0	17179.3	2575.7	3414.3	851.5	403.0	1366.7	5194.8
Taxa Richness	9	12	12	7	11	8	12	9	10	12	14	3	11	11
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	1	0	0	0	0	1	0	1	2	0	0	0	0
Pinus	8	43	2	6	16	54	18	24	14	10	10	1	10	10
Pinus edulis type	20	36	2	3	8	80	10	16	32	12	6	0	10	14
Juniperus	3	73	4	2	4	8	1	2	16	10	7	0	0	0
Quercus	0	1	1	0	0	0	0	2	1	0	0	0	0	0
Rhus type	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	3	0	0	0	0	0	2	0	0	0	2	0	4	0
Artemisia	40	13	10	24	60	8	20	26	20	74	32	1	75	80
Unknown Small Artemisia	12	0	12	0	8	0	0	0	4	20	11	0	0	6
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	1196	1272	1276	1301	1330	1416	1432	1446	1457	1479	1518	1635	1645	1649
Sample Volume	20	20	20	20	20	20	20	20	18	20	20	8	20	9
Sample Weight	24.9	27.9	22.6	23.7	23.2	20.8	21.4	23	21.2	21.4	24.5	10.6	20.3	11.2
Tracers	84	6	24	30	208	16	22	14	106	76	172	10	194	116
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	238	240	105	154	348	238	93	259	271	260	168	2	252	316
Pollen Concentration gr/gm or gr/wash	2430.3	30620.8	4134.6	4626.1	1540.2	15274.1	4219.0	17179.3	2575.7	3414.3	851.5	403.0	1366.7	5194.8
Taxa Richness	9	12	12	7	11	8	12	9	10	12	14	3	11	11
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	29	1	32	30	106	14	0	36	70	28	0	0	40	104
Unknown	4	0	2	0	8	6	0	0	0	10	0	0	0	4
Total Aggregates	1	0	0	0	0	0	1	1	0	1	1	0	0	0
Cheno-Am Aggregates	0	0	0	0	0	0	1(10)	1(10)	0	0	1(8)	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	1(10)	0	0	0	0	0	0	0	0	1(12)	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	1196	1272	1276	1301	1330	1416	1432	1446	1457	1479	1518	1635	1645	1649
Sample Volume	20	20	20	20	20	20	20	20	18	20	20	8	20	9
Sample Weight	24.9	27.9	22.6	23.7	23.2	20.8	21.4	23	21.2	21.4	24.5	10.6	20.3	11.2
Tracers	84	6	24	30	208	16	22	14	106	76	172	10	194	116
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	238	240	105	154	348	238	93	259	271	260	168	2	252	316
Pollen Concentration gr/gm or gr/wash	2430.3	30620.8	4134.6	4626.1	1540.2	15274.1	4219.0	17179.3	2575.7	3414.3	851.5	403.0	1366.7	5194.8
Taxa Richness	9	12	12	7	11	8	12	9	10	12	14	3	11	11
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.2 (continued). Pollen counts from LA 135290.

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	1661	1706	1719	1772	1820	1821	1852	1899	1920	1923	1991	2028	2043	2051
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	21.7	26.7	22.6	21.9	23.4	23.9	31.2	25.3	25.1	23.6	26.6	23.1	23	24.4
Tracers	108	78	89	69	49	54	106	40	100	48	99	138	99	104
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	237	229	208	115	297	298	239	224	218	243	216	234	264	255
Pollen Concentration gr/gm or gr/wash	2159.9	2348.5	2208.6	1625.4	5532.3	4931.6	1543.5	4727.5	1855.0	4581.6	1751.9	1567.8	2476.3	2146.2
Taxa Richness	15	13	10	8	16	11	15	10	14	12	12	10	8	10
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	3	0	0	0	0	0.001	0	0	3	0	0	0	0
Zea mays	2	14	0	0	0	0	8	0	0.001	12	0	0	2	0
Opuntia (Cylindro)	0	0	0	0	0	0	2	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	1661	1706	1719	1772	1820	1821	1852	1899	1920	1923	1991	2028	2043	2051
Opuntia (Platy)	0	0.001	0	3	1	0.001	1	6	0	0	3	0.001	0.001	2
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	5	0	4	0	3	0	0	0	0	0	0	10	3	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	1	0	0	0	0	1	0	0	5	0	3	0	0	1
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	2	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	6	20	7	2	21	21	12	22	12	12	24	21	23	8
Large Poaceae	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Populus	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	61	44	44	56	81	86	78	18	39	24	20	68	74	62
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	39	50	27	2	30	44	28	20	33	56	37	28	62	24
Ambrosia	1	2	0	0	0	0	2	2	1	0	2	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	1661	1706	1719	1772	1820	1821	1852	1899	1920	1923	1991	2028	2043	2051
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	7	0	0	0	2	0	0	0	3	5	7	11	0	10
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0.001	0	0	1	0.001	0.001	0	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	1	0	0	0	0	0	0	0	0	0.001	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Pinus	17	1	6	4	27	12	38	68	17	30	9	2	0	28
Pinus edulis type	6	20	12	2	17	16	6	30	14	2	2	4	0	14
Juniperus	10	10	6	8	14	14	6	4	11	6	7	2	0	0
Quercus	0	1	0	0	1	1	0	0	3	0	3	0	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	1	0	0	0	2	0	0	2	1	4	0	0	0	2
Artemisia	44	28	30	10	30	48	26	20	15	65	33	32	37	60

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	1661	1706	1719	1772	1820	1821	1852	1899	1920	1923	1991	2028	2043	2051
Unknown Small Artemisia	0	0	8	0	10	0	0	0	2	0	0	0	3	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	31	36	59	28	52	54	28	32	56	24	64	56	60	42
Unknown	3	0	3	0	1	0	2	0	6	0	1	0	0	1
Total Aggregates	1	0	0	0	2	1	0	0	0	0	1	0	0	1
Cheno-Am Aggregates	1(10)	0	0	0	1(12)	1(100+)	0	0	0	0	0	0	0	1(8)
Sunflower Family Aggregates	0	0	0	0	1(6)	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	1(12)	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	1661	1706	1719	1772	1820	1821	1852	1899	1920	1923	1991	2028	2043	2051
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	X	0	0	0	0	0	0	0	0

Table Y.2 (continued). Pollen counts from LA 135290.

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2068	2084	2100	2104	2105	2134	2137	2149	2161	2179	2185	2186	2231	2234
Sample Volume	20	20	20	20	20	20	19	20	20	20	20	20	20	20
Sample Weight	25.7	25.6	24.6	30.1	25.3	19	24.5	22.1	25.2	21	25.3	27.3	27.8	1
Tracers	16	27	26	125	144	124	25	216	66	180	42	26	54	20
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	237	205	278	205	242	263	238	200	229	199	264	227	283	3
Pollen Concentration gr/gm or gr/wash	12309.9	6334.5	9283.2	1163.7	1418.7	2384.2	8299.1	894.8	2940.7	1124.4	5306.3	6830.5	4026.3	3203.7
Taxa Richness	10	17	14	19	14	9	20	9	6	8	15	11	8	3
Gossypium	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	3	7	0	0	0	4	0	0	0	22	28	0	0.001
Zea mays	36	48	30	2	4	0	75	55	0	0	78	85	0	0.001
Opuntia (Cylindro)	0	0.001	1	0	0	0	0	0	0	0	2	3	0	0
Opuntia (Platy)	1	0.001	0	3	0	0.001	0	0	0	0	6	0.001	0	0
Cactaceae	0	0	0	0.001	0	0	0	0	0	0	0	0	0	0
Cleome	9	1	0	1	0	8	0	0	0	0	0	0	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Rosaceae	0	0	0	3	0	0	2	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2068	2084	2100	2104	2105	2134	2137	2149	2161	2179	2185	2186	2231	2234
Sample Volume	20	20	20	20	20	20	19	20	20	20	20	20	20	20
Sample Weight	25.7	25.6	24.6	30.1	25.3	19	24.5	22.1	25.2	21	25.3	27.3	27.8	1
Tracers	16	27	26	125	144	124	25	216	66	180	42	26	54	20
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	237	205	278	205	242	263	238	200	229	199	264	227	283	3
Pollen Concentration gr/gm or gr/wash	12309.9	6334.5	9283.2	1163.7	1418.7	2384.2	8299.1	894.8	2940.7	1124.4	5306.3	6830.5	4026.3	3203.7
Taxa Richness	10	17	14	19	14	9	20	9	6	8	15	11	8	3
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	5	0	0	0	2	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Poaceae	37	18	17	7	20	4	15	8	0	0	30	10	12	0
Large Poaceae	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	37	14	45	27	42	108	19	36	101	50	12	0	116	0
Fabaceae	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	48	32	34	33	20	24	39	0	20	16	20	8	28	0
Ambrosia	0	0	2	1	2	0	2	0	0	2	0	0	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2068	2084	2100	2104	2105	2134	2137	2149	2161	2179	2185	2186	2231	2234
Sample Volume	20	20	20	20	20	20	19	20	20	20	20	20	20	20
Sample Weight	25.7	25.6	24.6	30.1	25.3	19	24.5	22.1	25.2	21	25.3	27.3	27.8	1
Tracers	16	27	26	125	144	124	25	216	66	180	42	26	54	20
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	237	205	278	205	242	263	238	200	229	199	264	227	283	3
Pollen Concentration gr/gm or gr/wash	12309.9	6334.5	9283.2	1163.7	1418.7	2384.2	8299.1	894.8	2940.7	1124.4	5306.3	6830.5	4026.3	3203.7
Taxa Richness	10	17	14	19	14	9	20	9	6	8	15	11	8	3
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	2	0	0	0	0	0	3	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scrophulariaceae	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Onagraceae	0.001	0.001	0	0	4	0	0.001	0	0	0	2	20	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	1	1	0	1	0	1	0	0	0	0	0	0	0
Pinus	0	10	19	7	24	12	6	10	2	8	2	16	6	0.001
Pinus edulis type	0	6	0	4	4	0	3	12	2	8	14	2	10	0
Juniperus	0	5	3	7	16	10	5	6	4	4	2	2	4	0
Quercus	0	0	5	2	6	1	0	0	0	0	1	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2068	2084	2100	2104	2105	2134	2137	2149	2161	2179	2185	2186	2231	2234
Sample Volume	20	20	20	20	20	20	19	20	20	20	20	20	20	20
Sample Weight	25.7	25.6	24.6	30.1	25.3	19	24.5	22.1	25.2	21	25.3	27.3	27.8	1
Tracers	16	27	26	125	144	124	25	216	66	180	42	26	54	20
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	237	205	278	205	242	263	238	200	229	199	264	227	283	3
Pollen Concentration gr/gm or gr/wash	12309.9	6334.5	9283.2	1163.7	1418.7	2384.2	8299.1	894.8	2940.7	1124.4	5306.3	6830.5	4026.3	3203.7
Taxa Richness	10	17	14	19	14	9	20	9	6	8	15	11	8	3
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	1	0	1	1	0	1	0	0	2	0	0	0	0
Artemisia	47	31	90	20	42	40	38	5	65	44	34	24	10	0
Unknown Small Artemisia	0	1	5	4	12	0	1	0	0	0	2	0	3	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	12	32	13	74	40	56	18	61	33	64	34	24	92	3
Unknown	0	1	1	6	4	0	1	3	2	0	2	4	2	0
Total Aggregates	1	0	0	0	0	0	0	1	0	1	0	1	0	0
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	0	1(12)	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	1(4)	0	X(6)	0	X(5)	0	X(6)	1(4)	0	0	0	1(8)	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2068	2084	2100	2104	2105	2134	2137	2149	2161	2179	2185	2186	2231	2234
Sample Volume	20	20	20	20	20	20	19	20	20	20	20	20	20	20
Sample Weight	25.7	25.6	24.6	30.1	25.3	19	24.5	22.1	25.2	21	25.3	27.3	27.8	1
Tracers	16	27	26	125	144	124	25	216	66	180	42	26	54	20
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	237	205	278	205	242	263	238	200	229	199	264	227	283	3
Pollen Concentration gr/gm or gr/wash	12309.9	6334.5	9283.2	1163.7	1418.7	2384.2	8299.1	894.8	2940.7	1124.4	5306.3	6830.5	4026.3	3203.7
Taxa Richness	10	17	14	19	14	9	20	9	6	8	15	11	8	3
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.2 (continued). Pollen counts from LA 135290.

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2248	2249	2251	2252	2275	2276	2277	2278	2279	2280	2298	2316	2325	2348
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	26.4	28.9	21.9	21.4	19.2	22.4	24	25.9	28	26	21.9	22.4	21	24
Tracers	116	102	214	188	28	17	44	32	42	72	6	60	46	104

Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	216	255	216	109	209	10	1	2	1	1	224	218	262	236
Pollen Concentration gr/gm or gr/wash	1506.4	1847.6	984.4	578.6	8303.2	560.9	20.2	51.5	18.2	11.4	36409.4	3464.3	5792.7	2019.4
Taxa Richness	13	15	9	5	9	7	1	2	1	1	9	11	10	15
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	2	8	55	0	0	0	0	0	0	0	4	0	2
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	2	3	0	0	0	0	0	0	0	0	0	0	0.001	2
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	10	0	0	0	0	0	0	0	0	0	3	0	3
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	6	0	0	0	0	0	0	0	0	0	5	0
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Brassicaceae	0	0	0	0	0	0	0	0	0	0	1	1	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	26	17	4	0	0	0	0	0	0	0	3	3	4	3
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2248	2249	2251	2252	2275	2276	2277	2278	2279	2280	2298	2316	2325	2348
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	26.4	28.9	21.9	21.4	19.2	22.4	24	25.9	28	26	21.9	22.4	21	24
Tracers	116	102	214	188	28	17	44	32	42	72	6	60	46	104
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	216	255	216	109	209	10	1	2	1	1	224	218	262	236
Pollen Concentration gr/gm or gr/wash	1506.4	1847.6	984.4	578.6	8303.2	560.9	20.2	51.5	18.2	11.4	36409.4	3464.3	5792.7	2019.4
Taxa Richness	13	15	9	5	9	7	1	2	1	1	9	11	10	15
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	16	34	52	8	2	4	0	0	0	0	70	53	122	45
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Asteraceae Hi-Spine type	22	40	30	0	17	3	0	1	0	0	10	26	38	50
Ambrosia	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Euphorbiaceae	2	2	0	0	0	0	0	0	0	0	2	0	4	7
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Onagraceae	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2248	2249	2251	2252	2275	2276	2277	2278	2279	2280	2298	2316	2325	2348
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	26.4	28.9	21.9	21.4	19.2	22.4	24	25.9	28	26	21.9	22.4	21	24
Tracers	116	102	214	188	28	17	44	32	42	72	6	60	46	104
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	216	255	216	109	209	10	1	2	1	1	224	218	262	236
Pollen Concentration gr/gm or gr/wash	1506.4	1847.6	984.4	578.6	8303.2	560.9	20.2	51.5	18.2	11.4	36409.4	3464.3	5792.7	2019.4
Taxa Richness	13	15	9	5	9	7	1	2	1	1	9	11	10	15
Nyctaginaceae	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Pinus	4	12	12	8	20	1	1	0	1	1	34	0	0	23
Pinus edulis type	4	2	8	0	51	1	0	0	0	0	66	3	8	14
Juniperus	4	9	2	0	72	1	0	1	0	0	8	3	24	5
Quercus	0	0	0	1	1	0	0	0	0	0	0	0	0	2
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Artemisia	60	42	16	5	2	0	0	0	0	0	4	7	2	21
Unknown Small Artemisia	12	0	0	0	0	0	0	0	0	0	0	0	0	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	56	72	72	32	41	0	0	0	0	0	22	102	54	46
Unknown	4	5	6	0	1	0	0	0	0	0	4	11	0	9

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2248	2249	2251	2252	2275	2276	2277	2278	2279	2280	2298	2316	2325	2348
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	26.4	28.9	21.9	21.4	19.2	22.4	24	25.9	28	26	21.9	22.4	21	24
Tracers	116	102	214	188	28	17	44	32	42	72	6	60	46	104
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	216	255	216	109	209	10	1	2	1	1	224	218	262	236
Pollen Concentration gr/gm or gr/wash	1506.4	1847.6	984.4	578.6	8303.2	560.9	20.2	51.5	18.2	11.4	36409.4	3464.3	5792.7	2019.4
Taxa Richness	13	15	9	5	9	7	1	2	1	1	9	11	10	15
Total Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2248	2249	2251	2252	2275	2276	2277	2278	2279	2280	2298	2316	2325	2348
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	26.4	28.9	21.9	21.4	19.2	22.4	24	25.9	28	26	21.9	22.4	21	24
Tracers	116	102	214	188	28	17	44	32	42	72	6	60	46	104
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	216	255	216	109	209	10	1	2	1	1	224	218	262	236
Pollen Concentration gr/gm or gr/wash	1506.4	1847.6	984.4	578.6	8303.2	560.9	20.2	51.5	18.2	11.4	36409.4	3464.3	5792.7	2019.4
Taxa Richness	13	15	9	5	9	7	1	2	1	1	9	11	10	15
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.2 (continued). Pollen counts from LA 135290.

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2398	2402	2419	2425	2449	2460	2482	2486	2487	2494	2498	2523	2550	2558
Sample Volume	20	20	16	20	20	20	20	20	20	14	20	20	20	20
Sample Weight	24.8	21	17.3	26.4	23.7	23.3	21.7	19	23.9	18.6	23.1	29.4	25.1	19.3
Tracers	15	128	88	72	112	204	10	125	138	141	62	163	64	82
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	219	212	92	242	318	255	224	226	259	226	247	241	202	277
Pollen Concentration gr/gm or gr/wash	12573.7	1684.5	1290.7	2719.2	2558.7	1145.8	22047.0	2032.4	1677.2	1840.5	3683.4	1074.1	2685.7	3738.3
Taxa Richness	13	19	7	9	9	11	10	15	11	12	9	16	11	13
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	100	20	0	0	0	4	0	9	10	0	9	2	0	0
Opuntia (Cylindro)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	3	0	0	0	1	0	0	0	0	0	0	3	0	4
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	2	0	0	0	8	0	2	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2398	2402	2419	2425	2449	2460	2482	2486	2487	2494	2498	2523	2550	2558
Sample Volume	20	20	16	20	20	20	20	20	20	14	20	20	20	20
Sample Weight	24.8	21	17.3	26.4	23.7	23.3	21.7	19	23.9	18.6	23.1	29.4	25.1	19.3
Tracers	15	128	88	72	112	204	10	125	138	141	62	163	64	82
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	219	212	92	242	318	255	224	226	259	226	247	241	202	277
Pollen Concentration gr/gm or gr/wash	12573.7	1684.5	1290.7	2719.2	2558.7	1145.8	22047.0	2032.4	1677.2	1840.5	3683.4	1074.1	2685.7	3738.3
Taxa Richness	13	19	7	9	9	11	10	15	11	12	9	16	11	13
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	1	0	0	1	1	1	1	0	2	0	1	0	1
Eriogonum	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Brassicaceae	2	1	0	0	0	0	0	0	0	1	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	14	16	0	10	9	10	4	8	26	7	15	14	9	10
Large Poaceae	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2398	2402	2419	2425	2449	2460	2482	2486	2487	2494	2498	2523	2550	2558
Sample Volume	20	20	16	20	20	20	20	20	20	14	20	20	20	20
Sample Weight	24.8	21	17.3	26.4	23.7	23.3	21.7	19	23.9	18.6	23.1	29.4	25.1	19.3
Tracers	15	128	88	72	112	204	10	125	138	141	62	163	64	82
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	219	212	92	242	318	255	224	226	259	226	247	241	202	277
Pollen Concentration gr/gm or gr/wash	12573.7	1684.5	1290.7	2719.2	2558.7	1145.8	22047.0	2032.4	1677.2	1840.5	3683.4	1074.1	2685.7	3738.3
Taxa Richness	13	19	7	9	9	11	10	15	11	12	9	16	11	13
Cheno-Am	23	51	20	82	2	16	11	57	62	45	50	15	57	58
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Asteraceae Hi-Spine type	34	24	12	26	32	34	9	20	22	46	20	32	26	12
Ambrosia	6	0	0	0	0	0	2	2	0	0	0	1	3	2
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	6	0	0	0	0	0	0	0	0	0	0	0	2	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	0	1	0	12	12	0	0	0	4	3	0	3	0	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2398	2402	2419	2425	2449	2460	2482	2486	2487	2494	2498	2523	2550	2558
Sample Volume	20	20	16	20	20	20	20	20	20	14	20	20	20	20
Sample Weight	24.8	21	17.3	26.4	23.7	23.3	21.7	19	23.9	18.6	23.1	29.4	25.1	19.3
Tracers	15	128	88	72	112	204	10	125	138	141	62	163	64	82
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	219	212	92	242	318	255	224	226	259	226	247	241	202	277
Pollen Concentration gr/gm or gr/wash	12573.7	1684.5	1290.7	2719.2	2558.7	1145.8	22047.0	2032.4	1677.2	1840.5	3683.4	1074.1	2685.7	3738.3
Taxa Richness	13	19	7	9	9	11	10	15	11	12	9	16	11	13
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	1	8
Abies	0	0	0	0	0	0	4	1	0	0	0	0	0	4
Pinus	3	7	6	28	0	28	98	36	22	4	40	29	27	64
Pinus edulis type	0	5	6	12	0	14	67	18	4	6	40	10	10	70
Juniperus	1	8	2	0	0	2	13	6	2	3	8	13	2	4
Quercus	0	2	0	2	0	0	0	1	4	1	0	1	0	2
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	1	0	0	6	0	0	1	0	0	0	1	1	0
Artemisia	14	5	13	32	195	22	8	18	36	32	20	47	41	12
Unknown Small Artemisia	0	7	1	0	0	10	0	4	2	0	0	4	0	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	11	51	30	36	54	92	7	37	64	73	42	62	21	26
Unknown	1	4	2	0	5	14	0	3	0	2	2	2	2	0
Total Aggregates	0	0	0	1	0	0	0	2	1	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2398	2402	2419	2425	2449	2460	2482	2486	2487	2494	2498	2523	2550	2558
Sample Volume	20	20	16	20	20	20	20	20	20	14	20	20	20	20
Sample Weight	24.8	21	17.3	26.4	23.7	23.3	21.7	19	23.9	18.6	23.1	29.4	25.1	19.3
Tracers	15	128	88	72	112	204	10	125	138	141	62	163	64	82
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	219	212	92	242	318	255	224	226	259	226	247	241	202	277
Pollen Concentration gr/gm or gr/wash	12573.7	1684.5	1290.7	2719.2	2558.7	1145.8	22047.0	2032.4	1677.2	1840.5	3683.4	1074.1	2685.7	3738.3
Taxa Richness	13	19	7	9	9	11	10	15	11	12	9	16	11	13
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	1(100+)	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	1(20+)	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	2(20)	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290	135290
Specimen Number	2398	2402	2419	2425	2449	2460	2482	2486	2487	2494	2498	2523	2550	2558
Sample Volume	20	20	16	20	20	20	20	20	20	14	20	20	20	20
Sample Weight	24.8	21	17.3	26.4	23.7	23.3	21.7	19	23.9	18.6	23.1	29.4	25.1	19.3
Tracers	15	128	88	72	112	204	10	125	138	141	62	163	64	82
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	219	212	92	242	318	255	224	226	259	226	247	241	202	277
Pollen Concentration gr/gm or gr/wash	12573.7	1684.5	1290.7	2719.2	2558.7	1145.8	22047.0	2032.4	1677.2	1840.5	3683.4	1074.1	2685.7	3738.3
Taxa Richness	13	19	7	9	9	11	10	15	11	12	9	16	11	13
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.3. Pollen counts from LA 135290 and LA 139418.

Site Number	135290	135290	135290	135290	139418	139418	139418	139418	139418	139418	139418	139418	139418	139418
Specimen Number	2559	2562	2579	2586	379	380	381	382	383	384	390	391	392	393
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.5	24.3	28.2	25.8	23.7	25.6	21.1	23.4	22.2	22.1	27	22	27.3	24.6
Tracers	136	22	280	92	100	64	174	16	33	450	34	254	594	68
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	244	211	211	258	271	226	244	298	287	219	303	204	285	255
Pollen Concentration gr/gm or gr/wash	1630.6	8429.7	570.7	2321.5	2442.2	2946.1	1419.4	16999.7	8367.1	470.3	7049.5	779.7	375.4	3255.8
Taxa Richness	12	11	10	12	15	10	11	15	9	10	12	9	10	11
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	3	0.001	1	0.001	0	0	0	0	0	0	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0
Opuntia (Platy)	1	0.001	0	2	0.001	0	0	0.001	3	0.001	0.001	0	0	2
Cactaceae	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Cleome	0	0	0	0	0	2	0	0	0	0	0	0	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	3	0	0	0	0	0	4	0	0	0	4	2	0	0
Eriogonum	0	0	0	0	0	0	0	0	13	0	0	0	0	0
Brassicaceae	1	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	139418	139418	139418	139418	139418	139418	139418	139418	139418	139418
Specimen Number	2559	2562	2579	2586	379	380	381	382	383	384	390	391	392	393
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.5	24.3	28.2	25.8	23.7	25.6	21.1	23.4	22.2	22.1	27	22	27.3	24.6
Tracers	136	22	280	92	100	64	174	16	33	450	34	254	594	68
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	244	211	211	258	271	226	244	298	287	219	303	204	285	255
Pollen Concentration gr/gm or gr/wash	1630.6	8429.7	570.7	2321.5	2442.2	2946.1	1419.4	16999.7	8367.1	470.3	7049.5	779.7	375.4	3255.8
Taxa Richness	12	11	10	12	15	10	11	15	9	10	12	9	10	11
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	3	10	10	24	2	6	8	8	2	24	8	2	26	20
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	76	46	18	54	62	34	16	50	157	24	32	98	36	34
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	28	37	10	18	42	54	20	54	83	24	16	36	66	52
Ambrosia	0	0	0	0	2	0	2	1	0	0	0	0	0	2
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	3	0	0	3	0	0	1	0	0	6
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	139418	139418	139418	139418	139418	139418	139418	139418	139418	139418
Specimen Number	2559	2562	2579	2586	379	380	381	382	383	384	390	391	392	393
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.5	24.3	28.2	25.8	23.7	25.6	21.1	23.4	22.2	22.1	27	22	27.3	24.6
Tracers	136	22	280	92	100	64	174	16	33	450	34	254	594	68
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	244	211	211	258	271	226	244	298	287	219	303	204	285	255
Pollen Concentration gr/gm or gr/wash	1630.6	8429.7	570.7	2321.5	2442.2	2946.1	1419.4	16999.7	8367.1	470.3	7049.5	779.7	375.4	3255.8
Taxa Richness	12	11	10	12	15	10	11	15	9	10	12	9	10	11
Euphorbiaceae	0	6	2	0	0	0	0	1	0	0	0	2	0	0
Scrophulariaceae	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Onagraceae	0	0	0	1	0	0	0	0	0.001	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	1	0	0	6	0.001	4	0.001	0	0	0	0	0	0
Pinus	28	5	36	60	4	0	30	48	0	22	24	0	21	26
Pinus edulis type	22	1	14	14	10	14	88	71	0	62	112	4	52	50
Juniperus	8	3	10	14	90	40	44	40	7	18	78	4	10	14
Quercus	2	0	0	1	2	2	0	2	0	1	2	0	3	4
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	1	0	2	6	0	1	3	0	6	0	0	0	0
Artemisia	14	44	40	33	7	1	1	9	0	2	4	2	14	0
Unknown Small Artemisia	6	0	0	0	8	0	0	0	0	0	0	4	2	0

Site Number	135290	135290	135290	135290	139418	139418	139418	139418	139418	139418	139418	139418	139418	139418
Specimen Number	2559	2562	2579	2586	379	380	381	382	383	384	390	391	392	393
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.5	24.3	28.2	25.8	23.7	25.6	21.1	23.4	22.2	22.1	27	22	27.3	24.6
Tracers	136	22	280	92	100	64	174	16	33	450	34	254	594	68
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	244	211	211	258	271	226	244	298	287	219	303	204	285	255
Pollen Concentration gr/gm or gr/wash	1630.6	8429.7	570.7	2321.5	2442.2	2946.1	1419.4	16999.7	8367.1	470.3	7049.5	779.7	375.4	3255.8
Taxa Richness	12	11	10	12	15	10	11	15	9	10	12	9	10	11
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	48	57	58	32	26	58	20	6	6	28	22	40	40	36
Unknown	4	0	10	2	0	15	6	1	3	8	0	10	14	8
Total Aggregates	0	0	0	1	0	0	0	0	12	0	0	0	0	0
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	11(20+)	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	1(12)	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	X(3)	1(4)	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	X(10)	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	135290	135290	135290	135290	139418	139418	139418	139418	139418	139418	139418	139418	139418	139418
Specimen Number	2559	2562	2579	2586	379	380	381	382	383	384	390	391	392	393
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.5	24.3	28.2	25.8	23.7	25.6	21.1	23.4	22.2	22.1	27	22	27.3	24.6
Tracers	136	22	280	92	100	64	174	16	33	450	34	254	594	68
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	244	211	211	258	271	226	244	298	287	219	303	204	285	255
Pollen Concentration gr/gm or gr/wash	1630.6	8429.7	570.7	2321.5	2442.2	2946.1	1419.4	16999.7	8367.1	470.3	7049.5	779.7	375.4	3255.8
Taxa Richness	12	11	10	12	15	10	11	15	9	10	12	9	10	11
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.4. Pollen counts from LA 139418 and LA 141505.

Site Number	139418	139418	139418	139418	139418	139418	139418	139418	141505	141505	141505	141505	141505	141505
Specimen Number	394	395	396	405	406	407	408	410	21	38	75	79	83	84
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	24.9	21.6	19.6	22.8	23.7	26.3	24.3	27.1	22.5	25.7	26.8	8.1	20	20.9
Tracers	124	578	152	30	250	368	10	228	78	78	70	214	40	86
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	326	211	203	267	106	73	3	263	297	230	227	203	228	185
Pollen Concentration gr/gm or gr/wash	2255.1	361.0	1455.3	8337.1	382.1	161.1	263.7	909.1	3614.4	2450.5	2584.4	2501.3	6087.0	2198.3
Taxa Richness	18	13	10	12	8	7	0	10	10	11	12	13	10	10
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	2	2	0	0.001	0.001	0	0	0	0.001	0	0	1	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	4	2	0	0	0	0	0	0	0	8	1	1	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	1	2	0	2	0	0	0	0	0	0	0	0	0	2
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	0	4	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	139418	139418	139418	139418	139418	139418	139418	139418	141505	141505	141505	141505	141505	141505
Specimen Number	394	395	396	405	406	407	408	410	21	38	75	79	83	84
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	24.9	21.6	19.6	22.8	23.7	26.3	24.3	27.1	22.5	25.7	26.8	8.1	20	20.9
Tracers	124	578	152	30	250	368	10	228	78	78	70	214	40	86
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	326	211	203	267	106	73	3	263	297	230	227	203	228	185
Pollen Concentration gr/gm or gr/wash	2255.1	361.0	1455.3	8337.1	382.1	161.1	263.7	909.1	3614.4	2450.5	2584.4	2501.3	6087.0	2198.3
Taxa Richness	18	13	10	12	8	7	0	10	10	11	12	13	10	10
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	12	4	19	2	5	14	0	12	10	10	6	6	0	10
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	50	48	14	38	38	4	0	34	42	38	18	22	8	3
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	22	28	8	40	8	0	0	92	40	42	26	46	20	30
Ambrosia	2	0	2	0	0	0	0	2	2	0	0	0	2	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	1	6	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	139418	139418	139418	139418	139418	139418	139418	139418	141505	141505	141505	141505	141505	141505
Specimen Number	394	395	396	405	406	407	408	410	21	38	75	79	83	84
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	24.9	21.6	19.6	22.8	23.7	26.3	24.3	27.1	22.5	25.7	26.8	8.1	20	20.9
Tracers	124	578	152	30	250	368	10	228	78	78	70	214	40	86
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	326	211	203	267	106	73	3	263	297	230	227	203	228	185
Pollen Concentration gr/gm or gr/wash	2255.1	361.0	1455.3	8337.1	382.1	161.1	263.7	909.1	3614.4	2450.5	2584.4	2501.3	6087.0	2198.3
Taxa Richness	18	13	10	12	8	7	0	10	10	11	12	13	10	10
Euphorbiaceae	0	0	0	0	0	2	0	5	0	5	0	2	0	6
Scrophulariaceae	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0.001	0	0.001	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	2	0	2	0	0	2	0	0	0	0	3	0	0	0
Pinus	20	6	42	8	4	8	0	2	18	2	62	6	20	8
Pinus edulis type	98	52	63	104	18	12	0	24	126	53	60	70	150	72
Juniperus	29	4	9	36	8	0	0	18	22	16	10	4	8	28
Quercus	4	2	4	2	2	0	0	0	0	1	1	0	1	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	4	4	0	4	0	0	0	2	2	0	4	0	0	0
Artemisia	12	0	4	4	0	1	0	6	22	10	14	10	8	0
Unknown Small Artemisia	0	0	0	0	0	0	0	0	0	0	6	1	0	0

Site Number	139418	139418	139418	139418	139418	139418	139418	139418	141505	141505	141505	141505	141505	141505
Specimen Number	394	395	396	405	406	407	408	410	21	38	75	79	83	84
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	24.9	21.6	19.6	22.8	23.7	26.3	24.3	27.1	22.5	25.7	26.8	8.1	20	20.9
Tracers	124	578	152	30	250	368	10	228	78	78	70	214	40	86
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	326	211	203	267	106	73	3	263	297	230	227	203	228	185
Pollen Concentration gr/gm or gr/wash	2255.1	361.0	1455.3	8337.1	382.1	161.1	263.7	909.1	3614.4	2450.5	2584.4	2501.3	6087.0	2198.3
Taxa Richness	18	13	10	12	8	7	0	10	10	11	12	13	10	10
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	52	40	30	18	22	30	3	60	12	34	16	28	4	22
Unknown	8	11	6	8	1	0	0	6	0	10	0	0	0	2
Total Aggregates	0	0	0	1	0	0	0	0	1	0	0	2	1	0
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	1(40+)	0	0	0	0	1(12)	0	0	2(20+)	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	139418	139418	139418	139418	139418	139418	139418	139418	141505	141505	141505	141505	141505	141505
Specimen Number	394	395	396	405	406	407	408	410	21	38	75	79	83	84
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	24.9	21.6	19.6	22.8	23.7	26.3	24.3	27.1	22.5	25.7	26.8	8.1	20	20.9
Tracers	124	578	152	30	250	368	10	228	78	78	70	214	40	86
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	326	211	203	267	106	73	3	263	297	230	227	203	228	185
Pollen Concentration gr/gm or gr/wash	2255.1	361.0	1455.3	8337.1	382.1	161.1	263.7	909.1	3614.4	2450.5	2584.4	2501.3	6087.0	2198.3
Taxa Richness	18	13	10	12	8	7	0	10	10	11	12	13	10	10
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	1(12)	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.5. Pollen counts from LA 21592 and LA 15116.

Site Number	21592	21592	21592	21592	21592	21592	21592	21592	21592	21592	21592	15116	15116	15116
Specimen Number	30.1	30.2	30.3	30.4	30.5	30.6	31	32	33	34	35	18	32	36
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	28.4	27.4	26.2	30.1	31	27.4	26.2	24.7	22.3	27.4	32.8	21.9	20.7	22.6
Tracers	18	66	148	68	252	232	236	36	89	10	616	74	620	264
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166
Pollen Sum	8	206	129	328	215	237	255	259	219	211	207	276	215	208
Pollen Concentration gr/gm or gr/wash	334.2	2433.0	710.5	3422.6	587.8	796.3	880.8	6221.0	2356.7	16447.2	218.8	6329.6	622.6	1295.7
Taxa Richness	3	12	9	13	13	15	8	12	14	19	12	14	11	14
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	0.001	0	3	0	0	0	0	0	0	2	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Opuntia (Platy)	0	0	0	0.001	0	0	0	0	0	0.001	0	0	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	2	0	0	2	1	0	1	0	0	0	0	0	2
Eriogonum	0	1	0	2	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	2	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Site Number	21592	21592	21592	21592	21592	21592	21592	21592	21592	21592	21592	15116	15116	15116
Specimen Number	30.1	30.2	30.3	30.4	30.5	30.6	31	32	33	34	35	18	32	36
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	28.4	27.4	26.2	30.1	31	27.4	26.2	24.7	22.3	27.4	32.8	21.9	20.7	22.6
Tracers	18	66	148	68	252	232	236	36	89	10	616	74	620	264
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166
Pollen Sum	8	206	129	328	215	237	255	259	219	211	207	276	215	208
Pollen Concentration gr/gm or gr/wash	334.2	2433.0	710.5	3422.6	587.8	796.3	880.8	6221.0	2356.7	16447.2	218.8	6329.6	622.6	1295.7
Taxa Richness	3	12	9	13	13	15	8	12	14	19	12	14	11	14
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	0	5	14	12	3	6	28	9	115	4	16	30	16	6
Large Poaceae	0	0	0	0	0	3	0	0	1	0	0	0	0	0
Populus	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	3	0	0	1	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	1	10	26	14	50	22	41	27	5	9	17	32	20	14
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	2	8	18	20	40	47	49	14	8	9	26	50	38	28
Ambrosia	0	0	0	0	2	2	0	2	6	6	6	2	1	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	1	0	0	0

Site Number	21592	21592	21592	21592	21592	21592	21592	21592	21592	21592	21592	15116	15116	15116
Specimen Number	30.1	30.2	30.3	30.4	30.5	30.6	31	32	33	34	35	18	32	36
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	28.4	27.4	26.2	30.1	31	27.4	26.2	24.7	22.3	27.4	32.8	21.9	20.7	22.6
Tracers	18	66	148	68	252	232	236	36	89	10	616	74	620	264
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166
Pollen Sum	8	206	129	328	215	237	255	259	219	211	207	276	215	208
Pollen Concentration gr/gm or gr/wash	334.2	2433.0	710.5	3422.6	587.8	796.3	880.8	6221.0	2356.7	16447.2	218.8	6329.6	622.6	1295.7
Taxa Richness	3	12	9	13	13	15	8	12	14	19	12	14	11	14
Euphorbiaceae	0	0	0	0	8	4	0	0	4	0	0	0	0	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0.001	1	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	1	0	0	0	0	0	0.001	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	1	0	2	0.001	0	0	0.001	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	1	0	0	0	0	0	0.001	0	0.001	0	2	0	2
Abies	0	1	0	3	0	0	0	6	1	9	0.001	1	0	2
Pinus	2	130	2	125	18	50	8	134	19	147	7	70	28	60
Pinus edulis type	0	28	6	85	9	14	18	24	8	14	2	33	44	40
Juniperus	0	7	2	24	6	10	8	15	15	0	12	14	18	16
Quercus	0	0	2	2	0	2	0	4	2	1	0	3	4	4
Rhus type	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Ephedra	0	2	0	0	2	2	0	0	0	1	0	8	2	6
Artemisia	0	1	0	2	2	4	12	2	2	4	8	10	10	12
Unknown Small Artemisia	0	0	0	0	0	0	0	0	0	0	2	0	0	0

Site Number	21592	21592	21592	21592	21592	21592	21592	21592	21592	21592	21592	15116	15116	15116
Specimen Number	30.1	30.2	30.3	30.4	30.5	30.6	31	32	33	34	35	18	32	36
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	28.4	27.4	26.2	30.1	31	27.4	26.2	24.7	22.3	27.4	32.8	21.9	20.7	22.6
Tracers	18	66	148	68	252	232	236	36	89	10	616	74	620	264
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166
Pollen Sum	8	206	129	328	215	237	255	259	219	211	207	276	215	208
Pollen Concentration gr/gm or gr/wash	334.2	2433.0	710.5	3422.6	587.8	796.3	880.8	6221.0	2356.7	16447.2	218.8	6329.6	622.6	1295.7
Taxa Richness	3	12	9	13	13	15	8	12	14	19	12	14	11	14
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	1	0	0	0	0	0	0.001	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	3	8	56	36	68	62	82	21	21	1	104	14	24	6
Unknown	0	1	2	1	0	6	6	0	2	1	5	3	8	8
Total Aggregates	0	1	0	0	0	1	0	0	9	1	0	0	1	0
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	1(12+)	0	0	0	0
Grass Aggregates	0	0	0	0	0	1(6)	0	0	9(10)	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	1(100+)	0	0	0	0	0	0	0	0	0	0	1(20+)	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	21592	21592	21592	21592	21592	21592	21592	21592	21592	21592	21592	15116	15116	15116
Specimen Number	30.1	30.2	30.3	30.4	30.5	30.6	31	32	33	34	35	18	32	36
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	28.4	27.4	26.2	30.1	31	27.4	26.2	24.7	22.3	27.4	32.8	21.9	20.7	22.6
Tracers	18	66	148	68	252	232	236	36	89	10	616	74	620	264
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166
Pollen Sum	8	206	129	328	215	237	255	259	219	211	207	276	215	208
Pollen Concentration gr/gm or gr/wash	334.2	2433.0	710.5	3422.6	587.8	796.3	880.8	6221.0	2356.7	16447.2	218.8	6329.6	622.6	1295.7
Taxa Richness	3	12	9	13	13	15	8	12	14	19	12	14	11	14
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.6. Pollen counts from LA 15116, LA 70025, LA 85403, LA 85404, and LA 85407.

Site Number	15116	70025	70025	85403	85403	85403	85403	85403	85404	85404	85404	85404	85404	85407
Specimen Number	39	22	23	28	35	50	51	54	70	73	90	95	96	299
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	18.2	18.1	18.9	17.4	20.6	22.5	23.5	20.6	22.1	23.5	22.4	21.5	20	15.7
Tracers	442	898	486	112	470	109	400	228	520	180	390	286	280	45
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	205	226	227	195	275	14	211	279	196	200	260	113	117	208
Pollen Concentration gr/gm or gr/wash	947.1	516.8	918.5	3718.9	1055.6	212.2	834.3	2207.7	633.9	1757.3	1106.1	683.0	776.5	10942.0
Taxa Richness	11	13	12	9	13	1	12	10	12	10	14	8	6	11
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0
Zea mays	0	1	6	0	0	0	0	0	0	0	8	1	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	0	0	1	0	0	5	0	0	0	0	0	0
cf. Helianthus	0	0	1	0	0	0	0	0	0	0	0	0	0	5
Liliaceae	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	2	0	1	0	0	0	0	0	0	0	0	0	0	1
Eriogonum	0	0	0	0	1	0	0	0	0	0	2	0	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	1	0	0	0	0	0	0	0

Site Number	15116	70025	70025	85403	85403	85403	85403	85403	85404	85404	85404	85404	85404	85407
Specimen Number	39	22	23	28	35	50	51	54	70	73	90	95	96	299
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	18.2	18.1	18.9	17.4	20.6	22.5	23.5	20.6	22.1	23.5	22.4	21.5	20	15.7
Tracers	442	898	486	112	470	109	400	228	520	180	390	286	280	45
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	205	226	227	195	275	14	211	279	196	200	260	113	117	208
Pollen Concentration gr/gm or gr/wash	947.1	516.8	918.5	3718.9	1055.6	212.2	834.3	2207.7	633.9	1757.3	1106.1	683.0	776.5	10942.0
Taxa Richness	11	13	12	9	13	1	12	10	12	10	14	8	6	11
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	26	16	10	6	28	0	18	10	52	23	40	22	24	12
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	30	24	46	30	60	0	26	68	34	8	36	12	22	65
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	24	33	22	40	56	3	34	74	28	26	20	18	18	13
Ambrosia	2	4	0	0	2	0	0	0	2	2	1	0	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	15116	70025	70025	85403	85403	85403	85403	85403	85404	85404	85404	85404	85404	85407
Specimen Number	39	22	23	28	35	50	51	54	70	73	90	95	96	299
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	18.2	18.1	18.9	17.4	20.6	22.5	23.5	20.6	22.1	23.5	22.4	21.5	20	15.7
Tracers	442	898	486	112	470	109	400	228	520	180	390	286	280	45
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	205	226	227	195	275	14	211	279	196	200	260	113	117	208
Pollen Concentration gr/gm or gr/wash	947.1	516.8	918.5	3718.9	1055.6	212.2	834.3	2207.7	633.9	1757.3	1106.1	683.0	776.5	10942.0
Taxa Richness	11	13	12	9	13	1	12	10	12	10	14	8	6	11
Euphorbiaceae	0	0	7	0	4	0	1	0	0	0	6	0	0	0
Scrophulariaceae	0	0	0	1	1	0	0	1	1	0	1	2	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	2	2	0	0	0	1	0	0	2	0	0	0	5
Pinus	44	52	64	38	6	0	55	8	14	70	8	3	0	43
Pinus edulis type	33	22	8	58	4	0	18	6	8	46	14	18	18	40
Juniperus	10	10	4	11	14	0	2	6	2	4	12	0	2	8
Quercus	4	6	0	0	0	0	1	0	0	0	0	0	0	1
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	2	2	0	0	4	0	4	2	4	2	2	0	0	0
Artemisia	12	6	18	2	18	0	26	24	4	6	32	22	12	8
Unknown Small Artemisia	0	0	0	0	0	0	0	0	8	0	15	0	0	0

Site Number	15116	70025	70025	85403	85403	85403	85403	85403	85404	85404	85404	85404	85404	85407
Specimen Number	39	22	23	28	35	50	51	54	70	73	90	95	96	299
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	18.2	18.1	18.9	17.4	20.6	22.5	23.5	20.6	22.1	23.5	22.4	21.5	20	15.7
Tracers	442	898	486	112	470	109	400	228	520	180	390	286	280	45
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	205	226	227	195	275	14	211	279	196	200	260	113	117	208
Pollen Concentration gr/gm or gr/wash	947.1	516.8	918.5	3718.9	1055.6	212.2	834.3	2207.7	633.9	1757.3	1106.1	683.0	776.5	10942.0
Taxa Richness	11	13	12	9	13	1	12	10	12	10	14	8	6	11
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	14	38	28	6	70	11	22	62	34	10	54	10	18	6
Unknown	2	7	9	2	6	0	1	13	4	0	8	4	3	0
Total Aggregates	0	1	1	0	0	0	1	0	1	1	1	1	0	1
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	1(20+)
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	1(12)	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	1(6)	0	1(8)	1(8)	0	0
Maize Aggregates	0	X(6)	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	1(10+)	1(20+)	0	0	0	1(20+)	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	15116	70025	70025	85403	85403	85403	85403	85403	85404	85404	85404	85404	85404	85407
Specimen Number	39	22	23	28	35	50	51	54	70	73	90	95	96	299
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	18.2	18.1	18.9	17.4	20.6	22.5	23.5	20.6	22.1	23.5	22.4	21.5	20	15.7
Tracers	442	898	486	112	470	109	400	228	520	180	390	286	280	45
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	205	226	227	195	275	14	211	279	196	200	260	113	117	208
Pollen Concentration gr/gm or gr/wash	947.1	516.8	918.5	3718.9	1055.6	212.2	834.3	2207.7	633.9	1757.3	1106.1	683.0	776.5	10942.0
Taxa Richness	11	13	12	9	13	1	12	10	12	10	14	8	6	11
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.7. Pollen counts from LA 85407, LA 85408, and LA 85411.

Site Number	85407	85407	85407	85407	85407	85407	85407	85408	85408	85408	85411	85411	85411	85411
Specimen Number	302	329	330	358	390	391	490	11	66	77	31	127	173	174
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.5	19.7	21.6	21.4	18	15.7	18.3	21.6	23.2	19.8	20.5	18.8	23.7	18.3
Tracers	50	128	173	41	47	33	129	322	223	452	166	302	36	339
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	202	235	254	244	243	209	217	105	230	218	232	232	290	207
Pollen Concentration gr/gm or gr/wash	7700.0	3463.7	2526.3	10335.7	10675.3	14992.7	3416.4	561.1	1652.3	905.3	2533.8	1518.7	12632.6	1240.1
Taxa Richness	10	11	10	10	10	13	12	9	15	9	11	10	12	13
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	1	0	0	0	0	0	1	0	2	0	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	0	0	0	0	0	1	1	0	0	0	0	0	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	0	0	0	0	3	0	0	0	0	0	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	0	0	0	0	0	2	0	2	0	1
Eriogonum	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85407	85407	85407	85407	85407	85407	85407	85408	85408	85408	85411	85411	85411	85411
Specimen Number	302	329	330	358	390	391	490	11	66	77	31	127	173	174
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.5	19.7	21.6	21.4	18	15.7	18.3	21.6	23.2	19.8	20.5	18.8	23.7	18.3
Tracers	50	128	173	41	47	33	129	322	223	452	166	302	36	339
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	202	235	254	244	243	209	217	105	230	218	232	232	290	207
Pollen Concentration gr/gm or gr/wash	7700.0	3463.7	2526.3	10335.7	10675.3	14992.7	3416.4	561.1	1652.3	905.3	2533.8	1518.7	12632.6	1240.1
Taxa Richness	10	11	10	10	10	13	12	9	15	9	11	10	12	13
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	4	3	16	1	0	4	1	8	15	14	0	18	4	10
Large Poaceae	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	81	33	77	47	75	40	52	12	15	2	36	14	12	21
Fabaceae	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Asteraceae Hi-Spine type	18	23	38	21	29	20	25	14	25	0	20	30	8	20
Ambrosia	0	0	0	0	0	2	1	0	1	0	0	2	0	3
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	1	0	0	1	0	0	0	0	0	0	0	0	0

Site Number	85407	85407	85407	85407	85407	85407	85407	85408	85408	85408	85411	85411	85411	85411
Specimen Number	302	329	330	358	390	391	490	11	66	77	31	127	173	174
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.5	19.7	21.6	21.4	18	15.7	18.3	21.6	23.2	19.8	20.5	18.8	23.7	18.3
Tracers	50	128	173	41	47	33	129	322	223	452	166	302	36	339
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	202	235	254	244	243	209	217	105	230	218	232	232	290	207
Pollen Concentration gr/gm or gr/wash	7700.0	3463.7	2526.3	10335.7	10675.3	14992.7	3416.4	561.1	1652.3	905.3	2533.8	1518.7	12632.6	1240.1
Taxa Richness	10	11	10	10	10	13	12	9	15	9	11	10	12	13
Euphorbiaceae	0	0	5	0	0	3	0	1	0	2	0	2	2	5
Scrophulariaceae	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0.001	0
Picea	0	1	0	0	1	1	0	0	1	0	0	0	1	0
Abies	0	2	0	4	4	1	3	0	1	0	1	0	7	1
Pinus	25	92	26	81	70	66	62	12	71	75	70	56	122	36
Pinus edulis type	33	68	51	70	17	29	39	8	27	48	72	38	71	28
Juniperus	11	6	18	6	31	21	2	6	0	6	1	0	9	7
Quercus	2	0	0	0	0	0	0	2	8	2	2	2	9	5
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	1	0	1	2	1	3	0	2	0	0	0	0	2
Artemisia	7	0	6	4	4	2	2	8	24	22	6	18	0	26
Unknown Small Artemisia	0	0	0	0	0	0	0	0	0	0	6	0	0	0

Site Number	85407	85407	85407	85407	85407	85407	85407	85408	85408	85408	85411	85411	85411	85411
Specimen Number	302	329	330	358	390	391	490	11	66	77	31	127	173	174
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.5	19.7	21.6	21.4	18	15.7	18.3	21.6	23.2	19.8	20.5	18.8	23.7	18.3
Tracers	50	128	173	41	47	33	129	322	223	452	166	302	36	339
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	202	235	254	244	243	209	217	105	230	218	232	232	290	207
Pollen Concentration gr/gm or gr/wash	7700.0	3463.7	2526.3	10335.7	10675.3	14992.7	3416.4	561.1	1652.3	905.3	2533.8	1518.7	12632.6	1240.1
Taxa Richness	10	11	10	10	10	13	12	9	15	9	11	10	12	13
Sarcobatus	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	10	3	14	5	6	18	20	34	33	45	14	48	36	40
Unknown	8	1	0	0	2	0	3	0	3	0	0	2	8	2
Total Aggregates	2	0	1	3	1	0	0	0	0	0	1	0	0	0
Cheno-Am Aggregates	0	0	1(6)	0	0	0	0	0	0	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	1(10)	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	2(12)	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	2(10)	0	0	0	0	0	0	1(12+)	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85407	85407	85407	85407	85407	85407	85407	85408	85408	85408	85411	85411	85411	85411
Specimen Number	302	329	330	358	390	391	490	11	66	77	31	127	173	174
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.5	19.7	21.6	21.4	18	15.7	18.3	21.6	23.2	19.8	20.5	18.8	23.7	18.3
Tracers	50	128	173	41	47	33	129	322	223	452	166	302	36	339
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	202	235	254	244	243	209	217	105	230	218	232	232	290	207
Pollen Concentration gr/gm or gr/wash	7700.0	3463.7	2526.3	10335.7	10675.3	14992.7	3416.4	561.1	1652.3	905.3	2533.8	1518.7	12632.6	1240.1
Taxa Richness	10	11	10	10	10	13	12	9	15	9	11	10	12	13
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	1(8)	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.8. Pollen counts from LA 85411, LA 85413, LA 85414, LA 85417, and LA 85859.

Site Number	85411	85411	85411	85413	85413	85413	85413	85414	85414	85417	85417	85417	85859	85859
Specimen Number	175	177	180	9	61	222	223	43	44	123	148	149	107	122
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	25.4	24.5	19.7	21.4	25.8	22.2	22.8	20.8	22.2	18.6	21.6	24.5	26.6	27.3
Tracers	300	408	442	32	28	262	189	108	106	900	462	262	13	10
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	21358	21358
Pollen Sum	307	232	244	276	231	262	250	218	233	228	236	247	2	1
Pollen Concentration gr/gm or gr/wash	1497.4	862.6	1041.5	14979.3	11884.5	1674.1	2156.2	3606.7	3680.0	506.2	878.9	1430.1	123.5	78.2
Taxa Richness	13	10	10	9	16	11	15	10	11	7	10	11	0	1
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	0	0.001	3	0	0	0	0	0	4	0	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	0	0	10	10	4	0	0	0	0	0	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	18	0	0	0	1	0	0	0	0	0	0	0	0	0
Eriogonum	0	0	0	0	0	0	1	0	0	0	0	2	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85411	85411	85411	85413	85413	85413	85413	85414	85414	85417	85417	85417	85859	85859
Specimen Number	175	177	180	9	61	222	223	43	44	123	148	149	107	122
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	25.4	24.5	19.7	21.4	25.8	22.2	22.8	20.8	22.2	18.6	21.6	24.5	26.6	27.3
Tracers	300	408	442	32	28	262	189	108	106	900	462	262	13	10
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	21358	21358
Pollen Sum	307	232	244	276	231	262	250	218	233	228	236	247	2	1
Pollen Concentration gr/gm or gr/wash	1497.4	862.6	1041.5	14979.3	11884.5	1674.1	2156.2	3606.7	3680.0	506.2	878.9	1430.1	123.5	78.2
Taxa Richness	13	10	10	9	16	11	15	10	11	7	10	11	0	1
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	14	3	36	0	13	10	19	18	4	46	18	20	0	0
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	24	12	18	30	26	34	24	36	64	30	16	26	0	0
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	54	35	20	6	35	39	50	34	56	48	40	50	0	0
Ambrosia	2	2	2	2	1	4	1	6	0	0	2	2	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Site Number	85411	85411	85411	85413	85413	85413	85413	85414	85414	85417	85417	85417	85859	85859
Specimen Number	175	177	180	9	61	222	223	43	44	123	148	149	107	122
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	25.4	24.5	19.7	21.4	25.8	22.2	22.8	20.8	22.2	18.6	21.6	24.5	26.6	27.3
Tracers	300	408	442	32	28	262	189	108	106	900	462	262	13	10
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	21358	21358
Pollen Sum	307	232	244	276	231	262	250	218	233	228	236	247	2	1
Pollen Concentration gr/gm or gr/wash	1497.4	862.6	1041.5	14979.3	11884.5	1674.1	2156.2	3606.7	3680.0	506.2	878.9	1430.1	123.5	78.2
Taxa Richness	13	10	10	9	16	11	15	10	11	7	10	11	0	1
Euphorbiaceae	0	0	3	0	10	8	1	0	2	0	4	10	0	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0.001	0	0	0	0	0	0	0.001	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	1	0	1	0	0	0	0	0
Abies	2	0	0	4	0	0	0	0	0.001	0	0	0	0	0
Pinus	62	14	56	120	22	30	41	30	16	14	42	26	0	1
Pinus edulis type	48	28	24	86	39	28	17	26	18	4	30	14	0	0
Juniperus	12	0	6	16	17	34	17	22	24	16	8	10	0	0
Quercus	12	2	10	0	0	0	2	2	1	0	0	0	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Ephedra	2	0	0	0	0	2	0	2	0	0	0	0	0	0
Artemisia	6	32	18	4	13	26	40	10	16	20	18	46	0	0
Unknown Small Artemisia	0	18	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85411	85411	85411	85413	85413	85413	85413	85414	85414	85417	85417	85417	85859	85859
Specimen Number	175	177	180	9	61	222	223	43	44	123	148	149	107	122
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	25.4	24.5	19.7	21.4	25.8	22.2	22.8	20.8	22.2	18.6	21.6	24.5	26.6	27.3
Tracers	300	408	442	32	28	262	189	108	106	900	462	262	13	10
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	21358	21358
Pollen Sum	307	232	244	276	231	262	250	218	233	228	236	247	2	1
Pollen Concentration gr/gm or gr/wash	1497.4	862.6	1041.5	14979.3	11884.5	1674.1	2156.2	3606.7	3680.0	506.2	878.9	1430.1	123.5	78.2
Taxa Richness	13	10	10	9	16	11	15	10	11	7	10	11	0	1
Sarcobatus	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	36	66	42	8	35	28	26	32	30	44	54	34	2	0
Unknown	14	19	8	0	1	8	4	0	1	6	0	7	0	0
Total Aggregates	0	0	1	0	2	1	0	0	0	0	0	0	0	0
Cheno-Am Aggregates	0	0	0	0	1(20+)	0	0	0	0	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	1(6)	0	1(8)	1(4)	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85411	85411	85411	85413	85413	85413	85413	85414	85414	85417	85417	85417	85859	85859
Specimen Number	175	177	180	9	61	222	223	43	44	123	148	149	107	122
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	25.4	24.5	19.7	21.4	25.8	22.2	22.8	20.8	22.2	18.6	21.6	24.5	26.6	27.3
Tracers	300	408	442	32	28	262	189	108	106	900	462	262	13	10
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	21358	21358
Pollen Sum	307	232	244	276	231	262	250	218	233	228	236	247	2	1
Pollen Concentration gr/gm or gr/wash	1497.4	862.6	1041.5	14979.3	11884.5	1674.1	2156.2	3606.7	3680.0	506.2	878.9	1430.1	123.5	78.2
Taxa Richness	13	10	10	9	16	11	15	10	11	7	10	11	0	1
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.9. Pollen counts from LA 85859.

Site Number	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859
Specimen Number	135	142	180	329	333	334	335	336	337	338	339	340	341	342
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.7	19.4	21.5	23.1	24.6	18.8	20.9	21.1	21.3	26.7	20.2	22.7	23.3	22.2
Tracers	380	24	273	55	12	10	240	232	46	14	40	290	6	154
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	107	1	215	3	243	2	113	114	15	3	0	138	1	88
Pollen Concentration gr/gm or gr/wash	264.9	45.9	782.3	50.4	17581.3	227.2	481.2	497.4	327.0	171.4	0.0	447.7	152.8	549.8
Taxa Richness	7	1	8	1	12	3	7	6	1	2	0	5	1	6
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	2	0	0	0	0	4	0	0	0	0	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859
Specimen Number	135	142	180	329	333	334	335	336	337	338	339	340	341	342
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.7	19.4	21.5	23.1	24.6	18.8	20.9	21.1	21.3	26.7	20.2	22.7	23.3	22.2
Tracers	380	24	273	55	12	10	240	232	46	14	40	290	6	154
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	107	1	215	3	243	2	113	114	15	3	0	138	1	88
Pollen Concentration gr/gm or gr/wash	264.9	45.9	782.3	50.4	17581.3	227.2	481.2	497.4	327.0	171.4	0.0	447.7	152.8	549.8
Taxa Richness	7	1	8	1	12	3	7	6	1	2	0	5	1	6
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	1	0	12	0	9	0	0	22	0	0	0	0	0	4
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	12	0	28	0	19	2	26	18	0	2	0	22	0	6
Fabaceae	0	0	0	0	0	0.001	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	0	0	52	0	40	0	14	16	0	0	0	10	0	12
Ambrosia	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859
Specimen Number	135	142	180	329	333	334	335	336	337	338	339	340	341	342
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.7	19.4	21.5	23.1	24.6	18.8	20.9	21.1	21.3	26.7	20.2	22.7	23.3	22.2
Tracers	380	24	273	55	12	10	240	232	46	14	40	290	6	154
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	107	1	215	3	243	2	113	114	15	3	0	138	1	88
Pollen Concentration gr/gm or gr/wash	264.9	45.9	782.3	50.4	17581.3	227.2	481.2	497.4	327.0	171.4	0.0	447.7	152.8	549.8
Taxa Richness	7	1	8	1	12	3	7	6	1	2	0	5	1	6
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	0	0	0	0	1	0	4	0	0	0	0	0	0	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Pinus	14	1	14	0.001	131	0.001	10	0	0	0	0	2	0	0
Pinus edulis type	9	0	0	0	4	0	7	2	0	0	0	6	0	8
Juniperus	10	0	5	0	29	0	10	2	0	0	0	2	1	2
Quercus	0	0	0	0	2	0	0	0	0	0	0	0	0	0

Site Number	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859
Specimen Number	135	142	180	329	333	334	335	336	337	338	339	340	341	342
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.7	19.4	21.5	23.1	24.6	18.8	20.9	21.1	21.3	26.7	20.2	22.7	23.3	22.2
Tracers	380	24	273	55	12	10	240	232	46	14	40	290	6	154
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	107	1	215	3	243	2	113	114	15	3	0	138	1	88
Pollen Concentration gr/gm or gr/wash	264.9	45.9	782.3	50.4	17581.3	227.2	481.2	497.4	327.0	171.4	0.0	447.7	152.8	549.8
Taxa Richness	7	1	8	1	12	3	7	6	1	2	0	5	1	6
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Artemisia	4	0	38	0	2	0	0	0	3	1	0	0	0	2
Unknown Small Artemisia	0	0	5	0	0	0	0	0	0	0	0	0	0	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	56	0	46	3	2	0	40	48	12	0	0	96	0	50
Unknown	0	0	13	0	0	0	0	2	0	0	0	0	0	4
Total Aggregates	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	1(8)	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859	85859
Specimen Number	135	142	180	329	333	334	335	336	337	338	339	340	341	342
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.7	19.4	21.5	23.1	24.6	18.8	20.9	21.1	21.3	26.7	20.2	22.7	23.3	22.2
Tracers	380	24	273	55	12	10	240	232	46	14	40	290	6	154
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	107	1	215	3	243	2	113	114	15	3	0	138	1	88
Pollen Concentration gr/gm or gr/wash	264.9	45.9	782.3	50.4	17581.3	227.2	481.2	497.4	327.0	171.4	0.0	447.7	152.8	549.8
Taxa Richness	7	1	8	1	12	3	7	6	1	2	0	5	1	6
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.10. Pollen counts from LA 85859, LA 85861, LA 85864, LA 85867, and LA 85869.

Site Number	85859	85859	85859	85861	85861	85861	85864	85864	85867	85867	85867	85867	85869	85869
Specimen Number	356	357	358	173	184	195	3	8	66	75	76	77	249	252
Sample Volume	20	20	20	20	20	5	20	20	20	20	20	20	20	20
Sample Weight	20.7	18.7	22.4	20.7	17.9	8.3	16.9	15.8	22.1	22.1	24.6	22.2	22.0	22.5
Tracers	327	17	25	774	1230	634	48	126	277	90	168	32	8	10
Tracer Conc.	21358	21358	21358	37166	37166	37166	21358	21358	37166	37166	37166	37166	21358	21358
Pollen Sum	224	3	6	236	203	209	294	277	211	308	269	257	275	232
Pollen Concentration gr/gm or gr/wash	706.8	201.6	228.8	547.5	342.7	1476.1	7740.7	2971.8	1281.0	5755.2	2419.1	13445.5	33371.9	22022.5
Taxa Richness	11	1	1	8	11	10	12	9	15	10	11	17	10	7
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	0	0	0	12	0	0	0.001	0	0	0	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0
Cleome	0	0	0	0	2	0	0	0	3	0	1	1	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	3	0	0.001	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0
Rosaceae	0	0	0	2	0	0	2	0	0	0	0	2	0	0
Eriogonum	0	0	0	0	0	2	0	0	0	0	4	7	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	8	20	7	0	0
cf. Astragalus	0	0	0	0	1	0	0	0	1	43	0	9	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85859	85859	85859	85861	85861	85861	85864	85864	85867	85867	85867	85867	85869	85869
Specimen Number	356	357	358	173	184	195	3	8	66	75	76	77	249	252
Sample Volume	20	20	20	20	20	5	20	20	20	20	20	20	20	20
Sample Weight	20.7	18.7	22.4	20.7	17.9	8.3	16.9	15.8	22.1	22.1	24.6	22.2	22.0	22.5
Tracers	327	17	25	774	1230	634	48	126	277	90	168	32	8	10
Tracer Conc.	21358	21358	21358	37166	37166	37166	21358	21358	37166	37166	37166	37166	21358	21358
Pollen Sum	224	3	6	236	203	209	294	277	211	308	269	257	275	232
Pollen Concentration gr/gm or gr/wash	706.8	201.6	228.8	547.5	342.7	1476.1	7740.7	2971.8	1281.0	5755.2	2419.1	13445.5	33371.9	22022.5
Taxa Richness	11	1	1	8	11	10	12	9	15	10	11	17	10	7
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	10	0	0	28	23	20	18	3	8	0	4	1	1	18
Large Poaceae	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Cheno-Am	30	0	0	16	36	72	14	26	43	190	104	163	11	10
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	22	0	0	40	28	24	10	8	32	30	44	39	6	16
Ambrosia	4	0	0	0	3	2	2	0	1	0	0	0	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85859	85859	85859	85861	85861	85861	85864	85864	85867	85867	85867	85867	85869	85869
Specimen Number	356	357	358	173	184	195	3	8	66	75	76	77	249	252
Sample Volume	20	20	20	20	20	5	20	20	20	20	20	20	20	20
Sample Weight	20.7	18.7	22.4	20.7	17.9	8.3	16.9	15.8	22.1	22.1	24.6	22.2	22.0	22.5
Tracers	327	17	25	774	1230	634	48	126	277	90	168	32	8	10
Tracer Conc.	21358	21358	21358	37166	37166	37166	21358	21358	37166	37166	37166	37166	21358	21358
Pollen Sum	224	3	6	236	203	209	294	277	211	308	269	257	275	232
Pollen Concentration gr/gm or gr/wash	706.8	201.6	228.8	547.5	342.7	1476.1	7740.7	2971.8	1281.0	5755.2	2419.1	13445.5	33371.9	22022.5
Taxa Richness	11	1	1	8	11	10	12	9	15	10	11	17	10	7
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	2	0	0	0	1	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	4	0	4	0	0
Euphorbiaceae	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0.001	0	0	1	0	0	1	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	0	0	0	0	0	2	0	0	0	0	0	3	0
Pinus	58	1	0	0	2	1	70	70	15	3	6	2	44	58
Pinus edulis type	50	0	1	14	4	2	102	108	15	2	2	0	160	40
Juniperus	10	0	0	6	4	0	42	18	6	3	4	2	37	42
Quercus	0	0	0	2	0	0	8	5	2	0	0	0	1	0

Site Number	85859	85859	85859	85861	85861	85861	85864	85864	85867	85867	85867	85867	85869	85869
Specimen Number	356	357	358	173	184	195	3	8	66	75	76	77	249	252
Sample Volume	20	20	20	20	20	5	20	20	20	20	20	20	20	20
Sample Weight	20.7	18.7	22.4	20.7	17.9	8.3	16.9	15.8	22.1	22.1	24.6	22.2	22.0	22.5
Tracers	327	17	25	774	1230	634	48	126	277	90	168	32	8	10
Tracer Conc.	21358	21358	21358	37166	37166	37166	21358	21358	37166	37166	37166	37166	21358	21358
Pollen Sum	224	3	6	236	203	209	294	277	211	308	269	257	275	232
Pollen Concentration gr/gm or gr/wash	706.8	201.6	228.8	547.5	342.7	1476.1	7740.7	2971.8	1281.0	5755.2	2419.1	13445.5	33371.9	22022.5
Taxa Richness	11	1	1	8	11	10	12	9	15	10	11	17	10	7
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	6	0	0	0	0	0	0	0	0	0	0	2	1	2
Artemisia	4	0	0	16	4	6	4	16	9	3	22	0	5	0
Unknown Small Artemisia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	26	2	5	106	88	64	16	22	64	12	48	8	5	46
Unknown	2	0	0	6	6	4	3	0	8	1	8	2	0	0
Total Aggregates	0	0	0	0	0	0	0	0	1	6	1	7	1	0
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	0	6(100+)	1(6)	4(50+)	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85859	85859	85859	85861	85861	85861	85864	85864	85867	85867	85867	85867	85869	85869
Specimen Number	356	357	358	173	184	195	3	8	66	75	76	77	249	252
Sample Volume	20	20	20	20	20	5	20	20	20	20	20	20	20	20
Sample Weight	20.7	18.7	22.4	20.7	17.9	8.3	16.9	15.8	22.1	22.1	24.6	22.2	22.0	22.5
Tracers	327	17	25	774	1230	634	48	126	277	90	168	32	8	10
Tracer Conc.	21358	21358	21358	37166	37166	37166	21358	21358	37166	37166	37166	37166	21358	21358
Pollen Sum	224	3	6	236	203	209	294	277	211	308	269	257	275	232
Pollen Concentration gr/gm or gr/wash	706.8	201.6	228.8	547.5	342.7	1476.1	7740.7	2971.8	1281.0	5755.2	2419.1	13445.5	33371.9	22022.5
Taxa Richness	11	1	1	8	11	10	12	9	15	10	11	17	10	7
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	1(20+)	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	1(20+)	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	X(20+)	1(10+)	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	2(100+)	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	X(20+)	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	X(12+)	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.11. Pollen counts from LA 85869 and LA 86605.

Site Number	85869	85869	85869	85869	85869	85869	85869	85869	85869	85869	85869	86605	86605	86605
Specimen Number	254	263	271	282	287	294	307	308	314	320	329	39	44	46
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.3	27.3	20.5	33.0	24.5	25.6	23.2	22.4	27.5	26.6	24.1	22.5	18.1	24.5
Tracers	34	70	54	16	30	44	62	48	26	58	36	182	1104	225
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166
Pollen Sum	367	273	264	230	220	240	308	279	247	251	200	225	224	252
Pollen Concentration gr/gm or gr/wash	10338.2	3051.1	5093.5	9303.7	6392.9	4550.7	4573.3	5542.1	7378.2	3474.8	4923.5	2042.1	416.6	1699.0
Taxa Richness	10	12	8	11	9	14	7	10	10	12	8	10	13	14
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Opuntia (Platy)	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	0	0	0	0	0	0	0	0	0	0	3	0
cf. Helianthus	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	8	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	0	0	4	0	1	0	1	0	0	0
Eriogonum	0	0	0	0	0	0	0	8	0	0	0	0	0	0
Brassicaceae	0	0	4	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85869	85869	85869	85869	85869	85869	85869	85869	85869	85869	85869	86605	86605	86605
Specimen Number	254	263	271	282	287	294	307	308	314	320	329	39	44	46
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.3	27.3	20.5	33.0	24.5	25.6	23.2	22.4	27.5	26.6	24.1	22.5	18.1	24.5
Tracers	34	70	54	16	30	44	62	48	26	58	36	182	1104	225
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166
Pollen Sum	367	273	264	230	220	240	308	279	247	251	200	225	224	252
Pollen Concentration gr/gm or gr/wash	10338.2	3051.1	5093.5	9303.7	6392.9	4550.7	4573.3	5542.1	7378.2	3474.8	4923.5	2042.1	416.6	1699.0
Taxa Richness	10	12	8	11	9	14	7	10	10	12	8	10	13	14
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	14	18	6	15	8	6	20	26	21	31	19	2	20	6
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	34	10	18	14	26	10	40	54	14	22	36	22	39	19
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	30	35	18	23	80	80	76	40	52	18	15	55	60	18
Ambrosia	0	3	0	2	3	4	0	6	0	2	0	6	0	4
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85869	85869	85869	85869	85869	85869	85869	85869	85869	85869	85869	86605	86605	86605
Specimen Number	254	263	271	282	287	294	307	308	314	320	329	39	44	46
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.3	27.3	20.5	33.0	24.5	25.6	23.2	22.4	27.5	26.6	24.1	22.5	18.1	24.5
Tracers	34	70	54	16	30	44	62	48	26	58	36	182	1104	225
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166
Pollen Sum	367	273	264	230	220	240	308	279	247	251	200	225	224	252
Pollen Concentration gr/gm or gr/wash	10338.2	3051.1	5093.5	9303.7	6392.9	4550.7	4573.3	5542.1	7378.2	3474.8	4923.5	2042.1	416.6	1699.0
Taxa Richness	10	12	8	11	9	14	7	10	10	12	8	10	13	14
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	0	8	0	0	0	2	0	0	0	7	0	12	2	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Abies	1	0	0	3	0	8	0	0	0	1	0	0	0	5
Pinus	144	24	82	82	8	26	0	10	15	56	4	34	16	91
Pinus edulis type	86	25	66	7	6	26	0	18	13	52	24	28	18	57
Juniperus	30	60	30	71	32	16	22	48	60	26	57	12	10	16
Quercus	4	5	4	2	14	1	8	1	14	9	0	6	0	1

Site Number	85869	85869	85869	85869	85869	85869	85869	85869	85869	85869	85869	86605	86605	86605
Specimen Number	254	263	271	282	287	294	307	308	314	320	329	39	44	46
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.3	27.3	20.5	33.0	24.5	25.6	23.2	22.4	27.5	26.6	24.1	22.5	18.1	24.5
Tracers	34	70	54	16	30	44	62	48	26	58	36	182	1104	225
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166
Pollen Sum	367	273	264	230	220	240	308	279	247	251	200	225	224	252
Pollen Concentration gr/gm or gr/wash	10338.2	3051.1	5093.5	9303.7	6392.9	4550.7	4573.3	5542.1	7378.2	3474.8	4923.5	2042.1	416.6	1699.0
Taxa Richness	10	12	8	11	9	14	7	10	10	12	8	10	13	14
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	2	0	0	0	0	0	0	1	0	0	0	2	1
Artemisia	3	14	0	4	9	35	54	36	30	16	13	14	8	15
Unknown Small Artemisia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sarcobatus	0	3	0	0	0	2	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0.001	0	0	0	0	0	0	0	0	0	0
Deteriorated	20	66	36	7	32	19	80	30	24	10	29	28	32	16
Unknown	0	0	0	0	2	2	4	2	2	0	2	6	3	0
Total Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	85869	85869	85869	85869	85869	85869	85869	85869	85869	85869	85869	86605	86605	86605
Specimen Number	254	263	271	282	287	294	307	308	314	320	329	39	44	46
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.3	27.3	20.5	33.0	24.5	25.6	23.2	22.4	27.5	26.6	24.1	22.5	18.1	24.5
Tracers	34	70	54	16	30	44	62	48	26	58	36	182	1104	225
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166
Pollen Sum	367	273	264	230	220	240	308	279	247	251	200	225	224	252
Pollen Concentration gr/gm or gr/wash	10338.2	3051.1	5093.5	9303.7	6392.9	4550.7	4573.3	5542.1	7378.2	3474.8	4923.5	2042.1	416.6	1699.0
Taxa Richness	10	12	8	11	9	14	7	10	10	12	8	10	13	14
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.12. Pollen counts from LA 86605, LA 86606, LA 86607, and LA 87430.

Site Number	86605	86605	86605	86606	86606	86606	86606	86607	86607	86607	87430	87430	87430	87430
Specimen Number	93	95	106	14	16	41	60	3	10	15	25	33	77	169
Sample Volume	20	8	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.1	7.1	13.5	21.6	24.2	20.8	24.6	21.1	17.9	18.6	17.0	22.5	22.0	19.0
Tracers	454	654	970	634	580	264	478	494	270	648	110	248	112	10
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	21358	21358	21358	21358
Pollen Sum	222	218	147	104	211	213	201	206	236	238	136	103	101	3
Pollen Concentration gr/gm or gr/wash	951.5	1744.9	417.2	282.3	558.7	1441.6	635.3	734.5	1814.9	733.9	1553.3	394.2	875.5	337.2
Taxa Richness	9	11	8	7	12	12	11	11	11	8	8	7	8	2
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	2	0	0	0	0	4	0	0	0	0	0	4	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	13	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	2	10	0	2	4	2	0	0	0	0
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	0	0	0	0	0	2	1	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86605	86605	86605	86606	86606	86606	86606	86607	86607	86607	87430	87430	87430	87430
Specimen Number	93	95	106	14	16	41	60	3	10	15	25	33	77	169
Sample Volume	20	8	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.1	7.1	13.5	21.6	24.2	20.8	24.6	21.1	17.9	18.6	17.0	22.5	22.0	19.0
Tracers	454	654	970	634	580	264	478	494	270	648	110	248	112	10
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	21358	21358	21358	21358
Pollen Sum	222	218	147	104	211	213	201	206	236	238	136	103	101	3
Pollen Concentration gr/gm or gr/wash	951.5	1744.9	417.2	282.3	558.7	1441.6	635.3	734.5	1814.9	733.9	1553.3	394.2	875.5	337.2
Taxa Richness	9	11	8	7	12	12	11	11	11	8	8	7	8	2
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	2	20	6	4	18	10	18	8	14	18	16	0	19	1
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	4	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	44	60	20	6	18	18	28	30	7	32	10	6	12	0
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	80	30	19	8	12	22	26	24	55	28	18	6	10	0
Ambrosia	0	2	0	0	2	4	0	0	0	0	0	0	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86605	86605	86605	86606	86606	86606	86606	86607	86607	86607	87430	87430	87430	87430
Specimen Number	93	95	106	14	16	41	60	3	10	15	25	33	77	169
Sample Volume	20	8	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.1	7.1	13.5	21.6	24.2	20.8	24.6	21.1	17.9	18.6	17.0	22.5	22.0	19.0
Tracers	454	654	970	634	580	264	478	494	270	648	110	248	112	10
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	21358	21358	21358	21358
Pollen Sum	222	218	147	104	211	213	201	206	236	238	136	103	101	3
Pollen Concentration gr/gm or gr/wash	951.5	1744.9	417.2	282.3	558.7	1441.6	635.3	734.5	1814.9	733.9	1553.3	394.2	875.5	337.2
Taxa Richness	9	11	8	7	12	12	11	11	11	8	8	7	8	2
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	0	0	0	0	0	0	0	0	0	0	6	0	0	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Abies	0	0	0	0	2	0	2	2	0	0	0	1	0	0
Pinus	10	2	30	40	80	74	60	80	58	82	8	20	6	0
Pinus edulis type	10	16	14	4	12	30	10	24	22	4	50	16	3	0
Juniperus	2	10	4	2	14	14	10	16	8	12	6	0	10	0
Quercus	0	1	4	0	4	2	4	8	12	0	0	0	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86605	86605	86605	86606	86606	86606	86606	86607	86607	86607	87430	87430	87430	87430
Specimen Number	93	95	106	14	16	41	60	3	10	15	25	33	77	169
Sample Volume	20	8	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.1	7.1	13.5	21.6	24.2	20.8	24.6	21.1	17.9	18.6	17.0	22.5	22.0	19.0
Tracers	454	654	970	634	580	264	478	494	270	648	110	248	112	10
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	21358	21358	21358	21358
Pollen Sum	222	218	147	104	211	213	201	206	236	238	136	103	101	3
Pollen Concentration gr/gm or gr/wash	951.5	1744.9	417.2	282.3	558.7	1441.6	635.3	734.5	1814.9	733.9	1553.3	394.2	875.5	337.2
Taxa Richness	9	11	8	7	12	12	11	11	11	8	8	7	8	2
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	2	0	0	0	0	2	0	0	2	4	0	0	1	0
Artemisia	19	10	4	2	12	8	2	10	35	0	4	8	0	1
Unknown Small Artemisia	0	10	0	0	0	0	0	0	0	0	0	0	0	0
Sarcobatus	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	36	52	28	26	26	14	26	0	14	54	14	42	35	1
Unknown	4	3	18	12	8	4	10	0	4	2	4	0	1	0
Total Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	86605	86605	86605	86606	86606	86606	86606	86607	86607	86607	87430	87430	87430	87430
Specimen Number	93	95	106	14	16	41	60	3	10	15	25	33	77	169
Sample Volume	20	8	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	19.1	7.1	13.5	21.6	24.2	20.8	24.6	21.1	17.9	18.6	17.0	22.5	22.0	19.0
Tracers	454	654	970	634	580	264	478	494	270	648	110	248	112	10
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	21358	21358	21358	21358
Pollen Sum	222	218	147	104	211	213	201	206	236	238	136	103	101	3
Pollen Concentration gr/gm or gr/wash	951.5	1744.9	417.2	282.3	558.7	1441.6	635.3	734.5	1814.9	733.9	1553.3	394.2	875.5	337.2
Taxa Richness	9	11	8	7	12	12	11	11	11	8	8	7	8	2
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.13. Pollen counts from LA 87430, LA 99396, and LA 99397.

Site Number	87430	99396	99396	99396	99396	99396	99396	99396	99396	99396	99396	99397	99397	99397
Specimen Number	178	411	439	450	506	532	555	562	615	676	769	294	299	300
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	18.8	23.7	25.6	27.3	28.5	25.6	23.2	22.1	25.5	23.8	23.4	24.9	24.9	19.9
Tracers	34	42	18	176	48	39	84	182	50	136	164	265	212	364
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	210	352	209	230	214	228	212	219	2	125	231	231	201	239
Pollen Concentration gr/gm or gr/wash	7016.9	7552.8	9687.1	1022.4	3341.1	4877.4	2323.4	1162.9	33.5	824.8	1285.6	747.7	813.2	704.7
Taxa Richness	12	11	9	11	14	8	7	10	0	8	12	13	8	12
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	10	0	0	0	0	0	0	0	0	0	0	1	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	0	0	0	0	5	0	0	0	0	0	0	0	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	4	0	0	0	0	0	0	0	0	0	0	0	0	1
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Liliaceae	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	0	0	0	1	0	0	2	0	1	0
Eriogonum	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	87430	99396	99396	99396	99396	99396	99396	99396	99396	99396	99396	99397	99397	99397
Specimen Number	178	411	439	450	506	532	555	562	615	676	769	294	299	300
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	18.8	23.7	25.6	27.3	28.5	25.6	23.2	22.1	25.5	23.8	23.4	24.9	24.9	19.9
Tracers	34	42	18	176	48	39	84	182	50	136	164	265	212	364
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	210	352	209	230	214	228	212	219	2	125	231	231	201	239
Pollen Concentration gr/gm or gr/wash	7016.9	7552.8	9687.1	1022.4	3341.1	4877.4	2323.4	1162.9	33.5	824.8	1285.6	747.7	813.2	704.7
Taxa Richness	12	11	9	11	14	8	7	10	0	8	12	13	8	12
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	17	7	10	16	20	17	0	6	0	8	4	12	0	20
Large Poaceae	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	38	39	39	22	17	26	54	24	0	18	10	20	25	16
Fabaceae	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	8	60	52	60	67	87	38	42	0	38	38	48	28	62
Ambrosia	0	2	1	8	1	0	4	0	0	0	0	0	0	3
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	87430	99396	99396	99396	99396	99396	99396	99396	99396	99396	99396	99397	99397	99397
Specimen Number	178	411	439	450	506	532	555	562	615	676	769	294	299	300
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	18.8	23.7	25.6	27.3	28.5	25.6	23.2	22.1	25.5	23.8	23.4	24.9	24.9	19.9
Tracers	34	42	18	176	48	39	84	182	50	136	164	265	212	364
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	210	352	209	230	214	228	212	219	2	125	231	231	201	239
Pollen Concentration gr/gm or gr/wash	7016.9	7552.8	9687.1	1022.4	3341.1	4877.4	2323.4	1162.9	33.5	824.8	1285.6	747.7	813.2	704.7
Taxa Richness	12	11	9	11	14	8	7	10	0	8	12	13	8	12
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	1	0	0	0	0	0	0	4	0	1
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	5	0	0	0	0	0	0	10	0	2	0	1	5	6
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	0	0	0	1	0	0	0	0	0	1	0	0	0
Pinus	6	106	11	26	23	0	16	15	0	10	56	26	16	5
Pinus edulis type	20	90	11	18	4	4	14	5	0	8	36	16	38	2
Juniperus	10	26	49	20	12	20	10	8	0	2	14	8	20	16
Quercus	0	3	0	1	1	0	0	0	0	0	4	0	0	0

Site Number	87430	99396	99396	99396	99396	99396	99396	99396	99396	99396	99396	99397	99397	99397
Specimen Number	178	411	439	450	506	532	555	562	615	676	769	294	299	300
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	18.8	23.7	25.6	27.3	28.5	25.6	23.2	22.1	25.5	23.8	23.4	24.9	24.9	19.9
Tracers	34	42	18	176	48	39	84	182	50	136	164	265	212	364
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	210	352	209	230	214	228	212	219	2	125	231	231	201	239
Pollen Concentration gr/gm or gr/wash	7016.9	7552.8	9687.1	1022.4	3341.1	4877.4	2323.4	1162.9	33.5	824.8	1285.6	747.7	813.2	704.7
Taxa Richness	12	11	9	11	14	8	7	10	0	8	12	13	8	12
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	1	0	0	0	0	0	0	1	0	0
Ephedra	0	3	1	2	1	1	0	2	0	0	2	0	0	3
Artemisia	23	10	9	19	26	28	34	30	0	0	22	22	20	12
Unknown Small Artemisia	0	0	0	3	0	0	0	0	0	0	14	0	0	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	60	4	26	34	31	42	42	74	2	38	24	62	48	88
Unknown	3	1	0	0	2	1	0	2	0	0	4	8	0	3
Total Aggregates	1	0	0	1	1	0	0	0	0	0	0	0	0	1
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	1(12)
Grass Aggregates	0	0	0	1(10)	1(8)	0	0	0	0	0	0	0	0	0
Maize Aggregates	X(6)	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	87430	99396	99396	99396	99396	99396	99396	99396	99396	99396	99396	99397	99397	99397
Specimen Number	178	411	439	450	506	532	555	562	615	676	769	294	299	300
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	18.8	23.7	25.6	27.3	28.5	25.6	23.2	22.1	25.5	23.8	23.4	24.9	24.9	19.9
Tracers	34	42	18	176	48	39	84	182	50	136	164	265	212	364
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	210	352	209	230	214	228	212	219	2	125	231	231	201	239
Pollen Concentration gr/gm or gr/wash	7016.9	7552.8	9687.1	1022.4	3341.1	4877.4	2323.4	1162.9	33.5	824.8	1285.6	747.7	813.2	704.7
Taxa Richness	12	11	9	11	14	8	7	10	0	8	12	13	8	12
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	1(50+)	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.14. Pollen counts from LA 99397 and LA 127627.

Site Number	99397	99397	99397	99397	99397	99397	99397	99397	99397	99397	127627	127627	127627	127627
Specimen Number	309	310	311	312	317	318	319	320	332	333	8	66	67	69
Sample Volume	20	20	20	20	20	20	20	20	20	20	4	20	20	10
Sample Weight	33.8	28.2	22.7	22.3	23.7	24.4	27.5	27.5	24.9	25.8	4.3	23.0	24.3	10.0
Tracers	18	274	40	63	8	9	100	254	246	86	112	206	65	460
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166	37166
Pollen Sum	268	246	5	7	223	202	4	114	100	7	4	218	8	109
Pollen Concentration gr/gm or gr/wash	9408.2	680.0	117.6	106.4	25120.4	19646.2	31.1	348.6	348.7	67.4	308.7	1710.0	188.2	880.7
Taxa Richness	15	10	3	4	11	11	2	5	6	0	2	11	3	9
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	1	0	0	0	0	0	0	2	0	0
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	99397	99397	99397	99397	99397	99397	99397	99397	99397	99397	127627	127627	127627	127627
Specimen Number	309	310	311	312	317	318	319	320	332	333	8	66	67	69
Sample Volume	20	20	20	20	20	20	20	20	20	20	4	20	20	10
Sample Weight	33.8	28.2	22.7	22.3	23.7	24.4	27.5	27.5	24.9	25.8	4.3	23.0	24.3	10.0
Tracers	18	274	40	63	8	9	100	254	246	86	112	206	65	460
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166	37166
Pollen Sum	268	246	5	7	223	202	4	114	100	7	4	218	8	109
Pollen Concentration gr/gm or gr/wash	9408.2	680.0	117.6	106.4	25120.4	19646.2	31.1	348.6	348.7	67.4	308.7	1710.0	188.2	880.7
Taxa Richness	15	10	3	4	11	11	2	5	6	0	2	11	3	9
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	7	6	0	0	2	2	0	0	8	0	0	10	1	6
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	15	38	0	1	14	22	0	2	0	0	1	8	1	8
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	19	70	1	4	8	14	0	14	18	0	0	6	0	2
Ambrosia	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	99397	99397	99397	99397	99397	99397	99397	99397	99397	99397	127627	127627	127627	127627
Specimen Number	309	310	311	312	317	318	319	320	332	333	8	66	67	69
Sample Volume	20	20	20	20	20	20	20	20	20	20	4	20	20	10
Sample Weight	33.8	28.2	22.7	22.3	23.7	24.4	27.5	27.5	24.9	25.8	4.3	23.0	24.3	10.0
Tracers	18	274	40	63	8	9	100	254	246	86	112	206	65	460
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166	37166
Pollen Sum	268	246	5	7	223	202	4	114	100	7	4	218	8	109
Pollen Concentration gr/gm or gr/wash	9408.2	680.0	117.6	106.4	25120.4	19646.2	31.1	348.6	348.7	67.4	308.7	1710.0	188.2	880.7
Taxa Richness	15	10	3	4	11	11	2	5	6	0	2	11	3	9
Unknown Asteraceae Low-Spine type cf. Iva	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	3	5	0	0	0	1	0	0	0	0	0	0	0	1
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	1	0	0	0	0	0	0	0	0	0	0	4	0	0
Abies	1	1	0	0	1	1	0	0	0	0	0	0	0	0
Pinus	74	28	1	1	100	42	2	12	10	0	3	104	0	42
Pinus edulis type	47	26	1	0	54	76	2	26	6	0	0	44	0	35
Juniperus	72	10	0	1	30	29	0	0	3	0	0	2	1	1
Quercus	5	6	0	0	1	2	0	0	0	0	0	4	0	2
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	99397	99397	99397	99397	99397	99397	99397	99397	99397	99397	127627	127627	127627	127627
Specimen Number	309	310	311	312	317	318	319	320	332	333	8	66	67	69
Sample Volume	20	20	20	20	20	20	20	20	20	20	4	20	20	10
Sample Weight	33.8	28.2	22.7	22.3	23.7	24.4	27.5	27.5	24.9	25.8	4.3	23.0	24.3	10.0
Tracers	18	274	40	63	8	9	100	254	246	86	112	206	65	460
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166	37166
Pollen Sum	268	246	5	7	223	202	4	114	100	7	4	218	8	109
Pollen Concentration gr/gm or gr/wash	9408.2	680.0	117.6	106.4	25120.4	19646.2	31.1	348.6	348.7	67.4	308.7	1710.0	188.2	880.7
Taxa Richness	15	10	3	4	11	11	2	5	6	0	2	11	3	9
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	2	0	0	0	0	2	0	0	0	0	0	0	0	0
Artemisia	7	10	0	0	8	4	0	4	5	0	0	20	0	1
Unknown Small Artemisia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sarcobatus	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	9	40	2	0	1	7	0	54	50	7	0	10	5	7
Unknown	1	6	0	0	1	0	0	2	0	0	0	0	0	4
Total Aggregates	0	0	0	0	2	0	0	0	0	0	0	2	0	0
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	X(1000+)	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	99397	99397	99397	99397	99397	99397	99397	99397	99397	99397	127627	127627	127627	127627
Specimen Number	309	310	311	312	317	318	319	320	332	333	8	66	67	69
Sample Volume	20	20	20	20	20	20	20	20	20	20	4	20	20	10
Sample Weight	33.8	28.2	22.7	22.3	23.7	24.4	27.5	27.5	24.9	25.8	4.3	23.0	24.3	10.0
Tracers	18	274	40	63	8	9	100	254	246	86	112	206	65	460
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	37166	37166
Pollen Sum	268	246	5	7	223	202	4	114	100	7	4	218	8	109
Pollen Concentration gr/gm or gr/wash	9408.2	680.0	117.6	106.4	25120.4	19646.2	31.1	348.6	348.7	67.4	308.7	1710.0	188.2	880.7
Taxa Richness	15	10	3	4	11	11	2	5	6	0	2	11	3	9
Pine Aggregates	0	0	0	0	2(10)	0	0	0	0	0	0	2(100+)	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.15. Pollen counts from LA 127627, LA 127633, LA 127634, and LA 127635.

Site Number	127627	127627	127633	127633	127633	127633	127633	127634	127634	127634	127634	127634	127634	127635
Specimen Number	71	89	3	7	11	12	13	40	46	52	72	104	116	42
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.7	26.6	24.5	25.7	25.6	26.4	23.1	25.1	23.1	24.4	25.0	24.6	25.7	18.8
Tracers	30	94	126	860	1628	544	122	90	74	60	62	10	22	376
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	21358	21358	21358	21358	21358	21358	37166
Pollen Sum	234	204	219	210	163	200	278	290	238	243	257	2	284	160
Pollen Concentration gr/gm or gr/wash	12770.7	3032.3	2636.7	353.1	145.4	517.6	3666.2	2741.8	2973.7	3545.1	3541.3	173.6	10728.1	841.2
Taxa Richness	11	11	8	12	12	11	9	11	14	13	9	0	10	9
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	0	0	0	0	0	2	0.001	2	0	0	3	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0
Opuntia (Platy)	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	0	0	0	0	0	0	0	1	0	0	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	0	0	2	0	2	0	0	0	1	3
Eriogonum	0	0	0	0	8	0	0	2	0	4	0	0	0	0
Brassicaceae	0	0	0	0	2	0	0	0	0	0	0	0	8	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	127627	127627	127633	127633	127633	127633	127633	127634	127634	127634	127634	127634	127634	127635
Specimen Number	71	89	3	7	11	12	13	40	46	52	72	104	116	42
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.7	26.6	24.5	25.7	25.6	26.4	23.1	25.1	23.1	24.4	25.0	24.6	25.7	18.8
Tracers	30	94	126	860	1628	544	122	90	74	60	62	10	22	376
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	21358	21358	21358	21358	21358	21358	37166
Pollen Sum	234	204	219	210	163	200	278	290	238	243	257	2	284	160
Pollen Concentration gr/gm or gr/wash	12770.7	3032.3	2636.7	353.1	145.4	517.6	3666.2	2741.8	2973.7	3545.1	3541.3	173.6	10728.1	841.2
Taxa Richness	11	11	8	12	12	11	9	11	14	13	9	0	10	9
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	3	0	4	10	6	8	18	8	16	16	0	0	18	8
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	2	3	6	12	16	14	18	140	28	26	8	0	32	20
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	1	3	4	6	4	18	8	10	22	16	6	0	32	50
Ambrosia	0	1	0	2	0	0	0	0	2	8	2	0	6	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	127627	127627	127633	127633	127633	127633	127633	127634	127634	127634	127634	127634	127634	127635
Specimen Number	71	89	3	7	11	12	13	40	46	52	72	104	116	42
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.7	26.6	24.5	25.7	25.6	26.4	23.1	25.1	23.1	24.4	25.0	24.6	25.7	18.8
Tracers	30	94	126	860	1628	544	122	90	74	60	62	10	22	376
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	21358	21358	21358	21358	21358	21358	37166
Pollen Sum	234	204	219	210	163	200	278	290	238	243	257	2	284	160
Pollen Concentration gr/gm or gr/wash	12770.7	3032.3	2636.7	353.1	145.4	517.6	3666.2	2741.8	2973.7	3545.1	3541.3	173.6	10728.1	841.2
Taxa Richness	11	11	8	12	12	11	9	11	14	13	9	0	10	9
Euphorbiaceae	1	0	0	0	0	2	0	2	0	8	0	0	0	10
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0.001	0	0	0	0	2
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	2	1	0	1	0	0	0	0	0	0	1	0	0	0
Abies	2	0	1	2	2	2	3	2	0	2	0.001	0	0	0
Pinus	186	151	158	98	60	94	140	62	22	40	64	0	32	6
Pinus edulis type	32	31	36	50	32	44	60	34	40	50	160	0	32	4
Juniperus	1	2	5	10	5	8	12	0	2	2	4	0	0	0
Quercus	1	2	3	0	2	1	0	0	0	0	0	0	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Ephedra	0	1	0	2	0	4	0	2	0	0	0	0	0	0
Artemisia	0	4	0	4	2	2	6	8	35	16	0	0	78	4
Unknown Small Artemisia	0	0	0	0	0	0	0	0	22	0	0	0	0	0

Site Number	127627	127627	127633	127633	127633	127633	127633	127634	127634	127634	127634	127634	127634	127635
Specimen Number	71	89	3	7	11	12	13	40	46	52	72	104	116	42
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.7	26.6	24.5	25.7	25.6	26.4	23.1	25.1	23.1	24.4	25.0	24.6	25.7	18.8
Tracers	30	94	126	860	1628	544	122	90	74	60	62	10	22	376
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	21358	21358	21358	21358	21358	21358	37166
Pollen Sum	234	204	219	210	163	200	278	290	238	243	257	2	284	160
Pollen Concentration gr/gm or gr/wash	12770.7	3032.3	2636.7	353.1	145.4	517.6	3666.2	2741.8	2973.7	3545.1	3541.3	173.6	10728.1	841.2
Taxa Richness	11	11	8	12	12	11	9	11	14	13	9	0	10	9
Sarcobatus	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	2	3	0	12	18	2	10	10	30	42	6	2	22	42
Unknown	0	1	0	0	5	0	0	4	14	10	4	0	15	11
Total Aggregates	0	0	2	0	0	1	1	4	1	0	2	0	5	0
Cheno-Am Aggregates	0	0	0	0	0	0	0	3(6)	1(10)	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	1(8)	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	1(12)	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	2(25+)	0	0	0	1(10+)	0	0	0	2(20+)	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	5(30+)	0

Site Number	127627	127627	127633	127633	127633	127633	127633	127634	127634	127634	127634	127634	127634	127635
Specimen Number	71	89	3	7	11	12	13	40	46	52	72	104	116	42
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	22.7	26.6	24.5	25.7	25.6	26.4	23.1	25.1	23.1	24.4	25.0	24.6	25.7	18.8
Tracers	30	94	126	860	1628	544	122	90	74	60	62	10	22	376
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	21358	21358	21358	21358	21358	21358	37166
Pollen Sum	234	204	219	210	163	200	278	290	238	243	257	2	284	160
Pollen Concentration gr/gm or gr/wash	12770.7	3032.3	2636.7	353.1	145.4	517.6	3666.2	2741.8	2973.7	3545.1	3541.3	173.6	10728.1	841.2
Taxa Richness	11	11	8	12	12	11	9	11	14	13	9	0	10	9
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.16. Pollen counts from LA 127635, LA 135291, and LA 135292.

Site Number	127635	127635	127635	127635	135291	135291	135291	135291	135292	135292	135292
Specimen Number	109	117	134	136	11	31	57	62	78	84	88
Sample Volume	20	11	4	20	20	20	20	20	20	20	20
Sample Weight	19.7	13.5	6.6	20.1	24.0	21.6	23.4	20.1	25.3	21.6	26.2
Tracers	6	43	232	296	224	290	206	320	195	348	230
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	2	5	211	117	248	255	229.001	216	207	247	215
Pollen Concentration gr/gm or gr/wash	628.9	320.1	5121.5	730.9	1714.5	1513.0	1765.6	1248.1	1559.4	1221.3	1326.0
Taxa Richness	0	2	9	12	12	12	13	10	14	9	10
Gossypium	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0	2	2	0	2	0	0	1	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	0	0	0	0	0	0	0	0	0	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	0	0	0	0	0	0	5	4	6
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	3	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	1	0	0	1	0	0	1	0	2
Eriogonum	0	0	0	0	0	4	0	2	0	0	0
Brassicaceae	0	0	0	0	1	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0

Site Number	127635	127635	127635	127635	135291	135291	135291	135291	135292	135292	135292
Specimen Number	109	117	134	136	11	31	57	62	78	84	88
Sample Volume	20	11	4	20	20	20	20	20	20	20	20
Sample Weight	19.7	13.5	6.6	20.1	24.0	21.6	23.4	20.1	25.3	21.6	26.2
Tracers	6	43	232	296	224	290	206	320	195	348	230
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	2	5	211	117	248	255	229.001	216	207	247	215
Pollen Concentration gr/gm or gr/wash	628.9	320.1	5121.5	730.9	1714.5	1513.0	1765.6	1248.1	1559.4	1221.3	1326.0
Taxa Richness	0	2	9	12	12	12	13	10	14	9	10
Plantago	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0
Poaceae	0	0	4	2	8	16	22	18	9	10	8
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	0	2	6	6	90	40	23	20	34	36	26
Fabaceae	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	0	0	10	12	30	34	16	24	44	38	48
Ambrosia	0	0	0	4	6	0	4	6	3	4	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	2	0	0	0	0

Site Number	127635	127635	127635	127635	135291	135291	135291	135291	135292	135292	135292
Specimen Number	109	117	134	136	11	31	57	62	78	84	88
Sample Volume	20	11	4	20	20	20	20	20	20	20	20
Sample Weight	19.7	13.5	6.6	20.1	24.0	21.6	23.4	20.1	25.3	21.6	26.2
Tracers	6	43	232	296	224	290	206	320	195	348	230
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	2	5	211	117	248	255	229.001	216	207	247	215
Pollen Concentration gr/gm or gr/wash	628.9	320.1	5121.5	730.9	1714.5	1513.0	1765.6	1248.1	1559.4	1221.3	1326.0
Taxa Richness	0	2	9	12	12	12	13	10	14	9	10
Euphorbiaceae	0	0	0	0	0	2	2	0	1	4	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	1	0	0	0	0	0	0	0
Abies	0	0	0	2	1	0	0.001	0	0	0	0
Pinus	0	1	86	20	46	46	44	30	6	6	4
Pinus edulis type	0	0	80	14	14	32	18	26	2	0	8
Juniperus	0	0	14	0	4	10	8	14	8	0	10
Quercus	0	0	0	2	2	0	1	0	1	2	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	0	0	2	2	6	6	2	0	0	0
Artemisia	0	0	4	6	16	10	12	10	18	30	26
Unknown Small Artemisia	0	0	0	0	0	0	6	0	0	0	10

Site Number	127635	127635	127635	127635	135291	135291	135291	135291	135292	135292	135292
Specimen Number	109	117	134	136	11	31	57	62	78	84	88
Sample Volume	20	11	4	20	20	20	20	20	20	20	20
Sample Weight	19.7	13.5	6.6	20.1	24.0	21.6	23.4	20.1	25.3	21.6	26.2
Tracers	6	43	232	296	224	290	206	320	195	348	230
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	2	5	211	117	248	255	229.001	216	207	247	215
Pollen Concentration gr/gm or gr/wash	628.9	320.1	5121.5	730.9	1714.5	1513.0	1765.6	1248.1	1559.4	1221.3	1326.0
Taxa Richness	0	2	9	12	12	12	13	10	14	9	10
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	2	2	4	38	20	44	52	54	63	108	58
Unknown	0	0	0	6	8	8	12	10	8	5	9
Total Aggregates	0	0	0	0	0	0	1	0	0	0	0
Cheno-Am Aggregates	0	0	0	0	0	0	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	1(6)	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0

Site Number	127635	127635	127635	127635	135291	135291	135291	135291	135292	135292	135292
Specimen Number	109	117	134	136	11	31	57	62	78	84	88
Sample Volume	20	11	4	20	20	20	20	20	20	20	20
Sample Weight	19.7	13.5	6.6	20.1	24.0	21.6	23.4	20.1	25.3	21.6	26.2
Tracers	6	43	232	296	224	290	206	320	195	348	230
Tracer Conc.	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166	37166
Pollen Sum	2	5	211	117	248	255	229.001	216	207	247	215
Pollen Concentration gr/gm or gr/wash	628.9	320.1	5121.5	730.9	1714.5	1513.0	1765.6	1248.1	1559.4	1221.3	1326.0
Taxa Richness	0	2	9	12	12	12	13	10	14	9	10
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0

Table Y.17. Pollen counts from LA 12587.

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	631	642	657	694	707	880	1038	1063	1251	1258	1484	1486	1492	1590
Sample Volume	20	20	20	20	20	20	20	20	15	20	20	12	20	20
Sample Weight	37.2	29.7	29.1	27.7	27.3	24.5	24.8	27.9	16.4	21.8	27.8	10.4	25.0	21.5
Tracers	12	23	20	10	11	8	12	46	78	26	178	185	60	20
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	576	316	315	243	230	208	230	224	263	269	213	206	491	325
Pollen Concentration gr/gm or gr/wash	27558.7	9880.1	11559.7	18736.4	16358.1	22665.6	16506.5	3727.7	4391.1	10136.4	919.3	2286.8	6991.2	16142.7
Taxa Richness	14	11	9	11	10	9	8	11	14	11	7	8	10	11
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0.001	0	0	0	0	0	0	0
Zea mays	0	0	4	0	0	0	2	2	23	0	0	2	0	2
Opuntia (Cylindro)	0	0	0	0	0	0.001	0	0	0.001	0	0	0	0	0
Opuntia (Platy)	0	1	0.001	1	0	0.001	0	2	5	0.001	0	0	0.001	1
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	6	0	0	0	0	1	0	0	0	0	0	0	0	0
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	0	2	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	631	642	657	694	707	880	1038	1063	1251	1258	1484	1486	1492	1590
Sample Volume	20	20	20	20	20	20	20	20	15	20	20	12	20	20
Sample Weight	37.2	29.7	29.1	27.7	27.3	24.5	24.8	27.9	16.4	21.8	27.8	10.4	25.0	21.5
Tracers	12	23	20	10	11	8	12	46	78	26	178	185	60	20
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	576	316	315	243	230	208	230	224	263	269	213	206	491	325
Pollen Concentration gr/gm or gr/wash	27558.7	9880.1	11559.7	18736.4	16358.1	22665.6	16506.5	3727.7	4391.1	10136.4	919.3	2286.8	6991.2	16142.7
Taxa Richness	14	11	9	11	10	9	8	11	14	11	7	8	10	11
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	0	1	0	1	1	0	0	4	1	8	10	3	0	14
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	60	113	176	24	106	126	142	76	112	94	104	100	132	144
Fabaceae	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Asteraceae Hi-Spine type	28	47	28	2	27	30	43	16	22	42	28	30	56	68
Ambrosia	6	0	4	1	0	0	0	0	0	0	2	0	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	631	642	657	694	707	880	1038	1063	1251	1258	1484	1486	1492	1590
Sample Volume	20	20	20	20	20	20	20	20	15	20	20	12	20	20
Sample Weight	37.2	29.7	29.1	27.7	27.3	24.5	24.8	27.9	16.4	21.8	27.8	10.4	25.0	21.5
Tracers	12	23	20	10	11	8	12	46	78	26	178	185	60	20
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	576	316	315	243	230	208	230	224	263	269	213	206	491	325
Pollen Concentration gr/gm or gr/wash	27558.7	9880.1	11559.7	18736.4	16358.1	22665.6	16506.5	3727.7	4391.1	10136.4	919.3	2286.8	6991.2	16142.7
Taxa Richness	14	11	9	11	10	9	8	11	14	11	7	8	10	11
Euphorbiaceae	10	7	0	2	3	0	11	0	2	2	2	0	2	4
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0.001	0	0	0	0	0	0	2	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	4	1	0	1	0	0	0	0	0	0	0	0	0	0
Abies	8	2	0	1	0	0	0	0	1	2	0	0	0	0
Pinus	266	50	42	159	29	14	5	28	53	28	16	16	170	20
Pinus edulis type	112	46	44	29	13	10	9	58	8	24	25	18	78	4
Juniperus	22	13	2	14	8	0	0	2	4	8	0	3	2	6
Quercus	6	0	0	0	0	0	0	0	0	0	0	0	0	2
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	2	0	0	0	1	1	0	4	0	2	0	0	0	0
Artemisia	34	18	10	0	6	3	2	2	3	4	0	2	24	8
Unknown Small Artemisia	0	0	0	0	0	0	0	0	0	0	0	0	3	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	631	642	657	694	707	880	1038	1063	1251	1258	1484	1486	1492	1590
Sample Volume	20	20	20	20	20	20	20	20	15	20	20	12	20	20
Sample Weight	37.2	29.7	29.1	27.7	27.3	24.5	24.8	27.9	16.4	21.8	27.8	10.4	25.0	21.5
Tracers	12	23	20	10	11	8	12	46	78	26	178	185	60	20
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	576	316	315	243	230	208	230	224	263	269	213	206	491	325
Pollen Concentration gr/gm or gr/wash	27558.7	9880.1	11559.7	18736.4	16358.1	22665.6	16506.5	3727.7	4391.1	10136.4	919.3	2286.8	6991.2	16142.7
Taxa Richness	14	11	9	11	10	9	8	11	14	11	7	8	10	11
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	12	15	4	5	28	20	13	22	14	52	24	30	14	38
Unknown	0	0	1	3	8	2	3	4	8	3	2	1	5	14
Total Aggregates	0	2	0	0	0	1	0	2	4	0	0	1	3	0
Cheno-Am Aggregates	0	2(12)	0	0	0	1(4)	0	2(100+)	4(20+)	0	0	1(6)	3(100+)	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	X(6)	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	631	642	657	694	707	880	1038	1063	1251	1258	1484	1486	1492	1590
Sample Volume	20	20	20	20	20	20	20	20	15	20	20	12	20	20
Sample Weight	37.2	29.7	29.1	27.7	27.3	24.5	24.8	27.9	16.4	21.8	27.8	10.4	25.0	21.5
Tracers	12	23	20	10	11	8	12	46	78	26	178	185	60	20
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	576	316	315	243	230	208	230	224	263	269	213	206	491	325
Pollen Concentration gr/gm or gr/wash	27558.7	9880.1	11559.7	18736.4	16358.1	22665.6	16506.5	3727.7	4391.1	10136.4	919.3	2286.8	6991.2	16142.7
Taxa Richness	14	11	9	11	10	9	8	11	14	11	7	8	10	11
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.17 (continued). Pollen counts from LA 12587.

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	1591	1602	1698	1725	1887	1915	1916	1972	1998	2108	2123	2124	2125	2229
Sample Volume	20	20	20	20	20		20	20	1	20	20	20	10	20
Sample Weight	26.4	25.9	24.2	30.2	25.6		25.3	22.4	2.4	22.4	23.8	24.4	15.3	27.7
Tracers	14	12	50	30	9	80	8	36	20	28	30	12	60	22
Tracer Conc.	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	269	251	286	200	210	104	243	232	35	329	270	248	283	328
Pollen Concentration gr/gm or gr/wash	15544.6	17248.6	5048.3	4714.8	19466.9	13882.7	25642.3	6144.7	15573.5	11203.4	8076.6	18090.1	6584.2	11495.6
Taxa Richness	8	10	12	12	8	6	10	13	7	12	15	10	14	11
Gossypium	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	1591	1602	1698	1725	1887	1915	1916	1972	1998	2108	2123	2124	2125	2229
Sample Volume	20	20	20	20	20		20	20	1	20	20	20	10	20
Sample Weight	26.4	25.9	24.2	30.2	25.6		25.3	22.4	2.4	22.4	23.8	24.4	15.3	27.7
Tracers	14	12	50	30	9	80	8	36	20	28	30	12	60	22
Tracer Conc.	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	269	251	286	200	210	104	243	232	35	329	270	248	283	328
Pollen Concentration gr/gm or gr/wash	15544.6	17248.6	5048.3	4714.8	19466.9	13882.7	25642.3	6144.7	15573.5	11203.4	8076.6	18090.1	6584.2	11495.6
Taxa Richness	8	10	12	12	8	6	10	13	7	12	15	10	14	11
Zea mays	0	0	10	2	1	0	0	0.001	0	0.001	4	2	2	0
Opuntia (Cylindro)	0	0	0.001	1	0	0	0	2	0	0	1	0	1	0.001
Opuntia (Platy)	0	1	0	0	0	0	0	2	1	2	0.001	0	1	0.001
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	0	2	0	0	1	0	0	0	4	10	18	5
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	2	0	0	0	0	0	0	0	0	0	1	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	1	0	1	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	0	2	8	18	0	6	2	2	4	0	8	4	14	4
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	1591	1602	1698	1725	1887	1915	1916	1972	1998	2108	2123	2124	2125	2229
Sample Volume	20	20	20	20	20		20	20	1	20	20	20	10	20
Sample Weight	26.4	25.9	24.2	30.2	25.6		25.3	22.4	2.4	22.4	23.8	24.4	15.3	27.7
Tracers	14	12	50	30	9	80	8	36	20	28	30	12	60	22
Tracer Conc.	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	269	251	286	200	210	104	243	232	35	329	270	248	283	328
Pollen Concentration gr/gm or gr/wash	15544.6	17248.6	5048.3	4714.8	19466.9	13882.7	25642.3	6144.7	15573.5	11203.4	8076.6	18090.1	6584.2	11495.6
Taxa Richness	8	10	12	12	8	6	10	13	7	12	15	10	14	11
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	124	114	182	60	116	40	156	94	20	172	142	142	134	186
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	42	30	24	22	35	16	24	64	2	34	34	26	24	46
Ambrosia	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	2	4	4	2	1	0	8	1	0	8	1	2	4	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	1591	1602	1698	1725	1887	1915	1916	1972	1998	2108	2123	2124	2125	2229
Sample Volume	20	20	20	20	20		20	20	1	20	20	20	10	20
Sample Weight	26.4	25.9	24.2	30.2	25.6		25.3	22.4	2.4	22.4	23.8	24.4	15.3	27.7
Tracers	14	12	50	30	9	80	8	36	20	28	30	12	60	22
Tracer Conc.	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	269	251	286	200	210	104	243	232	35	329	270	248	283	328
Pollen Concentration gr/gm or gr/wash	15544.6	17248.6	5048.3	4714.8	19466.9	13882.7	25642.3	6144.7	15573.5	11203.4	8076.6	18090.1	6584.2	11495.6
Taxa Richness	8	10	12	12	8	6	10	13	7	12	15	10	14	11
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Pinus	38	39	12	28	32	6	6	26	2	48	6	14	4	34
Pinus edulis type	14	26	6	40	5	0	4	12	2	26	4	2	9	16
Juniperus	12	6	2	4	2	8	2	4	4	2	2	2	4	1
Quercus	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	2	0	0	2	0	0	0	0	0	0	0	0	1	0
Artemisia	2	4	8	12	9	6	2	2	0	10	8	0	4	10
Unknown Small Artemisia	0	0	1	0	0	0	0	4	0	2	2	0	0	2
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	1591	1602	1698	1725	1887	1915	1916	1972	1998	2108	2123	2124	2125	2229
Sample Volume	20	20	20	20	20		20	20	1	20	20	20	10	20
Sample Weight	26.4	25.9	24.2	30.2	25.6		25.3	22.4	2.4	22.4	23.8	24.4	15.3	27.7
Tracers	14	12	50	30	9	80	8	36	20	28	30	12	60	22
Tracer Conc.	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	269	251	286	200	210	104	243	232	35	329	270	248	283	328
Pollen Concentration gr/gm or gr/wash	15544.6	17248.6	5048.3	4714.8	19466.9	13882.7	25642.3	6144.7	15573.5	11203.4	8076.6	18090.1	6584.2	11495.6
Taxa Richness	8	10	12	12	8	6	10	13	7	12	15	10	14	11
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	20	22	24	4	6	22	34	14	0	18	52	42	56	24
Unknown	11	0	1	1	3	0	3	3	0	3	2	0	6	0
Total Aggregates	2	0	2	2	0	0	0	1	0	1	0	0	0	0
Cheno-Am Aggregates	2(50+)	0	2(100+)	2(500+)	0	0	0	1(8)	0	1(20+)	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	X(10)
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	1591	1602	1698	1725	1887	1915	1916	1972	1998	2108	2123	2124	2125	2229
Sample Volume	20	20	20	20	20		20	20	1	20	20	20	10	20
Sample Weight	26.4	25.9	24.2	30.2	25.6		25.3	22.4	2.4	22.4	23.8	24.4	15.3	27.7
Tracers	14	12	50	30	9	80	8	36	20	28	30	12	60	22
Tracer Conc.	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	269	251	286	200	210	104	243	232	35	329	270	248	283	328
Pollen Concentration gr/gm or gr/wash	15544.6	17248.6	5048.3	4714.8	19466.9	13882.7	25642.3	6144.7	15573.5	11203.4	8076.6	18090.1	6584.2	11495.6
Taxa Richness	8	10	12	12	8	6	10	13	7	12	15	10	14	11
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Table Y.17 (continued). Pollen counts from LA 12587.

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	2247	2563	2570	2631	2634	2648	2674	2679	2715	2746	2793	2875	2906	2923
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	5	20	20
Sample Weight	32.1	22.9	28.8	20.9	17.3	24.5	25.4	25.1	25.4	26.1	24.6	5.2	17.6	25.5
Tracers	12	30	16	20	94	32	24	30	14	34	14	116	24	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	223	274	291	241	234	336	275	269	274	260	205	131	275	245
Pollen Concentration gr/gm or gr/wash	12364.6	8518.3	13487.8	12314.1	3073.3	9153.4	9634.9	7629.9	16457.0	6257.7	12713.1	4638.4	13904.9	14657.5
Taxa Richness	11	9	13	10	11	12	10	12	14	12	10	6	12	10
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	0.001	2	0.001	4	0.001	0	2	2	0.001	2	0	3	2
Opuntia (Cylindro)	0.001	0	0.001	0	0	0	0	0	0.001	0.001	0.001	0	0.001	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	2247	2563	2570	2631	2634	2648	2674	2679	2715	2746	2793	2875	2906	2923
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	5	20	20
Sample Weight	32.1	22.9	28.8	20.9	17.3	24.5	25.4	25.1	25.4	26.1	24.6	5.2	17.6	25.5
Tracers	12	30	16	20	94	32	24	30	14	34	14	116	24	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	223	274	291	241	234	336	275	269	274	260	205	131	275	245
Pollen Concentration gr/gm or gr/wash	12364.6	8518.3	13487.8	12314.1	3073.3	9153.4	9634.9	7629.9	16457.0	6257.7	12713.1	4638.4	13904.9	14657.5
Taxa Richness	11	9	13	10	11	12	10	12	14	12	10	6	12	10
Opuntia (Platy)	2	0	4	2	0.001	0.001	0	2	0.001	0.001	0.001	0	0	0.001
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	6	16	10	107	54	12	8	16	2	47	0	0	12	22
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	0	0	2	0	0	0	0	0	0	0	2	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	0	2	6	6	10	12	4	6	8	4	0	0	8	0
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	2247	2563	2570	2631	2634	2648	2674	2679	2715	2746	2793	2875	2906	2923
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	5	20	20
Sample Weight	32.1	22.9	28.8	20.9	17.3	24.5	25.4	25.1	25.4	26.1	24.6	5.2	17.6	25.5
Tracers	12	30	16	20	94	32	24	30	14	34	14	116	24	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	223	274	291	241	234	336	275	269	274	260	205	131	275	245
Pollen Concentration gr/gm or gr/wash	12364.6	8518.3	13487.8	12314.1	3073.3	9153.4	9634.9	7629.9	16457.0	6257.7	12713.1	4638.4	13904.9	14657.5
Taxa Richness	11	9	13	10	11	12	10	12	14	12	10	6	12	10
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	96	136	156	82	100	100	110	122	120	86	124	60	146	150
Fabaceae	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Asteraceae Hi-Spine type	42	36	22	20	28	48	42	36	50	38	26	20	40	16
Ambrosia	0	0	3	0	2	0	0	0	0	0	0	4	0	14
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	2	0	3	2	0	5	2	8	2	8	4	0	12	2
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	2	0	0	0.001	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	2247	2563	2570	2631	2634	2648	2674	2679	2715	2746	2793	2875	2906	2923
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	5	20	20
Sample Weight	32.1	22.9	28.8	20.9	17.3	24.5	25.4	25.1	25.4	26.1	24.6	5.2	17.6	25.5
Tracers	12	30	16	20	94	32	24	30	14	34	14	116	24	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	223	274	291	241	234	336	275	269	274	260	205	131	275	245
Pollen Concentration gr/gm or gr/wash	12364.6	8518.3	13487.8	12314.1	3073.3	9153.4	9634.9	7629.9	16457.0	6257.7	12713.1	4638.4	13904.9	14657.5
Taxa Richness	11	9	13	10	11	12	10	12	14	12	10	6	12	10
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Pinus	12	26	21	2	0	34	32	14	32	16	14	0	8	6
Pinus edulis type	13	12	20	0	4	44	22	14	16	14	16	0	2	14
Juniperus	10	6	4	6	0	18	20	1	10	12	0	4	4	0
Quercus	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	0	0	0	0	0	2	0	0	0	2	0	0	0
Artemisia	6	4	6	4	6	8	14	13	4	2	4	6	8	0
Unknown Small Artemisia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	2247	2563	2570	2631	2634	2648	2674	2679	2715	2746	2793	2875	2906	2923
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	5	20	20
Sample Weight	32.1	22.9	28.8	20.9	17.3	24.5	25.4	25.1	25.4	26.1	24.6	5.2	17.6	25.5
Tracers	12	30	16	20	94	32	24	30	14	34	14	116	24	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	223	274	291	241	234	336	275	269	274	260	205	131	275	245
Pollen Concentration gr/gm or gr/wash	12364.6	8518.3	13487.8	12314.1	3073.3	9153.4	9634.9	7629.9	16457.0	6257.7	12713.1	4638.4	13904.9	14657.5
Taxa Richness	11	9	13	10	11	12	10	12	14	12	10	6	12	10
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	28	34	32	10	14	52	18	34	26	32	12	32	24	16
Unknown	3	0	0	0	10	0	0	0	0	1	0	3	6	0
Total Aggregates	1	2	2	0	0	1	1	0	0	0	1	0	0	1
Cheno-Am Aggregates	1(20+)	0	2(8)	0	0	1(100+)	1(500+)	0	0	0	1(10)	0	0	1(10)
Sunflower Family Aggregates	0	1(8)	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	X(6)
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	1(10)	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	2247	2563	2570	2631	2634	2648	2674	2679	2715	2746	2793	2875	2906	2923
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	5	20	20
Sample Weight	32.1	22.9	28.8	20.9	17.3	24.5	25.4	25.1	25.4	26.1	24.6	5.2	17.6	25.5
Tracers	12	30	16	20	94	32	24	30	14	34	14	116	24	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	223	274	291	241	234	336	275	269	274	260	205	131	275	245
Pollen Concentration gr/gm or gr/wash	12364.6	8518.3	13487.8	12314.1	3073.3	9153.4	9634.9	7629.9	16457.0	6257.7	12713.1	4638.4	13904.9	14657.5
Taxa Richness	11	9	13	10	11	12	10	12	14	12	10	6	12	10
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.17 (continued). Pollen counts from LA 12587.

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	2963	2988	2993	3003	3050	3080	3083	3159	3217	3258	3310	3334	3335	3358
Sample Volume	10	20	20	20	20	20	20		20	20	7	20	20	20
Sample Weight	12.1	24.0	28.6	24.7	20.8	22.0	23.3		27.5	24.4	8.5	26.1	25.8	22.6
Tracers	30	18	12	5	40	28	12	5	84	32	42	12	6	6
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358	21358
Pollen Sum	284	205	300	253	253	391	295	1	344	355	260	218	259	214
Pollen Concentration gr/gm or gr/wash	16709.8	10135.2	18669.6	43753.6	6494.7	13556.8	22534.4	2135.8	3180.6	9710.7	15554.8	14866.0	35734.6	33706.6
Taxa Richness	14	13	12	9	10	11	10	0	14	17	12	10	14	10
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	1	2	0	0	4	0	0	4	4	0	0	0	1
Opuntia (Cylindro)	0	0.001	0	0	0	0	0	0	0	3	0	0	0	0.001

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	2963	2988	2993	3003	3050	3080	3083	3159	3217	3258	3310	3334	3335	3358
Sample Volume	10	20	20	20	20	20	20		20	20	7	20	20	20
Sample Weight	12.1	24.0	28.6	24.7	20.8	22.0	23.3		27.5	24.4	8.5	26.1	25.8	22.6
Tracers	30	18	12	5	40	28	12	5	84	32	42	12	6	6
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358	21358
Pollen Sum	284	205	300	253	253	391	295	1	344	355	260	218	259	214
Pollen Concentration gr/gm or gr/wash	16709.8	10135.2	18669.6	43753.6	6494.7	13556.8	22534.4	2135.8	3180.6	9710.7	15554.8	14866.0	35734.6	33706.6
Taxa Richness	14	13	12	9	10	11	10	0	14	17	12	10	14	10
Opuntia (Platy)	2	0.001	2	0	0	0.001	0.001	0	1	2	0.001	2	5	0
Cactaceae	0	0	0	0	0	0	0	0	0	0.001	0	0	0	0
Cleome	14	2	1	2	0	1	4	0	1	15	2	2	0	12
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eriogonum	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	0	1	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	4	2	6	2	6	0	2	0	14	12	2	0	2	8
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	2963	2988	2993	3003	3050	3080	3083	3159	3217	3258	3310	3334	3335	3358
Sample Volume	10	20	20	20	20	20	20		20	20	7	20	20	20
Sample Weight	12.1	24.0	28.6	24.7	20.8	22.0	23.3		27.5	24.4	8.5	26.1	25.8	22.6
Tracers	30	18	12	5	40	28	12	5	84	32	42	12	6	6
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358	21358
Pollen Sum	284	205	300	253	253	391	295	1	344	355	260	218	259	214
Pollen Concentration gr/gm or gr/wash	16709.8	10135.2	18669.6	43753.6	6494.7	13556.8	22534.4	2135.8	3180.6	9710.7	15554.8	14866.0	35734.6	33706.6
Taxa Richness	14	13	12	9	10	11	10	0	14	17	12	10	14	10
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	108	110	160	126	96	170	156	0	154	176	132	104	98	94
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	30	21	58	40	34	78	32	0	32	48	28	36	28	18
Ambrosia	0	0	0	0	0	0	0	0	4	4	0	4	2	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	2	2	0	0	0	0
Euphorbiaceae	8	2	12	3	2	4	4	0	6	0	2	2	0	2
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0.001	0	0	0	0	0	0	0	0.001	0	0	1	1	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	2963	2988	2993	3003	3050	3080	3083	3159	3217	3258	3310	3334	3335	3358
Sample Volume	10	20	20	20	20	20	20		20	20	7	20	20	20
Sample Weight	12.1	24.0	28.6	24.7	20.8	22.0	23.3		27.5	24.4	8.5	26.1	25.8	22.6
Tracers	30	18	12	5	40	28	12	5	84	32	42	12	6	6
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358	21358
Pollen Sum	284	205	300	253	253	391	295	1	344	355	260	218	259	214
Pollen Concentration gr/gm or gr/wash	16709.8	10135.2	18669.6	43753.6	6494.7	13556.8	22534.4	2135.8	3180.6	9710.7	15554.8	14866.0	35734.6	33706.6
Taxa Richness	14	13	12	9	10	11	10	0	14	17	12	10	14	10
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0
Abies	0.001	1	0	0	0	0	0	0	0	0	0	0	1	0
Pinus	22	18	28	20	50	62	18	0	60	6	20	14	32	8
Pinus edulis type	18	13	4	6	12	28	8	0	26	6	16	10	26	22
Juniperus	2	2	0	10	12	4	8	0	8	8	8	0	8	0
Quercus	1	0	1	0	0	0	0	0	0	1	0	0	1	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	0	2	0	2	0	0	0	0	0	6	0	2	0
Artemisia	4	5	4	20	12	6	12	0	10	12	8	28	22	10
Unknown Small Artemisia	8	0	0	0	8	4	0	0	0	2	0	0	0	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	2963	2988	2993	3003	3050	3080	3083	3159	3217	3258	3310	3334	3335	3358
Sample Volume	10	20	20	20	20	20	20		20	20	7	20	20	20
Sample Weight	12.1	24.0	28.6	24.7	20.8	22.0	23.3		27.5	24.4	8.5	26.1	25.8	22.6
Tracers	30	18	12	5	40	28	12	5	84	32	42	12	6	6
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358	21358
Pollen Sum	284	205	300	253	253	391	295	1	344	355	260	218	259	214
Pollen Concentration gr/gm or gr/wash	16709.8	10135.2	18669.6	43753.6	6494.7	13556.8	22534.4	2135.8	3180.6	9710.7	15554.8	14866.0	35734.6	33706.6
Taxa Richness	14	13	12	9	10	11	10	0	14	17	12	10	14	10
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	60	26	18	22	16	28	50	1	20	48	34	14	26	38
Unknown	3	0	0	2	0	1	0	0	1	4	1	1	2	0
Total Aggregates	0	2	2	0	3	1	1	0	1	0	1	0	2	1
Cheno-Am Aggregates	0	1(20)	2(8)	0	3(20)	1(500+)	1(20+)	0	0	0	1(6)	0	2(20+)	1(8)
Sunflower Family Aggregates	0	1(10)	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	1(3)	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	X(20+)	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	2963	2988	2993	3003	3050	3080	3083	3159	3217	3258	3310	3334	3335	3358
Sample Volume	10	20	20	20	20	20	20		20	20	7	20	20	20
Sample Weight	12.1	24.0	28.6	24.7	20.8	22.0	23.3		27.5	24.4	8.5	26.1	25.8	22.6
Tracers	30	18	12	5	40	28	12	5	84	32	42	12	6	6
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358	21358
Pollen Sum	284	205	300	253	253	391	295	1	344	355	260	218	259	214
Pollen Concentration gr/gm or gr/wash	16709.8	10135.2	18669.6	43753.6	6494.7	13556.8	22534.4	2135.8	3180.6	9710.7	15554.8	14866.0	35734.6	33706.6
Taxa Richness	14	13	12	9	10	11	10	0	14	17	12	10	14	10
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.17 (continued). Pollen counts from LA 12587.

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3360	3369	3370	3394	3441	3444	3466	3467	3473	3498	3499	3502	3503	3513
Sample Volume	20	20	20	5	15	20	20	20		20	20	20	20	8
Sample Weight	17.4	26.6	26.5	5.4	16.9	26.2	27.1	26.0		29.0	22.9	32.0	21.5	9.1
Tracers	272	6	10	130	34	16	22	54	6	98	248	50	50	200
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358
Pollen Sum	204	240	265	265	286	305	235	281	232	275	216	284	277	257
Pollen Concentration gr/gm or gr/wash	920.6	32117.3	21358.0	8062.5	10630.7	15539.6	8418.5	4274.6	412921.3	2066.7	812.3	3791.0	5503.4	3015.9
Taxa Richness	13	11	8	12	10	11	14	14	7	14	9	10	9	8
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0.001	0	0	0	0.001	2	12	0.001	0	0.001	0	0.001	2	0
Opuntia (Cylindro)	1	0.001	0	0	0	0	0.001	0	0	0	0.001	0	0.001	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3360	3369	3370	3394	3441	3444	3466	3467	3473	3498	3499	3502	3503	3513
Sample Volume	20	20	20	5	15	20	20	20		20	20	20	20	8
Sample Weight	17.4	26.6	26.5	5.4	16.9	26.2	27.1	26.0		29.0	22.9	32.0	21.5	9.1
Tracers	272	6	10	130	34	16	22	54	6	98	248	50	50	200
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358
Pollen Sum	204	240	265	265	286	305	235	281	232	275	216	284	277	257
Pollen Concentration gr/gm or gr/wash	920.6	32117.3	21358.0	8062.5	10630.7	15539.6	8418.5	4274.6	412921.3	2066.7	812.3	3791.0	5503.4	3015.9
Taxa Richness	13	11	8	12	10	11	14	14	7	14	9	10	9	8
Opuntia (Platy)	0.001	0.001	0	0.001	0	0.001	0	6	0	1	0.001	0.001	2	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	4	3	10	4	0	1	2	0	0	4	1	0	0	4
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	1	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	10	2	3	8	0	4	6	2	0	8	0	0	0	8
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3360	3369	3370	3394	3441	3444	3466	3467	3473	3498	3499	3502	3503	3513
Sample Volume	20	20	20	5	15	20	20	20		20	20	20	20	8
Sample Weight	17.4	26.6	26.5	5.4	16.9	26.2	27.1	26.0		29.0	22.9	32.0	21.5	9.1
Tracers	272	6	10	130	34	16	22	54	6	98	248	50	50	200
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358
Pollen Sum	204	240	265	265	286	305	235	281	232	275	216	284	277	257
Pollen Concentration gr/gm or gr/wash	920.6	32117.3	21358.0	8062.5	10630.7	15539.6	8418.5	4274.6	412921.3	2066.7	812.3	3791.0	5503.4	3015.9
Taxa Richness	13	11	8	12	10	11	14	14	7	14	9	10	9	8
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	64	114	128	94	94	166	56	58	70	96	82	84	122	104
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	44	42	34	34	26	52	70	42	40	40	24	28	28	52
Ambrosia	0	0	0	2	0	4	6	6	0	4	0	4	2	4
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	2	0	0	2	20	0	2	2	0	4	0	8	0	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3360	3369	3370	3394	3441	3444	3466	3467	3473	3498	3499	3502	3503	3513
Sample Volume	20	20	20	5	15	20	20	20		20	20	20	20	8
Sample Weight	17.4	26.6	26.5	5.4	16.9	26.2	27.1	26.0		29.0	22.9	32.0	21.5	9.1
Tracers	272	6	10	130	34	16	22	54	6	98	248	50	50	200
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358
Pollen Sum	204	240	265	265	286	305	235	281	232	275	216	284	277	257
Pollen Concentration gr/gm or gr/wash	920.6	32117.3	21358.0	8062.5	10630.7	15539.6	8418.5	4274.6	412921.3	2066.7	812.3	3791.0	5503.4	3015.9
Taxa Richness	13	11	8	12	10	11	14	14	7	14	9	10	9	8
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0.001	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	0	0	0	0	0	0	1	2	0	0	0	0	0
Pinus	8	20	8	20	36	30	22	66	18	10	22	34	24	0
Pinus edulis type	30	18	8	12	48	32	4	46	10	2	26	48	44	4
Juniperus	6	4	10	4	10	2	6	12	22	8	0	12	0	4
Quercus	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	0	0	0	8	0	2	0	0	2	0	0	0	0
Artemisia	6	4	4	20	12	2	6	26	22	22	12	18	10	10
Unknown Small Artemisia	0	0	0	6	2	0	0	0	0	0	4	0	0	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3360	3369	3370	3394	3441	3444	3466	3467	3473	3498	3499	3502	3503	3513
Sample Volume	20	20	20	5	15	20	20	20		20	20	20	20	8
Sample Weight	17.4	26.6	26.5	5.4	16.9	26.2	27.1	26.0		29.0	22.9	32.0	21.5	9.1
Tracers	272	6	10	130	34	16	22	54	6	98	248	50	50	200
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358
Pollen Sum	204	240	265	265	286	305	235	281	232	275	216	284	277	257
Pollen Concentration gr/gm or gr/wash	920.6	32117.3	21358.0	8062.5	10630.7	15539.6	8418.5	4274.6	412921.3	2066.7	812.3	3791.0	5503.4	3015.9
Taxa Richness	13	11	8	12	10	11	14	14	7	14	9	10	9	8
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	28	24	58	52	30	10	38	12	48	70	44	42	36	66
Unknown	0	6	2	2	0	0	3	1	0	3	1	6	0	1
Total Aggregates	1	2	0	5	0	0	0	0	0	0	0	0	7	0
Cheno-Am Aggregates	1(20+)	2(20+)	0	5(12)	0	0	0	0	0	0	0	0	7(20+)	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	X(18+)	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3360	3369	3370	3394	3441	3444	3466	3467	3473	3498	3499	3502	3503	3513
Sample Volume	20	20	20	5	15	20	20	20		20	20	20	20	8
Sample Weight	17.4	26.6	26.5	5.4	16.9	26.2	27.1	26.0		29.0	22.9	32.0	21.5	9.1
Tracers	272	6	10	130	34	16	22	54	6	98	248	50	50	200
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	10679	21358	21358	21358	21358	21358
Pollen Sum	204	240	265	265	286	305	235	281	232	275	216	284	277	257
Pollen Concentration gr/gm or gr/wash	920.6	32117.3	21358.0	8062.5	10630.7	15539.6	8418.5	4274.6	412921.3	2066.7	812.3	3791.0	5503.4	3015.9
Taxa Richness	13	11	8	12	10	11	14	14	7	14	9	10	9	8
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.17 (continued). Pollen counts from LA 12587.

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3514	3515	3516	3517	3518	3519	3520	3521	3541	3650	3692	3710	3778	3798
Sample Volume	20	20	20	20	20	20	20	20	20	8	5	20	20	20
Sample Weight	26.8	26.9	29.5	11.4	18.9	21.8	27.3	24.6	21.1	7.7	6.3	25.0	23.8	27.2
Tracers	360	138	208	140	168	94	16	50	22	230	44	24	42	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	292	205	328	210	259	325	239	220	319	220	219	236	296	264
Pollen Concentration gr/gm or gr/wash	646.4	1179.5	1141.7	2810.3	1742.2	3387.3	11686.3	3820.1	14677.3	2653.2	16873.7	8400.8	6324.5	14807.0
Taxa Richness	10	11	15	10	13	13	14	7	10	10	10	8	13	14
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0	5	2	0	6	0.001	16	8	2	8	0.001	0	2	0
Opuntia (Cylindro)	0	0	0.001	0	2	0	2	0	0	0	0	2	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3514	3515	3516	3517	3518	3519	3520	3521	3541	3650	3692	3710	3778	3798
Sample Volume	20	20	20	20	20	20	20	20	20	8	5	20	20	20
Sample Weight	26.8	26.9	29.5	11.4	18.9	21.8	27.3	24.6	21.1	7.7	6.3	25.0	23.8	27.2
Tracers	360	138	208	140	168	94	16	50	22	230	44	24	42	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	292	205	328	210	259	325	239	220	319	220	219	236	296	264
Pollen Concentration gr/gm or gr/wash	646.4	1179.5	1141.7	2810.3	1742.2	3387.3	11686.3	3820.1	14677.3	2653.2	16873.7	8400.8	6324.5	14807.0
Taxa Richness	10	11	15	10	13	13	14	7	10	10	10	8	13	14
Opuntia (Platy)	0	0	0	0	0	0.001	0	0	0	0.001	0.001	0	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	4	3	12	3	10	12	10	10	18	4	1	8	1	3
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	2	0	1	0	0	0	0	0	0	0
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Brassicaceae	0	0	0	2	0	0	0	0	0	0	0	0	0	1
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	10	8	21	18	2	10	12	0	4	8	0	10	8	6
Large Poaceae	0	2	1	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3514	3515	3516	3517	3518	3519	3520	3521	3541	3650	3692	3710	3778	3798
Sample Volume	20	20	20	20	20	20	20	20	20	8	5	20	20	20
Sample Weight	26.8	26.9	29.5	11.4	18.9	21.8	27.3	24.6	21.1	7.7	6.3	25.0	23.8	27.2
Tracers	360	138	208	140	168	94	16	50	22	230	44	24	42	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	292	205	328	210	259	325	239	220	319	220	219	236	296	264
Pollen Concentration gr/gm or gr/wash	646.4	1179.5	1141.7	2810.3	1742.2	3387.3	11686.3	3820.1	14677.3	2653.2	16873.7	8400.8	6324.5	14807.0
Taxa Richness	10	11	15	10	13	13	14	7	10	10	10	8	13	14
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	106	72	120	64	144	140	46	42	150	94	94	134	140	40
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	90	34	70	27	18	46	60	0	36	22	32	22	32	25
Ambrosia	0	4	2	0	0	0	12	92	0	2	0	0	4	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Euphorbiaceae	10	0	2	1	10	6	0	6	6	0	3	0	8	2
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3514	3515	3516	3517	3518	3519	3520	3521	3541	3650	3692	3710	3778	3798
Sample Volume	20	20	20	20	20	20	20	20	20	8	5	20	20	20
Sample Weight	26.8	26.9	29.5	11.4	18.9	21.8	27.3	24.6	21.1	7.7	6.3	25.0	23.8	27.2
Tracers	360	138	208	140	168	94	16	50	22	230	44	24	42	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	292	205	328	210	259	325	239	220	319	220	219	236	296	264
Pollen Concentration gr/gm or gr/wash	646.4	1179.5	1141.7	2810.3	1742.2	3387.3	11686.3	3820.1	14677.3	2653.2	16873.7	8400.8	6324.5	14807.0
Taxa Richness	10	11	15	10	13	13	14	7	10	10	10	8	13	14
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	0	0	0	0	0	0.001	0	0	0	0	0	0	1
Pinus	4	10	10	16	4	18	22	0	6	10	22	12	10	43
Pinus edulis type	14	2	6	14	16	18	20	0	12	30	24	12	30	64
Juniperus	4	8	2	14	0	22	13	0	8	2	6	0	0	47
Quercus	0	0	0	0	2	0	0	0	0	0	0	0	1	2
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	0	0	0	0	2	0	6	0	0	0	0	2	0
Artemisia	2	0	12	20	10	10	6	10	10	0	4	8	8	10
Unknown Small Artemisia	2	14	4	0	2	10	0	0	0	0	0	0	0	0
Sarcobatus	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3514	3515	3516	3517	3518	3519	3520	3521	3541	3650	3692	3710	3778	3798
Sample Volume	20	20	20	20	20	20	20	20	20	8	5	20	20	20
Sample Weight	26.8	26.9	29.5	11.4	18.9	21.8	27.3	24.6	21.1	7.7	6.3	25.0	23.8	27.2
Tracers	360	138	208	140	168	94	16	50	22	230	44	24	42	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	292	205	328	210	259	325	239	220	319	220	219	236	296	264
Pollen Concentration gr/gm or gr/wash	646.4	1179.5	1141.7	2810.3	1742.2	3387.3	11686.3	3820.1	14677.3	2653.2	16873.7	8400.8	6324.5	14807.0
Taxa Richness	10	11	15	10	13	13	14	7	10	10	10	8	13	14
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	44	42	62	30	28	30	14	46	64	36	30	28	46	18
Unknown	0	1	0	0	0	0	4	0	3	1	0	0	2	1
Total Aggregates	2	0	2	1	3	1	0	0	0	3	3	0	0	0
Cheno-Am Aggregates	2(6)	0	0	0	0	0	0	0	0	3(20+)	3(6)	0	0	0
Sunflower Family Aggregates	0	0	2(6)	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	3(12)	0	X(3)	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	1(10)	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	1(6)	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3514	3515	3516	3517	3518	3519	3520	3521	3541	3650	3692	3710	3778	3798
Sample Volume	20	20	20	20	20	20	20	20	20	8	5	20	20	20
Sample Weight	26.8	26.9	29.5	11.4	18.9	21.8	27.3	24.6	21.1	7.7	6.3	25.0	23.8	27.2
Tracers	360	138	208	140	168	94	16	50	22	230	44	24	42	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	292	205	328	210	259	325	239	220	319	220	219	236	296	264
Pollen Concentration gr/gm or gr/wash	646.4	1179.5	1141.7	2810.3	1742.2	3387.3	11686.3	3820.1	14677.3	2653.2	16873.7	8400.8	6324.5	14807.0
Taxa Richness	10	11	15	10	13	13	14	7	10	10	10	8	13	14
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.17 (continued). Pollen counts from LA 12587.

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3820	3860	3872	3985	4009	4024	4051	4052	4055	4056	4057	4058	4059	4060
Sample Volume	20	20	20	20	20	10	20	20	20	20	20	20	20	20
Sample Weight	22.9	22.5	18.0	27.6	23.6	13.2	22.5	21.2	23.0	24.9	22.3	24.3	26.7	23.0
Tracers	8	26	20	16	16	50	12	44	4	14	150	33	18	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	203	232	259	206	225	233	304	294	243	288	232	352	319	254
Pollen Concentration gr/gm or gr/wash	23666.3	8470.2	15365.9	9963.2	12726.6	7540.0	24047.5	6731.6	56413.0	17645.2	1481.3	9375.3	14176.5	16847.6
Taxa Richness	9	11	9	12	8	13	13	13	9	12	12	14	9	12
Gossypium	0	0	0	0	0	0	0.001	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	4	1	0	0.001	0.001	2	0.001	0.001	0	1	4	0.001	1	0
Opuntia (Cylindro)	2	0	0	0	0	0	0.001	0.001	0	0	0.001	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3820	3860	3872	3985	4009	4024	4051	4052	4055	4056	4057	4058	4059	4060
Sample Volume	20	20	20	20	20	10	20	20	20	20	20	20	20	20
Sample Weight	22.9	22.5	18.0	27.6	23.6	13.2	22.5	21.2	23.0	24.9	22.3	24.3	26.7	23.0
Tracers	8	26	20	16	16	50	12	44	4	14	150	33	18	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	203	232	259	206	225	233	304	294	243	288	232	352	319	254
Pollen Concentration gr/gm or gr/wash	23666.3	8470.2	15365.9	9963.2	12726.6	7540.0	24047.5	6731.6	56413.0	17645.2	1481.3	9375.3	14176.5	16847.6
Taxa Richness	9	11	9	12	8	13	13	13	9	12	12	14	9	12
Opuntia (Platy)	0	0.001	0.001	0.001	0	0	0.001	0.001	0.001	0.001	3	5	0	0.001
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	4	0	4	2	0	10	0	1	0	8	0	0	8	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Portulaca	0	0	0	0	0	0.001	0	0	0	0.001	0	0	0	0
Rosaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Brassicaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	0	0	0	2	0	4	3	4	6	4	6	11	6	4
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3820	3860	3872	3985	4009	4024	4051	4052	4055	4056	4057	4058	4059	4060
Sample Volume	20	20	20	20	20	10	20	20	20	20	20	20	20	20
Sample Weight	22.9	22.5	18.0	27.6	23.6	13.2	22.5	21.2	23.0	24.9	22.3	24.3	26.7	23.0
Tracers	8	26	20	16	16	50	12	44	4	14	150	33	18	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	203	232	259	206	225	233	304	294	243	288	232	352	319	254
Pollen Concentration gr/gm or gr/wash	23666.3	8470.2	15365.9	9963.2	12726.6	7540.0	24047.5	6731.6	56413.0	17645.2	1481.3	9375.3	14176.5	16847.6
Taxa Richness	9	11	9	12	8	13	13	13	9	12	12	14	9	12
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	114	83	170	88	134	100	161	146	100	126	82	133	158	51
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	8	24	24	18	28	20	73	62	42	20	20	95	48	38
Ambrosia	0	4	0	4	0	0	0	2	0	0	2	0	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	0	4	0	0	2	4	8	10	6	6	0	2	0	2
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0	0.001	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3820	3860	3872	3985	4009	4024	4051	4052	4055	4056	4057	4058	4059	4060
Sample Volume	20	20	20	20	20	10	20	20	20	20	20	20	20	20
Sample Weight	22.9	22.5	18.0	27.6	23.6	13.2	22.5	21.2	23.0	24.9	22.3	24.3	26.7	23.0
Tracers	8	26	20	16	16	50	12	44	4	14	150	33	18	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	203	232	259	206	225	233	304	294	243	288	232	352	319	254
Pollen Concentration gr/gm or gr/wash	23666.3	8470.2	15365.9	9963.2	12726.6	7540.0	24047.5	6731.6	56413.0	17645.2	1481.3	9375.3	14176.5	16847.6
Taxa Richness	9	11	9	12	8	13	13	13	9	12	12	14	9	12
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0.001
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies	0	0	0	0	1	0	0	0	0	0	0	1	0	1
Pinus	20	16	16	10	10	12	7	2	2	4	38	35	6	53
Pinus edulis type	6	58	22	14	14	12	5	16	10	34	30	10	10	30
Juniperus	2	6	4	7	0	18	6	0	22	20	8	7	2	32
Quercus	0	1	0	0	0	1	0	0	0	0	0	1	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	0	2	0	0	0	0	1	0	0	2	0	0	0
Artemisia	12	10	6	28	10	6	13	10	10	12	10	13	14	18
Unknown Small Artemisia	0	0	0	2	0	4	0	0	0	0	0	0	0	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3820	3860	3872	3985	4009	4024	4051	4052	4055	4056	4057	4058	4059	4060
Sample Volume	20	20	20	20	20	10	20	20	20	20	20	20	20	20
Sample Weight	22.9	22.5	18.0	27.6	23.6	13.2	22.5	21.2	23.0	24.9	22.3	24.3	26.7	23.0
Tracers	8	26	20	16	16	50	12	44	4	14	150	33	18	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	203	232	259	206	225	233	304	294	243	288	232	352	319	254
Pollen Concentration gr/gm or gr/wash	23666.3	8470.2	15365.9	9963.2	12726.6	7540.0	24047.5	6731.6	56413.0	17645.2	1481.3	9375.3	14176.5	16847.6
Taxa Richness	9	11	9	12	8	13	13	13	9	12	12	14	9	12
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	30	23	6	30	26	38	27	38	44	52	24	31	66	23
Unknown	1	2	0	0	0	1	0	2	1	0	0	0	0	0
Total Aggregates	0	0	5	1	0	1	1	0	0	1	3	7	0	1
Cheno-Am Aggregates	0	0	5(20+)	1(20+)	0	0	1(6)	0	0	1(6)	3(10)	7(100+)	0	1(6)
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	1(4)	0	X(20+)	0	X(3)	X(8)	0	X(12)	0
Prickly Pear Aggregates	0	0	X(12+)	X(6)	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	3820	3860	3872	3985	4009	4024	4051	4052	4055	4056	4057	4058	4059	4060
Sample Volume	20	20	20	20	20	10	20	20	20	20	20	20	20	20
Sample Weight	22.9	22.5	18.0	27.6	23.6	13.2	22.5	21.2	23.0	24.9	22.3	24.3	26.7	23.0
Tracers	8	26	20	16	16	50	12	44	4	14	150	33	18	14
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	203	232	259	206	225	233	304	294	243	288	232	352	319	254
Pollen Concentration gr/gm or gr/wash	23666.3	8470.2	15365.9	9963.2	12726.6	7540.0	24047.5	6731.6	56413.0	17645.2	1481.3	9375.3	14176.5	16847.6
Taxa Richness	9	11	9	12	8	13	13	13	9	12	12	14	9	12
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.17 (continued). Pollen counts from LA 12587.

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	4061	4062	4063	4064	4065	4066	4067	4073	4097	4098	4100	4111	4112	4122
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	6	4	20
Sample Weight	22.1	23.2	22.4	23.5	25.8	26.3	25.9	25.2	26.5	29.6	18.0	9.3	4.2	20.4
Tracers	13	44	44	18	16	24	18	28	25	432	10	59	42	24
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	21358
Pollen Sum	210	264	358	456	268	229	296	252	351	237	6	266	207	224
Pollen Concentration gr/gm or gr/wash	15611.5	5523.6	7757.9	23024.2	13866.1	7748.7	13560.6	7627.9	11315.7	395.9	711.9	18017.4	43613.2	9771.6
Taxa Richness	12	10	11	10	17	11	10	6	16	9	3	15	12	10
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0.001	0.001	0.001	0.001	0.001	0	2	0.001	0.001	1	0	1	0.001	0
Opuntia (Cylindro)	0.001	0	0.001	0	0.001	0	0.001	0	0.001	0	0	0.001	0.001	0.001

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	4061	4062	4063	4064	4065	4066	4067	4073	4097	4098	4100	4111	4112	4122
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	6	4	20
Sample Weight	22.1	23.2	22.4	23.5	25.8	26.3	25.9	25.2	26.5	29.6	18.0	9.3	4.2	20.4
Tracers	13	44	44	18	16	24	18	28	25	432	10	59	42	24
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	21358
Pollen Sum	210	264	358	456	268	229	296	252	351	237	6	266	207	224
Pollen Concentration gr/gm or gr/wash	15611.5	5523.6	7757.9	23024.2	13866.1	7748.7	13560.6	7627.9	11315.7	395.9	711.9	18017.4	43613.2	9771.6
Taxa Richness	12	10	11	10	17	11	10	6	16	9	3	15	12	10
Opuntia (Platy)	0	2	0	0	0.001	0	0.001	0	1	2	0	0.001	0.001	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	1	0	1	1	1	0	0	0	0	0	1	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Eriogonum	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Brassicaceae	0	1	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	3	0	2	0	6	2	8	0	4	0	0	1	3	0
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	4061	4062	4063	4064	4065	4066	4067	4073	4097	4098	4100	4111	4112	4122
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	6	4	20
Sample Weight	22.1	23.2	22.4	23.5	25.8	26.3	25.9	25.2	26.5	29.6	18.0	9.3	4.2	20.4
Tracers	13	44	44	18	16	24	18	28	25	432	10	59	42	24
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	21358
Pollen Sum	210	264	358	456	268	229	296	252	351	237	6	266	207	224
Pollen Concentration gr/gm or gr/wash	15611.5	5523.6	7757.9	23024.2	13866.1	7748.7	13560.6	7627.9	11315.7	395.9	711.9	18017.4	43613.2	9771.6
Taxa Richness	12	10	11	10	17	11	10	6	16	9	3	15	12	10
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	77	132	180	148	104	128	174	124	139	85	0.001	146	100	24
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	26	38	38	46	22	38	34	26	21	28	0	34	17	16
Ambrosia	0	0	0	0	2	0	0	0	3	0	0	2	2	2
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	5	0	25	4	10	4	4	0	1	3	0.001	1	0	2
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0.001	0.001	0.001	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	4061	4062	4063	4064	4065	4066	4067	4073	4097	4098	4100	4111	4112	4122
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	6	4	20
Sample Weight	22.1	23.2	22.4	23.5	25.8	26.3	25.9	25.2	26.5	29.6	18.0	9.3	4.2	20.4
Tracers	13	44	44	18	16	24	18	28	25	432	10	59	42	24
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	21358
Pollen Sum	210	264	358	456	268	229	296	252	351	237	6	266	207	224
Pollen Concentration gr/gm or gr/wash	15611.5	5523.6	7757.9	23024.2	13866.1	7748.7	13560.6	7627.9	11315.7	395.9	711.9	18017.4	43613.2	9771.6
Taxa Richness	12	10	11	10	17	11	10	6	16	9	3	15	12	10
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0.001	0	0	0	0.001	0.001	0	0	0.001	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Abies	0	0	0	0	0	0	0	0	6	0	0	1	0	0.001
Pinus	12	4	2	52	22	0	2	36	114	3	0.001	8	22	88
Pinus edulis type	16	9	16	94	10	10	12	8	24	16	0	20	14	78
Juniperus	14	8	3	18	8	0	0	0	8	20	0	3	2	0
Quercus	0	0	0	0	0	0	0	0	2	0	0	1	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Artemisia	14	10	20	16	33	10	24	22	16	43	0	1	6	2
Unknown Small Artemisia	0	0	0	0	6	3	0	0	0	0	0	0	0	0
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	4061	4062	4063	4064	4065	4066	4067	4073	4097	4098	4100	4111	4112	4122
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	6	4	20
Sample Weight	22.1	23.2	22.4	23.5	25.8	26.3	25.9	25.2	26.5	29.6	18.0	9.3	4.2	20.4
Tracers	13	44	44	18	16	24	18	28	25	432	10	59	42	24
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	21358
Pollen Sum	210	264	358	456	268	229	296	252	351	237	6	266	207	224
Pollen Concentration gr/gm or gr/wash	15611.5	5523.6	7757.9	23024.2	13866.1	7748.7	13560.6	7627.9	11315.7	395.9	711.9	18017.4	43613.2	9771.6
Taxa Richness	12	10	11	10	17	11	10	6	16	9	3	15	12	10
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	42	56	68	76	42	30	36	36	1	36	6	44	36	8
Unknown	0	0	1	0	0	2	0	0	0	0	0	1	1	0
Total Aggregates	0	3	1	1	2	0	0	0	9	0	0	1	3	0
Cheno-Am Aggregates	0	3(8)	1(6)	1(6)	2(6)	0	0	0	9(16)	0	0	1(20)	3(20+)	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	X(8)	0	X(6)	X(3)	X(10)	0	0	X(3)	X(3)	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	X(200+)	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587
Specimen Number	4061	4062	4063	4064	4065	4066	4067	4073	4097	4098	4100	4111	4112	4122
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	6	4	20
Sample Weight	22.1	23.2	22.4	23.5	25.8	26.3	25.9	25.2	26.5	29.6	18.0	9.3	4.2	20.4
Tracers	13	44	44	18	16	24	18	28	25	432	10	59	42	24
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	37166	37166	21358
Pollen Sum	210	264	358	456	268	229	296	252	351	237	6	266	207	224
Pollen Concentration gr/gm or gr/wash	15611.5	5523.6	7757.9	23024.2	13866.1	7748.7	13560.6	7627.9	11315.7	395.9	711.9	18017.4	43613.2	9771.6
Taxa Richness	12	10	11	10	17	11	10	6	16	9	3	15	12	10
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	1	0	0	0	0	0	0	0	0

Table Y.18. Pollen counts from LA 12587, LA 86637, and LA 127631.

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	86637	86637	86637	127631
Specimen Number	4123	4128	4129	4130	4141	4154	4155	5120	5122	5123	274	275	276	14
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.8	26.1	24.2	30.3	21.4	23.5	21.8	25.4	25.6	28.9	24.9	23.8	23.6	18.3
Tracers	62	5	26	14	50	24	37	46	85	4	30	108	114	4
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	37166	37166	21358	21358	21358	21358	21358
Pollen Sum	276	233	296	204	269	240	232	252	231	224	215	228	347	229
Pollen Concentration gr/gm or gr/wash	3994.9	38133.4	10047.6	10271.2	5369.4	9088.5	6143.1	8015.9	3945.5	41385.7	6147.2	1894.5	2754.7	66816.7
Taxa Richness	10	13	11	10	13	13	12	13	11	12	12	9	6	10
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0.001	0	0.001	0	8	0.001	0.001	2	2	0.001	0	0	0	0
Opuntia (Cylindro)	0	0	0	0.001	0	0	0	1	1	0.001	0	0	0	0
Opuntia (Platy)	0	0.001	0.001	0.001	0	0.001	1	0.001	1	0.001	0	0.001	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	4	0	0	0	4	0	3	2	1	4	0	0	0	0
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	0	0	1	0	0	0	0	0	1	0	0	1
Eriogonum	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Brassicaceae	0	1	0	0	0	0	0	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	86637	86637	86637	127631
Specimen Number	4123	4128	4129	4130	4141	4154	4155	5120	5122	5123	274	275	276	14
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.8	26.1	24.2	30.3	21.4	23.5	21.8	25.4	25.6	28.9	24.9	23.8	23.6	18.3
Tracers	62	5	26	14	50	24	37	46	85	4	30	108	114	4
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	37166	37166	21358	21358	21358	21358	21358
Pollen Sum	276	233	296	204	269	240	232	252	231	224	215	228	347	229
Pollen Concentration gr/gm or gr/wash	3994.9	38133.4	10047.6	10271.2	5369.4	9088.5	6143.1	8015.9	3945.5	41385.7	6147.2	1894.5	2754.7	66816.7
Taxa Richness	10	13	11	10	13	13	12	13	11	12	12	9	6	10
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	0	8	0	4	6	8	1	9	1	10	0	6	1	6
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	136	21	132	56	86	92	114	139	127	132	58	116	108	20
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	26	8	28	24	54	16	31	21	21	18	76	38	0	10
Ambrosia	0	4	1	2	16	0	1	0	2	2	11	4	0	10
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	178	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	5	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	86637	86637	86637	127631
Specimen Number	4123	4128	4129	4130	4141	4154	4155	5120	5122	5123	274	275	276	14
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.8	26.1	24.2	30.3	21.4	23.5	21.8	25.4	25.6	28.9	24.9	23.8	23.6	18.3
Tracers	62	5	26	14	50	24	37	46	85	4	30	108	114	4
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	37166	37166	21358	21358	21358	21358	21358
Pollen Sum	276	233	296	204	269	240	232	252	231	224	215	228	347	229
Pollen Concentration gr/gm or gr/wash	3994.9	38133.4	10047.6	10271.2	5369.4	9088.5	6143.1	8015.9	3945.5	41385.7	6147.2	1894.5	2754.7	66816.7
Taxa Richness	10	13	11	10	13	13	12	13	11	12	12	9	6	10
Euphorbiaceae	2	0	0	0	5	1	0	5	0	2	1	0	0	2
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0	0	0	0	0	0.001	0	0	0	0	0	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0.001	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0.001	0	0	0	0	0	0	0	0
Picea	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Abies	0	3	2	0	0	0	0	0	0	0	0	0	0	0
Pinus	6	36	66	20	18	46	5	10	10	2	8	0	0	28
Pinus edulis type	16	102	12	66	26	48	10	12	21	2	16	12	0	98
Juniperus	2	31	20	16	0	14	4	1	0	0	4	4	2	42
Quercus	0	4	1	0	0	0	0	0	0	0	0	0	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	2	0	0	0	0	2	1	0	0	0	0	0	0
Artemisia	8	1	12	0	24	12	15	5	3	4	10	8	2	10
Unknown Small Artemisia	2	0	0	0	8	0	0	0	0	0	0	2	8	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	86637	86637	86637	127631
Specimen Number	4123	4128	4129	4130	4141	4154	4155	5120	5122	5123	274	275	276	14
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.8	26.1	24.2	30.3	21.4	23.5	21.8	25.4	25.6	28.9	24.9	23.8	23.6	18.3
Tracers	62	5	26	14	50	24	37	46	85	4	30	108	114	4
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	37166	37166	21358	21358	21358	21358	21358
Pollen Sum	276	233	296	204	269	240	232	252	231	224	215	228	347	229
Pollen Concentration gr/gm or gr/wash	3994.9	38133.4	10047.6	10271.2	5369.4	9088.5	6143.1	8015.9	3945.5	41385.7	6147.2	1894.5	2754.7	66816.7
Taxa Richness	10	13	11	10	13	13	12	13	11	12	12	9	6	10
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	66	12	22	14	10	3	41	39	40	48	8	32	40	2
Unknown	8	0	0	0	1	0	3	3	0	0	14	6	1	0
Total Aggregates	0	0	0	0	0	0	1	2	1	0	0	0	7	0
Cheno-Am Aggregates	0	0	0	0	0	0	1(10)	1(50+)	0	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	7(8)	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	X(4)	0	X(6)	1(12)	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	X(8)	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	X(500+)	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	X(75+)	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	12587	12587	12587	12587	12587	12587	12587	12587	12587	12587	86637	86637	86637	127631
Specimen Number	4123	4128	4129	4130	4141	4154	4155	5120	5122	5123	274	275	276	14
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.8	26.1	24.2	30.3	21.4	23.5	21.8	25.4	25.6	28.9	24.9	23.8	23.6	18.3
Tracers	62	5	26	14	50	24	37	46	85	4	30	108	114	4
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	37166	37166	21358	21358	21358	21358	21358
Pollen Sum	276	233	296	204	269	240	232	252	231	224	215	228	347	229
Pollen Concentration gr/gm or gr/wash	3994.9	38133.4	10047.6	10271.2	5369.4	9088.5	6143.1	8015.9	3945.5	41385.7	6147.2	1894.5	2754.7	66816.7
Taxa Richness	10	13	11	10	13	13	12	13	11	12	12	9	6	10
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.19. Pollen counts from LA 127631 and LA 128803.

Site Number	127631	127631	127631	127631	127631	128803	128803	128803	128803	128803	128803	128803	128803	128803
Specimen Number	33	41	48	50	52	6	7	11	12	15	17	19	20	22
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	21.2	25.8	28.0	21.8	20.8	23.7	23.8	23.4	21.8	19.4	18.9	20.3	22.3	25.3
Tracers	16	131	20	60	70	242	194	164	174	256	310	82	360	104
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	108	229	208	215	215	231	235	266	308	223	114	239	200	269
Pollen Concentration gr/gm or gr/wash	6800.3	1447.1	7933.0	3510.7	3153.8	860.2	1087.1	1480.4	1734.2	959.0	415.6	3066.5	532.1	2183.5
Taxa Richness	11	10	10	5	10	10	10	12	11	13	9	11	9	11
Gossypium	0	0	0	0	0	0	0	0	0	0.001	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	4	0	0	0	1	0	0	1	0.001	0	0	4	0	1
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	0	0	0	0	0.001	0	0	0	0	0.001	0	0	0	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	3	0	0	0	0	0	0	0	0	0	0	0
cf. Helianthus	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	8	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	3	0	0	1	1	0	0	0	4	0	0	0	1
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	7	0	0	0	2	0	0	0	0	0	2	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	127631	127631	127631	127631	127631	128803	128803	128803	128803	128803	128803	128803	128803	128803
Specimen Number	33	41	48	50	52	6	7	11	12	15	17	19	20	22
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	21.2	25.8	28.0	21.8	20.8	23.7	23.8	23.4	21.8	19.4	18.9	20.3	22.3	25.3
Tracers	16	131	20	60	70	242	194	164	174	256	310	82	360	104
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	108	229	208	215	215	231	235	266	308	223	114	239	200	269
Pollen Concentration gr/gm or gr/wash	6800.3	1447.1	7933.0	3510.7	3153.8	860.2	1087.1	1480.4	1734.2	959.0	415.6	3066.5	532.1	2183.5
Taxa Richness	11	10	10	5	10	10	10	12	11	13	9	11	9	11
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	7	0	15	30	20	0	24	30	13	8	18	14	8	18
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	22	56	48	38	28	38	20	40	90	28	22	44	57	52
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	6	30	28	32	16	31	102	50	92	42	10	14	30	64
Ambrosia	0	0	0	0	0	0	0	2	2	2	0	0	0	0
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	2	0	0	0	0	0	0

Site Number	127631	127631	127631	127631	127631	128803	128803	128803	128803	128803	128803	128803	128803	128803
Specimen Number	33	41	48	50	52	6	7	11	12	15	17	19	20	22
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	21.2	25.8	28.0	21.8	20.8	23.7	23.8	23.4	21.8	19.4	18.9	20.3	22.3	25.3
Tracers	16	131	20	60	70	242	194	164	174	256	310	82	360	104
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	108	229	208	215	215	231	235	266	308	223	114	239	200	269
Pollen Concentration gr/gm or gr/wash	6800.3	1447.1	7933.0	3510.7	3153.8	860.2	1087.1	1480.4	1734.2	959.0	415.6	3066.5	532.1	2183.5
Taxa Richness	11	10	10	5	10	10	10	12	11	13	9	11	9	11
Euphorbiaceae	0	0	4	0	0	4	10	24	10	0	0	3	8	7
Scrophulariaceae	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	0.001	0	0	0	0	0	2	0	0	0	0.001	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	7	0	0	0	0	0	0	0	0	0	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0
Abies	0	0	0	0	0	0	0	0	0	0	2	0	0	6
Pinus	2	13	4	0	10	22	4	2	6	22	12	24	10	12
Pinus edulis type	18	32	40	20	40	62	20	28	22	58	16	76	34	50
Juniperus	3	35	18	32	60	30	2	4	6	24	10	42	6	14
Quercus	0	0	0	0	0	0	4	0	2	2	0	1	2	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	0	0	0	0	0	2	0	14	0	4	0	2	0	0
Artemisia	6	8	0	0	4	6	3	12	14	4	0	0	6	6
Unknown Small Artemisia	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	127631	127631	127631	127631	127631	128803	128803	128803	128803	128803	128803	128803	128803	128803
Specimen Number	33	41	48	50	52	6	7	11	12	15	17	19	20	22
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	21.2	25.8	28.0	21.8	20.8	23.7	23.8	23.4	21.8	19.4	18.9	20.3	22.3	25.3
Tracers	16	131	20	60	70	242	194	164	174	256	310	82	360	104
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	108	229	208	215	215	231	235	266	308	223	114	239	200	269
Pollen Concentration gr/gm or gr/wash	6800.3	1447.1	7933.0	3510.7	3153.8	860.2	1087.1	1480.4	1734.2	959.0	415.6	3066.5	532.1	2183.5
Taxa Richness	11	10	10	5	10	10	10	12	11	13	9	11	9	11
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	21	21	46	52	32	27	26	38	39	22	20	12	30	34
Unknown	10	16	0	11	3	6	8	19	10	2	0	1	8	1
Total Aggregates	0	0	0	0	0	0	10	0	2	1	4	0	1	3
Cheno-Am Aggregates	0	0	0	0	0	0	10(50+)	0	2(10)	1(20+)	4(20+)	0	0	2(10)
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maize Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	1(10)
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	127631	127631	127631	127631	127631	128803	128803	128803	128803	128803	128803	128803	128803	128803
Specimen Number	33	41	48	50	52	6	7	11	12	15	17	19	20	22
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	21.2	25.8	28.0	21.8	20.8	23.7	23.8	23.4	21.8	19.4	18.9	20.3	22.3	25.3
Tracers	16	131	20	60	70	242	194	164	174	256	310	82	360	104
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	108	229	208	215	215	231	235	266	308	223	114	239	200	269
Pollen Concentration gr/gm or gr/wash	6800.3	1447.1	7933.0	3510.7	3153.8	860.2	1087.1	1480.4	1734.2	959.0	415.6	3066.5	532.1	2183.5
Taxa Richness	11	10	10	5	10	10	10	12	11	13	9	11	9	11
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.20. Pollen counts from LA 128803, LA 128804, and LA 128805.

Site Number	128803	128803	128803	128803	128803	128803	128803	128804	128804	128804	128804	128805	128805	128805
Specimen Number	23	26	27	34	35	36	39	214	216	220	223	165	181	182
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.2	24.1	18.7	17.8	21.9	21.2	20.0	22.7	24.4	22.0	21.3	24.4	20.1	22.2
Tracers	176	128	136	139	70	16	96	164	216	806	364	42	122	62
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	206	202	208	245	246	100	206	266	239	222	218	286	268	437
Pollen Concentration gr/gm or gr/wash	1077.5	1398.6	1746.8	2114.9	3427.3	6296.6	2291.5	1526.1	968.5	267.4	600.5	5960.6	2334.2	6781.1
Taxa Richness	12	11	11	11	10	5	12	12	10	15	7	12	12	12
Gossypium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbita	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays	0.001	0	0.001	1	0	0	0	0	0	0	0	0	0	0
Opuntia (Cylindro)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opuntia (Platy)	0	0.001	2	0	0	0	0	1	0	0.001	0	0.001	0.001	0
Cactaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleome	0	0	0	0	0	0	0	0	0	0	0	0	0	3
cf. Helianthus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Typha	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Cyperaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosaceae	0	0	1	0	0	0	0	0	0	0	0	0	0	3
Eriogonum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	0	0	0	0	0	0	1	0	0	0	0	0	0	0
cf. Astragalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	128803	128803	128803	128803	128803	128803	128803	128804	128804	128804	128804	128805	128805	128805
Specimen Number	23	26	27	34	35	36	39	214	216	220	223	165	181	182
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.2	24.1	18.7	17.8	21.9	21.2	20.0	22.7	24.4	22.0	21.3	24.4	20.1	22.2
Tracers	176	128	136	139	70	16	96	164	216	806	364	42	122	62
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	206	202	208	245	246	100	206	266	239	222	218	286	268	437
Pollen Concentration gr/gm or gr/wash	1077.5	1398.6	1746.8	2114.9	3427.3	6296.6	2291.5	1526.1	968.5	267.4	600.5	5960.6	2334.2	6781.1
Taxa Richness	12	11	11	11	10	5	12	12	10	15	7	12	12	12
Plantago	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	6	4	6	5	8	0	10	8	4	2	8	6	2	8
Large Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheno-Am	34	55	52	52	40	28	46	30	48	64	38	60	38	126
Fabaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Hi-Spine type	33	23	48	30	32	8	26	26	44	56	0	66	20	16
Ambrosia	0	4	4	0	0	0	4	2	0	2	8	16	3	10
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liguliflorae	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Sphaeralcea	0	0	0	0	0	0	0	0	0	0	0	0	0	2

Site Number	128803	128803	128803	128803	128803	128803	128803	128804	128804	128804	128804	128805	128805	128805
Specimen Number	23	26	27	34	35	36	39	214	216	220	223	165	181	182
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.2	24.1	18.7	17.8	21.9	21.2	20.0	22.7	24.4	22.0	21.3	24.4	20.1	22.2
Tracers	176	128	136	139	70	16	96	164	216	806	364	42	122	62
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	206	202	208	245	246	100	206	266	239	222	218	286	268	437
Pollen Concentration gr/gm or gr/wash	1077.5	1398.6	1746.8	2114.9	3427.3	6296.6	2291.5	1526.1	968.5	267.4	600.5	5960.6	2334.2	6781.1
Taxa Richness	12	11	11	11	10	5	12	12	10	15	7	12	12	12
Euphorbiaceae	4	8	5	2	2	4	4	4	1	0	0	0	2	0
Scrophulariaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	6	0	0	0	0	0	0	0	0	0	0	0.001	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Abies	0	0	0	0	0	0	1	0	0	1	0	2	1	0
Pinus	2	20	14	9	12	0	10	24	4	10	12	18	22	28
Pinus edulis type	26	22	24	93	92	27	62	100	40	32	70	46	138	82
Juniperus	23	34	14	20	29	0	6	46	34	30	16	10	22	78
Quercus	1	4	0	2	5	0	0	2	2	0	0	0	0	0
Rhus type	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephedra	1	0	0	2	1	0	0	4	4	2	0	2	2	0
Artemisia	10	12	0	5	1	12	6	10	2	8	0	8	8	14
Unknown Small Artemisia	0	0	0	0	0	0	0	0	0	6	0	0	0	0

Site Number	128803	128803	128803	128803	128803	128803	128803	128804	128804	128804	128804	128805	128805	128805
Specimen Number	23	26	27	34	35	36	39	214	216	220	223	165	181	182
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.2	24.1	18.7	17.8	21.9	21.2	20.0	22.7	24.4	22.0	21.3	24.4	20.1	22.2
Tracers	176	128	136	139	70	16	96	164	216	806	364	42	122	62
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	206	202	208	245	246	100	206	266	239	222	218	286	268	437
Pollen Concentration gr/gm or gr/wash	1077.5	1398.6	1746.8	2114.9	3427.3	6296.6	2291.5	1526.1	968.5	267.4	600.5	5960.6	2334.2	6781.1
Taxa Richness	12	11	11	11	10	5	12	12	10	15	7	12	12	12
Sarcobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elaeagnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deteriorated	48	16	30	16	22	17	28	6	48	0	58	46	0	46
Unknown	12	0	6	8	2	4	1	2	8	0	6	6	8	20
Total Aggregates	0	0	2	0	0	0	0	1	0	0	0	0	2	0
Cheno-Am Aggregates	0	0	2(8)	0	0	0	0	0	0	0	0	0	1(20+)	0
Sunflower Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	1(10)	0
Grass Aggregates	0	0	0	0	0	0	0	1(4)	0	0	0	0	0	0
Maize Aggregates	X(7)	0	0	0	0	0	0	0	0	0	0	0	0	0
Prickly Pear Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniper Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site Number	128803	128803	128803	128803	128803	128803	128803	128804	128804	128804	128804	128805	128805	128805
Specimen Number	23	26	27	34	35	36	39	214	216	220	223	165	181	182
Sample Volume	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Sample Weight	23.2	24.1	18.7	17.8	21.9	21.2	20.0	22.7	24.4	22.0	21.3	24.4	20.1	22.2
Tracers	176	128	136	139	70	16	96	164	216	806	364	42	122	62
Tracer Conc.	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358	21358
Pollen Sum	206	202	208	245	246	100	206	266	239	222	218	286	268	437
Pollen Concentration gr/gm or gr/wash	1077.5	1398.6	1746.8	2114.9	3427.3	6296.6	2291.5	1526.1	968.5	267.4	600.5	5960.6	2334.2	6781.1
Taxa Richness	12	11	11	11	10	5	12	12	10	15	7	12	12	12
Mustard Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trilete Spore	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table Y.21. Pollen counts from LA 128803, LA 128804, and LA 128805.

Site Number	128805	128805	128805	128805	128805
Specimen Number	200	205	222	226	245
Sample Volume	20	20	20	20	20
Sample Weight	26.3	22.9	24.3	25.1	20.0
Tracers	114	90	62	44	76
Tracer Conc.	21358	21358	21358	21358	21358
Pollen Sum	235	311	252	287	256
Pollen Concentration gr/gm or gr/wash	1674.0	3222.9	3572.4	5550.3	3597.1
Taxa Richness	11	13	10	12	12
Gossypium	0	0	0	0	0
Cucurbita	0	0	0	0	0
Zea mays	0	0	0	2	0
Opuntia (Cylindro)	0	0	0	0	0
Opuntia (Platy)	0	2	0.001	0	2
Cactaceae	0	0	0	0	0
Cleome	0	0	0	0	0
cf. Helianthus	0	0	0	0	0
Liliaceae	0	0	0	0	0
Solanaceae	0	0	0	0	0
Apiaceae	0	0	0	0	0
Typha	0	0	0	0	1
Cyperaceae	0	0	0	0	0
Lamiaceae	0	0	0	0	0
Portulaca	0	0	0	0	0
Rosaceae	0	0	0	2	0
Eriogonum	0	2	0	0	0
Brassicaceae	0	0	0	0	0
cf. Astragalus	0	0	0	0	0
Polygonaceae	0	0	0	0	0
Polygonum frilly (cf. paronychia) type	0	0	0	0	0
Plantago	0	0	0	0	0
Polygala type	0	0	0	0	0

Site Number	128805	128805	128805	128805	128805
Specimen Number	200	205	222	226	245
Sample Volume	20	20	20	20	20
Sample Weight	26.3	22.9	24.3	25.1	20.0
Tracers	114	90	62	44	76
Tracer Conc.	21358	21358	21358	21358	21358
Pollen Sum	235	311	252	287	256
Pollen Concentration gr/gm or gr/wash	1674.0	3222.9	3572.4	5550.3	3597.1
Taxa Richness	11	13	10	12	12
Poaceae	22	2	2	12	8
Large Poaceae	0	0	0	0	0
Populus	0	0	0	0	0
Juglans	0	0	0	0	0
Betula	0	0	0	0	0
Alnus	0	0	0	0	0
Salix	0	0	0	0	0
Cheno-Am	46	60	36	68	24
Fabaceae	0	0	0	0	0
Asteraceae Hi-Spine type	92	90	54	60	20
Ambrosia	6	12	10	14	12
Unknown Asteraceae LA 86637Sunflower Family Unknown	0	0	0	0	0
Asteraceae Broad Spine type	0	0	0	0	0
Unknown Asteraceae Low-Spine type cf. Iva	0	0	0	2	0
Liguliflorae	0	0	0	0	0
Sphaeralcea	0	0	0	0	0
Euphorbiaceae	1	4	14	0	2
Scrophulariaceae	0	0	0	0	0
Onagraceae	0	0.001	0	0	0
Unknown cf. Brassicaceae (prolate, semi-tectate)	0	0	0	1	1
Nyctaginaceae	0.001	0	0	0	0
Unknown cf. Nyctaginaceae	0	0	0	0	0
Convolvulaceae	0	0	0	0	0
Pseudotsuga	0	0	0	0	0

Site Number	128805	128805	128805	128805	128805
Specimen Number	200	205	222	226	245
Sample Volume	20	20	20	20	20
Sample Weight	26.3	22.9	24.3	25.1	20.0
Tracers	114	90	62	44	76
Tracer Conc.	21358	21358	21358	21358	21358
Pollen Sum	235	311	252	287	256
Pollen Concentration gr/gm or gr/wash	1674.0	3222.9	3572.4	5550.3	3597.1
Taxa Richness	11	13	10	12	12
Picea	0	0	0	0	0
Abies	0	0	0	0	0
Pinus	12	28	16	14	18
Pinus edulis type	24	42	62	36	100
Juniperus	8	22	22	24	12
Quercus	3	0	0	0	0
Rhus type	0	0	0	0	0
Fraxinus	0	0	0	0	0
Rhamnaceae	0	0	0	0	0
Ephedra	0	2	0	0	0
Artemisia	8	8	8	8	16
Unknown Small Artemisia	0	0	0	0	0
Sarcobatus	0	0	0	0	0
Ulmus	0	0	0	0	0
Elaeagnus	0	0	0	0	0
Erodium	0	0	0	0	0
Carya	0	0	0	0	0
Deteriorated	12	30	20	34	38
Unknown	1	6	8	10	2
Total Aggregates	0	1	0	0	0
Cheno-Am Aggregates	0	0	0	0	0
Sunflower Family Aggregates	0	0	0	0	0
Grass Aggregates	0	0	0	0	0
Maize Aggregates	0	0	0	0	0
Prickly Pear Aggregates	0	X(8)	0	0	0

Site Number	128805	128805	128805	128805	128805
Specimen Number	200	205	222	226	245
Sample Volume	20	20	20	20	20
Sample Weight	26.3	22.9	24.3	25.1	20.0
Tracers	114	90	62	44	76
Tracer Conc.	21358	21358	21358	21358	21358
Pollen Sum	235	311	252	287	256
Pollen Concentration gr/gm or gr/wash	1674.0	3222.9	3572.4	5550.3	3597.1
Taxa Richness	11	13	10	12	12
Pine Aggregates	0	0	0	0	0
Juniper Aggregates	0	1(20+)	0	0	0
Small Sagebrush Aggregates	0	0	0	0	0
Sagebrush Aggregates	0	0	0	0	0
Ragweed/Bursage Aggregates	0	0	0	0	0
Mustard Aggregates	0	0	0	0	0
cf. Locoweed Aggregates	0	0	0	0	0
Cactus Family Aggregates	0	0	0	0	0
Globemallow Aggregates	0	0	0	0	0
Trilete Spore	0	0	0	0	0

Note: .001 notes scan-identified taxi. Aggregate notation shows number of aggregates and size of largest aggregate in ( ).

APPENDIX Z
TECHNICAL REPORT ON DATING OF CERAMIC MATERIALS FROM LOS ALAMOS, NEW MEXICO

Technical data on the luminescence analysis of 33 ceramic materials from sites near Los Alamos, New Mexico, were originally presented in a series of four reports. These are combined here to reduce repetition. Because table formats differed slightly from report to report, the original tables are maintained in this appendix, which should also facilitate keeping separate each set of analyses. The samples are listed in Tables Z.1 through Z.4. The general laboratory procedures are presented at the end of the appendix.

Table Z.1. TL samples from the 2002 excavations.

Lab #	Site	FS#	Room	Material	Context	Burial Depth (cm)
UW1030	LA12587	1274	2	B/W sherd	Room floor	43
UW1031	LA12587	2078	7	B/W sherd	Room floor	32
UW1032	LA12587	4098	7	Burned plaster	Hearth	35
UW1033	LA12587	4209	2	Burned plaster	Hearth	63
UW1034	LA86534	1336	1	Burned plaster	Hearth	35
UW1035	LA86534	1651	2	Burned plaster	Hearth	45
UW1036	LA86534	2250	9	Burned plaster	Hearth	175
UW1037	LA4618	806	10	Burned adobe	Kiva hearth	180

Table Z.2. TL samples from the 2003 excavations.

UW Lab #	Type	Site	FS#	area	Room/feature	Burial Depth (cm)
UW1236	Adobe	135290	1424	1	4	32
UW1237	Floor	135290	1950	1	6	35
UW1238	Wall	135290	1738	1	6	38
UW1239	Sherd	135290	2400	1	7	30
UW1240	Sherd	135290	2259	1	2/11	65
UW1241	Sherd	135290	2379	1	2	57
UW1242	Floor	135290	2458	1	4	50
UW1243	Hearth rim	135290	2595	1	8/9	44
UW1244	Hearth base	135290	2574	1	8/9	44
UW1245	Sherd	85869	328	6		0
UW1246	Sherd	99396	414	1	1	10
UW1247	sherd	99396	612	1	1	22

Table Z.3. TL samples from the 2004 excavations.

UW Lab #	Site	FS #	Ceramic Type	Provenience	Burial Depth (cm)
UW1416	87430	123	Biscuit B	North wall Room 1	16
UW1417	127634	43	Biscuit B	East wall Room 1	8
UW1418	127634	95	Biscuit B	East of Room 1	17

UW Lab #	Site	FS #	Ceramic Type	Provenience	Burial Depth (cm)
UW1419	127635	106	Micaceous Plainware	(not specified)	40

Table Z.4. TL samples from the 2005 excavations.

UW Lab #	Site	FS#	Ceramic Type	Provenience	Burial Depth (cm)
UW1502	85411	30	Biscuit A	Room 1 stratum 3	20
UW1503	85411	68	Biscuit A	Room 1 stratum 2	25
UW1504	85417	47	Santa Fe B/w	Stratum 2	23
UW1505	85417	104	Burned adobe	Stratum 3	11
UW1506	85417	136	Burned adobe	Room 1 stratum 2	30
UW1507	85417	151	Burned floor	Room 1 stratum 5	40
UW1508	85861	142	Grey ware	Room 1 stratum 2	33
UW1509	85861	249	Burned plaster	Room 2 stratum 2	30
UW1586	85404	92	Burned floor	Stratum 3	29

Dose Rate

Dose rates were determined from radioactivity measurements using alpha counting (for U and Th) and flame photometry (for K). These results are given in Tables Z.5 through Z.8. Also given in these tables are the comparisons of beta dose rates measured directly by beta counting and derived analytically from alpha counting/flame photometry assuming secular equilibrium in the U and Th decay chains. Where these differ significantly, a possibility of disequilibrium is present. In the latter case, the more direct measure from beta counting is used in the age calculation. Otherwise the more precise alpha counting and flame photometry results are used. Average moisture contents through time for the samples were estimated at 70±30 percent of currently measured absorption values. Moisture contents of 10.5 percent were assumed for the associated sediments. Tables Z.9 through Z.12 give the total dose rates for TL. The OSL dose rates differ slightly because of differences in alpha efficiency.

Table Z.5. Dose rates from radioactivity measurements for 2002 samples.

Sample	U (ppm)	Th (ppm	K (%)	β dose rate (Gy/ka)	
				α-counting/flame phot.	β-counting
UW1030	6.70±0.42	14.46±1.79	3.18±0.03	3.922±0.082	3.884±0.258
Sediment	3.34±0.29	17.94±1.81	2.24±0.05		
UW1031	5.18±0.35	14.50±1.60	3.19±0.04	3.708±0.074	3.691±0.252
Sediment	2.24±0.22	15.00±1.52	2.14±0.05		
UW1032	3.06±0.28	17.85±1.86	2.30±0.02	2.783±0.067	2.874±0.186
Sediment	2.62±0.27	20.34±1.87	2.12±0.04		
UW1033	2.61±0.25	15.90±1.72	2.41±0.33	2.748±0.273	2.799±0.181
Sediment	2.78±0.26	17.76±1.83	2.22±0.01		
UW1034	2.52±0.29	22.90±2.15	2.33±0.07	2.863±0.094	2.661±0.178
Sediment	3.06±0.29	20.05±2.00	1.96±0.01		

Sample	U (ppm)	Th (ppm	K (%)	β dose rate (Gy/ka)	
				α-counting/flame phot.	β-counting
UW1035	4.65±0.31	11.70±1.53	2.08±0.03	2.664±0.065	2.606±0.172
Sediment	2.72±0.30	23.06±2.13	2.08±0.06		
UW1036	4.05±0.30	14.18±1.66	2.16±0.01	2.715±0.066	2.806±0.182
Sediment	3.23±0.30	20.02±2.00	2.10±0.05		
UW1037	2.90±0.25	14.71±1.66	2.81±0.31	3.080±0.252	2.996±0.196
sediment	2.86±0.23	11.56±1.45	2.71±0.15		

Table Z.6. Dose rates from radioactivity measurements for 2003 samples.

Sample	^{238}U (ppm)	^{232}Th (ppm)	K (%)	Beta dose rate (Gy/ka)	
				ß-counting	α-counting/flame photometry
UW1236	3.51±0.25	12.95±1.24	1.97±0.04	2.268±0.153	2.445±0.061
Sediment	3.40±0.27	14.37±1.65	2.10±0.01		
UW1237	3.93±0.23	4.44±0.84	2.03±0.02	2.330±0.157	2.327±0.043
sediment	3.17±0.27	15.69±1.72	2.16±0.08		
UW1238	2.76±0.27	19.55±1.84	2.08±0.04	2.321±0.179	2.605±0.072*
Sediment	2.48±0.29	22.98±2.15	2.02±0.06		
UW1239	5.88±0.37	12.27±1.61	2.15±0.03	2.793±0.237	2.920±0.074
Sediment	Use data from UW1238				
UW1240	4.72±0.20	13.45±1.02	2.13±0.02	2.838±0.187	2.767±0.045
Sediment	3.63±0.28	13.44±1.60	2.06±0.03		
UW1241	4.58±0.32	14.68±1.69	1.82±0.06	2.278±0.149	2.526±0.080*
Sediment	3.41±0.29	17.46±1.84	2.16±0.01		
UW1242	2.68±0.19	8.29±1.08	1.88±0.19	2.278±0.149	2.122±0.155
Sediment	2.32±0.25	18.57±1.76	2.04±0.06		
UW1243	4.28±0.28	10.73±1.33	2.06±0.07	2.275±0.149	2.571±0.077*
Sediment	3.09±0.22	9.49±1.29	2.19±0.01		
UW1244	3.37±0.24	9.61±1.32	2.10±0.06	2.357±0.161	2.442±0.072
Sediment	3.09±0.22	9.49±1.29	2.19±0.01		
UW1245	5.94±0.41	19.50±2.04	2.65±0.10	3.386±0.230	3.523±0.112
Sediment	4.83±0.35	16.53±1.84	2.02±0.07		
UW1246	5.62±0.35	11.51±1.53	2.29±0.05	2.665±0.171	2.974±0.078*
Sediment	2.79±0.26	16.76±1.79	2.29±0.08		
UW1247	3.49±0.28	16.02±1.73	1.93±0.03	2.255±0.158	2.493±0.068
sediment	2.79±0.26	16.76±1.79	2.29±0.08		

*indicates significant difference from beta counting

Table Z.7. Dose rates from radioactivity measurements for 2004 samples.

Sample	^{238}U (ppm)	^{232}Th (ppm)	K (%)	Beta dose rate (Gy/ka)	
				ß-counting	α-counting/flame photometry
UW1416	5.89±0.40	18.06±1.85	3.53±0.14	3.94±0.34	4.19±0.13
Sediment	3.78±0.29	15.57±1.58	2.37±0.02		
UW1417	5.84±0.36	11.16±1.51	2.54±0.01	3.15±0.28	3.20±0.07
UW1418	6.39±0.42	16.51±1.89	2.76±0.09	3.26±0.26	3.60±0.11
Sediment	5.86±0.39	16.11±1.87	2.68±0.03		
UW1419	4.56±0.30	12.37±1.31	2.01±0.01	2.50±0.19	2.62±0.06
sediment	4.73±0.35	17.09±1.87	2.49±0.02		

Table Z.8. Dose rates from radioactivity measurements for 2005 samples.

Sample	^{238}U (ppm)	^{232}Th (ppm)	% K	Beta dose rate (Gy/ka)	
				ß-counting	α-counting/flame photometry
UW1502	5.27±0.35	12.74±1.62	2.53±0.10	3.05±0.26	3.15±0.11
UW1503	4.16±0.32	17.12±1.85	2.52±0.11	3.16±0.26	3.09±0.11
Sed (181)	5.49±0.37	17.24±1.61	2.29±0.08		
UW1504	7.06±0.42	11.87±1.52	2.15±0.08	3.04±0.25	2.98±0.19
UW1505	5.45±0.41	22.01±2.20	2.12±0.06	2.92±.24	3.09±0.10
UW1506	7.00±0.43	14.02±1.72	2.11±0.03	3.21±0.26	3.09±0.08
Sed (99)	6.41±0.45	23.46±1.99	2.14±0.04		
Sed (82)	4.37±0.35	20.68±1.95	1.98±0.15		
UW1507	4.52±0.45	37.34±2.63	2.20±0.02	3.12±0.30	3.44±0.10
Sed (152)	5.45±0.51	38.29±3.11	2.30±0.01		
UW1508	3.80±0.25	8.55±1.17	2.02±0.06	2.60±0.21	2.41±0.07
Sed (188)	4.87±0.38	21.72±2.17	2.24±0.10		
UW1509	5.88±0.42	21.66±2.17	2.15±0.03	2.81±0.24	3.18±0.09*
Sed (250)	4.94±0.40	25.16±2.36	2.14±0.13		
UW1586	3.43±0.26	13.19±1.52	2.39±0.04	3.01±0.29	2.78±0.07
Sed (111)	3.38±0.29	18.48±1.71	2.20±0.10		

*indicates significant difference from beta counting

Table Z.9. Dose rates (Gy/ka) for 2002 TL samples.

Sample	alpha	beta	gamma	cosmic	total
UW1030	2.340±0.228	3.464±0.188	1.698±0.120	0.296±0.061	7.798±0.325
UW1031	1.493±0.138	3.223±0.192	1.444±0.100	0.309±0.064	6.469±0.265
UW1032	1.298±0.161	2.395±0.154	1.644±0.107	0.305±0.063	5.641±0.255
UW1033	1.001±0.127	2.240±0.285	1.559±0.106	0.279±0.058	5.079±0.334
UW1034	1.059±0.126	2.437±0.175	1.684±0.123	0.316±0.065	5.496±0.257
UW1035	1.357±0.157	2.272±0.154	1.766±0.130	0.305±0.063	5.699±0.263

Sample	alpha	beta	gamma	cosmic	total
UW1036	1.453±0.186	2.219±0.181	1.687±0.120	0.240±0.050	5.599±0.290
UW1037	1.070±0.134	2.618±0.273	1.439±0.101	0.235±0.049	5.362±0.324

Table Z.10. Dose rates (Gy/ka) for 2003 TL samples.

Sample	alpha	beta	gamma	cosmic	total
UW1236	0.985±0.106	2.114±0.134	1.454±0.101	0.320±0.066	4.873±0.209
UW1237	1.179±0.121	2.018±0.121	1.419±0.099	0.316±0.065	4.932±0.224
UW1238	1.610±0.195	2.014±0.193	1.721±0.121	0.312±0.065	5.657±0.299
UW1239	2.745±0.449	2.569±0.148	1.752±0.132	0.323±0.067	7.389±0.495
UW1240	1.780±0.266	2.510±0.109	1.455±0.104	0.288±0.060	6.032±0.311
UW1241	3.371±0.369	2.100±0.154	1.622±0.117	0.294±0.061	7.387±0.421
UW1242	1.015±0.082	1.880±0.166	1.428±0.100	0.300±0.062	4.622±0.219
UW1243	1.213±0.172	1.758±0.206	1.250±0.086	0.305±0.063	4.526±0.289
UW1244	1.216±0.134	2.024±0.160	1.231±0.082	0.305±0.063	4.777±0.233
UW1245	3.394±0.583	3.173±0.169	0.955±0.066	0.396±0.082	7.919±0.616
UW1246	2.268±0.284	2.316±0.197	1.395±0.135	0.365±0.075	6.344±0.379
UW1247	1.577±0.192	2.245±0.114	1.512±0.113	0.337±0.070	5.671±0.259

Table Z.11. Dose rates (Gy/ka) for 2004 TL samples.

Sample	alpha	beta	gamma	cosmic	total
UW1416	1.94±0.25	3.54±0.26	1.59±0.11	0.35±0.07	7.42±0.39
UW1417	1.67±0.20	2.67±0.20	1.64±0.15	0.37±0.08	6.35±0.33
UW1418	3.80±0.82	3.04±0.22	1.84±0.13	0.34±0.07	9.03±0.87
UW1419	3.06±0.41	2.39±010	1.79±0.13	0.31±0.06	7.56±0.44

Table Z.12. Dose rates (Gy/ka) for 2005 TL samples.

Sample	alpha	beta	gamma	cosmic	total
UW1502	5.27±1.20	2.66±0.20	1.78±0.12	0.34±0.07	10.05±1.23
UW1503	2.92±0.49	2.63±0.19	1.81±0.12	0.33±0.07	7.69±0.55
UW1504	1.55±0.20	2.61±0.19	1.95±0.13	0.33±0.07	6.44±0.31
UW1505	1.58±0.20	2.67±0.18	1.97±0.15	0.36±0.07	6.58±0.31
UW1506	2.41±0.38	2.55±0.20	1.82±0.12	0.32±0.07	7.11±0.46
UW1507	3.45±0.35	2.89±0.22	2.79±0.19	0.31±0.06	9.44±0.46
UW1508	1.38±0.17	2.04±0.15	1.93±0.14	0.32±0.07	5.66±0.28
UW1509	1.88±0.18	2.44±0.25	2.12±0.15	0.32±0.07	6.76±0.35
UW1586	1.56±0.20	2.29±0.18	1.62±0.11	0.32±0.07	5.79±0.30

Equivalent Dose

Equivalent dose was measured by TL, OSL and IRSL, as described in the procedures section. Anomalous fading was measured for TL only. The correction for lower alpha efficiency, b-value, was measured for all three, except for the first two sets (UW1030-UW1037 and UW1236-UW1247) where it was only measured for TL. A b-value of 0.7 ± 0.3 was assumed for the OSL b-value for these samples (based on measurements of other samples). Tables Z.13 through Z.17 give equivalent dose values and b-values, as well as the TL plateau region, the fit to the TL growth curves and the slope ratio between additive dose and regeneration TL growth curves. Where no IRSL or OSL equivalent value is given, no measurable signal was obtained.

Table Z.13. Equivalent dose values and b-values for the 2002 TL samples.

Sample	Equivalent dose (Gy)			TL parameters		
	TL	IRSL	OSL	Plateau (°C)	Slope ratio*	b-value (Gy μm^2)
UW1030	6.06±0.46			240-300	1	1.47±0.10
UW1031	6.29±0.61	3.70±0.71	5.54±0.63	290-350	0.66±0.05	1.11±0.03
UW1032	7.46±0.53	5.64±0.45	6.78±1.29	None	1	1.12±0.11
UW1033	7.42±0.67		4.48±0.28	310-370	0.75±0.06	1.05±0.06
UW1034	4.25±0.46	3.92±0.41	4.25±0.13	300-340	1	0.83±0.06
UW1035	3.30±0.36	3.14±0.48	6.18±0.99	270-390	1.51±0.14	1.20±0.10
UW1036	4.26±1.33	4.18±0.44	4.43±0.21	320-360	1.90±0.28	1.34±0.11
UW1037	3.63±0.40	3.72±0.46		310-410	1.36±0.12	1.07±0.10

* Growth curve fits were linear for all samples except for UW1030, UW1031, UW1032 and UW1037 for which they were quadratic.

Table Z.14. Equivalent dose values and b-values for the 2003 TL samples.

Sample	Equivalent dose (Gy)			TL Parameters		
	TL	IRSL	OSL	plateau (°C)	Slope ratio*	b-value (Gy μm^2)
UW1236	5.07±0.70	4.07±0.50	4.38±0.08	250-310	3.10±0.27	0.95±0.07
UW1237	4.90±0.66		3.50±0.32	250-310	1	1.56±0.14
UW1238	2.54±0.44	4.17±0.57	4.32±0.08	250-290	1.39±0.07	1.34±0.11
UW1239	5.48±0.38	4.38±0.54	4.78±0.22	250-360	1	1.98±0.28
UW1240	5.31±0.95		5.09±0.44	250-350	NA	1.37±0.26
UW1241	5.38±0.64	8.46±1.32	5.91±0.31	270-350	1.34±0.16	2.48±0.23
UW1242	5.36±0.29	5.10±0.69	4.42±0.13	260-320	1.42±0.06	1.36±0.06
UW1243	4.22±0.54	4.15±0.44	5.25±0.44	250-310	1.28±0.09	1.31±0.10
UW1244	2.72±0.32	3.45±0.59	4.79±0.34	250-360	2.42±0.17	1.45±0.08
UW1245	0.98±0.14	1.12±0.27	0.94±0.03	270-340	NA	1.95±0.30
UW1246	4.67±0.47	5.72±0.66	5.82±0.33	260-320	1.38±0.11	1.75±0.17
UW1247	4.70±0.52	3.80±0.39	4.24±0.11	250-340	2.50±0.25	1.30±0.13

* Growth curve fits were linear for all samples except UW1244. For UW1240 and UW1245, only an additive dose procedure was used because the regeneration growth curves resulted in a significant negative intercept, suggesting a growth curve of a different shape than for additive dose and therefore not amenable to the slide technique.

Table Z.15. Equivalent dose values and b-values for the 2004 TL samples.

Sample	**UW1416**	**UW1417**	**UW1418**	**UW1419**
Equivalent dose (Gy)				
TL	3.46±0.20	1.58±0.33	2.39±0.28	5.66±0.73
IRSL	3.28±0.32	2.48±0.33	4.13±1.46	2.82±0.25
OSL	4.02±0.16	2.97±0.09	3.16±0.08	18.01±2.29
TL parameters				
Plateau (°C)	270-350	260-380	250-390	250-400
Fit	linear	linear	Linear	Linear
1st/2nd glow ratio[a]	1	1.78±0.13	1	0.69±0.09
b-value (Gy µm^2)				
TL	1.25±0.12	1.33±0.10	2.44±0.46	2.46±0.28
IRSL	1.26±0.27	1.82±0.41		1.60±0.40
OSL	0.62±0.02	0.65±0.02	0.61±0.02	0.68±0.05

Table Z.16. Equivalent dose values and b-values for the 2005 TL samples.

Sample	**Equivalent dose (Gy)**			**b-value (Gy µm^2)**		
	TL	IRSL	OSL	TL	IRSL	OSL
UW1502	6.10±1.69	7.67±0.82	3.56±0.19	4.22±0.84	2.39±0.53	0.84±0.06
UW1503	3.08±0.18	6.59±0.91	7.41±0.94	2.28±0.32	2.71±0.46	1.33±0.08
UW1504	4.29±0.36	6.48±0.89	4.80±0.18	1.05±0.10	2.41±0.34	0.81±0.32*
UW1505	6.66±0.33	5.32±0.34	6.07±0.54	0.94±0.09	2.39±0.34	0.57±0.03
UW1506	5.18±0.23	4.80±0.18	High**	1.60±0.20	2.76±0.32	--
UW1507	5.77±0.68	4.00±0.33	4.47±0.27	1.64±0.09	1.49±0.29	0.79±0.09
UW1508	4.01±0.13	3.14±0.14	High**	1.57±0.14	2.64±0.28	--
UW1509	3.37±0.37	5.28±0.34	4.69±0.16	1.08±0.06	2.08±0.30	0.51±0.02
UW1586	2.69±0.42	3.82±0.32	3.26±0.09	1.59±0.13	--	0.81±0.32*

* Average of other values from this set. No good measure on either sample was obtained. ** The natural OSL signals on these sherds were abnormally high, possibly reflecting insufficient firing to reset the signal at the time of manufacture.

Table Z.17. Equivalent dose values and b-values for the 2005 TL samples.

Sample	TL plateau (°C)	Growth curve fit	1st/2nd glow slope ratio
UW1502	250-360	Linear	0.61±0.11
UW1503	280-320	Linear	1.0
UW1504	310-360	Linear	1.20±0.10
UW1505	260-310	Linear	1.0
UW1506	250-370	Linear	1.0
UW1507	250-280	Linear	1.98±0.12
UW1508	290-330	Linear	1.0
UW1509	250-330	Linear	1.83±0.09
UW1586	250-340	Linear	1.35±0.12

Table Z.18 lists samples according to whether significant fading was evident in the TL data, and if so whether a correction to the age could be applied.

Table Z.18. Significant fading test results for the TL data.

Group	No fading test or poor fading results	No significant fading evident	Fading but no correction	Fading and corrected
2004 set	UW1033	UW1030, UW1031, UW1034, UW1036, UW1037	UW1032,	UW1035
2005 set	UW1240, UW1241, UW1242, UW1245, UW1247		UW1236, UW1237, UW1239, UW1244, UW1246	UW1238, UW1243
2006 set	UW1418	UW1419	UW1502	UW1416, UW1417
2007 set	UW1507	UW1504	UW1505	UW1503, UW1506, UW1508, UW1509, UW1586

Age

Tables Z.19 through Z.22 give the derived ages and their bases. Discussion of the ages follows. For the sites excavated in 2002, the TL and OSL ages agreed on UW1031, UW1032, UW1034, UW1035, and UW1036, although the OSL age for UW1035 was based on only a single aliquot. On UW1032, even though the TL and OSL ages agreed, both produced anomalously old ages. The sample had no TL plateau, so it is probable the sample was not fired sufficiently in antiquity and therefore carries a small geological residual signal. UW1030 and UW1037 had no measurable OSL signal, so the age was based only on TL. Neither sample showed significant fading. For UW1033, the TL age was anomalously old, so the OSL age was taken as the best estimate. This sample may also have suffered from insufficient firing.

Table Z.19. Derived ages and bases for the 2002 TL data.

Sample	Basis	Years BP	% error	Years AD
UW1030	TL	777±68	8.7	1226±68
UW1031	TL/OSL	956±80	8.4	1047±80
UW1032	TL/OSL	1321±120	9.1	682±120
UW1033	OSL	943±109	11.6	1060±109
UW1034	TL/OSL	815±59	11.1	1188±59
UW1035	OSL/corrected TL	1202±201	16.7	801±201
UW1036	TL/OSL	821±42	5.1	1182±42
UW1037	TL	678±86	12.7	1325±86

In eight of the 2003 excavated samples, the TL and OSL ages were in agreement, for UW1238 only after the TL age was corrected for fading. On three samples, UW1241, UW1244 and UW1246, the TL age was younger than the OSL age, probably due to fading of the TL signal. This was verified by fading tests for UW1244 and UW1246, although an attempted correction produced an unrealistically old age. Fading was assumed for UW1241, for which no fading test was performed due to sample size. The OSL age was considered the best estimate for all three. For UW1243, the OSL produced an unreasonably old age (perhaps because of insufficient heating), so the TL age, corrected for fading, was taken as the best estimate. The sample had a relatively small TL plateau.

Table Z.20. Derived ages and bases for the 2003 TL samples.

Sample	Basis	Age (ka)	% error	Date (years AD)
UW1236	OSL/TL	0.970±0.072	7.4	1035 ± 73
UW1237	OSL/TL	0.871±0.079	9.1	1134 ± 79
UW1238	OSL/TL	0.891±0.085	9.6	1114± 85
UW1239	OSL/TL	0.788±0.056	7.0	1217 ± 56
UW1240	OSL/TL	0.955±0.090	9.4	1050 ± 90
UW1241	OSL	1.189±0.133	11.2	816 ± 133
UW1242	OSL/TL	1.117±0.062	5.6	888 ± 62
UW1243	TL	0.932±0.135	14.5	1073 ± 135
UW1244	OSL	1.154±0.125	10.8	851 ± 125
UW1245	OSL/TL	0.146±0.021	9.1	1859 ± 13
UW1246	OSL	1.169±0.134	11.5	836 ± 134
UW1247	OSL/TL	0.847±0.062	7.4	1158 ± 63

For the sites excavated in 2004, the TL and OSL ages for UW1416 were in agreement, after a correction for TL fading. For UW1417 and UW1418, the OSL age was taken as the best estimate because of fading of the TL signal. This was verified for UW1417, but a correction still underestimated the age in comparison with OSL. A fading test produced too scattered data to be conclusive for UW1418. OSL produced a Pleistocene age for UW1419, so the TL age was taken to be the estimate. No significant fading was detected for this sample. It is uncertain why the OSL signal was so large.

Table Z.21. Derived ages and bases for the 2004 TL samples.

Sample	Age (ka)	% error	Calendar date	Basis for age
UW1416	0.623±0.039	6.2	AD 1383 ± 39	OSL/corrected TL
UW1417	0.542±0.033	6.1	AD 1464 ± 33	OSL
UW1418	0.512±0.028	5.5	AD 1494 ± 28	OSL
UW1419	0.753±.108	14.3	AD 1253 ± 108	TL

For the sites excavated in 2005, the TL and OSL ages were in agreement for UW1502, UW1504, UW1505 UW1507 and UW1586. In the case of UW1504, the IRSL age agreed as well. For UW1586, the TL age was first corrected for fading. On UW1503, the IRSL age agreed with the fading-corrected TL age. The OSL age was slightly older, but the TL and IRSL were judged to be the best estimate. The age could be underestimated. For UW1506, no OSL age was obtained and the IRSL age is probably too young because of fading. The TL signal also faded, but correction produced a rather old, imprecise date, so the uncorrected TL was taken as the best estimate, although possibly underestimated. UW1508 behaved similarly to UW1506 but the fading correction produced a reasonably precise date. For UW1509 both TL and IRSL produced younger dates. Fading was evident for TL but the correction was still young. OSL was taken as the best estimate.

Table Z.22. Derived ages and bases for the 2005 TL samples.

Sample	Age (ka)	% error	Calendar age	Basis for age
UW1502	0.611±0.043	7.1	AD1395±43	TL/OSL
UW1503	0.801±0.114	14.2	AD1205±114	corrTL/IRSL
UW1504	0.722±0.047	6.5	AD1284±47	TL/OSL/IRSL
UW1505	1.014±0.059	5.8	AD 992±59	TL/OSL
UW1506	0.729±0.059	8.0	AD1277±58	TL
UW1507	0.591±0.039	6.6	AD1415±39	TL/OSL
UW1508	0.795±0.073	9.2	AD1211±73	corrTL
UW1509	0.813±0.053	6.6	AD1193±53	OSL
UW1586	0.619±0.057	7.9	AD1388±49	corrTL/OSL

Procedures for Thermoluminescence Analysis of Pottery

Sample Preparation -- fine grain

The sherd is broken to expose a fresh profile. Material is drilled from the center of the cross-section, more than 2 mm from either surface, using a tungsten carbide drill tip. The material retrieved is ground gently by a corundum mortar and pestle, treated with HCl, and then settled in acetone for 2 and 20 minutes to separate the 1-8 µm fraction. This is settled onto a maximum of 72 stainless steel discs.

Glow-Outs

Thermoluminescence is measured by a Daybreak reader using a 9635Q photomultiplier with a Corning 7-59 blue filter, in N_2 atmosphere at 1°C/s to 450°C. A preheat of 240°C with no hold time precedes each measurement. Artificial irradiation is given with a ^{241}Am alpha source and a ^{90}Sr beta source, the latter calibrated against a ^{137}Cs gamma source. Discs are stored at room temperature for at least one week after irradiation before glow out. Data are processed by Daybreak TLApplic software.

Fading Test

Several discs are used to test for anomalous fading. The natural luminescence is first measured by heating to 450°C. The discs are then given an equal alpha irradiation and stored at room temperature for varied times: 10 min, 2 hours, 1 day, 1 week and 8 weeks. The irradiations are staggered in time so that all of the second glows are performed on the same day. The second glows are normalized by the natural signal and then compared to determine any loss of signal with time (on a log scale). If the sample shows fading and the signal versus time values can be reasonably fit to a logarithmic function, an attempt is made to correct the age following procedures recommended by Huntley and Lamothe (2001).

Equivalent Dose

The equivalent dose is determined by a combination additive dose and regeneration (Aitken 1985). Additive dose involves administering incremental doses to natural material. A growth curve plotting dose against luminescence can be extrapolated to the dose axis to estimate an equivalent dose, but for pottery this estimate is usually inaccurate because of errors in extrapolation due to nonlinearity. Regeneration involves zeroing natural material by heating to 450°C and then rebuilding a growth curve with incremental doses. The problem here is sensitivity change caused by the heating. By constructing both curves, the regeneration curve can be used to define the extrapolated area and to correct for sensitivity change by comparing it with the additive dose curve. This works where the shapes of the curves differ only in scale (i.e., the sensitivity change is independent of dose). The curves are combined using the "Australian slide" method in a program developed by David Huntley of Simon Fraser University (Prescott et al. 1993). The equivalent dose is taken as the horizontal distance between the two curves after a scale adjustment for sensitivity change. Where the growth curves are not linear, they are fit to quadratic functions. Dose increments (usually five) are determined so that the maximum additive dose results in a signal about three times that of the natural and the maximum regeneration dose about five times the natural. If the regeneration curve has a significant negative intercept, which is not expected given current understanding, the additive dose intercept is taken as the best, if not fully reliable approximation.

A plateau region is determined by calculating the equivalent dose at temperature increments between 240° and 450°C and determining over which temperature range the values do not differ significantly. This plateau region is compared with a similar one constructed for the b-value (alpha efficiency), and the overlap defines the integrated range for final analysis.

Alpha Effectiveness

Alpha efficiency is determined by comparing additive dose curves using alpha and beta irradiations. The slide program is also used in this regard, taking the scale factor (which is the ratio of the two slopes) as the b-value (Aitken 1985).

Radioactivity

Radioactivity is measured by alpha counting in conjunction with atomic emission for ^{40}K. Samples for alpha counting are crushed in a mill to flour consistency, packed into plexiglass containers with ZnS:Ag screens, and sealed for one month before counting. The pairs technique is used to separate the U and Th decay series. For atomic emission measurements, samples are dissolved in HF and other acids and analyzed by a Jenway flame photometer. K concentrations for each sample are determined by bracketing between standards of known concentration.

Conversion to ^{40}K is by natural atomic abundance. Radioactivity is also measured, as a check, by beta counting, using a Risø low level beta GM multicounter system. About 0.5 g of crushed sample is placed on each of four plastic sample holders. All are counted for 24 hours. The average is converted to dose rate following Bøtter-Jensen and Mejdahl (1988) and compared with the beta dose rate calculated from the alpha counting and flame photometer results.

Both the sherd and an associated soil sample are measured for radioactivity. Additional soil samples are analyzed where the environment is complex, and gamma contributions determined by gradients (after Aitken 1985: Appendix H). Cosmic radiation is determined after Prescott and Hutton (1988). Radioactivity concentrations are translated into dose rates following Adamiec and Aitken (1998).

Moisture Contents

Water absorption values for the sherds are determined by comparing the saturated and dried weights. For temperate climates, moisture in the pottery is taken to be 80 ± 20 percent of total absorption, unless otherwise indicated by the archaeologist. Again for temperate climates, soil moisture contents are taken from typical moisture retention quantities for different textured soils (Brady 1974:196), unless otherwise measured. For drier climates, moisture values are determined in consultation with the archaeologist.

Procedures for Optically Stimulated or Infrared Stimulated Luminescence of Fine-Grained Pottery

Optically stimulated luminescence (OSL) or infrared stimulated luminescence (IRSL) on fine-grain (1-8µm) pottery samples is carried out on single aliquots following procedures adapted from Banerjee et al. (2001) and Roberts and Wintle (2001). Equivalent dose is determined by the single-aliquot regenerative dose (SAR) method (Murray and Wintle 2000).

The SAR method measures the natural signal and the signal from a series of regeneration doses on a single aliquot. The method uses a small test dose to monitor and correct for sensitivity changes brought about by preheating, irradiation or light stimulation. SAR consists of the following steps: 1) preheat, 2) measurement of natural signal (OSL or IRSL), L(1), 3) test dose, 4) cut heat, 5) measurement of test dose signal, T(1), 6) regeneration dose, 7) preheat, 8) measurement of signal from regeneration, L(2), 9) test dose, 10) cut heat, 11) measurement of test dose signal, T(2), 12) repeat of steps 6 through 11 for various regeneration doses. A growth curve is constructed from the L(i)/T(i) ratios and the equivalent dose is found by interpolation of L(1)/T(1). Usually a zero regeneration dose and a repeated regeneration dose are employed to insure the procedure is working properly. For fine-grained ceramics, a preheat of 240°C for 10s, a test dose of 1.8 Gy, and a cut heat of 160°C are currently being used, although these parameters may be modified from sample to sample.

The luminescence, L(i) and T(i), is measured on a Risø TL-DA-15 automated reader by a succession of two stimulations. First, 100s at 60°C of IRSL (880nm diodes), and second 100s at 125°C of OSL (470nm diodes). The OSL is also called blue stimulated luminescence (BSL). Detection is through 7.5mm of Hoya U340 (ultra-violet) filters. The stimulations are used to construct IRSL and OSL growth curves, so that two estimations of equivalent dose are available. Only feldspars are sensitive to IRSL, but they are also sensitive to blue light. Nevertheless, the IRSL exposure is expected to greatly reduce the feldspar contribution, so that the OSL signal is mainly from quartz. The procedure is still undergoing study.

Alpha efficiency for IRSL and OSL is measured by adding two alpha regeneration doses to the SAR sequence, retaining the beta irradiation for the test dose. The slope of the alpha growth curve is compared to the slope of the beta growth curve to determine a b-value.

APPENDIX AA
SUMMARY OF COALITION PERIOD CULINARY WARE DATA

Table AA.1. Inventory of thin-sectioned culinary ceramics from Pajarito Plateau Coalition period sites.

Site No.	Sample No.	ID No.	Unit No.	Ceramic Type	Temper Type	Point-count Analysis?
60372	163	969	90S/88E	Plain Gray	Crushed Volcanic Rock (Mafic)	y
60372	164	983	90S/88E	Smeared-indented corrugated	Coarse Anthill Sand	y
60372	165	984	90S/88E	Smeared-indented corrugated	Fine Anthill Sand	
60372	166	1021	90S/88E	Smeared-indented corrugated	Coarse Anthill Sand	
60372	167	1024	90S/88E	Smeared-indented corrugated	Fine Anthill Sand	y
60372	168	962	90S/88E	Plain gray	Crushed Volcanic Rock (Mafic)	
60372	169	966	90S/88E	Smeared-indented corrugated	Coarse Anthill Sand	
60372	170	967	90S/88E	Smeared-indented corrugated	Coarse Anthill Sand	y
60372	171	1083	90S/88E	Plain gray	Coarse Anthill Sand	y
60372	172	1082	90S/88E	Smeared-indented corrugated	Fine Anthill Sand	
60372	173	1135	90S/88E	Smeared-indented corrugated	Coarse Anthill Sand	
60372	174	1046	90S/88E	Smeared-indented corrugated	Coarse Anthill Sand	
60372	177	1107	90S/88E	Smeared-indented corrugated	Coarse Anthill Sand	y
60372	178	1108	90S/88E	Smeared-indented corrugated	Fine Anthill Sand	y
60372	179	1098	90S/88E	Smeared-indented corrugated	Fine Anthill Sand	
86534	197	1250	1817	Smeared-indented corrugated	Coarse Anthill Sand	y
86534	200	1265	1824	Smeared-indented corrugated	Fine Anthill Sand	y
86534	201	1271	1824	Smeared-indented corrugated	Fine Anthill Sand	
86534	202	1272	1824	Smeared-indented corrugated	Fine Anthill Sand	
86534	203	1273	1824	Smeared-indented corrugated	Coarse Anthill Sand	
86534	204	1274	1824	Smeared-indented corrugated	Coarse Anthill Sand	
86534	205	1275	1824	Smeared-indented corrugated	Fine Anthill Sand	y
86534	206	1295	2126	Smeared-indented corrugated	Coarse Anthill Sand	y
86534	207	1251	1817	Smeared-indented corrugated	Coarse Anthill Sand	y
12587	208	1143	4157	Smeared-indented corrugated	Coarse Anthill Sand	
12587	210	1157	4162	Smeared-indented corrugated	Sparse Mica	y
12587	211	1151	4162	Clapboard	Coarse Anthill Sand	
12587	212	1152	4162	Smeared-indented corrugated	Fine Anthill Sand	y
12587	217	1217	5099	Plain gray	Coarse Anthill Sand	y

Site No.	Sample No.	ID No.	Unit No.	Ceramic Type	Temper Type	Point-count Analysis?
12587	218	1213	5099	Plain gray	Fine Anthill Sand	y
12587	219	1218	5099	Smeared-indented corrugated	Coarse Anthill Sand	
12587	220	1219	5099	Smeared-indented corrugated	Coarse Anthill Sand	y
12587	221	1236	5099	Smeared-indented corrugated	Sparse Mica	y
12587	222	1179	5135	Plain gray	Sparse Mica	
12587	223	1168	5135	Smeared-indented corrugated	Fine Anthill Sand	
12587	224	1163	5135	Smeared-indented corrugated	Coarse Anthill Sand	y
12587	225	1191	5176	Plain gray	Fine Anthill Sand	y
12587	226	1192	5176	Smeared-indented corrugated	Fine Anthill Sand	
12587	227	1203	5176	Smeared-indented corrugated	Sparse Mica	

Table AA.2. Qualitative attributes of temper in Pajarito Coalition period culinary ceramics.

	Mineral Grains					Lithic Grains		
Sample	**Grain Size Mode**	**Dominant**	**Accessory 1**	**Accessory 2**	**Accessory 3**	**Type 1**	**Type 2**	**Type 3**
163	Medium sand	Feldspar	Quartz	Olivine	Fe Oxides	Basalt	Basalt	Andesite
164	Very coarse sand	Feldspar	Quartz	Biotite	Plagioclase	Rhyolite		
165	Fine sand	Feldspar	Quartz	Biotite		Rhyolite	Pumice	Andesite
166	Very coarse sand	Feldspar	Quartz	Plagioclase	Biotite	Andesite		
167	Fine sand	Feldspar	Quartz		Diatoms	Pumice	Rhyolite	
168	Coarse Sand	Plagioclase	Olivine	Pyroxene		Basalt	Basalt	Basalt
169	Very coarse sand	Feldspar	Quartz	Plagioclase	Biotite	Rhyolite	Andesite	
170	Very coarse sand	Feldspar	Quartz	Plagioclase	Biotite	Andesite	Rhyolite	
171	Very coarse sand	Feldspar	Quartz		Diatoms	Rhyolite	Andesite	Pumice
172	Very coarse sand	Feldspar	Quartz	Plagioclase	Biotite	Rhyolite	Pumice	Andesite
173	Very coarse sand	Feldspar	Quartz	Plagioclase		Rhyolite		
174	Granule	Feldspar	Quartz			Andesite	Rhyolite	Basalt
177	Granule	Feldspar	Quartz	Plagioclase	Biotite	Rhyolite	Andesite	Basalt
178	Very coarse sand	Feldspar	Quartz	Plagioclase	Biotite	Andesite	Rhyolite	Andesite
179	Coarse Sand	Plagioclase	Feldspar	Quartz	Biotite	Rhyolite	Andesite	
197	Very coarse sand	Feldspar	Quartz	Plagioclase	Biotite	Rhyolite	Andesite	

	Mineral Grains					Lithic Grains		
Sample	**Grain Size Mode**	**Dominant**	**Accessory 1**	**Accessory 2**	**Accessory 3**	**Type 1**	**Type 2**	**Type 3**
200	Medium sand	Quartz	Feldspar	Fe Oxides		Rhyolite	Glass	
201	Medium sand	Quartz	Feldspar			Basalt		
202	Coarse Sand	Feldspar	Quartz	Amphibole	Biotite	Rhyolite		
203	Very coarse sand	Feldspar	Quartz			Rhyolite	Basalt	
204	Very coarse sand	Feldspar	Quartz	Plagioclase	Biotite	Rhyolite	Andesite	
205	Coarse Sand	Feldspar	Quartz	Biotite	Earthy hematite/Diatoms	Basalt	Andesite	
206	Very coarse sand	Feldspar	Quartz			Rhyolite		
207	Very coarse sand	Feldspar	Quartz	Biotite	Olivine	Rhyolite	Andesite	Glass
208	Very coarse sand	Feldspar	Quartz	Biotite	Plagioclase	Rhyolite		
210	Coarse Sand	Microcline	Quartz	Plagioclase	Muscovite	Granitic		
211	Granule	Feldspar	Quartz	Plagioclase	Biotite			
212	Coarse Sand	Feldspar	Quartz			Rhyolite	Pumice	
217	Very coarse sand	Feldspar	Quartz	Plagioclase	Biotite/Diatoms	Andesite	Pumice	
218	Medium sand	Quartz	Feldspar		Diatoms	Rhyolite		
219	Very coarse sand	Feldspar	Quartz	Plagioclase	Biotite	Rhyolite		
220	Coarse Sand	Feldspar	Quartz	Biotite	Fe Oxides	Andesite	Pumice	
221	Coarse Sand	Microcline	Plagioclase	Quartz	Muscovite	Granitic		
222	Coarse Sand	Microcline	Quartz	Muscovite	Biotite	Granitic		
223	Medium sand	Quartz	Feldspar	Quartz	Plagioclase	Rhyolite	Pumice	
224	Very coarse sand	Feldspar	Quartz		Diatoms	Rhyolite		
225	Medium sand	Quartz	Quartz	Feldspar		Rhyolite	Pumice	
226	Medium sand	Quartz	Quartz	Feldspar	Biotite	Andesite	Basalt	Rhyolite
227	Coarse Sand	Microcline	Quartz	Muscovite	Biotite	Granitic		

Table AA.3. Point-count data from Pajarito Coalition culinary ceramics – general categories and generic temper groups.

Sample No.	Total Grains	Mineral & Lithic Grains (m+l)		Mineral Grains (m)		Lithic Grains		Glass (% of Lithics)		Non-Glass Lithics (% of Lithics)		Minerals & Non-glass Lithics (% of Mineral + Lithics)		m/m+l	Generic Temper Group
		n	%	n	%	n	%	n	%	n	%	n	%		
163	1039	343	33.0	69	20.1	274	79.9	5	1.8	269	98.2	338	98.5	20.1	LV
164	1017	292	28.7	148	50.7	144	49.3	130	90.3	14	9.7	162	55.5	50.7	mLVg
167	834	96	11.5	74	77.1	22	22.9	14	63.6	8	36.4	82	85.4	77.1	Mg
170	712	150	21.1	139	92.7	11	7.3	3	27.3	8	72.7	147	98.0	92.7	Mg
171	839	171	20.4	59	34.5	112	65.5	99	88.4	13	11.6	72	42.1	34.5	mLVg
177	962	151	15.7	83	55.0	68	45.0	22	32.4	46	67.7	129	85.4	55.0	mLVg
178	786	165	21.0	71	43.0	94	57.0	53	56.4	41	43.6	112	67.9	43.0	mLVg
197	528	109	20.6	56	51.4	53	48.6	5	9.4	48	90.6	104	95.4	51.4	mLV
200	685	99	14.5	61	61.6	38	38.4	12	31.6	26	68.4	87	87.9	61.6	mLVg
205	744	147	19.8	93	63.3	54	36.7	25	46.3	29	53.7	122	83.0	63.3	mLVg
206	816	128	15.7	80	62.5	48	37.5	16	33.3	32	66.7	112	87.5	62.5	mLVg
207	462	95	20.6	57	60.0	38	40.0	19	50.0	19	50.0	76	80.0	60.0	mLVg
210	748	325	43.5	205	63.1	120	36.9	0	0.0	120	100.0	325	100.0	63.1	mLP
212	691	224	32.4	61	27.2	163	72.8	39	23.9	124	76.1	185	82.6	27.2	LVg
217	888	235	26.5	126	53.6	109	46.4	93	85.3	16	14.7	142	60.4	53.6	mLVg
218	761	111	14.6	59	53.2	52	46.9	20	38.5	32	61.5	91	82.0	53.2	mLVg
220	511	152	29.8	100	65.8	52	34.2	18	34.6	34	65.4	134	88.2	65.8	mLVg
221	587	242	41.2	152	62.8	90	37.2	1	1.1	89	98.9	241	99.6	62.8	mLP
224	633	153	24.2	106	69.3	47	30.7	23	48.9	24	51.1	130	85.0	69.3	mLVg
225	1103	257	23.3	190	74.0	67	26.1	15	22.4	52	77.6	242	94.2	73.9	mLVg

M = Mineralic: m/m+l ≥80 percent; L = Lithic: m/m+l ≤ 35 percent; mL = Mixed mineral and lithic: m/m+l between 35 and 75 percent; The addition of V = volcanic, P = plutonic, M = metamorphic; g = Glass grains ≥ 20 percent of all lithic grains

Table AA.4. Point-count data for Pajarito Coalition culinary ceramics - lithic parameters and matrix parameters.

		Lithic Parameters										Matrix Parameters						
Sample No.	Mineral & Lithic Grains	Lvf	Lvi	Lvm	Lvv	Pum	Lvh	Lma	Lmt	Lpf	Lpi	Total Points	Clay Lump	Grog	Other	Unkn	Paste	Voids
163	343	1.5	0.9	76.1	1.5	0.0	0.0	0.0	0.0	0.0	0.0	1139	0.0	0.0	0.0	0.2	56.3	4.7
164	292	4.5	0.0	0.0	44.5	0.0	0.0	0.0	0.0	0.3	0.0	1117	0.2	0.0	0.0	0.0	60.3	4.4
167	96	6.3	0.0	0.0	13.5	1.0	0.0	0.0	0.0	2.1	0.0	934	8.9	0.1	0.5	0.1	63.9	5.5
170	150	4.0	0.7	0.0	1.3	0.7	0.0	0.0	0.0	0.7	0.0	812	0.0	0.2	0.0	0.0	64.0	4.9
171	171	6.4	0.0	0.0	45.6	12.3	1.2	0.0	0.0	0.0	0.0	939	1.7	0.5	0.1	0.0	64.9	3.9
177	151	29.8	0.0	0.0	14.6	0.0	0.0	0.0	0.0	0.7	0.0	1062	0.7	0.8	0.0	0.0	71.7	3.3
178	165	24.8	0.0	0.0	26.7	5.5	0.0	0.0	0.0	0.0	0.0	886	0.7	0.3	0.0	0.1	65.2	3.7
197	109	44.0	0.0	0.0	4.6	0.0	0.0	0.0	0.0	0.0	0.0	628	0.0	0.0	0.0	0.0	62.3	4.5
200	99	26.3	0.0	0.0	9.1	3.0	0.0	0.0	0.0	0.0	0.0	785	0.0	0.1	0.0	0.1	71.1	3.3
205	147	19.7	0.0	0.0	15.0	2.0	0.0	0.0	0.0	0.0	0.0	844	0.2	0.0	0.2	0.0	66.8	3.4
206	128	25.0	0.0	0.0	9.4	3.1	0.0	0.0	0.0	0.0	0.0	916	0.0	0.0	0.0	0.0	72.3	2.8
207	95	15.8	3.2	0.0	15.8	4.2	1.1	0.0	0.0	0.0	0.0	562	0.0	0.0	0.0	0.2	61.7	3.4
210	325	2.2	0.0	0.0	0.0	0.0	21.2	12.9	0.0	0.0	0.6	848	0.1	0.0	0.0	0.1	43.9	5.8
212	224	54.5	0.9	0.0	13.8	3.6	0.0	0.0	0.0	0.0	0.0	791	0.0	0.0	0.0	0.0	52.6	6.4
217	235	6.8	0.0	0.0	8.5	31.1	0.0	0.0	0.0	0.0	0.0	988	1.0	0.0	0.1	0.2	56.7	8.1
218	111	28.8	0.0	0.0	16.2	1.8	0.0	0.0	0.0	0.0	0.0	861	3.9	1.9	0.1	0.0	64.9	4.6
220	152	13.2	8.6	0.0	5.3	6.6	0.7	0.0	0.0	0.0	0.0	611	0.0	0.0	0.0	0.0	52.4	6.4
221	242	4.5	0.0	0.0	0.4	0.0	28.1	3.7	0.4	0.0	0.0	687	0.1	0.0	0.4	0.1	44.7	4.8
224	153	15.7	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	733	0.1	0.0	0.5	0.0	61.4	3.4
225	257	19.1	0.8	0.0	5.1	0.8	0.0	0.0	0.0	0.4	0.0	1203	0.1	0.0	0.1	0.1	66.1	4.0

Table AA.5. Point-count data from Pajarito Coalition culinary ceramics – mineral parameters.

Sample No	Total Points	Mineral & Lithic Grains	Qtz	Mic	Fspar	Plag	Fsalt	Fsgn	Opq	Musc	Biot	Px	Amph	Oliv	Epid	CaCO
			%	%	%	%	%	%	%	%	%	%	%	%	%	%
163	1139	343	3.8	0.0	8.2	1.5	2.0	0.0	0.0	0.0	0.0	1.7	0.0	2.6	0.3	0.0
164	1117	292	16.8	0.0	29.1	0.0	3.4	0.0	1.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0
167	934	96	18.8	0.0	0.0	55.2	0.0	2.1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
170	812	150	24.7	0.0	52.7	2.0	10.7	0.0	2.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0
171	939	171	2.9	0.0	18.7	0.0	7.6	0.0	0.6	1.8	1.2	0.0	0.0	0.0	1.8	0.0
177	1062	151	9.9	0.0	29.8	0.7	9.9	0.0	2.0	0.7	0.0	1.3	0.0	0.0	0.7	0.0
178	886	165	6.7	0.0	26.1	0.6	7.9	0.0	0.6	0.0	0.0	0.0	0.6	0.0	0.6	0.0
197	628	109	13.8	0.0	32.1	1.8	2.8	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200	785	99	10.1	0.0	30.3	1.0	15.2	1.0	1.0	2.0	0.0	1.0	0.0	0.0	0.0	0.0
205	844	147	21.8	0.0	36.1	0.0	3.4	0.0	0.7	1.4	0.0	0.0	0.0	0.0	0.0	0.0
206	916	128	12.5	0.0	35.9	0.0	8.6	1.6	0.8	0.8	0.8	0.0	0.8	0.0	0.8	0.0
207	562	95	12.6	0.0	37.9	3.2	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
210	848	325	12.0	4.9	18.2	3.4	9.2	2.2	2.2	6.5	3.7	0.3	0.0	0.0	0.6	0.0
212	791	224	3.6	0.0	16.1	0.0	7.1	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0
217	988	235	14.9	0.0	27.7	0.4	7.7	0.0	0.0	0.4	0.9	0.0	1.3	0.4	0.0	0.0
218	861	111	18.9	0.0	27.0	0.9	2.7	0.0	0.9	0.0	0.9	1.8	0.0	0.0	0.0	0.0
220	611	152	16.4	0.0	40.8	1.3	5.3	0.0	0.7	0.0	0.7	0.0	0.7	0.0	0.0	0.0
221	687	242	12.0	3.7	16.1	1.2	15.3	2.5	1.2	5.4	4.1	0.8	0.0	0.0	0.0	0.4
224	733	153	22.9	0.0	37.9	2.0	5.9	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
225	1203	257	14.4	0.0	38.1	3.1	12.1	3.1	0.8	1.2	0.4	0.8	0.0	0.0	0.0	0.0

APPENDIX BB
SUMMARY OF CLASSIC PERIOD CULINARY WARE DATA

Table BB.1. Inventory of thin-sectioned micaceous culinary ceramics from Pajarito Plateau Classic-period sites.

Site No	Unit	Sample No.	ID No.	Type	Temp obs	Point-count Analysis
82	B	48	281	Washboard	Dense Mica	y
82	B	49	282	Washboard	Sparse Mica	y
82	B	50	283	Washboard	Dense Mica	
82	B	58	328	Plain Gray	Dense Mica	y
82	B	59	327	Washboard	Sparse Mica	
82	B	60	300	SIC	Sparse Mica	
82	B	70	381	Plain Gray	Dense Mica	
82	B	71	392	Plain Gray	Sparse Mica	y
82	B	72	399	Clapboard	Dense Mica	y
82	B	73	393	Plain Gray	Dense Mica	
82	B	77	452	Clapboard	Dense Mica	
82	B	78	459	Plain Gray	Dense Mica	
82	B	79	458	Plain Gray	Dense Mica	
82	B	80	455	Plain Gray	Sparse Mica	
82	B	81	457	Plain Gray	Sparse Mica	y
82	B	82	453	Washboard	Sparse Mica	y
82	B	83	441	Plain Gray	Sparse Mica	
82	B	87	488	Plain Gray	Sparse Mica	
82	B	88	496	Plain Gray	Dense Mica	
82	B	89	497	Plain Gray	Dense Mica	
82	B	102	530	Plain Gray	Dense Mica	
82	B	103	528	Plain Gray	Dense Mica	y
82	A	126	119	Plain Gray	Sparse Mica	
82	A	127	120	Plain Gray	Dense Mica	y
82	A	128	121	Plain Gray	Dense Mica	y
82	A	137	201	Plain Gray	Dense Mica	y
82	A	138	202	Plain Gray	Dense Mica	y
82	A	139	203	Plain Gray	Dense Mica	
82	A	140	205	Plain Gray	Sparse Mica	y

Site No	Unit	Sample No.	ID No.	Type	Temp obs	Point-count Analysis
82	A	142	228	Plain Gray	Dense Mica	
3840	129S98E	156	6	Plain Gray	Dense Mica	y
3840	129S98E	157	1	SIC	Dense Mica	y
3840	129S98E	158	3	Plain Gray	Dense Mica	y
3840	129S98E	159	2	Plain Gray	Sparse Mica	y
60550	112S108E	180	39	Plain Gray	Sparse Mica	y
60550	112S108E	181	40	Plain Gray	Sparse Mica	y
60550	112S108E	182	8	Plain Gray	Dense Mica	
60550	112S108E	183	11	Plain Gray	Dense Mica	
60550	112S108E	186	23	Plain Gray	Sparse Mica	y
60550	112S108E	191	27	SIC	Dense Mica	
60550	112S108E	193	34	Plain Gray	Sparse Mica	
60550	112S108E	194	44	Plain Gray	Dense Mica	y

Table BB.2. Qualitative attributes of temper in Pajarito Classic period micaceous culinary ceramics.

	Mineral Grains					Lithic Grains		
Sample No.	**Grain Size Mode**	**Dominant**	**Accessory 1**	**Accessory 2**	**Accessory 3**	**Type 1**	**Type 2**	**Type 3**
48	Medium sand	Quartz	Plagioclase	Biotite	Muscovite	Granitic		
49	Coarse sand	Muscovite	Feldspar	Quartz	Biotite	Granitic		
50	Coarse sand	Muscovite	Quartz	Feldspar	Biotite	Granitic		
58	Coarse sand	Muscovite	Quartz	Biotite	Feldspar	Granitic		
59	Medium sand	Quartz	Microcline	Biotite	Muscovite	Andesite	Granitic	Basalt
60	Medium sand	Quartz	Feldspar	Fe Oxides	Mica	Granitic		
70	Medium sand	Muscovite	Quartz	Feldspar	Microcline	Granitic		
71	Coarse sand	Quartz	Muscovite	Feldspar		Rhyolite	Granitic	
72	Coarse sand	Quartz	Muscovite	Feldspar	Biotite	Granitic		
73	Medium sand	Muscovite	Feldspar	Microcline	Quartz	Granitic		
77	Medium sand	Muscovite	Quartz	Feldspar	Biotite	Granitic		
78	Coarse sand	Muscovite	Feldspar	Quartz	Biotite	Granitic		
79	Coarse sand	Quartz	Feldspar	Microcline	Biotite	Granitic		
80	Coarse sand	Muscovite	Quartz	Feldspar	Biotite	Granitic		
81	Fine sand	Plagioclase	Muscovite	Fe Oxides	Quartz	Andesite		
82	Medium sand	Quartz	Muscovite	Feldspar	Biotite	Mica Schist	Andesite	
83	Medium sand	Plagioclase	Quartz	Fe Oxides	Pyroxene	Basalt		
87	Medium sand	Quartz	Plagioclase			Rhyolite	Basalt	Pumice
88	Coarse sand	Quartz	Biotite	Feldspar	Muscovite	Granitic		
89	Granule	Muscovite	Quartz	Biotite	Feldspar	Granitic		
102	Coarse sand	Muscovite	Quartz	Biotite	Fe Oxides	Granitic		
103	Coarse sand	Muscovite	Quartz	Biotite	Feldspar	Mica Schist		
126	Very fine sand	Quartz	Quartz	Plagioclase	Microcline	Granitic	Andesite	
127	Medium sand	Quartz	Muscovite	Plagioclase		Basalt	Rhyolite	Mica Schist
128	Granule	Muscovite	Quartz	Biotite	Fe Oxides	Granitic		
137	Granule	Muscovite	Quartz	Biotite	Fe Oxides	Granitic		

	Mineral Grains					Lithic Grains		
Sample No.	**Grain Size Mode**	**Dominant**	**Accessory 1**	**Accessory 2**	**Accessory 3**	**Type 1**	**Type 2**	**Type 3**
138	Coarse sand	Muscovite	Quartz	Biotite	Fe Oxides	Granitic		
139	Coarse sand	Muscovite	Quartz	Biotite	Fe Oxides	Granitic		
140	Medium sand	Quartz	Feldspar	Biotite	Fe Oxides	Andesite	Basalt	
142	Coarse sand	Quartz	Muscovite	Microcline	Plagioclase	Granitic		
156	Coarse sand	Quartz	Muscovite	Microcline	Biotite	Granitic		
157	Coarse sand	Muscovite	Biotite	Feldspar	Quartz	Granitic		
158	Coarse sand	Quartz	Muscovite	Microcline	Biotite	Granitic		
159	Coarse sand	Feldspar	Muscovite	Quartz	Biotite	Granitic		
180	Coarse sand	Microcline	Plagioclase	Quartz	Biotite	Granitic		
181	Medium sand	Quartz	Muscovite	Microcline	Plagioclase	Granitic		
182	Granule	Microcline	Quartz	Muscovite	Fe Oxides	Granitic	Mica Schist	
183	Granule	Quartz	Muscovite	Plagioclase	Microcline	Granitic	Mica Schist	
186	Very coarse sand	Quartz	Biotite	Microcline	Plagioclase	Granitic		
191	Medium sand	Microcline	Plagioclase	Quartz	Muscovite	Granitic		
193	Coarse sand	Quartz	Muscovite	Feldspar	Fe Oxides	Granitic		
194	Very coarse sand	Microcline	Plagioclase	Quartz	Muscovite	Granitic		

Table BB.3. Point-count data for Pajarito Classic period micaceous culinary ceramics – generic temper groups.

Sample No	Total Grains	Mineral & Lithic Grains (m+l)		Mineral Grains (m)		Lithic Grains		Glass (% of Lithics)		Non-Glass Lithics (% of Lithics)		Minerals & Non-glass Lithics (% of m+l)		m/m+l	Generic Temper Group
		n	%	n	%	n	%	n	%	n	%	n	%		
48	756	311	41.1	173	55.6	138	44.4	0	0.0	138	100.0	311	100.0	55.6	mLP
49	851	412	48.4	243	59.0	169	41.0	0	0.0	169	100.0	412	100.0	59.0	mLP
58	835	390	46.7	161	41.3	229	58.7	0	0.0	229	100.0	390	100.0	41.3	mLP
71	993	230	23.2	161	70.0	69	30.0	0	0.0	69	100.0	230	100.0	70.0	mLVP
72	721	323	44.8	156	48.3	167	51.7	0	0.0	167	100.0	323	100.0	48.3	mLP
81	692	252	36.4	94	37.3	158	62.7	1	0.6	157	99.4	251	99.6	37.3	mLV
82	1156	308	26.6	240	77.9	68	22.1	0	0.0	68	100.0	308	100.0	77.9	mLVM
103	910	462	50.8	205	44.4	257	55.6	0	0.0	257	100.0	462	100.0	44.4	mLM
127	759	109	14.4	65	59.6	44	40.4	2	4.5	42	95.5	107	98.2	59.6	mLVM
128	760	351	46.2	198	56.4	153	43.6	0	0.0	153	100.0	351	100.0	56.4	mLP
137	779	344	44.2	174	50.6	170	49.4	0	0.0	170	100.0	344	100.0	50.6	mLP
138	960	452	47.1	279	61.7	173	38.3	0	0.0	173	100.0	452	100.0	61.7	mLP
140	782	234	29.9	37	15.8	197	84.2	0	0.0	197	100.0	234	100.0	15.8	LV
156	753	268	35.6	124	46.3	144	53.7	0	0.0	144	100.0	268	100.0	46.3	mLP
157	481	237	49.3	137	57.8	100	42.2	0	0.0	100	100.0	237	100.0	57.8	mLP
158	529	203	38.4	111	54.7	92	45.3	0	0.0	92	100.0	203	100.0	54.7	mLP
159	617	277	44.9	143	51.6	134	48.4	1	0.7	133	99.3	276	99.6	51.6	mLP
180	746	268	35.9	153	57.1	115	42.9	0	0.0	115	100.0	268	100.0	57.1	mLP
181	831	371	44.6	170	45.8	201	54.2	0	0.0	201	100.0	371	100.0	45.8	mLP
186	870	390	44.8	279	71.5	111	28.5	6	5.4	105	94.6	384	98.5	71.5	mLP
194	1030	422	41.0	238	56.4	184	43.6	0	0.0	184	100.0	422	100.0	56.4	mLP

M = Mineralic: m/m+l ≥80 percent; L = Lithic: m/m+l ≤ 35 percent; mL = Mixed mineral and lithic: m/m+l between 35 and 75 percent; The addition of V = volcanic, P = plutonic, M = metamorphic; g = Glass grains ≥ 20 percent of all lithic grains.

Table BB.4. Point-count data from Pajarito Classic period micaceous culinary ceramics – mineral parameters.

Sample No.	Total Grains	Mineral & Lithic Grains	Qtz	Micro	Fspar	Plag	Fsalt	Fsgn	Opq	Musc	Biot	Chlor	Px	Amph	Oliv	Epid	Sphene
48	756	311	7.4	1.0	8.7	0.6	11.3	1.0	1.0	3.2	21.2	0.0	0.0	0.0	0.0	0.3	0.0
49	851	412	10.9	0.2	7.0	2.9	6.6	0.7	2.2	22.8	5.6	0.0	0.0	0.0	0.0	0.0	0.0
58	835	390	6.4	0.0	4.1	0.3	7.9	0.0	1.5	13.3	7.7	0.0	0.0	0.0	0.0	0.0	0.0
71	993	230	15.7	1.3	28.7	1.7	12.2	0.0	1.3	8.3	0.9	0.0	0.0	0.0	0.0	0.0	0.0
72	721	323	7.7	0.3	5.3	0.0	6.5	0.0	0.9	23.5	3.4	0.0	0.3	0.0	0.3	0.0	0.0
81	692	252	9.9	0.4	4.0	8.7	1.6	0.0	0.0	10.3	0.4	0.0	2.0	0.0	0.0	0.0	0.0
82	1156	308	23.7	0.0	14.0	1.3	15.9	0.0	4.2	14.3	4.2	0.0	0.3	0.0	0.0	0.0	0.0
103	910	462	6.3	0.0	4.1	0.2	6.1	0.2	0.9	22.5	3.9	0.0	0.2	0.0	0.0	0.0	0.0
127	759	109	10.1	0.0	14.7	0.0	11.9	3.7	5.5	8.3	3.7	0.9	0.9	0.0	0.0	0.0	0.0
128	760	351	8.8	0.0	6.6	0.0	6.8	0.3	2.0	24.5	7.1	0.0	0.3	0.0	0.0	0.0	0.0
137	779	344	12.8	0.0	4.9	0.9	4.4	0.0	2.6	16.6	8.4	0.0	0.0	0.0	0.0	0.0	0.0
138	960	452	7.7	0.0	13.5	1.3	10.6	0.9	1.3	17.0	9.1	0.0	0.0	0.2	0.0	0.0	0.0
140	782	234	3.8	0.0	5.1	1.7	2.1	0.0	1.7	0.0	0.4	0.0	0.9	0.0	0.0	0.0	0.0
156	753	268	12.3	0.7	2.6	0.7	10.1	0.7	1.1	11.2	6.3	0.0	0.4	0.0	0.0	0.0	0.0
157	481	237	13.9	0.0	9.7	1.3	9.7	0.0	1.7	15.2	6.3	0.0	0.0	0.0	0.0	0.0	0.0
158	529	203	8.4	2.0	11.3	0.0	14.8	0.0	2.5	11.8	3.9	0.0	0.0	0.0	0.0	0.0	0.0
159	617	277	6.1	0.7	6.1	4.3	13.4	2.5	2.2	11.9	3.2	0.0	0.4	0.4	0.0	0.0	0.4
180	746	268	13.8	3.0	13.8	2.6	15.3	1.9	0.4	3.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0
181	831	371	9.7	2.7	10.8	0.8	7.0	0.0	1.9	8.1	2.2	0.0	1.9	0.8	0.0	0.0	0.0
186	870	390	8.7	4.4	10.0	1.3	16.9	1.5	1.8	5.6	19.0	0.0	1.5	0.0	0.5	0.3	0.0
194	1030	422	11.4	9.5	14.7	2.1	14.0	0.0	0.2	3.8	0.7	0.0	0.0	0.0	0.0	0.0	0.0

Table BB.5. Point-count data for Pajarito Classic period micaceous culinary ceramics – lithic and matrix parameters.

		Lithic Parameters											Matrix Parameters						
Sample No	Mineral & Lithic Grains	Lvf	Lvi	Lvm	Lvv	Pum	Lvh	Lma	Lmt	Lpf	Lpi	Lpm	Total Points	Clay lump	Grog	Other	Unkn	Paste	Voids
48	311	0.3	0.3	0.0	0.0	0.0	34.7	7.1	1.9	0.0	0.0	0.0	756	0.0	0.0	0.0	0.0	50.7	8.2
49	412	0.2	0.0	0.0	0.0	0.0	38.1	1.2	1.5	0.0	0.0	0.0	851	0.0	0.0	0.1	0.0	42.2	9.3
58	390	0.0	0.0	0.0	0.0	0.0	37.7	21.0	0.0	0.0	0.0	0.0	835	0.0	0.0	0.0	0.0	44.4	8.9
71	230	7.8	0.0	0.0	0.0	0.0	9.6	0.9	0.0	11.7	0.0	0.0	993	0.0	0.0	0.0	0.0	71.4	5.4
72	323	1.2	0.0	0.0	0.0	0.0	42.1	6.2	2.2	0.0	0.0	0.0	721	0.0	0.0	0.0	0.1	48.1	6.9
81	252	6.0	49.2	4.4	0.4	0.0	2.8	0.0	0.0	0.0	0.0	0.0	692	0.0	1.3	0.0	0.0	56.4	5.9
82	308	10.7	0.3	0.0	0.0	0.0	10.7	0.3	0.0	0.0	0.0	0.0	1156	2.3	0.0	0.0	0.0	67.6	3.5
103	462	0.2	0.0	0.0	0.0	0.0	30.1	24.0	1.3	0.0	0.0	0.0	910	0.0	0.0	0.0	0.0	37.9	11.3
127	109	12.8	0.0	12.8	1.8	0.0	9.2	2.8	0.9	0.0	0.0	0.0	759	0.0	2.5	1.2	0.1	74.7	7.1
128	351	0.0	0.0	0.0	0.0	0.0	37.6	5.7	0.3	0.0	0.0	0.0	760	0.0	0.0	0.0	0.0	45.5	8.3
137	344	0.0	0.0	0.0	0.0	0.0	45.1	4.4	0.0	0.0	0.0	0.0	779	0.0	0.0	0.1	0.0	45.1	10.7
138	452	1.5	0.0	0.0	0.0	0.0	33.2	3.5	0.0	0.0	0.0	0.0	960	0.0	0.0	0.0	0.0	45.0	7.9
140	234	37.2	45.7	0.4	0.0	0.4	0.4	0.0	0.0	0.0	0.0	0.0	782	0.0	0.0	0.8	0.0	62.7	6.6
156	268	0.4	0.0	0.0	0.0	0.0	42.9	10.1	0.0	0.0	0.4	0.0	753	0.0	0.0	0.0	0.0	58.6	5.8
157	237	0.8	0.0	0.0	0.0	0.0	41.4	0.0	0.0	0.0	0.0	0.0	481	0.0	0.0	0.2	0.0	43.2	7.3
158	203	0.5	1.0	0.0	0.0	0.0	39.9	3.4	0.5	0.0	0.0	0.0	529	0.0	0.0	0.0	0.0	50.9	10.8
159	277	2.2	0.0	0.0	0.4	0.0	44.4	0.7	0.7	0.0	0.0	0.0	617	0.0	0.0	0.0	0.0	49.1	6.0
180	268	3.4	0.0	0.0	0.0	0.0	39.2	0.0	0.4	0.0	0.0	0.0	746	0.0	0.0	0.0	0.0	56.4	7.6
181	371	0.0	0.0	0.0	0.0	0.0	51.2	3.0	0.0	0.0	0.0	0.0	831	0.0	0.0	0.0	0.0	48.9	6.5
186	390	0.3	0.5	0.0	1.5	0.8	22.6	0.8	0.8	0.0	0.0	1.3	870	0.0	0.0	0.0	0.0	46.9	8.3
194	422	0.0	0.0	0.0	0.0	0.0	39.8	3.8	0.0	0.0	0.0	0.0	1030	0.0	0.0	0.0	0.0	45.3	13.7

APPENDIX CC

Description of Ceramic Methodology

The following is the list of ceramic attributes that the Museum of New Mexico uses to perform basic pottery analyses. This includes sorting by pottery ware and type, vessel form, pigment type, interior and exterior modifications, temper and paste composition, rim sherd size and diameter, and vessel wall thickness.

Museum of New Mexico
Office of Archaeological Studies
Ceramic Analysis Coding List
Updated November 2005

TEMPER TYPE

0	Not examined
1	Indeterminate
2	Sand
3	Granite with abundant mica
4	Granite without abundant mica
5	Highly micaceous (residual) paste
6	Sherd
7	Sherd and sand
8	Fine tuff or ash
9	Large tuff fragments (vitric tuff)
10	Fine tuff and sand
11	Leucocratic igneous or granite (El Paso area)
12	Fine sandstone
13	Fine Jornada leucocratic igneous
14	Gray crystalline basalt
15	Sand and mica
16	Crushed andesite or diorite
17	Andesite diorite with sherd
18	Andesite diorite with sand and sherd
19	San Marcos latite
20	Fine sand or silt, and mica
21	Indeterminate dark igneous
22	Self tempered
23	Dark igneous and sherd (Chupadero)
24	Taos granite
25	Dark igneous and sand
26	Trachyte (Chuska area)
27	Mogollon volcanics
28	Coarse sand and fine igneous
29	Latite
30	Trachyte and sherd
31	Ant hill sand
32	Shale, sand, and sherd
33	Dark feldspar
34	Sherd and calcium carbonate
35	Fine feldspar, quartz, and hornblende
36	Dark igneous (southern origin)
37	Calcium carbonate
38	Micaceous schist (Gran Quivara)
39	Hornblende tuff
40	Fine Jornada leucocratic igneous and sherd
42	Sand and Mogollon volcanics
43	Basalt and sand
44	Oblate shale and sand
45	Dark crystalline particles and tuff
47	Tuff and mica
48	Andesite or diorite, sand, and shale
50	Vitrified
51	Casas Grandes igneous
52	Shale, dark particles, and mica
53	Tuff, mica and sand
54	Dark sand
55	Quartz and sandstone
56	Shale and sherd
57	Shale
58	Latite and Sand
59	Mica, quartz, and sandstone
60	Very Fine Sand (silt)
61	Quartzite (Leucocratic Igneous)
62	Multi-lithic sand
63	Dark matrix sandstone
64	Andesite or diorite with sand
65	Basalt (Zia)
70	Tuff and Phenocrysts (anthill)
71	Scoria (reddish porous basalt)
75	Quartz, Tuff, Mica in micaceous paste
76	Oblate shale and tuff
77	Large tuff predominate with anthill sand
78	Sapawe (Schist w/ mica, late Rio Grande)
79	Jemez Ash (predominately large ash and/or tuff)
80	Jemez Basalt (predominately basalt w/ash or tuff)

ADDITIONAL TEMPER TYPES (Duwe)

90	Tuff w/quartz sand
91	Tuff w/quartz sand and volcanics
92	Tuff w/quartz sand and plutonics
93	Tuff w/quartz sand and volcanics and plutonics

POTTERY TYPE

INDETERMINATE TRADITION

1101	Indeterminate Utility Ware
1201	Unpainted Undifferentiated White
1202	Mineral Paint Undifferentiated
1203	Indeterminate Organic Paint
1302	Indeterminate Red Ware
1401	Indeterminate Black Ware

NORTHERN RIO GRANDE (TEWA) TRADITION

Prehistoric White Ware

2201	Unpainted Undifferentiated White
2202	Mineral Paint Undifferentiated
2203	San Marcial Black-on-white
2204	Pueblo II Indeterminate Mineral
2205	Red Mesa Black-on-white Rio Grande Paste
2206	Red Mesa Black-on-white Squiggle Hatchure
2207	Kwahe'e Black-on-white Solid Designs

2208 Kwahe'e Black-on-white Thin Parallel Lines
2210 Kwahe'e Black-on-white Hatchured Gallup Style
2211 Kwahe'e Black-on-white Solid and Hatchure
2212 Kwahe'e Black-on-white Checkerboard
2213 Kwahe'e Black-on-white Other Design
2216 Organic Paint Undifferentiated
2217 Indeterminate Organic Coalition Paste
2218 Santa Fe Black-on-white
2219 Wiyo Black-on-white
2229 Biscuit Ware Unpainted Slipped Both Sides
2230 Biscuit Ware Painted Unspecified
2231 Biscuit A Abiquiu Black-on-white
2232 Biscuit B Bandelier Black-on-white
2233 Sankawi Black-on-cream
2234 Unpainted Santa Fe Paste (Seldom Used)
2236 Galisteo Black-on-white
2237 Unpainted Galisteo Paste
2238 Unpainted Biscuit Ware Slipped One Side
2240 Jemez-Santa Fe Vallecitos Black-on-white
2241 Jemez Paste, slipped, unpainted
2250 Organic Slipped Red
2251 Gallina Black-on-white
2252 Biscuit Ware, Slip and Paint Not Observable

Northern Rio Grande (Tewa) Historic Decorated and Polychrome Ware

2533 Tewa Polychrome (type)
2534 Ogapoge Polychrome
2535 Pojoaque Polychrome
2536 Tewa Polychrome Painted Undifferentiated (Two Slips)
2537 Black-on-cream Undifferentiated
2538 Historic Organic Paint Undifferentiated No Slip
2539 Powhoge Polychrome
2540 Historic White\Cream Slipped Unpainted
2541 Red-on-tan Unpainted
2542 Historic Unpainted Red and Cream Slipped
2543 San Juan Red-on-tan
2544 Historic Tewa Black-on-red
2545 Sakona Polychrome
2550 Jemez Black-on-white
2551 Jemez Unpainted
2552 Casitas Red-on-brown
2553 Tewa Paste With Mineral Paint
2554 Powhoge-like Late Polychrome

Prehistoric Utility Ware

3101 Plain Gray Rim
3102 Unknown Gray Rim
3103 Plain Gray Body
3104 Wide Neckbanded
3105 Wide Neckbanded Wiped
3106 Incised Neckbanded
2209 Kwahe'e Black-on-white Thick Parallel Lines
3107 Coiled Neckbanded
3108 Clapboard Neck
3109 Plain Scored Gray
3110 Basket Impressed Gray
3111 Indented Corrugated
3112 Incised Corrugated
3113 Plain Corrugated
3114 Smeared Plain Corrugated
3115 Alternating Corrugated
3116 Punched Corrugated
3117 Incised Plain Corrugated
3118 Smeared Indented Corrugated
3119 Patterned Corrugated
3120 Polished Gray
3121 Neck Corrugated
3122 Plain Incised
3126 Low Relief Corrugated
3130 Mica Utility Undifferentiated
3131 Sapawe Micaceous (Early Form)
3132 Potsuwi'i Incised
3133 Thin Plain Non Micaceous -Classic period
3134 Brushed
3140 Mud Ware
3141 Punctated Gray
3401 Local Brown Ware

Historic Plain Ware

3151 Tewa Buff Undifferentiated
3152 Tewa Polished Gray
3153 Tewa Polished Black
3154 Highly Micaceous Paste
3155 Smudged Interior Mica Slip Exterior
3156 Tewa Polished Red
3157 Polished Interior with Mica Slip
3158 Smudged Micaceous
3159 Smudged Interior Buff Exterior
3160 Tewa Unpolished Black
3161 Wide Neckbanded Wiped
3162 Tewa Unpolished Buff
3163 Smudged Exterior Buff Interior
3166 Unpolished Micaceous Slip
3167 Incised Utility Unpolished
3170 Micaceous Utility Undifferentiated (Temper not examined)
3171 Sapawe Micaceous (Late Variety)
3172 Potsuwi=i Incised
3173 Striated Micaceous
3179 Historic Plain Neck Banded
3180 Smudged Interior Unpolished Exterior
3181 Smudged Interior Corrugated Exterior
3185 Tewa Polished Gray with Mica Slip

3186 Tewa Polished Black with Mica Slip
3187 Polished with Highly Micaceous Paste
3401 Local Brown Ware

Sand Tempered Gray Wares
4101 Plain Gray Rim
4102 Unknown Gray Rim
4103 Plain Gray Body
4104 Wide Neckbanded
4105 Wide Neckbanded Wiped
4106 Incised Neckbanded
4107 Coiled Neckbanded
4108 Clapboard Neckbanded
4109 Plain Wiped Scored Gray
4110 Basket Impressed Gray
4111 Indented Corrugated
4112 Incised Corrugated
4113 Plain Corrugated
4114 Smeared Plain Corrugated
4115 Alternating Corrugated
4116 Punched Corrugated
4117 Incised Plain Corrugated
4118 Smeared Indented Corrugated
4119 Patterned Corrugated
4120 Polished Gray
4121 Neck Corrugated
4122 Plain Incised
4123 Unfired Plain Gray Ware
4126 Low Relief Corrugated
4140 Mud Ware
4141 Lino Smudged

Cibola White Ware
(Sand and/or sherd temper)
4201 Unpainted Undifferentiated White
4202 Mineral Paint Undifferentiated
4203 Kiathulana Black-on-white
4204 Pueblo II Indeterminate Mineral
4205 Red Mesa Black-on-white
4206 Red Mesa Black-on-white Squiggle Hatchure
4207 Escavada Black-on-white Solid Designs
4208 Red Mesa Black-on-white Thin Parallel Lines
4209 Pueblo II Black-on-white Thick Parallel Lines
4210 Gallup Black-on-white
4213 Basketmaker III-PI Mineral Paint
4214 Chaco McElmo Black-on-white
4215 San Marcial Black-on-white
4216 Indeterminate Organic Paint
4217 Smudged White Paste
4218 White Mound Black-on-white
4219 La Plata Black-on-white
4220 Indeterminate Late Pueblo I design
4221 Reserve Black-on-white
4222 Tularosa Black-on-white
4223 Late Pueblo IV Cibola Design
4224 Local Red Slipped Red on Buff
4225 Reserve/Tularosa Black-on-white
4226 Klagetoh Black-on-white
4227 Snowflake Black-on-white
4229 PIII Indeterminate Organic Paint
4230 Chaco Black-on-white

WHITE MOUNTAIN & OTHER RED WARE TRADITION

4301 White Mountain Red Painted Undifferentiated
4302 Wingate Black-on-red
4303 Puerco Black-on-red
4304 St. Johns Black-on-red
4305 St. Johns Polychrome
4306 White Mountain Red Ware (Unpainted, Undifferentiated)
4307 Wingate Polychrome
4311 Tallahogan Red
4312 Tohatchi Red (red slip over red paste)
4313 Tohatchi Red-on-brown
4314 Local Red-on-brown
4325 Deadman Style, Cibola paste
4401 Local Brown Ware

MIDDLE RIO GRANDE (KERES AREA) TRADITION

Glaze Ware Series
Utility Ware
5103 Plain Gray (MRG)
5110 Carnue Gray
5153 Historic Polished Black (MRG)
5155 Smudged Interior Mica Slipped Exterior (MRG)
5157 Polished Interior Mica Slipped Exterior (MRG)

Glaze Ware
5401 Glaze Red Unpainted
5402 Glaze Polychrome Unpainted
5403 Glaze Yellow Unpainted
5404 Glaze Unslipped Unpainted
54055405 Glaze-on-polychrome Undifferentiated
5406 Glaze-on-red Undifferentiated
5407 Glaze Body Both Surfaces Missing
5408 Glaze-on-yellow Undifferentiated
5409 Glaze Unslipped Undifferentiated
5410 Red-on-glaze body (Probable A)
5448 Unpainted Glaze A Yellow Unpainted Rim

5449 Unpainted Glaze A Red Rim
5451 Los Padillas Glaze Polychrome (Glaze A
5452 Arenal Polychrome (Glaze A)
5453 San Clemente Polychrome (Glaze A)
5454 Cienequilla Glaze-on-yellow (Glaze A)
5455 Cienequilla Polychrome Glaze A (Glaze A)
5456 Tonque Glaze Polychrome
5457 Largo Glaze-on-yellow (Glaze B)
5458 Largo Glaze Polychrome (Glaze B)
5459 Espinosa Glaze Polychrome (Glaze C)
5460 San Lazaro Polychrome (Glaze D)
5461 Puaray Glaze-on-red (Glaze E)
5462 Puaray Glaze-on-yellow (Glaze E)
5463 Kotyiti Glaze-on-yellow (Glaze F)
5464 Kotyiti Glaze-on-red (Glaze F)
5465 Kotyiti Glaze Polychrome (Glaze F)
5466 Largo Glaze-on-red (Glaze B)
5467 Puaray Polychrome (Glaze E)
5468 Heshtauthla Poly (Glaze A)

Matte Paint Series
5502 Puname Polychrome Zia Basalt
5503 Puname Polychrome Santa Ana Sand
5504 Puname style Polychrome Tuff Temper
5505 Puname Polychrome Indeterminate (Zia

5606 Acoma/Zuni Polychrome Undifferentiated
5607 Puname Polychrome Unpainted
5625 Acoma/Zuni Polychrome Indeterminate
5626 Acoma/Zuni Historic Black-on-cream
5627 Acoma/ Zuni Historic White Unpainted
5628 Acoma/Zuni Historic Red Slip Unpainted
5629 Santa Ana Area Red Slipped Painted
5630 Santa Ana Area Red Slipped Unpainted

TAOS AREA TRADITION

Prehistoric Utility Ware
6101 Plain Gray Rim
6102 Unknown Gray Rim
6103 Plain Gray Body
6104 Wide Neckbanded
6105 Wide Neckbanded Wiped or Undulated
6106 Incised Neckbanded
6107 Coiled Necked
6108 Clapboard Neck
6109 Wiped Scored Gray
6110 Basket Impression Gray
6111 Indented Corrugated
6112 Incised Corrugated
6113 Plain Corrugated
6114 Smeared Plain Corrugated
6115 Alternating Corrugated
6116 Punched Corrugated
7237 Indeterminate Organic San Juan White Ware
7238 Mancos Black-on-white, Gallup Style

5450 Agua Fria Glaze-on-red (Glaze A)
6117
6118
6119
6120
6121
6122
6123
6124
6170
6171
6172
6180
6185

Prehistoric White Ware
6201
6202 Mineral paint Undifferentiated
6204
6206
6207
6208
6209
6210
6211
6212
6213
6214
6215
6216
6217
6219
6222
6223 Trampas Black-on-white

SAN JUAN TRADITION

Prehistoric Utility Ware
7103

Prehistoric White Ware
7201
7202
7204
7205
7206
7207
7208
7210
7211
7213
7235
7236

Prehistoric Red Ware
7301 Unpainted San Juan Red
7302 Undifferentiated Black Paint San Juan Red
7303 Deadmans Black-on-red
7304 Unpainted Slipped San Juan Red
7305 Abajo Red-on-orange

TUSAYAN TRADITION

Prehistoric White Ware
8202 Indeterminate Tusayan B/W
8203 Lino Black-on-white
8204 Kanaha Black-on-white

Prehistoric Red Ware
8301 Tsegi Orange Ware Slipped Unpainted
8302 Slipped Red Mineral Paint Undifferentiated
8303 Medicine Black-on-red

Prehistoric Yellow ware
8502 Black-on-yellow Undifferentiated
8503 Historic Hopi Polychrome Undifferentiated

CHUSKA TRADITION

Prehistoric Utility Ware
9113 Chuska Corrugated

Prehistoric White Ware
9201 Unpainted Undifferentiated
9202 Indeterminate Painted Chuska Paste
9203 Naschitti Black-on-white
9207 Brimhall Black-on-white
9208 Nava Black-on-white
9209 Chuska Black-on-white
9210 Toadlena Black-on-white

SOUTHERN JORNADA MOGOLLON (EL PASO) TRADITION

Red Ware
10301 Plain Slipped Red
10304 Undifferentiated R/b

Brown Ware
10401 El Paso Brown Rim
10403 El Paso Brown Body
10451
10452
12207 Socorro Black-on-white (Solid Designs)
12210 Socorro Black-on-white (Hatchured design)
12211 Socorro B/W (Hatchured and solid designs)
12440 Pitohe
12451 Los Lunas Smudged
10453

Polychrome Ware
10502
10503

NORTHERN JORNADA MOGOLLON TRADITION

White Ware
11201
11204
11207
11210
11211
11212
11215

Red Ware
11301
11302
11304
11305
11306
11307
11308
11309
11310
11315
11320
11321

Brown Ware
11401
11403
11404
11405
11408
11410
11411
11413
11451
11452
11455
11456
11458
11460

EASTERN MOGOLLON TRADITION

12201 El Paso Smudged Surface
12204 Thin El Paso Unpainted Brown
12452 Indented Corrugated Brown

MOGOLLON HIGHLAND TRADITION

Decorated Pottery
13201 Mogollon Red-on-brown
13202 Mimbres white ware Unpainted
13203 Mimbres Black-on-white Undifferentiated
13204 Three Circles Red-on-white
13205 Mimbres Boldface Black-on-white
13207 Classic Mimbres Black-on-white
13211 Indeterminate Painted Brown Ware

Red Ware
13302 San Francisco Red

Brown Ware
13401 Alma Plain Rim
13403 Alma Plain body
13404 Alma Scored
13410 Reserve Plain/Indented Corrugated
13411 Reserve Indented Corrugated
13412 Reserve Indented Corrugated Smudged
13413 Reserve Plain Corrugated
13414 Reserve Plain Corrugated Smudged
13420 Reserve Smudged
13421 Tularosa Patterned Smudged
13422 Plain Smudged with Red Slip exterior

CHIHUAHUA TRADITION

Red Ware
14301 Playas Plain Red
14302 Playas Incised

Polychrome
14502 Unpainted Decorated
14505 Ramos Polychrome
14506 Escondido Polychrome
14507 Barbicora Polychrome
14508 Indeterminate Thin Parallel Lines

SALADO TRADITION

15501 Slipped Unpainted (Salado Polychrome)
15502 Salado Painted (Undifferentiated)
15503 Red Slipped (Salado paste)
15505 Gila Polychrome

ATHABASCAN TRADITION
12 Indented corrugated
13 Plain corrugated
14 Smeared indented corrugated
15 Smeared plain corrugated
16 Wide neck banded wiped
17 Wide banded incised
18 Indented corrugated incised

16101
16103
16106
16120
16125
16510
16550
16551

Jemez
17101
17103
17111
17118
17180
17181

PIGMENT
0 Not recorded
1 None
2 Indeterminate
3 Mineral black
4 Mineral brown
5 Mineral red
6 Organic
7 Organic diffuse
8 Glaze paint
9 Black mineral int/ext
10 Sub-glaze
11 Indeterminate (burned-out)
12 Mineral black and red
13 Diffuse mineral
14 Organic Black-on-white clay polychrome

INTERIOR/EXTERIOR MANIPULATION
0 Not recorded
1 Plain unpolished
2 Plain polished
3 Polished white slip
4 Polished red slip
5 Polished smudged
6 Plain scored
7 Micaceous slip
8 Surface dis[illegible]
9 Wide coil (fillets)
10 Narrow coil
11 Clapboard

19 Plain indented corrugated
20 Alternating wide fillet/indented Corrugated
21 Punched corrugated
22 Plain incised herringbone
23 Patterned corrugated
24 Neck corrugated plain
25 Light polish white slip

26 Polished white slip/plain unpolished
27 Unpolished white slip
28 Polished thin white slip
29 Basket impressed
30 Vegetal impressed
31 Polished cream/red slip
32 Polished cream slip
33 Unpolished red slip
35 Zoned corrugated
36 Polished striated
37 Low relief corrugated
38 Parallel incised
39 Parallel herringbone incised
40 Polished thin cream
41 Unpolished cream
44 Fingernail Incised
45 Punctate linear
46 Punctate herringbone incised
47 Punctate linear and herringbone
48 Neck corrugated (indented)
49 Alternating wide neckbanded
50 Floated
51 Smudged with micaceous slip
52 Fugitive Red
54 Indeterminate incised
55 Smeared indeterminate
56 Alternating plain indented corrugated
57 Red or white micaceous slip
58 Polished red punctate
59 Red slip incised
60 Punctate
61 Smeared, plain corrugated with/mica slip
62 Incised/punctated w/mica slip
63 Brushed
64 Striated with mica slip
65 Polished gray with polished mica slip
66 Narrow coil w/ white slip
67 Alternating coil/indented corrugated
68 Alternating herringbone/parallel incised
100 Indeterminate

VESSEL FORM

0 Not applicable
1 Indeterminate
2 Bowl rim
3 Bowl body
4 Seed jar
5 Olla rim
54 Soup plate bottom
55 Jar foot
56 Square corner
57 Miniature soup plate
58 Pot rest
59 Jar body with indeterminate handle

MODIFICATIONS

0 Not applicable
6 Jar neck
7 Jar rim
8 Jar body
9 Jar body with strap or coil handle
10 Jar body with lug handle
11 Dipper with handle
12 Gourd dipper
13 Dipper rim
14 Indeterminate coil/strap handle
15 Canteen rim
16 Miniature jar
17 Miniature pinch pot rim
18 Miniature pinch pot body
19 Jar rim with strap handle
20 Cloud blower
21 Applique
22 Jar rim with lug handle
23 Bowl rim with indeterminate handle
24 Seed jar rim
25 Effigy
26 Fired coil
27 Body sherd polished int/ext
28 Body sherd unpolished
29 Body sherd unpolished int/polished ext
30 Body sherd polished int/unpolished ext
31 Feather box
32 Indeterminate rim
33 Soup plate
34 Pipe stem
35 Jar rim with coil handle
36 Pipe bowl
37 Dipper handle
38 Pitcher rim
39 Pitcher body
40 Terrace bowl
41 Curved pipe
43 Perforated coil (non-vessel)
44 Plate tray
45 Spindle Whorl
46 Figurine
47 Jar Lid
48 Flared bowl rim
49 Double Bowl
50 Candlestick
51 Olla
52 Indeterminate lug handle
53 Dipper body
1 None
2 Drill hole (complete)
3 Ceramic scraper
4 Beveled edge
5 Firing spall
6 Punched hole
7 Interior worn from cooking
8 Interior spall (erosion)
9 Abraded surface (exterior)

10 Drill hole (incomplete)
11 Interior surface partially worn
12 Abraded surface (interior)
13 Exterior firing spall
14 Interior partially spalled during firing
15 Rim wear
16 interior/exterior erosion
17 Sooted exterior/interior
18 Sooted interior
19 Exterior partially exfoliated (erosion)
20 Sooted exterior
21 Punched rim
22 Shaped (all sides)
23 Spindle whorl
24 Reshaped Rim
25 Shaped form with drilled hole (not spindle whorl or ornament)
26 Pendant
27 Pigment residue
28 Intentional Chipping
29 Serrated
30 Unknown residue
31 Small chip tray (poss. Puki)
32 Slag residue
33 Rounded from water transport
34 Drill with incised design
35 Single groove (incised)

CONSTRUCTION
0 Not examined
1 Indeterminate
2 Interior coil application
3 Exterior coil application

COMMENTS
1 Photo
2 Re-look
3 Partial vessel
4 Petrographic
5 Missing
8 Whole vessel
9 Written comment
10 Refired
11 Stylistic analysis
12 Photo and Stylistic analysis

WARE GROUP
1 Gray
2 White
3 Red
4 Plain Brown
4.5 Textured Brown
5 Glaze
6 Micaceous
7 Historic Plain
8 Historic Decorated
9 Polychrome

TRADITION
1 Indeterminate
2.0 Rio Grande (Prehistoric)
2.1 Rio Grande (Historic Tewa)
2.5 Rio Grande (Keres)
4 Cibola
6 Taos
7 Upper Rio Grande
8 Tusayan
9 Chuskan
10 Southern Jornada Mogollon (El Paso)
11 Northern Jornada Mogollon
12 Eastern Mogollon Highlands
13 Mogollon Highlands
14 Chihuahuan
15 Salado
16 Athabaskan

GROUP
1 Indeterminate White Ware
2 Cibola White Ware
2.5 Yellow Ware (Hopi)
3 Rio Grande Glaze Ware
4 El Paso Brown Ware
5 El Paso Polychrome
6 Chupadero (Black-on-white paste)
7 Three Rivers (red paste)
8 Jornada Brown Ware
9 Corona Corrugated
10 Mogollon Brown Ware
11 Chihuahuan Polychrome
12 Salado Polychrome

13 Athabaskan Utility

MUNSELL
0 Not examined
1 10R
2 2.5YR
3 5YR
4 7.5YR
5 10YR

Group
1 Indeterminate white ware
2 Cibola white ware
3 Rio Grande glaze ware
4 El Paso brown ware
5 El Paso polychrome
6 Chupadero Black-on-white paste
7 Three Rivers red ware
8 Jornada brown ware
9 Corona corrugated
10 Mogollon brown ware
11 Chihuahuan polychrome
12 Salado polychrome
13 Athabaskan utility

HISTORIC WARE GROUP
1 Prehistoric Gray Ware
2 Prehistoric White Ware
3 Prehistoric Red Ware
4 Prehistoric Glaze Ware
5 Prehistoric-Historic Black-on-cream
6 Historic Unpolished Micaceous Plain
7 Historic Micaceous Polished
8 Historic Buff Utility
9 Historic Red Utility
10 Historic Polished Gray\Black Utility
11 Historic Tewa Polychrome
12 Historic Intrusive Matte Paint Polychrome
13 Historic or Indeterminate Glaze Ware
14 Other
15 Prehistoric brown
16 Historic Intrusive Utility (Middle Rio Grande)

Thics White Slip (Duwe)

0 absent
1 present

For Rim Measurement (banding lines) (Duwe)

99 present but incomplete (not measureable)

Rim ticks (Duwe)

0 absent
1 present